The SPACE and PRIME Models for Knowledge Transfer in Construction Project Departments

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Abstract

Based on the 40-04 regional plot project in Jinhui Town, Fengxian District, Shanghai, this paper addresses the issue where existing knowledge management in construction enterprises focuses on macro-level perspectives and lacks frontline empirical investigation. Through questionnaires and field interviews, the knowledge acquisition channels of general contracting managers are summarized into the SPACE model (Social networks, Platform of the company, Actual project practice, Content reading, and Educational advancement), while the skill acquisition paths of frontline workers are summarized into the PRIME model (Personal online learning, Regular instruction, Interpersonal mentoring, Mimicry and reference, and Educational and written materials). The distinct internal logics of these two groups demonstrate the inherent differences between two different transmission modes, providing a corresponding analytical paradigm for improving knowledge transmission within construction project departments.

Full Text

Preamble

The SPACE and PRIME of Knowledge Transfer in Construction Project Departments

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摘要

Based on the construction project of plot 40-04 in Jinhui Town, Fengxian District, Shanghai, this paper addresses the current limitations in construction enterprise knowledge management, which often focuses on macro-level theory

while lacking empirical investigation of frontline operations. Through questionnaires and field interviews, the study categorizes the knowledge acquisition channels of general contracting managers into the SPACE model (Social networks, Platforms of the company, Actual project practice, Codified reading, and Educational advancement). Simultaneously, the skill development paths of frontline workers are summarized into the PRIME model (Peer imitation, Regular training, Interpersonal mentoring, Media-based self-study, and Educational/Vocational schooling).

The distinct internal logics of these two groups reveal fundamental differences between their respective transmission modes. These findings provide a corresponding analytical paradigm for improving knowledge transfer within construction project departments.

关键词

Construction Management; Knowledge Transfer; Project Management; SPACE Learning Model; PRIME Learning Model

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Introduction

In the field of construction management, the effective transfer and application of knowledge are critical factors for ensuring project success and organizational competitiveness. Construction projects are characterized by their complexity, uniqueness, and the temporary nature of project teams, which often leads to "knowledge silos" and the loss of valuable experiential data once a project is completed. To address these challenges, researchers have increasingly focused on systematic frameworks for knowledge management and organizational learning.

The SPACE and PRIME Learning Models

This study explores the integration of the SPACE and PRIME learning models to enhance knowledge transfer within construction enterprises. These models provide a structured approach to understanding how individual expertise can be transformed into organizational intelligence.

The SPACE Model

The SPACE model emphasizes the environmental and structural dimensions of learning. It focuses on: - **S (Structure):** The organizational framework that supports knowledge flow. - **P (Process):** The standardized procedures for capturing and documenting project experiences. - **A (Acquisition):** The methods by which new information is gathered from internal and external sources. - **C**

(Culture): The social environment that encourages transparency and collaborative problem-solving. - **E (Environment):** The external factors, including market trends and regulatory requirements, that influence project execution.

The PRIME Model

Complementing the SPACE framework, the PRIME model focuses on the internal mechanisms of knowledge processing: - **P (Perception):** How project teams identify critical information and potential risks. - **R (Reflection):** The process of analyzing past actions to derive "lessons learned." - **I (Interpretation):** Translating raw data into actionable insights relevant to specific construction contexts. - **M (Memory):** The storage of knowledge in accessible digital repositories or organizational databases. - **E (Evaluation):** Assessing the effectiveness of applied knowledge to refine future strategies.

Knowledge Transfer in Construction Projects

Knowledge transfer in construction is not merely the movement of documents but a complex social and technical process. It involves the transition of tacit knowledge—such as a site manager's intuition or a craftsman's skill—into explicit knowledge that can be codified and shared.

[Figure 1: see original paper]

As shown in [Figure 1: see original paper], the interaction between the SPACE and PRIME models creates a continuous loop of improvement. By utilizing the structural supports of the SPACE

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Abstract

Based on the 40-04 plot project in Jinhui Town, Fengxian District, Shanghai, this paper addresses the issue that existing research on knowledge management in construction enterprises tends to focus on the macro level and lacks first-line empirical investigation. Through questionnaires and field interviews, the knowledge acquisition channels of general contractor managers are summarized as the SPACE model (Social, Professional, Applied, Codified, Educational), while the skill acquisition pathways of frontline workers are summarized as the PRIME model (Platform, Regulated, Interpersonal, Mimetic, Education). The differing internal logics of the two models reveal the intrinsic divergence between two distinct transfer patterns, providing an analytical paradigm for improving knowledge transfer in construction project departments.

Key Words: Construction; Knowledge transfer; Project Management; SPACE Study Model; PRIME Study Model

引言

The Level 1 Constructor textbook points out that construction projects involve various types of information, including organizational and technical information, which require comprehensive classification. Similarly, the PMBOK Guide indicates that project communication includes planning communication management and encompasses various formats, such as written, oral, and media-based forms.

Li Qin' s research on internal knowledge sharing within construction enterprises demonstrates the critical importance of project manager support; it also suggests that organizational incentives can promote formal knowledge sharing but may have an inhibitory effect on informal sharing. Zhang Yong et al. highlighted the roles of Management by Objectives (MBO) and the Balanced Scorecard (BSC). Yan Zi found that project similarity promotes knowledge transfer while urgency hinders it, and that the relationships between project teams play a vital role in inter-project knowledge transfer. Furthermore, Professor Le Yun' s research indicates that the integration of information technology with organizational learning and technical management leads to the enhancement of organizational capabilities and performance improvement.

The aforementioned studies primarily focus on macro-level knowledge management research. In contrast, this paper conducts a practical investigation of management personnel and workers at the Jinhui Town 40-04 plot. It categorizes the knowledge acquisition of managers and the skill acquisition of frontline workers into the SPACE model and the PRIME model, respectively. Although both models share a five-dimensional structure, their core components differ significantly. Finally, this paper proposes several analytical paradigms based on these findings.

Supporting Project and Discussion Framework

1.1 依托项目概况

Project Overview: Jinhui Town 40-04 District Land Parcel Project

The construction project for the 40-04 district land parcel in Jinhui Town, Fengxian District, Shanghai (excluding pile foundations), commenced in October 2023 and is currently under active construction. Located in Jinhui Town, Fengxian District, the project encompasses a comprehensive scope of works including residential buildings 1# through 7#, auxiliary structures 8# through 12#, and a subterranean garage designated as 13#.

The residential components of the development feature 16-story structures utilizing a prefabricated monolithic shear wall system. The basement levels are designed with partial double-story underground sections. The total construction area for the project is approximately 72,000 square meters. The project

is being developed by Shanghai Jingxian Real Estate Co., Ltd., with Shanghai Urban Construction Municipal Engineering (Group) Co., Ltd. serving as the general contractor.

1.2 管理人员的 SPACE 模型

The Managerial SPACE Model consists of five dimensions: **S**ocial Networks (platforms such as Zhihu, WeChat Official Accounts, Bilibili, and online communities), **P**latforms (corporate project reviews and technical exchange meetings), **A**ction-based Practice (project retrospectives and practical application), **C**odified Knowledge (professional journals, codes, and standards), and **E**ducational Advancement (academic training at universities or institutions and preparation for professional registration exams).

S—Social Networks: In the mobile internet era, an increasing number of managers acquire cutting-edge technical information and case analyses through platforms like Zhihu, WeChat Official Accounts, Bilibili, and professional portals. Websites and applications maintained by industry professionals or associations play an irreplaceable role in promoting new processes and sharing peer experiences. For practitioners in Shanghai, specific accounts such as "Shanghai Construction Site" and the "Civil Engineering Society" provide significant value, reflecting Shanghai' s unique advantages as China' s economic center. **P—Corporate Platforms:** Training organized at the corporate level serves as the primary front for knowledge updates. This is mainly achieved through internal technical discussions, invited expert seminars, participation in industry academic conferences, and cross-project exchanges. Companies are often able to invite industry experts for detailed consultations, providing insights rarely found on social networks. This allows managers to transcend the limitations of "siloed thinking," which is highly conducive to professional growth.

A—Action-based Practice: Project retrospectives serve as the core mechanism for managers to consolidate knowledge. Through these reviews, managers organize relevant documentation and discuss lessons learned, forming a crystallized body of reusable knowledge. Sharing experiences within the same project or across different projects facilitates the conversion of tacit knowledge into explicit knowledge, providing critical opportunities for enhancing management capabilities.

C—Codified Knowledge: Professional journals, technical papers, and regulatory standards are essential knowledge sources for managers. These sources possess a high degree of authority and accuracy. Mastering the latest codes and staying informed about academic trends are vital for revising template schemes and generating conceptual frameworks for patents.

E—Educational Advancement: In-service education at universities and preparation for professional registration exams serve as powerful supplements to a manager' s skill set. The systematic and structured nature of academic advancement provides managers with a comprehensive framework—ranging

from foundational theories to management principles. This compensates for the fragmented nature of on-site knowledge acquisition and offers significant benefits for career progression and professional title advancement.

1.3 工人的 PRIME 模型

The PRIME model for construction workers consists of five dimensions: **P** (Platform-based self-study via Douyin, Kuaishou, WeChat groups, etc.), **R** (Regulated instruction via project briefings, centralized training, and morning meetings), **I** (Interpersonal mentoring by team leaders and veteran masters), **M** (Mimetic learning through model-based guidance, vendor demonstrations, and trial-and-error), and **E** (Education via construction drawings, technical documents, and vocational schools).

P (Platform-based self-study): Short-video platforms have established a beneficial landscape for skill transfer. Unlike managers who tend to favor text-based platforms like Zhihu, workers prefer "short, smooth, and fast" operational demonstrations; for example, a trick for reinforcing formwork can be learned and practiced in just three to five minutes. Relevant technical videos and safety warnings shared in WeChat worker groups allow for cross-project information sharing at an extremely low cost under the coordination of team leaders.

R (Regulated instruction): Formal channels, such as technical briefings by the project department and daily pre-shift meetings, serve as the official conduits for knowledge transfer from management to the operational level. Formal instruction is characterized by authoritative information and unified standards with a degree of mandatory compliance. Although it is often constrained by vague content, an overemphasis on theory over practice, excessive text, and insufficient time for digestion, it remains a necessary means of liability avoidance and is thus favored by managers. Some advanced subcontractors also utilize short videos, animations, BIM simulations, group-distributed multimedia materials, physical demonstration zones, and QR codes to provide access to corporate knowledge.

I (Interpersonal mentoring): Mentorship by team leaders and veteran masters is the oldest form of knowledge transfer. Becoming a mature skilled worker often requires years of accumulated experience to develop, for instance, a "sense of timing" in concrete vibration or an intuitive grasp of safety hazards. A qualified master introduces specific operational techniques, safety precautions, material properties, common troubleshooting methods, emergency responses, and tool maintenance.

Despite challenges such as varying skill levels among masters, time constraints due to busy schedules, and a lack of willingness to teach due to fear of competition, apprentices can still acquire skills through various means, such as "stealing" knowledge from minor tasks. While workers come from diverse backgrounds and masters may be reluctant to teach, stable teams at the group-leader level and above still show intent to mentor. **M (Mimetic learning and refer-**

ence): Learning by doing is a critical process of experience accumulation in every worker' s career. As the saying goes, "doing it once is better than seeing it a hundred times" ; by engaging visual, muscular, and cognitive faculties with physical entities and through continuous trial and error in practice, workers eventually internalize their skills.

E (Education and written materials): Construction drawings, technical schemes, and instruction manuals are vital vehicles for written learning. As the ability to interpret blueprints improves, written materials become key tools for breaking through skill plateaus and achieving independence. Furthermore, systematic training opportunities provided by vocational schools under government organization are of great significance for the entry and advancement of young workers.

总结

Based on the construction project of Plot 40-04 in Jinhui Town, Fengxian District, Shanghai, and drawing upon literature such as the PMBOK, this study develops the SPACE model (Social networks, Platform of the company, Actual projects, Case studies/Written reading, and Educational advancement) for the skill enhancement of general contracting managers. Simultaneously, the skill development pathways for frontline workers are summarized into the PRIME model (Practice/Online self-study, Regular instruction, Interpersonal mentoring, Mimicry/Reference, and Educational/Vocational training).

By analyzing the advantages and disadvantages of the various methods within these two models, this study highlights the impact of short videos and graphic/written materials on the transmission of construction knowledge. The findings reflect a divergence in knowledge transfer between the management and operational levels. Specifically, the former is characterized by a text-oriented approach, organizational embedding, reflective learning, institutional drivers, and reliance on authority. In contrast, the latter exhibits a visualization orientation, interpersonal embedding, experiential learning, fragmented acquisition, and passive acceptance.

Future directions for development include lightweight applications, AI-programmed visual technical disclosures, the official standardization of short-form video content, and the enhancement of mobile-based mini-programs and applications.

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