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Design and Development of a Career Path Guidance System Using Full Stack Technologies

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Abstract—Career planning is a critical skill in the rapidly evolving 21st-century workplace, where the World Economic Forum projects that approximately 39% of core work skills will change by 2030. Existing career guidance platforms remain fragmented, static, and non-personalized, limiting their effectiveness for students and early-career professionals. This paper presents the design and development of a web-based Career Path Guidance System built using full-stack technologies—HTML/CSS/JavaScript for the frontend and Python/JSON for the backend. The proposed system provides personalized career roadmaps, skill assessment modules, and structured learning pathways in a unified, responsive interface. The architecture adopts a lightweight, database-free design using JSON files for persistence, ensuring simplicity and maintainability. Testing results confirm that all functional modules—including authentication, profile management, and roadmap generation—operate correctly and reliably. The platform addresses key gaps in existing systems by offering interactive, personalized, and data-driven career guidance, thereby empowering users to make proactive career decisions.

Index Terms—Career guidance, full-stack web development, personalized roadmap, skill assessment, Python, JSON, HTML/CSS/JavaScript, career planning platform.

I. INTRODUCTION

Career planning is a strategic process by which individuals define their professional goals and map out the skills, education, and experiences needed to achieve them. In the 21st-century workplace, this process is increasingly critical as technology and industry shifts continuously reshape job demands. The World Economic Forum predicts that by 2030 approximately 39% of core workplace skills will have changed, underscoring the need for ongoing adaptability and upskilling [8].

Existing career information is often fragmented across many websites and portals, making it challenging for users to stay informed. The Career Builder Roadmap Platform addresses this gap by unifying career guidance tools into one comprehensive web application. Users can assess their interests and strengths, explore occupations and required skills, and generate personalized career roadmaps. By consolidating diverse resources, the platform helps users remain proactive about their career development.

A. Problem Statement

Despite the abundance of online resources, individuals face considerable challenges in career planning. Most existing platforms provide static or generic information, requiring users to search multiple sites for relevant data. This fragmentation hinders informed decision-making: SHRM research indicates that a lack of clear career development paths leads to lower employee engagement and higher turnover [5]. There is a clear need for a unified, user-friendly system that aggregates career guidance into one place.

B. Objectives

The primary objectives of the Career Builder Roadmap Platform are:

- Develop an intuitive web interface using HTML, CSS, and JavaScript for interactive career exploration.
- Implement a robust Python/JSON backend for data processing and server-side logic.
- Integrate comprehensive career data including skill assessments, occupational profiles, and educational pathways.
- Enable personalized career roadmaps aligned with user-defined short-term and long-term goals.
- Ensure maintainability without complex dependencies by avoiding AI modules or proprietary cloud databases.
- Enhance user engagement through clear, structured career advancement pathways.

II. LITERATURE SURVEY

A review of existing literature highlights several foundational works relevant to this project. Fowler [1] discusses scalable enterprise web architectures, emphasizing MVC and layered patterns that improve maintainability and performance. Patel and Shah [2] survey modern full-stack technologies including HTML5, CSS3, and Python, underscoring the importance of responsive, reusable, and rapidly deployable platforms.

Gupta and Jain [3] identify critical issues in existing career guidance portals—static content, poor personalization, and weak navigation—and advocate for dynamic dashboards and modular UI components. Garofalo [4] evaluates CSS frameworks such as Tailwind and Bootstrap, finding that utility-first frameworks reduce bloat and improve load times. Robins and Keller [5] stress user-centered design principles, showing that usability directly impacts engagement with career and learning platforms.

Singh and Mehta [6] review CRUD systems and relational schema design for web applications, providing insights directly applicable to backend architecture. Sharma [7] examines student-career portals in academic settings, noting deficiencies in analytics, UI modernity, and interactivity. Green [8] presents security best practices for web applications, relevant to user authentication and data protection. Williams [9] analyzes HTML5 and JavaScript best practices for interactive UI development, while Rivas and Lee [10] evaluate career tracking tools and identify the need for customizable, user-friendly dashboards.

A. Existing Systems

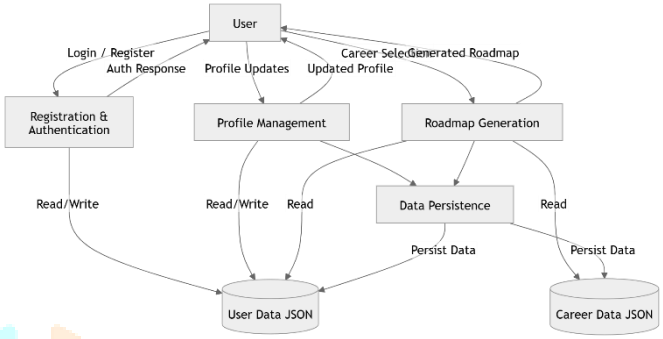
Current career-path guidance systems are primarily static job portals with limited or non-personalized recommendations. These platforms display predefined career descriptions and salary data but do not offer interactive skill mapping, customized course suggestions, or real-time performance tracking. Key shortcomings include:

- Limited personalization and static career recommendations.
- No dynamic roadmap generation or skill tracking.
- Lack of user-centric dashboards or progression insights.
- No centralized database for storing user profiles and preferences.
- Outdated UI/UX with poor navigation and low interactivity.

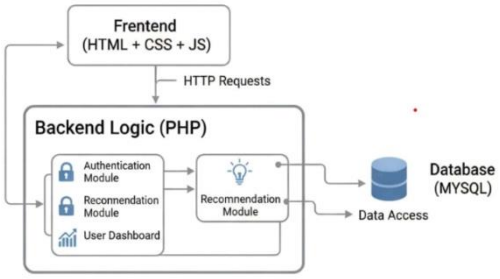
B. Research Gaps

Despite available tools, significant gaps remain: no personalized or skill-based career pathways, outdated career and industry information, lack of unified resource repositories, missing progress tracking mechanisms, absence of interactive visual roadmaps, poor mobile responsiveness, and weak database structures for storing skills and roadmap data.

IV. SYSTEM ANALYSIS AND DESIGN



B. UML Diagrams



V. IMPLEMENTATION

A. Frontend

The frontend is built using HTML, CSS, and JavaScript running in the user's browser. HTML pages define key screens including Login, Registration, Profile, and Roadmap views. CSS style sheets control layout, colours, typography, and responsiveness. JavaScript handles client-side interactions—validating inputs, sending AJAX requests to the backend, and updating page content dynamically. The interface collects user data, displays profiles and generated roadmaps, and communicates with the backend through HTTP requests, forming a responsive and interactive user experience.

B. Backend

The backend is developed in Python using Flask. It exposes routes such as /login, /profile, and /roadmap, each handling specific actions. The authentication module verifies credentials by reading from JSON files, while the registration module checks for unique user entries before saving. The profile module manages updates to users.json, and a dedicated career module generates personalized roadmaps by combining career data templates with individual user profiles. A Data Manager utility provides consistent load and save functions across the application.

C. Pseudocode

The core algorithms are presented below:

Algorithm 1: User Login

Input: email, password | Output: Boolean

1. accounts ← readJson("users.json")
2. FOR each user IN accounts:
3. IF user.email = email AND user.password = password:

4. RETURN True (login success)
5. RETURN False (not found)

Algorithm 2: Roadmap Generation

Input: goal, userSession | Output: Roadmap
1. IF NOT userSession.isLoggedIn(): RETURN error
2. roadmaps ← readJson("roadmaps.json")
3. IF goal IN roadmaps: display Roadmap (roadmaps [goal])
4. ELSE: display Message ("No roadmap found")

VI. TESTING

A. Testing Strategy

The system was validated through four complementary testing approaches. Unit testing verified individual components such as readJson () parsing and password validation logic in isolation. Integration testing confirmed correct interaction between the JavaScript frontend and Python backend, ensuring accurate roadmap data is returned via API calls. System testing evaluated complete end-to-end workflows including registration, login, quiz completion, and roadmap generation from a user perspective. Manual testing provided exploratory validation of UI flow, usability, and edge-case handling.

B. Test Results

Table I summarizes the test cases and results. All seven test cases passed, confirming system reliability across core functional areas.

TABLE I

Test Case Results Summary

ID	Test Case	Expected Output	Input	Result
TC1	Valid Login	Redirect to dashboard	Valid email + password	**Pass**
TC2	Invalid Login (wrong password)	"Incorrect password" error	Wrong password	**Pass**
TC3	Invalid Login (no username)	"Enter username" prompt	Blank username	**Pass**
TC4	Roadmap Generation (complete quiz)	Roadmap with career options	All quiz answers valid	**Pass**
TC5	Roadmap Generation (incomplete)	Prompt to complete fields	Missing quiz answers	**Pass**
TC6	JSON Read (career profiles)	Careers.json loads without error	Trigger roadmap view	**Pass**
TC7	JSON Write (new user)	Record saved; login works	New user registration	**Pass**

VII. RESULTS AND DISCUSSION

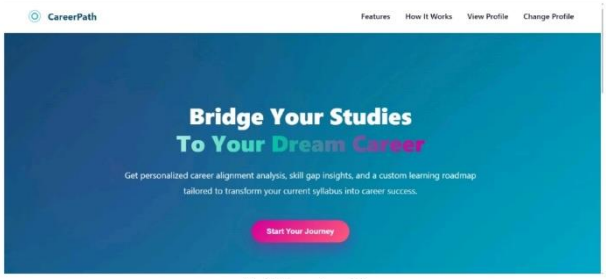
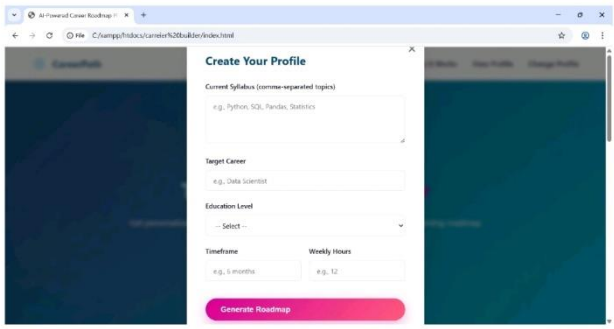


Fig 2: Home Page UI



The testing phase confirmed that the Career Builder Roadmap Platform meets all functional and usability requirements. Both unit and integration tests passed successfully, and system testing demonstrated that users can register, log in, complete the career interest quiz, and receive personalized roadmaps without issues. Manual testing further validated smooth UI navigation with no crashes or unhandled errors.

VIII. CONCLUSION

This paper presented the design and development of a web-based Career Path Guidance System using full-stack technologies. The platform successfully delivers personalized career roadmaps, skill assessment, and structured learning pathways in a unified, responsive interface, addressing key limitations of existing static career portals.

Built with HTML/CSS/JavaScript on the frontend and Python/JSON on the backend, the system provides 24/7 accessibility and meaningful personalization through structured matching logic—without relying on AI or proprietary databases. While current limitations include static JSON-based data and the absence of adaptive learning or real-time labour market feeds, the architecture provides a solid foundation for future enhancements such as database integration, AI-driven recommendations, mobile optimization, and multilingual support. The project demonstrates that accessible, structured career guidance systems can be effectively built with standard web technologies, contributing a scalable and maintainable solution for students and early-career professionals.

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