

A Cloud-Based Integrated Management Model: Driving Operational Efficiency and Financial Accountability in Teacher Education Programs

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ARTICLE HISTORY

Received: 01 July 26

Final Revision: 09 July 26

Accepted: 14 July 26

Online Publication: 30 September 26

KEYWORDS

Teacher Professional Education, Integrated Management System, Cloud Computing, Job Order Card, Education Management

KATA KUNCI

Pendidikan Profesi Guru, Sistem Manajemen Terpadu, Komputasi Awan, Kartu Pesanan Pekerjaan, Manajemen Pendidikan

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DOI

10.37034/jems.v8i4.520

ABSTRACT

The management of the Teacher Professional Education (PPG) program involves a highly complex administrative and financial ecosystem, making it susceptible to bureaucratic inefficiency and information fragmentation among implementing divisions. This study aims to develop and implement a cloud-based Integrated Management Model utilizing digital job order cards to accelerate operational efficiency and strengthen reporting accountability. Adopting a participatory managerial innovation design, this research reengineers conventional workflows into a cohesive digital ecosystem. Data were collected through methodological triangulation, encompassing operational observations, system log extraction, and in-depth interviews with university leadership, administrative staff, and the finance division at the Graduate School of Universitas Negeri Malang. The implementation results demonstrate that system integration successfully curtailed clerical redundancy substantially and accelerated the fund availability verification process by up to 50%. The establishment of a centralized database created a single source of truth that effectively eliminated information asymmetry across units. Furthermore, the system automatically generated a digital audit trail ensuring every budget absorption was recorded transparently, thereby minimizing the probability of reporting revisions. In conclusion, managerial transformation through governance digitalization proves essential in realizing good governance principles. This integrated model serves not merely as a tactical solution for PPG operational effectiveness but also presents a highly scalable strategic prototype replicable across various other academic programs.

ABSTRAK

Pengelolaan Program Pendidikan Profesi Guru (PPG) melibatkan ekosistem administratif dan keuangan yang sangat kompleks, sehingga rentan terhadap inefisiensi birokrasi dan fragmentasi informasi antar divisi pelaksana. Penelitian ini bertujuan untuk mengembangkan dan mengimplementasikan Model Manajemen Terintegrasi berbasis komputasi awan (*cloud*) melalui instrumen *job order card digital* guna akselerasi efisiensi operasional dan memperkuat akuntabilitas pelaporan. Mengadopsi desain inovasi manajerial berbasis partisipatif, penelitian ini merencanakan ulang alur kerja konvensional menjadi ekosistem digital yang kohesif. Pengumpulan data dilakukan secara triangulasi melalui observasi operasional, ekstraksi log sistem, serta wawancara mendalam dengan unsur pimpinan, staf tata usaha, dan bagian keuangan di Sekolah Pascasarjana Universitas Negeri Malang. Hasil implementasi membuktikan bahwa integrasi sistem berhasil memangkas redundansi tugas klerikal secara substansial dan akselerasi proses verifikasi ketersediaan dana hingga 50%. Keberadaan basis data terpusat menciptakan sumber rujukan tunggal (*single source of truth*) yang secara efektif meniadakan asimetri informasi lintas unit. Lebih lanjut, sistem ini secara otomatis menghasilkan jejak audit digital (*digital audit trail*) yang memastikan setiap serapan anggaran terekam secara transparan, sehingga probabilitas revisi pelaporan dapat diminimalisasi. Sebagai simpulan, transformasi manajerial melalui digitalisasi tata kelola terbukti esensial dalam mewujudkan prinsip *good governance*. Model terintegrasi ini tidak sekadar menjadi solusi taktis bagi efektivitas penyelenggaraan PPG, melainkan juga menghadirkan prototipe strategis dengan skalabilitas tinggi untuk direplikasi pada berbagai program akademik lainnya.

1. Introduction

Global trends indicate that digital transformation has emerged as a primary catalyst for change in organizational governance across various sectors, including education. Digital transformation not only alters operational processes but also drives the restructuring of business models and organizational governance, rendering them more adaptive to technological advancements [1]. Modern organizations are increasingly required to integrate technology-driven work systems to improve operational efficiency, transparency, and accountability in resource management [2], [3]. In its evolution, digitalization no longer serves merely as an administrative tool; it has become a foundational cornerstone for data-driven decision-making and organizational performance enhancement [4]. Within this context, cloud-based information systems facilitate real-time data integration and cross-unit collaboration, thereby accelerating workflows, improving information accuracy, and supporting more responsive decision-making [5].

A study demonstrate that organizations adopting integrated digital management systems exhibit performance that is more adaptive, efficient, and responsive to the dynamics of the external environment [6]. Furthermore, the demand for implementing good governance principles has intensified, particularly within public organizations managing complex resources. Given that transparency and accountability serve as key indicators of governance success, fragmented systems are no longer deemed adequate to support these requirements [7]. Therefore, the integration of technology-based systems has become a strategic imperative to ensure sustainability, service quality, and the effectiveness of organizational governance in the digital era [8].

Within the context of Indonesian higher education, digital transformation has emerged as a key strategic agenda for enhancing the quality of academic and administrative governance. The utilization of digital technology not only facilitates the learning process but also reinforces the integration of business processes, resource management, and data-driven decision-making within higher education institutions. Consequently, universities are compelled to develop information systems capable of effectively integrating various organizational functions to enhance efficiency, transparency, and the quality of academic services [9].

The Teacher Professional Education Program (PPG) constitutes a national strategic initiative designed to produce professional educators by reinforcing pedagogical, professional, social, and personal competencies in alignment with national education standards [10]. The implementation of this program involves an array of complex activities, spanning from learning management within a Learning Management System (LMS), field experience programs (PPL), and

competency assessments, to academic and financial administration, thus necessitating integrated coordination among various institutional units [10], [11].

As a Teacher Training and Education Institution (LPTK) administering the PPG program, Universitas Negeri Malang bears the responsibility of ensuring that all academic processes, administration, and financial management of the program operate effectively, efficiently, and accountably. However, the operational complexity involving multiple institutional units with high information interdependency frequently engenders coordination impediments when the utilized information systems are not optimally integrated [9]. The fragmentation of information systems poses a risk of delaying information flow, generating data duplication, and causing reporting inconsistencies, thereby diminishing the effectiveness of organizational decision-making [12]. Consequently, reinforcing governance through an integrated information system has become a strategic imperative to elevate the quality of the PPG program's implementation, expedite cross-unit coordination, and deliver services that are more effective, transparent, and accountable [9], [11].

The primary issue in the management of educational programs generally lies in the fragmentation of information systems and the suboptimal integration of data across working units, which diminishes the efficiency of business processes and impedes rapid decision-making [12]. Within the Teacher Professional Education Program (PPG), although an innovation in the form of job order cards has been implemented as an instrument for planning and controlling activities, its implementation remains partial and has not yet been integrated into a digital information system, rendering it incapable of optimally supporting cross-divisional coordination. Consequently, cross-unit coordination processes still rely on manual communication, which is susceptible to delays in information delivery, miscommunication, and data inconsistency. Furthermore, administrative and financial verification processes frequently encounter obstacles when data is not available in real-time and remains dispersed across disparate documents and applications, thereby prolonging verification times and elevating the risk of recording errors [9]. Such conditions have the potential to engender task duplication, discrepancies between planned and actual activities, and a reduction in organizational workflow efficiency.

From a governance perspective, the limitations of an unintegrated documentation system also complicate reporting, monitoring, and evaluation processes, as well as the provision of audit trails required to ensure organizational transparency and accountability [11]. These issues indicate a gap between the organization's need for an integrated digital management system and prevailing conventional management practices. If these

conditions are not promptly addressed, the effectiveness of program implementation, service quality, and organizational governance are at risk of deteriorating. Therefore, there is a requisite for innovation in the form of an integrated information system capable of interconnecting all business processes, enhancing cross-unit coordination, providing real-time data, and supporting faster, more accurate, and accountable decision-making.

In response to these issues, this study proposes the development of a digital integrated management model through the integration of job order cards into a cloud-based system. This approach adopts the Integrated Management System (IMS) concept, coupled with cloud computing technology, to integrate business processes, enhance cross-functional coordination, and support data-driven decision-making. The implementation of a cloud-based system enables each division to simultaneously input, update, and access activity data via a single integrated database, thereby improving information consistency and mitigating the occurrence of information silos [13], [14]. This integration allows administrative and financial verification processes to be executed more rapidly, accurately, and with comprehensive documentation, as all data is available in real-time and fully traceable within a single platform. Additionally, the system features a monitoring dashboard that leadership and evaluators can utilize to track the progress of activity implementation, assess the alignment between planning and actualization, and support more effective decision-making. Through this integration, the system is anticipated to minimize process duplication, enhance operational efficiency, bolster reporting transparency, and improve the accountability of program management. Furthermore, the utilization of a cloud-based integrated information system fosters the cultivation of a data-driven culture, which supports collaboration, documentation discipline, and the enhancement of organizational governance quality. Consequently, the developed model functions not merely as an administrative tool, but rather as a strategic instrument to support digital transformation and elevate the management effectiveness of the Teacher Professional Education Program (PPG).

Drawing upon this background, this study aims to develop and implement an integrated management model for administering the Teacher Professional Education Program (PPG) through the integration of cloud-based digital job order cards. Specifically, this research seeks to enhance workflow efficiency, expedite administrative and financial verification processes, and bolster the transparency and accountability of program management. Additionally, the study endeavors to evaluate the effectiveness of the developed system based on indicators of efficiency, data accuracy, and user acceptance. The findings of this research are anticipated to offer practical

contributions by providing a management model that can be replicated across other educational programs. From an academic standpoint, this study is expected to enrich the existing literature on digital-based managerial innovations within the education sector. Furthermore, the research supports the application of good governance principles in the administration of public programs. Consequently, this study holds significant theoretical and practical relevance for the development of modern and sustainable educational governance.

2. Research Method

2.1. Research Approach and Design

This study adopts a qualitative approach with an intrinsic case study design, enabling exploration of organizational dynamics, program implementers' perceptions, and the managerial context that shapes the success or challenges of innovation [15], [16], [17]. This applied developmental design was selected not merely to explore existing governance dynamics, but also to engineer and implement an operational intervention in the form of an Integrated Management Model. Through the integration of cloud-based digital job order cards, a participatory approach ensures the collaborative engagement of all stakeholders in designing, testing, and validating the developed system, thereby enhancing the efficiency and accountability of program management.

2.2. Location and Timeframe

This research was conducted at the implementing unit of the Teacher Professional Education Program (PPG) within the Graduate School of Universitas Negeri Malang. Research subjects were selected utilizing purposive sampling based on their strategic roles within the activity governance ecosystem. Key informants encompassed activity implementation coordinators, financial division staff, and administrative education personnel. This cross-divisional representation is crucial for comprehensively mapping the information flow and evaluating the effectiveness of the collaborative system from various managerial authority perspectives.

2.3. Data Collection

Data collection was conducted holistically employing methodological triangulation techniques to ensure the depth and validity of the information. Data acquisition encompassed: (1) Operational observation, wherein the researchers directly observed existing workflows and the dynamics of user interaction with the digital job order cards; (2) Semi-structured interviews with the research subjects to delve into their perceptions, levels of user acceptance, and barriers to technological adaptation; and (3) Document analysis and digital footprint review (system log data), utilized to track data

entry history, verification speed, and budget report consistency.

2.4. Research Stages

The development and implementation of this integrated management model were executed continuously through four primary stages:

- a. Preparation and Needs Analysis Stage: This involved a critical evaluation of the manual job order cards' weaknesses from the preceding year, mapping the integration needs of cross-divisional workflows, and designing the database architecture for the new system.
- b. Integrated System Development Stage: Focused on designing interactive digital job order cards utilizing collaborative platforms (e.g., Google Sheets), developing a real-time monitoring dashboard, and configuring an automated notification system connecting data inputters with financial verifiers.
- c. Implementation Stage: Encompassed socialization and technical training for all executing users, followed by a trial run and the direct implementation of the system within the ongoing sequence of PPG operational activities.
- d. Evaluation and Model Refinement Stage: Comprised conducting post-implementation assessments of data processing time efficiency, gathering user feedback, and performing iterative model refinements based on empirical constraints encountered in the field.

2.5. Analysis Technique

The collected data were analyzed using a descriptive qualitative method. Qualitative data derived from field notes and interview transcripts were analyzed thematically to identify user behavioral patterns, bureaucratic bottlenecks, and adaptive responses to system digitalization. Meanwhile, historical data from documents and system logs were evaluated to measure efficiency metrics, such as the reduction ratio in financial verification duration and the decline in administrative error rates when compared to the preceding conventional management system. To uphold the credibility and validity of the findings, the researchers rigorously applied source, methodological, and temporal triangulation strategies throughout the analysis process.

3. Result and Discussion

3.1. Design and Development of a Cloud-Based Integrated Management Model

The implementation of a cloud computing-based digital job order card has fundamentally transformed the operational governance architecture of the Teacher Professional Education Program (PPG) at Universitas

Negeri Malang. Prior to this intervention, the job order card instrument existed in physical document form and was managed separately by each working unit, resulting in suboptimal cross-unit coordination. As stated by the Director of the Graduate School (SPs), the manual system was a commendable initial step toward administrative order; however, its transparency was suboptimal as physical documents frequently *"slipped away or were delayed on a single desk, meaning time efficiency was not achieved."* This finding aligns with research indicating that information system fragmentation constitutes a primary cause of low business process efficiency and delayed information flow within higher education institutions [9].

Through the utilization of a cloud-based collaborative platform, the developed integrated management model enables direct interconnection among the academic division, the financial verification section, and administrative education personnel. The system's design ensures that every data input from one division is automatically stored in a centralized database and can be processed in real-time by the subsequent division without necessitating manual document transfer. These characteristics align with the concept of a cloud-based integrated information system, which is capable of enhancing interoperability, accelerating information flow, and mitigating the occurrence of information silos within an organization.

The implementation results of this system also corroborate the Integrated Management System (IMS) concept, which posits that the integration of business processes through information systems can dismantle organizational silos and enhance cross-functional coordination. Concurrently, leadership asserted that operational information fragmentation is *"the primary adversary of public institution accountability,"* thereby necessitating a digital system capable of establishing a sustainable check-and-balance mechanism. Consequently, this transformation is not merely a process of digitizing records but rather constitutes a form of Business Process Redesign (BPR) that reengineers workflows, coordination mechanisms, and decision-making processes through the utilization of digital technology. This approach facilitates cross-functional process integration, eliminates non-value-added activities, and elevates the efficiency and service quality of the organization [18], [19]. System interoperability allows leadership to simultaneously access the dashboard to monitor key indicators, such as activity implementation status, the percentage of time target achievements, and budget realization compared to predetermined ceilings. The real-time availability of this information supports faster, more accurate, and data-driven decision-making in the event of program implementation deviations or operational constraints, as also reported in studies concerning cloud computing implementation in the governance of public sector and higher education organizations [4], [8].

3.2. Acceleration of Operational Workflow Efficiency

Regarding operational efficiency, the system's consistent implementation demonstrates a highly measurable acceleration in cross-unit administrative workflows. Digital system log data and functional field observations indicate a drastic reduction in document processing duration. From the operational perspective of the SPs Administrative Sub-coordinator, the primary impediment in the preceding system stemmed from *"waiting times (delays) and task duplication,"* wherein documents frequently stalled while awaiting validation or wet signatures, thereby severing the information flow. By transitioning to the cloud, administrative personnel no longer need to wait for physical files; once the executing division inputs data and secures approval, staff can immediately execute correspondence and logistical requirements, ensuring that *"parallel work can be conducted."*

This efficiency achievement aligns with Business Process Management (BPM) principles, which emphasize the importance of business process integration to eliminate non-value-added activities, mitigate task duplication, and enhance the quality of organizational processes [20]. This optimization has an exponential impact on institutional processing time savings. Financial representatives confirmed that the automated notifications from the new system *"can reduce time by up to 50%,"* whereas the fund availability verification process, which previously required 2 to 3 days due to manual document retrieval can now be *"completed in a matter of hours."* Within the broader spectrum of higher education management, the efficiency generated by this cloud system is no longer merely an administrative performance indicator on paper; it has materialized into the tangible effectiveness of educational administration.

3.3. Reinforcement of Financial Transparency and Accountability

In the dimension of fiscal management, the integration of digital job order cards generated a fundamental positive disruption to the transparency and accountability of PPG program financial reporting. This integrated model enforces strict entry protocols wherein every detail of budget requirements must be inputted from the planning phase. During the pre-integration period, the financial department frequently encountered anomalies wherein *"budgeted activities had already been executed, but the supporting evidence was submitted late,"* or implementation proceeded while the actual budget ceiling had depleted due to delayed manual data updates. Through the interactive cloud system, these anomalies can be mitigated, as financial verifiers can precisely *"check fund availability and lock the nominal amount"* immediately after an activity proposal enters the system. This systemic regulation dramatically reduces the

probability of discrepancies between the budget plan and actual realization in the field.

Furthermore, this cloud-based database architecture independently establishes an indisputable tracking mechanism. The financial division emphasized that the capability to record *"audit trails and automated timestamps"* constitutes the most essential feature in modern governance. The platform's ability to precisely detect the user entity inputting data alongside its chronology serves as a crucial instrument to *"minimize double claims and ensure that every rupiah disbursed... is valid for BPK (Supreme Audit Agency) or SPI (Internal Supervisory Unit) audits."* These findings reinforce the theoretical foundation of public sector governance, which stipulates that financial accountability can only be absolutely realized through transparent, systematic, and non-manipulative data tracking.

3.4. User Acceptance and Managerial Implications

From an organizational perspective, post-implementation evaluation indicates a highly elevated level of user acceptance, albeit accompanied by adaptation dynamics during the initiation phase. The Administrative Sub-coordinator noted that potential initial resistance was indeed expected, particularly among *"senior staff accustomed to paper."* However, this learning curve was accelerated due to the system's interface design, which utilizes a spreadsheet format functionally familiar to administrative personnel, coupled with adequate technical assistance. This workflow disruption was ultimately met with an affirmative response once program implementers experienced the direct benefit of a drastic reduction in month-end administrative stress.

The strategic implications of this successful digital-based governance implementation position the integrated management model not solely as a tactical operational solution, but also as a scalable policy design. The availability of comprehensive visual analytics bolsters leadership's capacity to execute data-driven decision-making. The success in suppressing inefficiencies within PPG governance paves the way for broader integration in the future, with the SPs Director projecting this model as an *"excellent prototype that can be replicated for regular postgraduate programs or even adopted by other faculties within UM as part of governance standardization."* Holistically, this research affirms that the digitalization of managerial instruments, coupled with a participatory approach, can serve as an essential foundation for cultivating a far more responsive, transparent, and accountable academic community work culture on a global scale.

4. Conclusion

In conclusion, this study affirms that the implementation of the Integrated Management Model

via cloud-based digital job order cards serves as an effective, transformative solution to address the governance complexities of the Teacher Professional Education Program (PPG) at Universitas Negeri Malang. Empirical findings demonstrate that real-time workflow integration significantly mitigates administrative inefficiencies, including reducing financial verification times by up to 50%, eliminating redundant tasks within administrative units, and providing leadership with accurate performance data. Theoretically, this research validates the robustness of the Integrated Management System and Business Process Management frameworks in bolstering public institution accountability through the provision of transparent and absolute digital audit trails. From a practical standpoint, the model has evolved from a mere operational aid into a strategic instrument that supports data-driven decision-making to realize good governance principles within higher education environments. As a scholarly contribution, this study offers a governance innovation prototype with high replicability across other academic units, while simultaneously serving as a foundation for developing educational management information systems that are more responsive, adaptive, and globally standardized in the future.

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