Breaking the Master-Apprentice Dilemma in Construction Enterprises from the Perspective of Knowledge Co-creation

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Abstract

From the perspective of knowledge co-creation, this paper analyzes the causes and impacts of practical dilemmas in the traditional "mentor-apprentice" model of construction enterprises, including the interruption of tacit knowledge transfer, cognitive generation gaps, communication barriers, and insufficient management time. It proposes reconstructing mentor-apprentice interaction through a "knowledge partner"relationship, supported by three measures: growth visualization, performance incentive design, and collaborative micro-topic research. An AI system is introduced as an auxiliary tool to enable the systematic extraction and efficient transmission of tacit knowledge. Based on a practical case from the Jinhui Town project in Fengxian District, Shanghai, the effectiveness of this framework is verified in improving apprentices' practical capabilities, promoting the systematization of mentors' knowledge, and stimulating two-way learning motivation, thereby providing an operable new pathway for talent cultivation in construction enterprises.

Full Text

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Abstract Based on the perspective of knowledge co-creation, this paper analyzes the causes and impacts of the practical dilemmas in the traditional "master-apprentice" model within construction enterprises, including interruptions in tacit knowledge flows, generational cognitive gaps, communication barriers, and shortages of managerial time. The paper proposes reconstructing master-apprentice interaction as a "knowledge partnership." Through three measures—visualizing growth, designing performance incentives, and conducting collaborative micro-research—and by introducing an AI system as an auxiliary tool, it enables the systematic extraction and efficient transfer of tacit knowledge. A practical case from the Jinhui Town project in Fengxian District, Shanghai, verifies the effectiveness of this framework in improving apprentices' practical abilities, promoting the systematization of masters' knowledge, and stimulating motivation for two-way learning, thereby providing an actionable new pathway for talent cultivation in construction enterprises.

Keywords Project Management; Learning Organization; Master-Apprentice; Knowledge Co-creation

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Abstract: From the perspective of knowledge co-creation, this paper analyzes the causes and impacts of the practical dilemmas in the traditional master-apprentice model within construction enterprises, including the interruption of tacit knowledge flow, cognitive gaps, communication barriers, and a scarcity of managerial time. It proposes to restructure the mentor-apprentice interaction as a "knowledge partnership" and introduces three measures: visualization of growth, performance incentive design, and collaborative micro-research. Additionally, an AI system is employed as an auxiliary tool to systematically extract and efficiently transfer tacit knowledge. Through a case study of the Jinhui Town project in Fengxian District, Shanghai, the framework is validated to be effective in enhancing apprentices' practical abilities, promoting mentors' knowledge systematization, and stimulating mutual learning motivation, thereby providing an actionable new pathway for talent cultivation in construction enterprises.

Key Words: Project Management; Learning Organization; Master-Apprentice; Knowledge Co-creation.

0 Introduction

The textbook for first-class constructors points out that construction projects involve various types of information, including organizational information and technical information, which require integrated classification

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. PMBOK indicates that project communication includes communication planning and communication management, and encompasses written, oral, and media forms

2

. The National Bureau of Statistics' *2025 Migrant Worker Monitoring Survey Report* shows that the average age of migrant workers is 43.3 years, and those aged 50 and above account for about 31.6%. The contraction of the industry workforce, the wave of retirement among experienced masters, the high mobility of project departments, and managers' time-management difficulties, together with differences in age and knowledge structure, have led to negative incentives in the master-apprentice system. Zhao Xueyao et al. point to explorations of government coordination in cultivating highly skilled talent and master-apprentice

teaching pathways using master studios as carriers

1

; Chen Hao proposed the categorized selection of masters and apprentices and the implementation of

improve outcomes through assessment and other methods[2].

The above approaches are generally applicable, but their practical means need to be strengthened. This paper attempts to approach the issue from knowledge transmission, relationship reconstruction, and system cultivation, and to explore solutions for knowledge inheritance in the mentor-apprentice system by using new technological systems such as AI.

1 Current Status, Pain Points, and Cases

1.1 Difficulties in Traditional Mentor-Apprentice Training

As is well known, front-line personnel in construction enterprises are highly mobile. At the same time, some mentors have doubts about training knowledge, and some managers, constrained by various routine affairs, lack sufficient time for in-depth mentoring. This has led to frequent interruptions in the tacit knowledge accumulated by project departments.

At present, front-line workers and junior project-department managers mostly acquire knowledge points through WeChat public accounts, video channels, and similar channels. Their knowledge is insufficiently systematic, fragmented, and scattered, and they lack the systematic capability of "stringing pearls together" in the Steve Jobs sense.

In mentor-apprentice relationships that do exist, apprentices often, because of their lack of practical ability and because the reading materials are constructor qualification textbooks and the like, mistake "being able to understand" the knowledge points transmitted by the mentor for "being able to do it." The effect by which the mentor's own "bucket of water"is output as only "a bottle of water"is underestimated, and apprentices easily overlook deeper wisdom such as on-site situational judgment and risk intuition. These problems arise from differences between mentors'"many years of accumulation"and apprentices'"instant retrieval" through information sources such as short videos and constructor textbooks, as well as from a cognitive gap; at the same time, apprentices do not understand the gulf between observational learning and hands-on practical learning.

Meanwhile, because some mentors are experienced and mature, they may easily adopt a crude communication style that "humiliates the other party to demonstrate their own intelligence," causing apprentices to become unwilling to ask questions and thereby cutting off the channel for mutual understanding.

1.2 Vision for Mentor-Apprentice Training

For junior managers and senior managers in project departments, the goal relationship should move toward "knowledge partnership" : drawing on the collegiate tutorial system, mentor and apprentice should clarify common objectives, define the division of labor in writing, and jointly diagnose whether learning bottlenecks lie in logic, methods, or mindset, thereby achieving bidirectional knowledge co-creation through a partner-based approach.

For mentors, they should adopt a posture of "high IQ and high EQ," tolerate ignorance, provide patient guidance, create a psychologically safe zone, and transform apprentices' confusion into teaching opportunities. Mentors should recognize that the benefits of educating apprentices lie in the following: mentors maintain front-line "academic youth," and by studying real problems and summarizing systematically, they force themselves to output their own knowledge, so that mentoring becomes an engine for continuous refinement rather than a one-way drain.

1.3 Improvement Measures for Mentor-Apprentice Training

To achieve the envisioned goals, the measures are: 1) visualization of growth: establish a competency milestone map, and use case reviews, paper writing, and other means to string practice into a chain of pearls; 2) performance-incentive design: incorporate mentoring outcomes into mentors' performance evaluations, driving mentors to systematically extract and output tacit knowledge; 3) jointly promoting breakthroughs in thinking: pair mentors and apprentices to undertake micro-research topics, realizing the inheritance of thinking and the breaking of boundaries through collisions with real problems.

There are many tools for implementing the above measures, among which the most effective lever is an AI system. With the current capabilities of AI, after the mentor provides a framework-based indication of resources such as core industry journals, high-quality social media, well-known experts, and paper frameworks, AI can assist in analysis and complete tedious tasks such as the apprentice' s education plan and outcome analysis, thereby promoting self-motivated learning by the apprentice.

1.4 Case of Mentor-Apprentice Training

Project name: Shanghai Fengxian District Jinhui Town 40-04 Regional Plot Project (excluding pile foundations), with a total building area of approximately 72,000 m^2. The project is undertaken by Shanghai Urban Construction Municipal Engineering (Group) Co., Ltd.

The project department used AI to complete the preparation of the mentoring framework. While assigning paper-writing tasks to the student, the mentor also provided guidance on the team' s technical report materials, including AI

training, and delivered outputs such as paper-writing methods. This not only completed the mentor' s task of systematizing knowledge, but also enabled the apprentice to receive training and subsequently write a publishable paper.

2 Conclusion

From the perspective of knowledge co-creation, this paper systematically analyzes the practical difficulties faced by the "mentor–apprentice" system in construction enterprises, and identifies personnel mobility, cognitive discontinuity, rough communication, and insufficient time as the core obstacles leading to the loss of tacit knowledge. By introducing the concept of "knowledge partners," the paper redefines the mentor–apprentice relationship, emphasizes two-way empowerment and the construction of a psychologically safe zone, and, on this basis, designs three coordinated measures: visualized milestones, performance linkage, and micro-topic research.

In particular, this paper proposes using AI systems to assist in the preparation of educational plans, outcome analysis, and resource recommendation, thereby reducing mentors' teaching burden while stimulating apprentices' motivation for independent exploration. The practice of the project in Fengxian District, Shanghai, shows that this model not only helps apprentices quickly master systematic knowledge and improve their thesis-writing ability, but also prompts mentors to complete experience summarization and theoretical refinement, achieving mutual growth in teaching and learning. In the future, the deep integration of AI with on-site scenario simulation can be further explored, so as to promote the continuous evolution of talent cultivation in construction enterprises toward intelligentization and co-creation.

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Author contribution statement:

Cui Lei: Proposed the research ideas; drafted the paper; revised the final version.

Note: Figure translations are in progress. See original paper for figures.