Reform and Practice Exploration of Information Resource Management Course Based on CDIO

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Abstract: Facing the structural contradictions in the development of Information Resource Management (IRM) courses triggered by the rapid advancement of large language model (LLM) technology, a systemic reform of IRM curricula is urgently needed. This study reconstructs the IRM course framework using the CDIO (Conceive-Design-Implement-Operate) concept: In the C (Conceive) phase, a curriculum cluster integrating LLM technology is constructed; In the D (Design) phase, the course is fully proceduralized using a project-driven model; In the I (Implement) phase, industry-education collaboration introduces authentic enterprise projects to address the shortage of teaching resources; In the O (Operate) phase, a dynamic feedback mechanism is established for continuous course optimization. By reconstructing the interdisciplinary talent cultivation plan, designing modularized courses, innovating blended virtual-physical teaching models, implementing engineering-oriented teaching methods, and establishing a diversified assessment system. This achieves deep coupling between the education chain and the industry chain, fostering interdisciplinary talents adaptable to intelligent development.

Keywords: CDIO; Information Resources; Large Language Models (LLMs)

1. Introduction

With the rapid development of LLM technology, Information Resource Management (IRM) faces triple challenges: accelerated technological iteration, surging demand for interdisciplinary skills, and increasingly complex practical scenarios. Traditional curriculum systems suffer from issues such as lagging technical instruction, disciplinary barriers hindering interdisciplinary competency cultivation, and insufficient teaching resources to support engineering practices, making talent cultivation difficult to meet societal needs. The CDIO-based reform practice of IRM courses reconstructs a dynamic knowledge system covering the entire technological chain, designs blended virtual-physical scenario-based projects, and establishes a closed-loop cultivation mechanism through industry-education collaboration, systematically enhancing students' engineering thinking and industry adaptability [1]. This holds dual value for promoting the transformation of the IRM education paradigm and supporting the national digital transformation strategy, with significant practical implications for achieving deep integration of the education chain, talent chain, and industry chain.

2. Contradictions in IRM Course Teaching

The rapid development of new technologies like LLMs profoundly impacts the technological ecosystem and practical models of IRM, highlighting structural contradictions between the IRM curriculum system and industry demands. A significant misalignment exists between the pace of technological iteration and curriculum renewal cycles, making it difficult for teaching content to keep pace with the technological frontier. The gap in interdisciplinary competencies is particularly acute, lacking effective articulation between technical courses and business-oriented courses. Rigid teaching resources constrain practical ability cultivation, with contradictions such as insufficient experimental computing power, outdated case studies, and superficial industry-academia cooperation limiting students to basic internships. These issues lead to pronounced technical deficiencies in graduates, necessitating the construction of a CDIO-driven dynamic educational system to resolve these challenges.

2.1 Course Content Lags Behind Technological Iteration

The iteration speed of information technology is extremely rapid. Taking the LLM field as an example, the progression from basic neural network models to the current powerful generative pre-trained large models has occurred within just a few years. The Transformer architecture has revolutionized research and application directions in numerous fields such as natural language processing and computer vision. LLMs demonstrate outstanding performance in key IRM processes like information extraction and knowledge graph construction. However, IRM course content largely adheres to traditional frameworks. Many university courses still rely on card catalogs for building information classification systems and Boolean logic-based information retrieval models. New theories and technologies associated with LLMs, such as Transformer-based information representation learning and large-scale unsupervised pre-training techniques, have not been promptly incorporated into syllabi. Consequently, graduates often struggle when confronted with practical business demands, such as automating the classification of massive text data using LLMs or constructing intelligent recommendation systems.

2.2 Single Cultivation Path Fails to Meet Interdisciplinary Competency Needs

IRM has deeply integrated into multidisciplinary fields. For instance, building an efficient healthcare IRM system in a real-world setting requires not only proficiency in information system development processes and database design skills but also familiarity with healthcare business processes and an understanding of relevant legal and regulatory constraints on medical data management. Similarly, designing a financial IRM risk assessment model necessitates expertise in financial market operation principles, data mining algorithms, and strong programming skills to implement financial models [1]. Currently, the cultivation model for IRM majors in most universities is relatively monolithic. In terms of curriculum design, core disciplinary courses dominate, while interdisciplinary courses appear fragmented, failing to form effective knowledge integration. For example, in one university's IRM curriculum, computer programming courses and management courses are taught independently, making it difficult for students to flexibly apply programming skills to information management practices, hindering the development of systematic interdisciplinary thinking. When faced with complex, multidisciplinary LLM application projects, students struggle to integrate knowledge and formulate effective solutions.

2.3 Rigid Teaching Resources Struggle to Adapt to Complex Practice Scenarios

Driven by LLMs, IRM practice scenarios are becoming increasingly complex and diverse. E-commerce enterprises leverage LLMs to analyze massive volumes of user browsing records and purchase behavior data, gaining precise insights into user needs to achieve personalized recommendations, thereby enhancing user shopping experiences and boosting sales. Manufacturing enterprises utilize LLMs to optimize supply chain information management, enabling intelligent scheduling and risk warning throughout the entire process from raw material procurement to product distribution. However, teaching resources have failed to adapt timely to these real-world developments [2]. At the hardware level, the computing performance of most university laboratories is limited, struggling to support the training demands of LLMs. Faced with models containing billions of parameters, standard computers lack sufficient computational power, resulting in low operational efficiency. On the software side, the IRM software used in teaching is often basic versions, incapable of simulating complex real-world business scenarios. Teaching case studies are also outdated, lacking fresh examples based on LLM applications. In practical teaching sessions, cooperation between schools and enterprises remains shallow, preventing students from engaging with authentic enterprise projects and depriving them of experience solving practical problems in complex and dynamic environments. This results in a significant gap between students' practical abilities and industry requirements.

3. CDIO Concept for Restructuring the Information Resource Management Course

Artificial intelligence drives the

forward-looking restructuring of the IRM curriculum. Systematically advancing reform using the CDIO model involves deeply integrating LLM technology to construct interdisciplinary course clusters; innovating project-driven frameworks to hone technical application skills through practices like e-commerce recommendation systems; forging industry-education collaboration pathways leveraging authentic enterprise scenarios and dual-supervision systems; and establishing dynamic optimization mechanisms to continuously track technological evolution and industry needs.

3.1 C (Conceive) Stage: Adapting Course Content to Large Language Model Technology

The Conceive stage requires prospective planning for the IRM course. Given the dominance of LLM technology, the top-level course design should deeply integrate knowledge systems related to LLMs. Course objectives should be jointly discussed by information management experts, computer scientists, and senior industry practitioners. Clarify that the course aims to cultivate students' mastery of core theories and practical skills in LLM-driven IRM, enabling them to adapt to business environments dominated by LLMs. For instance, determine that students need to understand LLM architecture principles, training processes, and how to utilize LLMs for the collection, integration, and analysis of information resources [3]. In curriculum system setup, break down traditional disciplinary boundaries to build an interdisciplinary course cluster centered on LLM applications. Beyond foundational IRM courses, add extension courses like deep learning algorithms and big data processing technologies to ensure students build a solid foundation for technical practice.

3.2 D (Design) Stage: Project-Driven Course Framework Design

Adopt a project-driven model to reshape the IRM course system, orienting course content around actual projects decomposed into multiple interrelated project modules. Each module corresponds to specific learning objectives and skill requirements, guiding students to master knowledge and skills through project completion. For example, designing a "Building an E-commerce Information Resource Management System Based on Large Models" project requires starting with demand analysis, using LLMs to analyze user data and product data from e-commerce platforms to optimize product recommendation algorithms and enhance user shopping experiences. During project execution, students sequentially learn about data mining, information system design, LLM application development, etc., and comprehensively apply this knowledge in project practice [4]. Simultaneously, develop detailed project guides and assessment criteria for each project, clarifying student tasks and expected outcomes at each stage to ensure the orderly implementation of project-driven teaching.

3.3 I (Implement) Stage: Industry-Education Collaborative Teaching Implementation Path

The industry-education collaboration mechanism is key to ensuring effective course implementation. Establish deep cooperative relationships between universities and enterprises, where enterprises provide students with authentic project practice environments and cutting-edge industry case studies. Collaborate with internet companies to involve students in enterprise LLM-related IRM projects, such as sentiment analysis of social media data and public opinion monitoring projects. Enterprise mentors and university instructors jointly supervise students: enterprise mentors impart practical work experience and industry operational standards, while university instructors provide theoretical support and guidance. Utilize enterprise technical resources, such as high-performance computing equipment and professional software tools, to compensate for the lack of university teaching resources. Universities regularly invite enterprise experts to share the latest industry trends and LLM application cases, ensuring students' knowledge aligns closely with industry realities [5].

3.4 O (Operate) Stage: Continuous Optimization Course Feedback Mechanism

Establish a comprehensive course operation mechanism to achieve continuous optimization. Regularly collect feedback from students, teachers, and enterprises through surveys, seminars, etc., to understand satisfaction levels and suggestions for improvement. For instance, organize student evaluations of course content, teaching methods, and practical sessions at the end of each semester, while inviting enterprise mentors to assess students' practical performance and the practicality of the course setup. Based on feedback, the course team adjusts and optimizes the curriculum, updating content, improving teaching methods, and refining practical components. Furthermore, monitor industry development trends and technological innovations, promptly incorporating new knowledge and skills into the course to ensure it remains highly aligned with industry needs, cultivating IRM professionals capable of adapting to the times.

4. CDIO-Oriented Course Practice Reform Measures

Grounded in the CDIO engineering education philosophy, systematically reconstruct the IRM talent cultivation plan. Integrate cutting-edge technologies like LLM principles and knowledge graph construction, using modularized courses to connect the entire Conceive-Design-Implement-Operate process; Innovate blended virtual-physical teaching models, deepening engineering capabilities through virtual simulation experiments and hands-on projects like healthcare information systems; Implement a diversified assessment mechanism, strengthening the weight of project design practice and enhancing teamwork skills. Relying on enterprise dual-supervision collaboration and a continuous feedback mechanism, cultivate interdisciplinary talents capable of managing the full lifecycle of complex systems.

4.1 Restructuring the Talent Cultivation Plan Based on CDIO Concept

Reconstruct the talent cultivation plan for the IRM major using the CDIO concept. In setting cultivation objectives, explicitly focus on cultivating interdisciplinary applied talents capable of conceiving, designing, implementing, and operating complex IRM projects. For example, require graduates to independently complete the full-process business of IRM projects—from initial planning to building management systems based on LLMs and putting them into actual operation—in the context of widespread LLM application. In curriculum system planning, break down traditional disciplinary barriers, integrate multidisciplinary knowledge from information management, computer science, data analysis, etc., and add courses closely related to LLM technology, such as "Principles and Applications of Large Models" and "Information Processing and Decision Making Based on Large Models," ensuring the course content is both cutting-edge and practical. Simultaneously, establish a series of practice projects spanning the entire learning process, from foundational course experiments to comprehensive graduation design projects, progressively enhancing students' practical abilities and project experience [6].

4.2 Design of Modularized Course Content System

Modularize the IRM course content according to the four stages of CDIO. The Conceive module covers LLM technology development trends and demand analysis in the IRM domain, cultivating students' abilities in overall project planning and problem definition. Through case analysis and group discussions, students learn to identify key problems in IRM and propose initial solutions. The Design module focuses on project architecture design, technology selection, etc. Taking the "Enterprise Knowledge Graph Construction Based on Large Models" project as an example, students learn knowledge graph design principles, LLM application techniques in knowledge extraction and fusion, and how to select appropriate LLMs and development tools based on actual business needs. The Implement module emphasizes practical operation; students master skills like LLM training and deployment, and information system coding implementation through actual project development. Utilize practice platforms allowing students to complete project implementation in simulated training environments, such as building information retrieval systems using open-source LLM frameworks and conducting performance optimization [7]. The Operate module focuses on project operation and maintenance management, user feedback collection, and system optimization. Students learn how to monitor system operating status, analyze user behavior data, and continuously improve the IRM system based on feedback.

4.3 Innovation in Blended Virtual-Physical Teaching Model

The blended virtual-physical teaching model breaks through the time and space limitations of traditional teaching by organically integrating virtual teaching environments with physical experimental scenarios, constructing a closed-loop learning system of "theoretical cognition — virtual training — practical transformation." Its core lies in using digital tools to simulate real scenarios while reinforcing skill application through physical operations, achieving deep knowledge transformation from "understanding" to "application," thereby enhancing student learning experience and practical ability. In virtual teaching, utilize online learning platforms, virtual simulation experiments, etc., to provide students with abundant learning resources. For example, develop LLM-based IRM virtual simulation experiments, enabling students to repeatedly simulate operations like LLM training and data processing for experimental practice without time and space constraints, deepening their understanding and application of theoretical knowledge. In experimental teaching, strengthen the integration of classroom lectures and lab practices. After teachers explain LLM principles and IRM theories in class, arrange for laboratory practice sessions, such as conducting text classification experiments using LLMs, transforming theoretical knowledge into practical skills.

4.4 Improvement of Engineering-Oriented Teaching Methods

Introduce engineering-oriented teaching methods to bring the teaching process closer to real engineering projects. Employ project-driven teaching: instructors design challenging teaching projects based on actual industry projects, such as "Development of a Healthcare Information Resource Management System Based on Large Models." Students participate in groups, simulating the entire enterprise project flow from requirements analysis and design proposal formulation to system development and testing. During project implementation, instructors act as project mentors, guiding students to solve encountered problems and cultivating their teamwork and practical problem-solving abilities [8]. Utilize case-based teaching to strengthen practical combat readiness, selecting numerous real IRM project cases, especially successful and failed cases involving LLM applications. Through in-depth case analysis, students understand key stages and common problems in project implementation, learning how to apply the CDIO concept for project management and technical application in different scenarios.

4.5 Diversified Assessment and Continuous Improvement Mechanism

Construct a diversified assessment system to comprehensively measure student learning outcomes and ability enhancement. Assessment should not only cover theoretical knowledge mastery but also emphasize practical performance in project work. For example, course assessment might comprise 40% theoretical examination and 60% project practice assessment. Project practice assessment evaluates multiple dimensions, including project proposal design, implementation process, teamwork capability, and project outcome quality. Regularly solicit feedback from students, teachers, and enterprises to build a continuous improvement mechanism. Systematically collect student opinions on course content, teaching methods, and practical sessions; encourage teachers to reflect on teaching and summarize experiences; deepen university-enterprise cooperation to understand enterprise requirements for graduate competencies and course evaluations. Based on feedback, promptly adjust the talent cultivation plan, course content, and teaching methods, continuously optimizing course practice reform measures to ensure the curriculum consistently meets industry development needs and student growth requirements.

5. Conclusion

Based on the CDIO engineering education philosophy, this study systematically reconstructs the IRM course system for the era of large models, effectively resolving the core contradictions in traditional teaching: technological lag, interdisciplinary competency gaps, and insufficient practical resources. Through the four-stage "Conceive-Design-Implement-Operate" closed-loop framework, the project-driven model permeates the entire teaching process, realizing the transformation of theoretical knowledge into engineering capabilities. Deepening industry-education collaborative practice, leveraging authentic enterprise projects and a dual-supervision system, addresses the shortage of teaching resources; students significantly enhance their problem-solving abilities in complex scenarios through practical tasks such as social media public opinion analysis. The diversified assessment and multi-source feedback mechanism ensure the course continuously adapts to technological evolution, markedly strengthening students' engineering thinking and industry alignment, and promoting the sustainable coupling of the education chain and the industry chain. The educational reform in IRM provides a replicable practical pathway for the transformation of engineering course paradigms, playing a significant role in supporting the national digital transformation strategy.

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