

Conceptual Framework of Personality-Based Career and Skill Recommendation

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Abstract—The increasing complexity of the modern career landscape has heightened the need for personalized guidance systems[7] capable of assisting individuals in making informed and psychologically aligned career decisions. Existing career recommendation approaches frequently rely on single-model assessments or preference-based matching, resulting in recommendations that inadequately reflect the individual's underlying personality traits and vocational interests. To address this limitation, this paper proposes a conceptual framework that integrates the Big Five Personality Traits and Holland's RIASEC typology to generate personalized career and skill path recommendations.

The proposed framework consists of four major components: the Personality Profiling and Data Processing component, the Trait Interaction Matrix component, the Career–Skill Ontology component, and the Dual-Model Recommendation Engine component. These components collectively transform psychometric inputs into structured outputs comprising recommended career pathways, associated skill requirements. By incorporating two established psychological models, the framework offers a more comprehensive understanding of career–personality alignment and supports users in identifying skill gaps relevant to their recommended career trajectories.

This study contributes a structured conceptual architecture that can serve as a foundation for future empirical validation and system development. Future research directions include expert evaluation of the framework, the incorporation of proficiency weighting for skill prioritization, and the integration of machine learning techniques to enhance recommendation accuracy.

Index Terms—Career recommendation systems, Personality modeling, Big Five traits, RIASEC typology, Skill recommendation, Ontology-based reasoning, Hybrid recommender systems, Design science research, Psychometric integration.

I. INTRODUCTION

Selecting an appropriate career path has become increasingly challenging due to rapid technological developments, evolving job requirements, and the growing emphasis on multidimensional skill sets[5]. Conventional career guidance methods typically rely on academic indicators, general aptitude assessments, or labor-market trends[5]. While useful, these approaches often overlook an individual's underlying psychological dispositions, which significantly influence career satisfaction, performance, and long-term stability.

Two widely validated psychometric models—the Big Five Personality Traits and Holland's RIASEC typology [2],[3]—offer complementary perspectives on individual differences. The Big Five model explains behavioral tendencies such as sociability, emotional regulation, creativity, and task orientation[1],[4], while the RIASEC framework identifies preferred vocational environments. Although both models have been applied independently in career counseling, they are rarely integrated into a unified structure capable of producing personalized career and skill-development pathways.

To address this gap, this paper proposes a conceptual framework that combines Big Five personality attributes with RIASEC vocational interests to generate psychologically aligned career and skill-path recommendations. The framework formalizes the interaction between personality traits, vocational preferences, career environments, and required competencies to support more individualized guidance.

II. RELATED WORK

This section reviews previous studies on job recommendation systems, recommendation techniques, and skill- or career-oriented recommendation frameworks. The purpose is to establish the research foundation supporting the development of a dual-model, personality-based career and skill path framework.

2.1 Job Recommendation Systems

Job recommendation systems have evolved significantly with the increasing availability of online recruitment platforms, user-profile data, and computational techniques. Early job recommendation systems relied primarily on keyword matching and rule-based logic, where job descriptions were mapped to user-provided preferences or resumes. Modern systems, however, increasingly utilize machine learning, text mining, and semantic analysis[6] to classify job roles and match them to user profiles.

Systems such as LinkedIn, Indeed, and Glassdoor apply algorithmic matching techniques that compare job requirements with applicant attributes derived from resumes, skills, or activity histories. Academic studies have proposed more specialized models that extract user preferences, competencies, and employment histories to generate job recommendations with improved precision[6]. Despite their advancements, these systems primarily focus on observable characteristics—skills, qualifications, job history—while overlooking psychological attributes that influence long-term satisfaction, work alignment, and role retention.

Moreover, traditional job recommenders often lack a structured mechanism for identifying underlying personality–career fit, limiting their ability to generate personalized career trajectories beyond job matching. This highlights the need for systems that integrate deeper psychometric insights to enhance the relevance and stability of career recommendations.

2.2 Recommendation Techniques

A substantial body of research has explored the design and optimization of recommendation techniques applicable across domains, including job and skill recommendations. Among the most prominent techniques are:

Content-Based Filtering (CBF): CBF recommends items by analyzing similarities between user profiles

and item attributes. In career contexts, this may involve matching user skills or preferences to job descriptions[7]. While effective for personalized suggestions, CBF suffers from overspecialization and limited diversity in results.

Collaborative Filtering (CF): CF generates recommendations based on patterns observed among users with similar behaviors or profiles. Although widely used in e-commerce and entertainment, its application in career guidance is limited due to sparse user–item interaction data and the unique, individualized nature of career decisions[7].

Hybrid Recommendation Systems: Hybrid systems combine CBF, CF, ontology-based reasoning, and rule-based structures to compensate for the limitations of single-technique approaches. In job and career recommendation domains, hybrid systems have demonstrated improved performance in matching user profiles with job requirements, identifying skill gaps, and suggesting potential career transitions[7].

Semantic and Ontology-Driven Approaches: Some studies utilize domain ontologies, knowledge graphs, or semantic networks to represent the relationships between skills, job roles, and competencies. These approaches support structured reasoning and improve generalization across diverse job families[8],[11].

Although these techniques enhance job or skill matching, they generally do not incorporate psychometric constructs such as personality traits or vocational interests. As a result, they focus on observable competencies rather than deeper behavioral or motivational factors.

2.3 Skill and Career Recommendation Systems

Skill-oriented and career-path recommendation systems have gained increasing attention in response to the growing demand for upskilling, reskilling, and personalized professional development. These systems typically analyze user skill profiles, job descriptions, or competency frameworks to identify skill gaps and recommend suitable learning pathways. Common approaches include text mining, vector-space representations, and ontology-based mappings to associate job roles with required skills, as well as systems that recommend courses, certifications, or training programs aligned with user profiles[11].

Several studies have extended traditional job recommendation approaches by modeling careers as progressive pathways rather than isolated positions.

Notable frameworks such as CaPaR (Career Path Recommendation) conceptualize career development as a sequence of role transitions driven by skill similarity and job progression patterns[6],[7]. Similarly, systems such as SkillRec emphasize structured job–skill relationships to infer feasible career trajectories and recommend relevant skills for professional advancement. These approaches highlight the importance of viewing career development as an evolving process supported by systematic skill acquisition and competency alignment.

Despite their contributions, existing skill and career recommendation systems largely adopt a skill-centric perspective, with limited consideration of underlying psychological factors. Most frameworks assume that skill similarity and competency alignment are sufficient for effective career guidance, without incorporating personality traits or vocational interest models. Consequently, recommended career paths may be technically feasible but psychologically misaligned, as they do not account for individual behavioral tendencies, interpersonal styles, or motivational strengths. This limitation underscores the need for career-path recommendation frameworks that integrate psychometric dimensions alongside skill-based reasoning to improve long-term career satisfaction and occupational fit[6],[7].

2.4 Research Gap

The review of existing literature reveals a clear gap:

1. Job recommendation systems primarily focus on job–profile or job–skill similarity while largely ignoring underlying psychological attributes that influence long-term career fit and satisfaction.
2. Recommendation techniques emphasize optimization of matching accuracy and system performance but do not incorporate validated

psychometric data into the recommendation process.

3. Skill- and career-path recommendation systems effectively identify competencies and career transitions; however, they rarely integrate personality traits or vocational interest models into their frameworks.
4. No existing frameworks combine the Big Five Personality Traits with Holland’s RIASEC vocational typology to simultaneously generate psychologically aligned career recommendations and structured skill-development pathways.

This gap highlights the need for a conceptual framework that systematically integrates psychometric inputs, vocational preferences, and skill-based reasoning to deliver more personalized and psychologically congruent career guidance.

III. METHODOLOGY

This study adopts the Design Science Research Methodology (DSRM) to construct a conceptual framework that integrates Big Five personality traits and Holland’s RIASEC vocational types into a unified career and skill-path recommendation structure[9]. DSRM is widely used in information systems research for developing innovative artifacts—such as models, frameworks, or systems—that address identified practical or theoretical problems. The methodology provides a structured, iterative process for problem identification, artifact design, demonstration, and evaluation[10].

In this research, DSRM guides the development of the proposed conceptual framework by outlining the phases through which the problem is analyzed, the objectives are defined, the architecture is designed, and the final conceptual model is articulated. The six steps of the methodology, adapted from established DSRM literature, are summarized in Table 1.

Table 1. Design Science Research Methodology (DSRM) Steps Applied in This Study

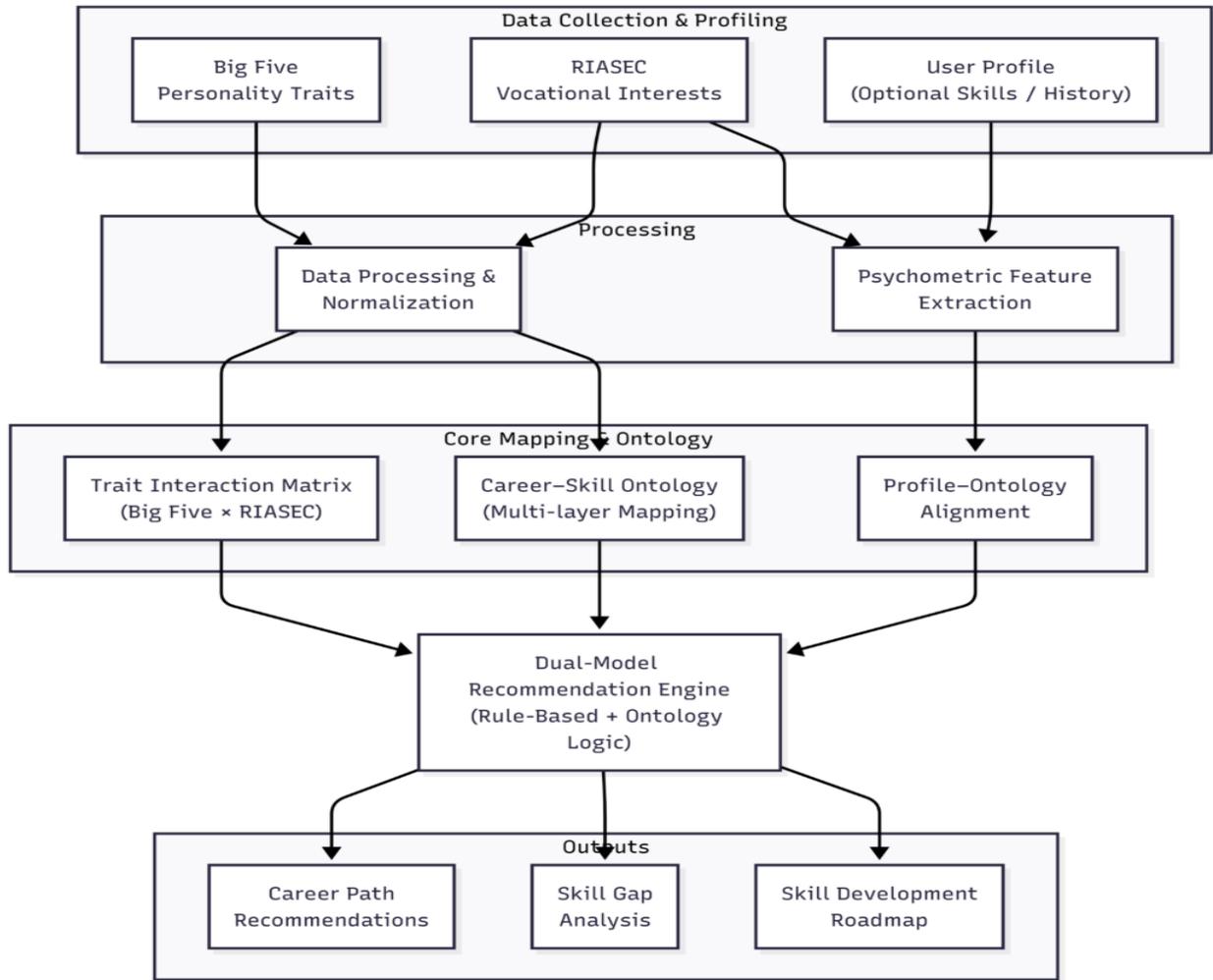
DSRM Step	Description	Application in This Research
1. Problem Identification and Motivation	Define the core problem and justify the need for a solution.	Existing job, career, and skill recommendation systems rarely integrate psychometric models. Current systems lack frameworks that combine personality traits (Big Five) and vocational interest types (RIASEC) for career–skill pathway generation.
2. Define the Objectives for a Solution	Establish what the proposed artifact must achieve.	Develop a conceptual framework that incorporates Big Five and RIASEC data to generate personalized career

<p>3. Design and Development of the Artifact 4. Demonstration</p>	<p>Create the artifact based on theoretical foundations and identified requirements. Show how the artifact solves the problem using examples or scenarios.</p>	<p>recommendations, identify skill requirements, and outline skill-development pathways.</p>
<p>5. Evaluation</p>	<p>Assess how well the artifact supports the objectives.</p>	<p>Construct a multi-component architecture including: Personality Profiling, Trait Interaction Matrix, Career-Skill Ontology, and a Dual-Model Recommendation Engine. Demonstrate, through conceptual scenarios, how psychometric inputs are transformed into recommended career paths and skill roadmaps within the proposed framework.</p>
<p>6. Communication of the Artifact</p>	<p>Present the artifact to relevant academic and practitioner communities.</p>	<p>Evaluate the framework conceptually by comparing its design to limitations identified in existing systems and by analyzing its completeness and theoretical coherence. Communicate the framework through this research paper, including detailed descriptions, diagrams, and component explanations for potential future implementation or empirical testing.</p>

IV. RESULTS

The proposed conceptual framework integrates Big Five personality traits and Holland’s RIASEC vocational types to generate personalized career and skill-path recommendations. The framework is designed as a structured, multi-component

architecture that transforms psychometric inputs into actionable outputs through systematic processing, trait interaction analysis, and ontology-based mapping. Figure 1 illustrates the overall design of the conceptual framework.



4.1 Framework Overview

The framework consists of four primary components:

1. Personality Profiling and Data Processing Component
2. Trait Interaction Matrix Component
3. Career-Skill Ontology Component
4. Dual-Model Recommendation Engine

These components collectively form an end-to-end architecture that receives psychometric data, processes and interprets the traits, maps them to structured career and skill data, and generates personalized recommendations. The design supports modularity, enabling each component to function independently while maintaining interoperability across the framework. This structure mirrors established practices in recommender-system architecture and aligns with psychometric career theory.

4.2 Personality Profiling and Data Processing Component

This component serves as the entry point for psychometric inputs and performs data standardization, normalization, and preparation for downstream processing. The component accepts two types of inputs:

Big Five Personality Scores

- Neuroticism
- Extraversion
- Openness
- Agreeableness
- Conscientiousness

RIASEC Vocational Interest Scores

- Realistic
- Investigative
- Artistic
- Social
- Enterprising
- Conventional

The system standardizes scores to a uniform scale and extracts trait signatures that characterize behavioral tendencies and vocational orientations. These signatures form the data basis for the Trait Interaction Matrix component.

This component ensures data consistency and supports accurate interpretation of personality and interest

patterns, which is essential for producing meaningful career recommendations.

4.3 Trait Interaction Matrix Component

The Trait Interaction Matrix acts as the analytical core of the framework. It integrates personality traits (Big Five) with vocational interest types (RIASEC) to identify trait–environment compatibility and derive career–personality matching rules.

This matrix evaluates interactions such as:

- Extraversion + Enterprising → Leadership-oriented roles
- Realistic + Openness → Technical innovation or field-based roles
- Conscientiousness + Conventional → Structured and process-driven roles
- Investigative + Openness → Analytical and problem-solving roles
- High Neuroticism → Low-stress or predictable career environments

The matrix functions as a rule-based mapping layer that converts the combined psychometric profile into career environment profiles. These environment profiles represent clusters of occupations aligned with both behavioral tendencies and vocational preferences.

The output of this component is a structured list of potential career categories that serve as input to the Career–Skill Ontology component.

4.4 Career–Skill Ontology Component

This component represents a structured knowledge base linking:

- Career families
- Job roles and subroles
- Required skills and competencies
- Skill progression pathways
- Learning resources (optional)

The ontology is designed as a hierarchical model that defines relationships among occupations, skills, and competency levels. It ensures that recommendations are consistent, generalizable, and aligned with validated occupational taxonomies[11].

Using the environment profiles generated by the Trait Interaction Matrix, this component identifies:

- Suitable career families
- Skill requirements for each role
- Skill gaps for the individual
- Possible learning trajectories

The ontology acts as the backbone of the framework by enabling systematic reasoning across diverse career and skill domains.

4.5 Dual-Model Recommendation Engine

The recommendation engine synthesizes information from all previous components to generate the final outputs:

1. Career Path Recommendations
2. Required Skill Lists
3. Personalized Skill-Development Pathways

The engine uses hybrid reasoning, combining rule-based logic derived from the Trait Interaction Matrix with ontology-based filtering derived from the Career-Skill Ontology.

The process includes:

- Matching psychometric profiles with career-environment clusters
- Identifying relevant occupations and roles within those clusters
- Extracting required skills for each role
- Computing skill gaps by comparing user competencies (if available)
- Suggesting skill-development sequences based on ontology pathways

The outputs provide a structured, psychologically grounded roadmap that aligns an individual's personality with long-term career environments and corresponding skill requirements.

4.6 Framework Contribution

The proposed conceptual framework offers several key contributions:

- It integrates two validated psychometric models—Big Five and RIASEC—within a unified architecture.
- It bridges the gap between personality assessment and career/skill recommendation systems, which are traditionally treated separately.

- It provides a structured basis for producing psychologically congruent career paths and actionable skill-development plans.
- It establishes an extensible design suitable for future empirical validation, implementation, or adaptation with machine-learning techniques.

4.7 Extension of Existing Career-Path Frameworks

The proposed conceptual framework builds upon existing career-path recommendation approaches, particularly frameworks such as CaPaR, which model career development as a sequence of role transitions driven by skill similarity and progression patterns[6]. Such frameworks demonstrate the effectiveness of structured career pathways and emphasize the importance of skill-based reasoning in professional advancement.

However, existing approaches remain largely skill-centric and do not incorporate psychometric factors that influence individual career fit. The proposed framework extends prior work by integrating Big Five personality traits and Holland's RIASEC vocational typology as core inputs to the career-path recommendation process. Through the use of a Trait Interaction Matrix and a Career-Skill Ontology, the framework enables the generation of career and skill pathways that are both technically feasible and psychologically congruent.

By combining skill-based career progression with validated psychological models, the proposed framework enhances personalization and supports more sustainable, personality-aligned career guidance.

V. CONCLUSION

This study presented a conceptual framework that integrates the Big Five Personality Traits and Holland's RIASEC typology to support personalized career and skill-path recommendations. By combining behavioural tendencies with vocational interests, the framework addresses limitations in existing job and skill recommenders that primarily rely on profile matching or competency data. The proposed architecture—consisting of psychometric processing, a trait-interaction matrix, a career-skill ontology, and a dual-model recommendation engine—illustrates how psychological inputs can be systematically transformed into meaningful career pathways and targeted skill-development sequences.

The framework contributes to the design of more psychologically aligned recommendation systems and provides a structured foundation for future model development. Although conceptual, the framework demonstrates the potential benefits of integrating validated psychometric theories into career-guidance technologies.

For future research and work, I'm focusing on empirical validation using real user data, expert review of trait-interaction and ontology mappings, and refinement of rule-based logic. The framework may also be extended through machine-learning models capable of adaptive recommendation, integration with large-scale skill taxonomies, and deployment within interactive digital platforms for academic or professional guidance.

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