Navigator for Build People: A Digital Navigation Framework for Human-Centered Skill Development and Decision Support

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Abstract

Recent research in machine learning optimization and automated code generation demonstrates the increasing role of intelligent systems in supporting complex technical processes. While such approaches effectively improve algorithmic performance and development efficiency, significantly less attention is given to human-centered navigation in professional domains characterized by complex skill ecosystems, such as the construction industry.

This paper presents *Navigator for Build People*, a digital navigation framework designed to guide individuals through skill development, learning paths, and decision-making processes in the building and construction domain. Inspired by adaptive optimization and automated generation techniques discussed in recent studies, the proposed system applies structured knowledge modeling and adaptive guidance to human professional growth. The framework integrates user profiling, domain knowledge representation, and decision support mechanisms to reduce uncertainty, lower entry barriers, and support continuous development.

The proposed approach extends intelligent system concepts from algorithm-level optimization to human-centered navigation and demonstrates how adaptive models can be applied beyond traditional machine learning tasks.

Keywords: digital navigation, human-centered systems, construction domain, decision support, adaptive guidance

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1. Introduction

Modern intelligent systems increasingly focus on optimizing complex processes through adaptive models, perturbation techniques, and automated generation mechanisms. Recent studies have demonstrated that structured interventions—such as equation perturbation in machine learning training or automated ablation code generation—can significantly improve system efficiency and analytical clarity [1], [2].

In parallel, professional domains such as construction and building engineering exhibit comparable complexity at the human level. Individuals must navigate non-linear learning paths, evolving standards, diverse toolchains, and heterogeneous career roles. Despite this complexity, most digital systems in the construction sector remain project-centered, addressing scheduling, modeling, or resource optimization rather than individual development.

This paper argues that concepts successfully applied in intelligent algorithm optimization can be transferred to human-centered navigation. We propose *Navigator for Build People*, a digital framework that guides individuals through professional development using structured knowledge representation and adaptive decision support.

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2. Motivation and Problem Definition

The motivation for this research arises from several observed challenges:

- construction-related knowledge is fragmented across educational, regulatory, and industrial sources;
- individuals lack adaptive guidance when selecting skills or learning paths;
- decision-making is often based on incomplete or outdated information;
- entry into the construction domain remains difficult for beginners and career changers.

Similar to how perturbation-based methods reveal model sensitivity and optimal training behavior [1], individuals require structured guidance to understand their current state and possible development trajectories.

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3. Conceptual Foundation

3.1 From Algorithm Optimization to Human Navigation

In machine learning, perturbation and ablation techniques are used to evaluate the contribution of individual components and optimize training behavior [1], [2]. Analogously, human-centered navigation requires identifying which skills, experiences, or decisions contribute most effectively to professional growth.

The *Navigator for Build People* applies this principle by modeling professional development as a navigable space rather than a linear sequence.

3.2 Core Principles

The proposed framework is built on the following principles:

- **structured decomposition:** skills and professional roles are decomposed into atomic, analyzable components;
- **adaptive guidance:** navigation paths evolve based on user progress and feedback;
- **decision transparency:** users understand the rationale behind specific recommendations;
- **human-centered focus:** optimization targets individual development rather than system throughput.

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4. System Architecture

The proposed framework consists of the following components.

4.1 User Profiling Layer

This layer captures user background, experience level, professional goals, and current competencies. The profile is continuously updated based on user interaction and progress.

4.2 Knowledge Representation Layer

Construction-related skills, standards, tools, and roles are represented as interconnected nodes. Dependencies and prerequisite relationships are explicitly defined to support navigation and reasoning.

4.3 Navigation Engine

The navigation engine generates adaptive learning and development paths by analyzing the gap between the user's current state and target goals.

4.4 Decision Support Module

This module provides comparative analysis between alternative development choices, similar to evaluating alternative configurations in ablation studies.

4.5 Interaction Interface

The interface visualizes progress, recommended paths, and alternative options using intuitive navigation metaphors.

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5. Use Scenarios

The system supports multiple user scenarios, including:

- guided specialization selection for students;
- competency gap analysis for junior professionals;
- structured self-learning for independent learners;
- career transition support within the construction domain.

Each scenario emphasizes adaptive navigation rather than static recommendation lists.

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6. Discussion

The proposed framework demonstrates how ideas from intelligent system optimization can be transferred to human-centered applications. While perturbation and ablation techniques optimize machine learning models, *Navigator for Build People* optimizes professional development trajectories.

Key challenges include data completeness, knowledge base maintenance, and personalization accuracy. However, these challenges are comparable to those addressed in modern adaptive systems and can be mitigated through iterative refinement and user feedback.

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7. Conclusion

This paper introduced a digital navigation framework for human-centered skill development in the construction domain. Inspired by recent advances in adaptive optimization and automated analysis techniques [1], [2], the proposed system structures professional growth as a navigable space supported by adaptive guidance and decision support.

Future work includes implementing a prototype system, integrating data-driven recommendation models, and conducting empirical user evaluations.

References

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