Research and Practice on Project Teaching Based on Low Code Collaboration

Wenying Zeng

{707685549@qq.com}

College of Computer Engineering and Technology (College of Artificial Intelligence) , Guangdong Polytechnic of Science and Technology, Zhuhai, China

Abstract: With the rapid development of information technology, many companies have been faced up to digital demands, and may need more and more business information system, and programming engineering. How to grasp programming methods rapidly is also a challenge for students. Project teaching also need agile program to cultivate the students for understand business logic. Low code development platforms provide convenience for quickly building applications, while collaborative tools enhance team collaboration and project management capabilities. Project teaching based on low code collaboration can cultivate students' practical and problem-solving abilities, while also reducing their requirements for programming technology. In terms of research, it is possible to evaluate the impact of this teaching method on learning outcomes and teaching effectiveness, and explore how to better integrate low code development platforms and collaborative tools to improve teaching effectiveness. In summary, project teaching research and practice based on low code collaboration is an innovative teaching method that deserves further in-depth research and promotion.

Keywords: low code development platforms; collaborative tools; project teaching; practical research.

1 Introduction

With the development of technologies such as artificial intelligence, cloud computing, big data, and software engineering, improving software development efficiency has become a concern. Low code development platforms can quickly build applications through visual operations. It can simplify the development process, shorten the development cycle, improve development efficiency, and save development costs; Easily design, develop, and run business software.

In software development, the mainstream software development frameworks currently mainly include: in the field of software development, many mainstream software development frameworks are widely used. The following are some common mainstream software development frameworks: Spring framework NET framework, Angular framework, Django framework, Django framework, Ruby on Rails framework, Vue.js, Express.js, ASP. NET, etc. Developers can choose the appropriate framework for software development based on project requirements and personal preferences.

Low code collaboration is a new type of software development approach that makes software development easier to get started and more efficient through graphical interfaces and simple

ITEI 2023, November 24-26, Zhengzhou, People's Republic of China

DOI 10.4108/eai.24-11-2023.2343552

drag and drop operations [1]. In project teaching, adopting low code collaboration can effectively improve students' practical and team collaboration abilities.

In terms of project teaching research, it is necessary to explore with specific cases. For example, a software development project with certain difficulty can be selected and students can be grouped to complete it, and low code collaboration tools can be used for collaboration during the process. At the same time, it is necessary to evaluate students' completion status to understand the impact of low code collaboration on project teaching effectiveness.

In practice, some low code collaboration platforms such as Jeecg [2], Mendix and OutSystems [3] can be introduced to help students master the basic skills of low code collaboration through practice. In the classroom, corresponding tasks and goals can be set to enable students to collaborate in groups and provide timely feedback and guidance. In addition, relevant industry professionals can also be invited to participate in project teaching to understand market demand and the latest technological trends.

In short, adopting low code collaboration in project teaching can improve students' practical ability, team collaboration ability, and innovation ability. In order to better achieve teaching objectives, it is necessary to continuously explore and summarize experience in research and practice, and continuously improve teaching methods and strategies for low code collaboration.

2 Analysis of Low Code Platforms

The origin and development and application method of the low code platforms are analyzed as follows.

2.1 the Origin of low code development platform

Low Code Development Platform (LCDP) is a development platform that can quickly generate applications without coding or with a small amount of code [4]. By using visualization for application development, developers can create web pages and mobile applications through a graphical user interface, using drag and drop components and model driven logic. The official name was not officially determined until June 2014, and the field of low code development can be traced back to the earlier fourth generation programming languages and rapid application development tools [1]. The earliest programming languages and tools can be traced back to the 1990s to the early 21st century, similar to previous development environments. Early low code development platforms were based on model driven approaches, and later evolved into data driven approaches, creating principles for automatic code generation and visual programming.

Allow end users to develop their own applications using easily understandable visualization tools. Build the necessary functions for business processes, logic, and data models, and add your own code if necessary. After completing the business logic and functional construction, the application can be delivered and updated with one click, automatically tracking all changes and processing database scripts and deployment processes, achieving deployment on multiple platforms such as IOS, Android, and Web [5].

2.2 Current situation

Abroad, there are Salesforce (founded in 1999), OutSystems (founded in 2001), Mendix (founded in 2005), Kony (founded in 2007), Scratch (founded by MIT in 2008), iVX (founded in 2008), J2Paas (founded in 2017), Start (founded in 2006), Yita (founded in 2015), Light Flow (founded in 2015), and YonBuilder (founded in 2020). OutSystems announced a financing of $360 million in 2018. Subdivision includes low code platforms for databases, request processing, mobility, flowability, and generalization. The market growth of low code development can be attributed to its flexibility and ease of use, shifting the focus towards application universality and the ability to add custom code when needed or expected. Mobile accessibility is one of the driving factors for using low code development platforms.

Open source low code solutions combine the advantages of low code solutions, such as reducing application development time and costs, as well as the advantages of open source communities, where programmers and citizen programmers constantly share new code and development ideas.

2.3 Development trends

Low code development platforms will evolve along two dimensions:

Universality, which is the dimension of language attributes; With the continuous maturity and development of low code development platforms, they gradually have the ability to develop general scenarios, such as websites, games, 3D scenes, e-commerce, enterprise applications, and personal applications; The supported systems will also be more comprehensive, such as supporting various applications such as WebApp, iOS/Android, Windows/Mac/Linux, and mini programs; Convenience refers to the process of continuously reducing the amount of code, ultimately achieving zero code programming [6].

Universality and convenience are urgent issues and the next challenge for low code development platforms. Ultimately, it became possible to remove program syntax and preserve program logic.

In recent years, China's low code has entered a period of accelerated development, bringing diverse demand scenarios [7]. Based on the model driven concept, low code platforms utilize technologies such as visualization, API integration, cloud native, and multi end experience, combined with the characteristics of various industries and production scenarios, fully considering the role attributes and skills of different users, and evolving various application forms [8].

A set of curriculum teaching methods based on low code development platforms in the context of new engineering disciplines has been proposed for practical teaching of software tools and environment courses [9].

Building digital applications using low code development platforms is a necessity for the digital transformation and development of large and medium-sized enterprises, and also provides tools for accelerating the digital construction of services for public service institutions of small and medium-sized enterprises. Based on the demand for standardization and standardization of service management in small and medium-sized enterprises, it is

proposed to develop a public service tracking system for small and medium-sized enterprises using a low code platform [10].

Reference [11] proposes a curriculum reform plan for computational thinking based on low code development, introducing the specific curriculum reform process from theoretical teaching, experimental teaching, practical assignments, industry certification, and subject competitions. The effectiveness of the reform is demonstrated through course completion and student feedback.

The compilation, deployment, interaction, and monitoring of smart contracts in blockchain are obstacles for non professional developers to access blockchain. To address this challenge, a low code method called EDALoCo was proposed in reference [12], which facilitates the development of event driven applications for smart contract management. Make blockchain easier for software developers who are not experts in this technology to access, as modeling can be done through graphical flows that specify communication between data producers, data processors, and data consumers.

In the global energy environment, oil and gas companies seeking to reduce costs and optimize productivity have largely embraced digital technology, but its effectiveness is often slow or disappointing. By leveraging low code platforms, this risk and challenge can be reduced [13].

Agile development methodology is widely popular. The company is turning to agility to rapidly develop products and achieve digital transformation of the organization. Companies need employees who understand agility. Universities have an obligation to cultivate students' understanding of agile development. It is difficult to provide agile experience for students who are just starting programming. One remedial measure is to use low code or no code development platforms. As a result, students spend less time learning to create applications and can experience and understand agile rituals and roles [14].

A low code development platform provides a user-friendly visual environment that can create attractive UI, responsive design, and software applications with minimal programming skills. This article [15] discusses the application of Oracle APEX low code platform in application development for the establishment of user access audit and control automation system. With the demand for enterprise digital transformation, low code solutions can automatically create and deploy important business applications, and related research is increasing.

Low code development platforms have advantages such as easy to learn and use, fast operation and maintenance, and are developing rapidly. Domestic low code platforms include Yida, Aisuda, Qingzhou, Weida, J2PaaS, Huozi Ge, Mingdaoyun, Dadayun, JePaaS platform, Huayan Rubik's Cube, APICloud platform, etc [16]. Some Foreign low code platforms include Visual LANSA, Retool, Quixy, Creato, GeneXus, Zoho Creator, Web.com, Appian, KiSSFLOW-BPM&Workflow Software, Mendix, OutSystems, Salesforce Lightning, Microsoft PowerApps, AppSheet, Google App Maker, FileMaker, etc [17].

2.4 Low code platform application methods

A low code platform is an application development tool that allows users to quickly create applications using graphical interfaces, drag and drop components, and pre made code snippets. The following are the basic steps for creating an application using a low code platform:

Determine application requirements: Before starting to use a low code platform, it is necessary to clarify the requirements and functions of the application in order to build it correctly on the platform.

Import data: If the application needs to process data, it needs to be imported into the platform for use in the application.

Create a model: Use platform modeling tools to build the user interface and interaction logic of the application by dragging and dropping components.

Configure application: Configure the model based on application requirements, such as adding data sources, defining page layouts, etc.

Add business logic: Use the platform's code editor to write custom code to meet the specific requirements and functions of the application.

Testing and deployment: After completing the design and development of the application, it is tested on the platform and deployed to the target environment.

In summary, using a low code platform can help developers build applications faster, reduce development costs and technical barriers, and improve the quality and maintainability of applications.

3 Mainstream software development frameworks and low code collaboration methods

3.1 Mainstream software development frameworks and low code collaboration methods

Mainstream software development frameworks and low code collaboration methods can be combined to a certain extent to improve team development efficiency and collaboration capabilities. Here are some ways to combine mainstream software development frameworks with low code collaboration methods:

Utilizing low code platforms for rapid prototyping development: Low code platforms provide visual interfaces and drag and drop programming capabilities, allowing for the rapid creation of application prototypes. The development team can quickly build the basic framework and UI interface of the project using a low code platform, and then further develop and optimize the functionality through traditional software development frameworks.

Using low code development platforms for business logic development: Low code development platforms typically provide rich components and preset functions that can quickly implement common business logic. The development team can use low code platforms to develop simple business modules, reduce repetitive work, save time and effort, and invest more energy in the development of core functions.

Combining collaborative tools for team collaboration: Multi person collaboration is very important in the software development process. Teams can use collaborative tools for task allocation, progress tracking, problem discussion, etc. to achieve better collaborative effects. Through collaborative tools, team members can share development progress, communicate

problems, and solutions in real-time, improving team communication efficiency and collaboration capabilities.

Low code collaboration method in teaching practice: In teaching practice, combining low code collaboration method can promote students' participation and practical ability. Teachers can use low code development platforms to create project prototypes or basic functions, and collaborate with students for collaborative development. At the same time, collaborative tools can also be used for collaboration and communication among students, enabling them to better understand and apply software development knowledge.

Although low code collaboration methods can improve development efficiency and collaboration capabilities, they are not suitable for all types of software development projects. For complex requirements and specific technical scenarios, traditional software development frameworks and manual coding may still be required for implementation. Therefore, when choosing to use low code collaboration methods, it is necessary to evaluate and make decisions based on the specific needs and characteristics of the project.

Project teaching based on low code collaboration can be applied to various software development related courses, such as software engineering, web development, mobile application development, etc. Here are some specific application scenarios:

Group project collaboration: Through a low code collaboration platform, students can collaborate on projects within the group to jointly complete a challenging software development task. In this process, students need to coordinate division of labor, communicate and communicate, solve problems, and improve team collaboration and practical skills.

Classroom demonstration: In the classroom, students can be invited to use a low code collaborative platform for software development demonstrations to showcase their creativity and skills. In this way, it not only promotes communication and cooperation among students, but also allows them to feel their value and sense of achievement in the field of software development.

Competition competition: Project teaching based on low code collaboration can also be applied to various competition competitions, such as Hacksong and programming marathon. Participants can quickly build prototypes, implement functions, and complete corresponding tasks within the specified time using a low code collaboration platform.

In summary, project teaching based on low code collaboration is widely used, which can improve students' practical ability, team collaboration ability, and innovation ability. At the same time, it can also help students better adapt to the trends and technological needs of the future software development industry.

3.2 Project Design Method Based on Programming Language and Low Code Collaboration

The project design method based on programming language and low code collaboration can be achieved through the following steps:

Choose a suitable low code collaboration platform: Based on specific needs, choose a suitable low code development platform. There are currently many low code collaboration platforms available in the market to choose from, such as Mendix, OutSystems, etc. When choosing a

platform, it is necessary to consider factors such as supported programming languages, cloud deployment solutions, and security.

Design project requirements and architecture: Based on project requirements, design the functionality and architecture of the project. During this process, factors such as system complexity, performance requirements, and scalability need to be considered. At the same time, it is also necessary to select and design corresponding technologies based on different programming languages and their characteristics.

Divide tasks and collaborate: Divide the entire project into multiple subtasks and assign them to different team members for collaboration. During this process, the graphical interface provided by the low code collaboration platform can be utilized to achieve task allocation and collaborative management. Collaborative development using version control tools such as GitHub.

Coding and debugging: Code and debug according to the specific requirements of the task. At this point, the basic framework can be quickly built based on the component libraries and templates provided by the low code collaboration platform, and then specific functions can be achieved by writing code. During the debugging process, it is necessary to pay attention to the correctness of the code logic and the stability of the system.

Integration and testing: Conduct integration and testing after completing each sub task. At this point, it is necessary to consider the compatibility and overall performance between different modules. Automated testing tools provided by low code collaboration platforms can be utilized to quickly conduct testing and quality verification.

Deployment and launch: After completing testing, deploy the system to the cloud or local server and publish it to the public. At this point, it is necessary to consider factors such as system security, reliability, scalability, and make corresponding optimizations and configurations.

In summary, project design methods based on programming language and low code collaboration can greatly improve development efficiency and team collaboration ability, while also meeting the needs of different programming languages. However, in the practical process, it is still necessary to flexibly apply and improve this method based on specific situations.

3.3 SpringBoot project development based on low code collaboration

Low code collaborative development refers to the use of low code platforms to quickly build applications through visual interfaces, drag and drop components, and other methods to accelerate software development. SpringBoot is a web framework based on the Java language, which can simplify the complex configurations and dependencies required for developers to build applications in the Java language, thereby improving the efficiency of software development.

The development of a SpringBoot project based on low code collaboration can be achieved through the following steps:

Choosing a suitable low code platform: Before developing the SpringBoot project, it is necessary to choose a suitable low code platform. There are currently many low code

platforms available in the market to choose from, such as OutSystems, Microsoft PowerApps, Mendix, and so on.

Quickly building applications: Using a low code platform, developers can quickly build applications through visual interfaces, drag and drop components, and other methods. For example, the platform's built-in templates or component libraries can be used to build user interfaces, create data models, and so on.

Integrating the SpringBoot framework: After building an application, developers need to integrate the SpringBoot framework into the application to build applications in the Java language. Project dependencies can be managed through building tools such as Maven or Gradle, and SpringBoot related dependencies can be introduced.

Writing business logic: After integrating the SpringBoot framework, developers can start writing business logic code. You can use the annotations, class libraries, and other methods provided by SpringBoot to quickly build the business logic of your application.

Testing and deployment: Finally, developers need to test the application and deploy it to the server. The functionality and performance of the application can be verified through automated testing tools or manual testing. Once the test is successful, the application can be deployed to the production environment for users to use.

D.SpringBoot project development based on low code guidance

Through creative design, select a low code development platform to quickly build a prototype system, communicate with customers, and then design and develop the actual project.

The development of a SpringBoot project based on low code guidance can be achieved through the following steps:

Choosing a suitable low code platform: Before developing the SpringBoot project, it is necessary to choose a suitable low code platform. There are currently many low code platforms available in the market to choose from, such as OutSystems, Microsoft PowerApps, Mendix, and so on.

Create application templates: Using a low code platform, developers can create a template for a SpringBoot application and set necessary configuration information and dependencies.

Guidance interface: Low code platforms typically provide a guidance interface to guide developers through the process of building applications. By filling in relevant information and selecting components, developers can quickly build an initial version of a SpringBoot application.

Integrated business logic: After building the application, developers need to introduce corresponding business logic based on specific business requirements. You can quickly integrate the business logic of applications using tools, class libraries, and other methods provided by low code platforms.

Testing and deployment: Finally, developers need to test the application and deploy it to the server. The functionality and performance of the application can be verified through automated testing tools or manual testing. Once the test is successful, the application can be deployed to the production environment for users to use.

In short, the development of SpringBoot projects based on low code guidance can greatly improve software development efficiency and reduce development difficulty and technical barriers. Developers only need to focus on the business logic of the application, without overly focusing on the underlying technical implementation details.

4 Teaching Practice of Spring Boot Project Based on Low Code Collaboration

Spring Boot project development projects can choose open-source frameworks, such as using Ruoyi, Jeecg Boot, Guns, etc., which encapsulate Spring Boot and integrate functions such as dependencies, configuration, and pages.

Jeecg Boot is a low code development platform based on Spring Boot, adopting a front-end and back-end separation architecture, integrating Spring Boot2. x, Spring Cloud, Ant Design of Vue, MyBatis plus, Shiro, and JWT. You can use a code generator to generate front-end and back-end code with one click. Suitable for J2EE project development, suitable for systems such as SaaS projects, MIS, OA, ERP, CRM, etc.

4.1 SpringBoot based open source low code platform

Currently, there are multiple options for open source low code platforms based on SpringBoot, among which the following are some common open source low code platforms:

Joget Workflow: Joget Workflow is an open source low code platform developed based on Spring Boot and Java EE, and provides visual building tools and business logic designers. This platform supports functions such as custom forms, processes, data integration, and reports.

Tahu: Tahu is an open source low code platform based on Spring Boot and Vue.js, which provides visual application building tools and encoders. This platform supports functions such as custom UI components, forms, reports, data integration, and security control.

VANTIQ: VANTIQ is a real-time application platform developed based on Spring Boot and JavaScript, and provides visual application building tools and templates. This platform supports real-time event processing, streaming data analysis, IoT device integration, artificial intelligence, and machine learning functions.

WaveMaker: WaveMaker is a low code platform developed based on Spring Boot and Angular, and provides visual application building tools and business logic designers. This platform supports functions such as custom UI components, forms, reports, data integration, and security control.

JHipster: JHipster is a web application generator based on Spring Boot and AngularJS, which can help developers quickly build modern web applications. This platform supports functions such as custom UI components, forms, reports, data integration, and security control.

These low code platforms all provide visual construction tools and business logic designers, allowing developers to quickly build applications and reduce development difficulty and

technical barriers. And they are all developed based on Spring Boot, so they have good scalability and stability.

4.2 Deployment and Application of a Low Code Platform Based on SpringBoot

The deployment process of a low code platform based on Spring Boot includes steps such as preparing the environment, obtaining the low code platform, configuring databases and application servers, deploying the low code platform, configuring platform parameters, starting the low code platform, creating and deploying applications, and monitoring and management.

4.2.1 Deployment of Low Code Platforms Based on Spring Boot

The deployment steps for a low code platform based on Spring Boot are as follows.

(1) Preparation environment: Firstly, it is necessary to ensure that the Java runtime environment (JRE or JDK) is installed on the server. You can download and install the appropriate Java version from the official website.

(2) Obtain a low code platform: Select a Spring Boot based low code platform based on your needs, such as common ones such as Ketos, Joget Workflow, OutSystems, Jeecg Boot [2], etc. Download and configure the corresponding software package according to the documentation provided by the platform.

(3) Configuration database: Low code platforms typically use a database to store application data. According to platform requirements, install and configure the required relational databases (such as MySQL, PostgreSQL) or non relational databases (such as MongoDB).

(4) Configure Application Server: Low code platforms may require an application server to host and execute applications. According to platform requirements, you can choose Tomcat, Jetty, etc. as application servers and configure them accordingly according to the platform documentation.

(5) Deploy Low Code Platform: Deploy software packages from low code platforms to servers. This can be achieved by uploading compressed files and decompressing them, or by cloning the repository using version management tools such as Git.

(6) Configure platform parameters: According to the requirements of the platform, set necessary parameters such as database connection information, port number, etc. in the configuration file of the low code platform. These configurations can be adjusted according to the actual situation.

(7) Start low code platform: Execute startup commands or scripts to start the low code platform. According to the platform documentation, it can be launched using a command-line interface or an integrated development environment (IDE).

(8) Create and deploy applications: Create custom applications through visual interfaces or designers provided by low code platforms. Design and configure the required forms, processes, business logic, etc. Then, deploy the application to a low code platform.

(9) Monitoring and management: By using the monitoring and management functions provided by low code platforms, real-time monitoring of application running status,

performance indicators, etc. can be achieved. According to the requirements of the platform, alarm rules and logging can be set, as well as error troubleshooting and performance optimization.

4.2.2 Simple Function Development

Online configuration can be achieved by configuring forms, reports, icons, processes, and statistical forms online. The business process is implemented using workflow.

4.2.3 Reuse existing functions

Low code platforms such as the Jeegg Boot framework already have a large number of available features that can be directly utilized, including system management, message center, system monitoring, report examples, and code generators.

5 Conclusion

Using a low code development platform, fast visual development, easy to understand business development processes, and implement usable systems.

In software development, mainstream software development frameworks and low code collaboration methods are two important concepts that can be combined. Mainstream software development frameworks provide rich functionality and tools to help development teams build efficient and maintainable applications. The principle of low code collaboration emphasizes the use of low code development platforms and collaborative tools to improve team development efficiency and collaboration capabilities.

By combining mainstream software development frameworks and low code collaboration methods, development teams can more efficiently conduct software development and project management. Low code platforms can be used for rapid prototyping and simplified business logic development, reducing repetitive work and saving time and effort. Collaborative tools can promote communication and collaboration among team members, achieving goals such as task allocation, progress tracking, and problem solving.

In teaching practice, project teaching research and practice based on low code collaboration can also provide students with better participation and practical ability. Project prototypes can be created and developed collaboratively through low code development platforms, while collaborative tools can be used for cooperation and communication between students.

However, when choosing to use low code collaboration methods, it is necessary to evaluate and make decisions based on specific project requirements and characteristics. For complex requirements and specific technical scenarios, traditional software development frameworks and manual coding may still be required for implementation. In summary, combining mainstream software development frameworks and low code collaboration methods can help improve team development efficiency and collaboration capabilities, but it needs to be flexibly applied according to actual situations.

Acknowledgments. The research work is supported by the following funds: the Comprehensive Project Practice of the 2021 Curriculum Ideological and Political Construction

Project of Guangdong Higher Education Teaching Management Association - HarmonyOS Application Development (Project No. X-KCSZ2021267); The 2023 Guangdong Vocational College of Science and Technology Education Quality Engineering Project Education Reform Research and Practice Project "Project Teaching Research and Practice Based on Low Code Collaboration" (Project No. 3); The 2022 Guangdong Vocational College of Science and Technology's School level Gold Course Comprehensive Project (Project No. 13); The 2023 Education and Teaching Reform Research and Practice Project of the Guangdong Higher Vocational Education Computer Majors Teaching Guidance Committee "Research and Practice of Comprehensive Project Practical Course Teaching Reform Based on CDIO Concept" (Project No. JSJJZW2023003); Guangdong Province High Quality Continuing Education Network Course Construction Project "Information Technology and Artificial Intelligence" (Project No. JXJYGC2021EY0282).

References

[1] https://baike.baidu.com/item/ Low code development platform/23661682? Fr=aladdin

[2] Low code - JEECG low code development platform - official website http://www.jeecg.com/lowcodeIndex

[3] 2021 Inventory: Top Ten Low Code/No Code Platforms Abroad https://blog.csdn.net/qq_42738998/article/details/119805436

[4] https://zhanjq.blog.csdn.net/article/details/127677775

[5] SpringBoot Low Code Rapid Development Platform | MyBatis Plus (baomidou. com) https://www.baomidou.com/pages/2fedc1/

[6] Springboot Framework Alibaba Open Source Low Code Tool LowCodeEngine Finclip https://www.finclip.com/news/f/12895.html

[7] Low code development framework platform "Free Experience" - Gemcode Low Code (gemcode. com). https://www.gemcoder.com/slogan/

[8] Li Fei, Zhao Long, Feng Qiangzhong. On Multiple Application Forms of Low Code Platforms in Business Systems [J]. Science and Technology Innovation and Application, 2022, 12 (16): 193-196. DOI: 10.19981/j.CN23-1581/G3.2022.16.047

[9] Shi Lei, Fan Yuqi, Hu Xuegang, et al. Software Tools and Environment Course Teaching Based on Low Code Development Platform in the Context of New Engineering Construction [J]. Computer Education, 2022 (04): 115-119. DOI: 10.16512/j.cnki.jsjy.2022.022.04.030

[10] Gong Xintao, Gu Junxin, Ren Hao. Development of a low code based public service tracking system for small and medium-sized enterprises [J]. Office Automation, 2023,28 (14): 59-61

[11] Wu Yongliang, Zhang Yunxia, Zhou Qianqian, et al. Curriculum Reform of Computational Thinking Based on Low Code Development [J]. Computer Education, 2022 (10): 197-200. DOI: 10.16512/j.cnki.jsjy.2022.10.13

[12] Rosa-Bilbao J , Boubeta-Puig J , Rutle A .EDALoCo: Enhancing the accessibility of blockchains through a low-code approach to the development of event-driven applications for smart contract management[J].Computer Standards and Interfaces. 2023.

[13] Deshpande A .'Low-Code' Platforms Provide Development Tools For Business-Specific Solutions[J].The American oil & gas reporter, 2023.

[14] Lebens M , Finnegan R .Using a Low Code Development Environment to Teach the Agile Methodology[M]. 2021.

[15] Talesra K , Nagaraja G S .Low-Code Platform for Application Development[J].International Journal of Applied Engineering Research, 2021(5):16.
[16]What are the low code platforms in China? Worktile community https://worktile.com/kb/ask/18807.html
[17]https://blog.csdn.net/wildhorseli/article/details/126846555