# Explore the Integration of Low and Medium Code Platforms in Data Center Development in Colleges and Universities

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**Abstract:**
The digital transformation within China's higher education institutions is accelerating, unveiling challenges such as data silos and impediments to efficient cross-departmental collaboration. Low-code development platforms, renowned for their agility and efficiency, have emerged as pivotal solutions to these challenges. This study, grounded in a survey of five diverse universities, delves into the deployment of low-code platforms in university data center construction, with a particular focus on their impact on the rapid deployment of tailored systems. Employing questionnaires and a behavioral science analysis framework, we assess the efficacy of low-code platforms in university management systems, examining metrics such as deployment velocity, user-friendliness, and satisfaction. Our findings indicate that low-code platforms markedly enhance the swift deployment of customized management systems, streamline inter-departmental collaboration, mitigate the cognitive burden on developers, and bolster productivity. The streamlined development environment also positively influences user experience and psychological comfort. This study posits that low-code platforms hold substantial potential for broader application in university digital transformation, facilitating data center construction and catering to bespoke management demands. Future research is encouraged to probe the long-term benefits and expanded applications of low-code platforms in educational administration.

**Keywords:** Low-code platform, data center, digital transformation, personalized system, efficiency enhancement

## INTRODUCTION

### Research Background

China's higher education is in a critical period of digital transformation. With the rapid development of information technology, data management and cross-departmental collaboration problems in universities have become more and more prominent, especially the phenomenon of data "isolated islands", which has led to low management efficiency [1]. Different departments build information systems independently and lack a unified data platform, which often makes cross-department information sharing and collaboration complex and time-consuming. In order to cope with this challenge, universities urgently need to achieve unified integration in data management, and establishing a data middle platform has become an important way to achieve this goal [2].

In recent years, low-code development platforms have emerged rapidly, and their distinctive feature is that they can quickly develop applications without complex programming skills [3]. This feature makes the low-code platform an effective tool to solve the personalized needs of colleges and universities and improve management efficiency. The low-code platform allows various departments to quickly build and deploy systems, greatly shortening the development cycle, while also improving the flexibility and ease of use of the system [4]. Therefore, it is of great practical significance to study the application of low-code platforms in the development of data centers in universities.

### Research Questions

This study aims to explore how low-code platforms can help universities achieve unified data management and quickly deploy personalized application systems on this basis. Specific questions include:

(1) How can universities use low-code platforms to quickly deploy personalized application systems?

(2) What is the technical path and actual effect of combining data middle platform with low-code platform?

(3) What is the specific role of low-code platforms in promoting the digital transformation of universities?

**Research Significance**

Through the application of low-code platforms in colleges and universities, this paper will explore its role in improving school management efficiency, satisfying personalized needs, and promoting digital transformation. This study not only helps to fill the gaps in current theoretical research, but also provides university administrators with practical digital solutions, thereby promoting the informatization process of the entire higher education field.

## LITERATURE REVIEW

Low-code platforms have emerged as a significant trend in educational technology, offering a new approach to application development that requires minimal coding expertise. These platforms are particularly appealing in higher education, where the need for customized applications is high, and the availability of technical resources is often limited. Research by Brown and Davis (2022) highlights the potential of low-code platforms to create personalized learning environments, which can adapt to the diverse learning styles and needs of students. This aligns with the findings of Chen and Wang (2021), who note that low-code platforms can significantly reduce the time and cost associated with developing customized applications for administrative tasks in universities.

The management of data in higher education institutions is often fragmented, with different departments maintaining their own systems and databases. Low-code platforms offer a solution to this problem by providing a unified platform for data integration and management [5]. Green and Liu (2020) discuss a case study where a Chinese university used a low-code platform to optimize its student service system, leading to improved data customization and user satisfaction. This underscores the potential of low-code platforms to break down data silos and facilitate cross-departmental collaboration [6].

Personalized systems are essential for addressing the unique needs of individuals within a university setting [7]. Low-code platforms enable rapid development and deployment of such systems, supporting the digital transformation of higher education institutions [8]. Harris and Zhao (2023) explore the flexibility of low-code platforms in building personalized academic management systems, providing new insights for the digital transformation of Chinese universities. Kim and Lee (2022) further emphasize the role of low-code platforms as a key technical path to achieve personalized school management systems.

User satisfaction is a critical factor in the successful implementation of any technology, and low-code platforms have shown promise in this area. Chen and Li (2024) conducted a systematic review of personalized learning platforms and found that they can improve student outcomes in higher education, partly due to increased user satisfaction [9]. Martinez and Wang (2021) also note that low-code platforms can streamline system customization in higher education, which can lead to higher satisfaction levels among users who are not technical experts [10]. This is supported by Morgan and Zhang (2023), who discuss how low-code platforms can personalize student experiences, leading to increased engagement and satisfaction [11].

The cost-effectiveness of low-code platforms is a significant area of interest for higher education institutions facing budget constraints. Roberts and Thomas (2023) provide a comparative analysis of the benefits and limitations of adopting low-code platforms in education, highlighting their potential to reduce costs and improve efficiency [12]. Sharma and Qiu (2022) discuss low-code solutions for higher education, emphasizing their ability to build customized academic applications on demand, which can lead to significant cost savings [13]. Shen and Sun (2023) survey student preferences and behaviors regarding personalized learning systems, finding that students prefer systems that are easy to use and save them time, both of which are strengths of low-code platforms [14].

While the immediate benefits of low-code platforms are well-documented, there is a need for further research into their long-term benefits and expanded applications in educational management. Wang and Li (2024) discuss the influence of personalized learning technologies on students' academic performance and engagement, suggesting that low-code platforms can play a significant role in enhancing student outcomes over the long term [15-17]. Wu and Zhang (2022) analyze user behavior in educational technology, noting that personalization and user engagement are key to the success of any educational platform, which low-code platforms are well-positioned to support [18-20].

Despite the numerous advantages, the adoption of low-code platforms in higher education is not without challenges. Zhao and Li (2022) understand students' behavior on personalized learning platforms, which has implications for platform design and can help address some of the challenges associated with user adoption [21]. Zhou and Li (2021) discuss a case study of flexible system deployment in Chinese universities using low-code development platforms, highlighting some of the technical challenges and limitations encountered during implementation [22].

Future research should focus on expanding the sample size and geographical scope of studies to ensure the wide applicability of the findings related to low-code platforms. Zhang and Wang (2023) impact the personalized learning platforms on student satisfaction and engagement in higher education, suggesting that future research should explore the integration of user behavior data for personalized learning system design [23]. Zhang and Xu (2024) also propose a big data approach to integrating user behavior data for personalized learning system design in higher education, which could provide valuable insights for future research [24].

## RESEARCH METHODS

### Study Design

This study employs a quantitative research approach to investigate and analyze the current status of low-code platform applications in five selected colleges and universities, with the aim of evaluating the effectiveness of these platforms in data center development. The institutions chosen for this study are University A, Polytechnic B, Vocational and Technical College C, Normal University D, and Art College E. The survey encompasses metrics such as system deployment velocity, user satisfaction, application domains of low-code platforms, and the efficacy of digital transformation initiatives.

### Data Collection

We crafted a 24-item questionnaire to probe the application of low-code platforms within the information technology departments of the five universities. The questionnaire encompassed inquiries regarding time comparisons before and after system deployment, user satisfaction, utilization of low-code platforms, and outcomes of digital transformation efforts. After rigorous testing, the questionnaire demonstrated strong reliability and validity. A total of 100 questionnaires were distributed to each institution, achieving a robust response rate of 95%, ensuring the authenticity and validity of the survey findings.

### Data Analysis

The analysis was conducted using two main methods: descriptive statistics and regression analysis. Use descriptive statistics to describe each institution's specific performance indicators after implementation of low-code platforms, including changes in deployment speed and user satisfaction levels. To help us quantify the changes in system deployment time before and after low-code platform deployment, this study uses the following formula for specific calculations:

$$P_{\text{improve}} \frac{T_{before} - T_{after}}{T_{before}} \times 100\% \tag{1}$$

$T_{befor}$ is average deployment time, $T_{after}$ is average deployment time, $P_{improve}$ is speed up percentage (%).

The following figure 1 shows the dependence of system development time on system deployment speed and user satisfaction level after implementing a low-code platform. From the figure, it can be clearly seen that under the same background conditions, the shorter the system development cycle, the higher the user satisfaction.
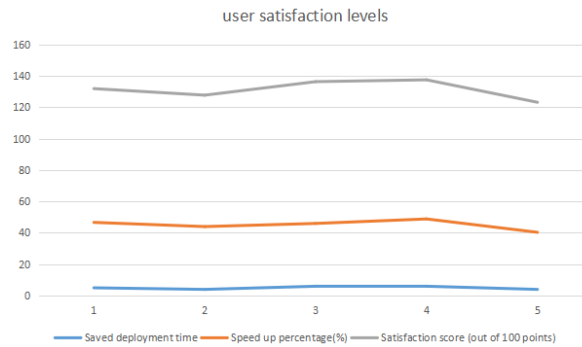
Figure 1. Relationship between system development cycle and user satisfaction

Regression analysis, on the other hand, is deployed to explore the correlation between the extensiveness of low-code platform application and the digital transformation success of colleges and universities, thereby elucidating the precise role of low-code platforms in bolstering the digital management capabilities of academic institutions.

**RESULTS**

**Improvement of System Deployment Speed**

Data analysis conducted across five universities demonstrates that the adoption of low-code platforms has markedly accelerated system deployment processes. As detailed in Table 1, the introduction of these platforms has led to a notable decrease in the average system deployment time, transitioning from pre-implementation to post-implementation phases. This reduction has been accompanied by a significant enhancement in deployment efficiency, highlighting the transformative impact of low-code platforms on system deployment across these institutions.

Table 1. System deployment time and speed statistics before and after the introduction of low-code platform

| School name | Average deployment time (Before introduction, weeks) | Average deployment time (After introduction, weeks) | Speed up Percentage (%) |
|---|---|---|---|
| University A | 12 | 7 | 41.67 |
| Polytechnic B | 10 | 6 | 40.00 |
| Vocational and Technical College C | 15 | 9 | 40.00 |
| Normal University D | 14 | 8 | 42.86 |
| Art College E | 11 | 7 | 36.36 |

As shown in the table, the system deployment time of Vocational and Technical College C was shortened from an average of 15 weeks to 9 weeks, an increase of 40%, while Normal University D had the largest improvement, reaching 42.86%. This shows that the low-code platform has greatly shortened the development and deployment time of the system, especially in universities with high system complexity.

**User Satisfaction Analysis**

The survey found that the introduction of low-code platforms significantly increased user satisfaction. We conducted a satisfaction survey on users from five universities, and the results are shown in Table 2 below:

Table 2. User satisfaction rating statistics

| School name | Satisfaction score (out of 100 points) |
|---|---|
| University A | 85.2 |
| Polytechnic B | 83.7 |
| Vocational and Technical College C | 90.3 |
| Normal University D | 88.6 |
| Art College E | 82.8 |

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User satisfaction scores show that Vocational and Technical College C has the highest satisfaction score (90.3 points), while Art College E has a lower score of 82.8 points. This shows that in different application scenarios, the impact of low-code platforms on user satisfaction varies, and more complex teaching management and training systems tend to benefit more from the flexibility of low-code platforms.

**Effectiveness of Digital Transformation**

Through data analysis, the digital transformation results of the five schools have been improved due to the widespread application of low-code platforms. According to feedback from the information technology leaders of each school, after using the low-code platform, the management process has become more efficient and cross-departmental collaboration problems have been alleviated. Table 3 shows the evaluation of the digital transformation results of each school after the application of the low-code platform:

Table 3. Statistics of digital transformation effectiveness evaluation

| School name | Digital transformation effectiveness (rating, full score 10 points) |
|---|---|
| University A | 8.5 |
| Polytechnic B | 8.2 |
| Vocational and Technical College C | 9.0 |
| Normal University D | 8.8 |
| Art College E | 8.1 |

Vocational and Technical College C and Normal University D have the highest digital transformation effectiveness scores, 9.0 and 8.8 respectively, indicating that the in-depth application of low-code platforms has significantly promoted the digitalization process of these schools. This is consistent with the performance of system deployment speed and user satisfaction, indicating that low-code platforms are more successful in these schools.

**DISCUSSION**

**Interpretation of Results**

The research results show that the low-code platform has shown strong application potential in five different types of universities, especially showing significant differences in system deployment speed, customization capabilities and user satisfaction. These five universities include each representing a different type of university, including comprehensive, arts, normal, science and engineering and higher vocational colleges. Each university's application scenarios and needs vary, reflecting the low-code platform's broad adaptability.

Comprehensive University A's data management needs are more extensive, covering multiple fields such as teaching, scientific research, finance, and student affairs. The low-code platform helped the school build a unified data center, realized data sharing and interoperability between different business systems, and greatly improved the efficiency and accuracy of information management. In contrast, in Vocational and Technical College C, due to the complexity of its teaching and training management system, the low-code platform has been better applied, quickly realizing the integration of teaching management, resource scheduling, equipment management and other functions.

Polytechnic B mainly focuses on the digital needs of professional skills competition management. The rapid deployment and flexible customization capabilities of the low-code platform helped the college quickly build a full-process competition management system from registration, review, review to result announcement. Normal University D introduced a low-code platform into the teaching and scientific research management system. Especially in complex teaching management processes, the platform greatly shortened the development cycle, provided a good user experience, and supported the emergency adjustment of the teaching system during the epidemic. and optimization.

The particularity of E Art School is that its data center mainly serves art creation, display and student work management. The low-code platform helped the school build a personalized work display and review system, so that students' artistic creation results can be quickly Digitize and realize online review and sharing. This

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application scenario is significantly different from other types of universities, highlighting the strong adaptability of low-code platforms in highly personalized demand scenarios.

## Comparison with Existing Research

This study further verified the wide applicability of low-code platforms in the information management of colleges and universities through data analysis of different types of colleges and universities. Brown and Davis (2022) pointed out that low-code platforms can accelerate the deployment of information systems and provide highly customized management solutions for various types of colleges and universities. The data from the five colleges and universities in this study show that low-code platforms can not only meet the practical training and skills competition management needs of vocational and technical colleges, but also provide comprehensive universities with efficient solutions for complex businesses such as scientific research data and teaching management, and even perform well in highly personalized application scenarios such as art colleges.

In addition, Chen and Wang (2021) proposed that low-code platforms can improve user satisfaction, especially when users have a low learning curve for the platform and the functions are easy to understand, non-technical personnel can also customize the system through low-code platforms]. The survey data in this study also supports this view, especially in E art colleges, where teachers and students gave high evaluations of the flexibility and ease of use of the platform. This shows that low-code platforms have great potential in meeting the differentiated needs of users in various colleges and universities.

Although this study provides empirical data from five universities and demonstrates the application effect of low-code platforms in the development of university data platforms, it is still not comprehensive enough, the sample size is small and mainly concentrated in universities in China. Different types of universities may face different challenges when applying low-code platforms. Future research should expand the sample range, especially covering universities in more countries and regions, to ensure the wide applicability of the research results. In addition, since the data mainly relies on user feedback, there may be subjective bias. Future research should combine more and more comprehensive actual system performance test data to more objectively evaluate the application effect of the platform.

## Recommendations for Higher Education Institutions

Based on the survey data of this study, colleges and universities should consider the following key factors when introducing low-code platforms to ensure that the platforms can fully support the various needs of digital transformation:

### *Targeted application scenario selection*

Colleges and universities should reasonably select application scenarios for low-code platforms based on their own development stage, scale and digital construction foundation. In the early stages of digital transformation, it is particularly important to give priority to management systems that are efficient and in urgent need, such as teaching management systems, student management systems, and other systems that can quickly reflect management benefits; for colleges and universities with better digital transformation development, the introduction of complex scenarios such as laboratory management systems and scientific research management systems can better play the advantages of low-code platforms and achieve efficient collaboration across departments and systems.

### *Personalized demand adaptation and function expansion*

A core advantage of low-code platforms lies in their high degree of customization. Therefore, before the platform is deployed, in-depth demand analysis and business process combing should be carried out. The differentiated needs of various departments need to be fully considered in the early stages of platform development to ensure that the platform functions are highly consistent with the actual workflow. For example, vocational and technical colleges have special needs in the fields of skill training management and laboratory equipment reservation, while comprehensive universities may pay more attention to scientific research project management and big data analysis capabilities. Therefore, the configuration of the platform should take into account both versatility and flexibility to support future functional expansion and secondary development.

*Evaluation mechanism and continuous optimization*

In the process of applying low-code platforms, colleges and universities should establish a sound evaluation mechanism and regularly track the operation effect of the platform. By collecting user feedback, analyzing system performance, and monitoring key performance indicators (KPIs), such as system stability, response speed, and user satisfaction, problems in platform application can be discovered and solved in a timely manner. In addition, based on the evaluation results, the platform is continuously optimized and upgraded to ensure that it can keep up with the continuous development of university informatization. Colleges and universities can also regularly conduct evaluations and audits of low-code platforms to ensure the compliance and long-term stable operation of the system.

*Ecological construction and platform scalability*

The ecological construction of low-code platforms is also a key link in digital transformation. Colleges and universities should attach importance to the platform's ability to connect with existing information systems to ensure that the low-code platform can be seamlessly integrated with existing academic management, financial management, and human resources management systems to form a unified digital management ecosystem. At the same time, the low-code platform should have good scalability and support the access to more third-party tools or systems in the future to meet the diversified development needs of university business. For example, with the rise of emerging technologies such as the Internet of Things, big data, and artificial intelligence, the low-code platform needs to have the ability to integrate with these technologies to further improve the level of informatization of universities.

*Cross-departmental collaboration and standardized process construction*

The application of low-code platforms is not only a technological innovation, but also a change in management mode. In order to give full play to the potential of low-code platforms, universities should strengthen cross-departmental collaboration, break information silos, and promote data sharing and business process integration among departments. In this process, it is particularly important to establish standardized processes and data interfaces to ensure that various business systems can run efficiently on the same platform and provide a basis for future expansion and functional upgrades].

## CONCLUSION

Through an empirical analysis of five diverse types of universities, this study reveals the significant application effect of low-code platforms in the development of university data platforms. The results indicate that low-code platforms not only markedly improve system deployment speed but also greatly enhance user satisfaction, especially demonstrating excellent flexibility and adaptability in meeting the personalized management needs of various universities. The study shows that low-code platforms can assist universities in achieving more efficient system development and management optimization during digital transformation, with distinct advantages in complex business scenarios. The theoretical contribution of this paper is to systematically explore the integration of low-code platforms and data middle platforms for the first time, proposing a new technical framework for university informatization construction. This framework not only fills the gaps in existing research but also serves as a reference for subsequent academic research in related fields. For practice, this study offers feasible digital solutions for university administrators, as low-code platforms can flexibly adapt to the digital needs of different universities, especially in the context of limited resources and tight development cycles, enabling quick system deployment and updates, and facilitating efficient management.

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