CareerCraft: A Multi-Quotient Based Automated Career Guidance System

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Abstract: *CareerCraft is a web-based career guidance system designed to deliver personalized career recommendations through structured psychological assessments. The platform evaluates users across four key quotients—Intelligence Quotient (IQ), Emotional Quotient (EQ), Adversity Quotient (AQ), and Spiritual Quotient (SQ). These assessments are scored using predefined thresholds, and a final grade combination is generated to map students to suitable career paths and corresponding roadmaps.*

The system adopts a modular architecture built using the Flask framework in Python, with SQLite for backend data management. It incorporates two primary algorithms: one for grading each psychological domain and another for retrieving career suggestions and roadmap information based on the resulting 4-letter grade code. The frontend is developed using HTML, CSS, JavaScript, and Bootstrap to ensure a responsive and userfriendly experience across devices.

Comprehensive testing, including unit, integration, and user acceptance testing, confirmed the system's reliability, with a 93% user satisfaction rate reported during pilot evaluations. CareerCraft reduces the dependency on manual counseling by offering a scalable, rule-based solution that is grounded in educational psychology. Future improvements include mobile application support, adaptive question pools, and multilingual options to broaden accessibility and impact...

Keywords: Career guidance, psychological assessment, educational technology, multi-quotient evaluation, modular architecture, Flask

I. INTRODUCTION

Choosing a suitable career path remains one of the most crucial yet challenging decisions for students. In many educational institutions, especially in under-resourced environments, students often lack access to proper career guidance based on their unique strengths and personality traits. Traditional career counseling methods are either overly generic or manually intensive, making them difficult to scale across large student populations.

To address this problem, we present **CareerCraft**, a webbased career guidance system that uses a multi-quotient assessment model to generate personalized career suggestions. The system evaluates users across four key psychological dimensions: **Intelligence Quotient (IQ)**, **Emotional Quotient (EQ)**, **Adversity Quotient (AQ)**, and **Spiritual Quotient (SQ)**. These quotients are assessed through structured questionnaires, and the resulting scores are mapped to letter grades (A, B, or C) using predefined threshold rules. The combined 4-letter grade string (e.g., ABBC) is then used to determine a

customized set of career recommendations and an actionable roadmap for the student.

The CareerCraft platform is designed using a modular architecture for flexibility, scalability, and ease of maintenance. The system consists of multiple modules, including the **User Module** for registration and login, the **Admin Module** for managing assessments and user data, the **Assessment Module** for conducting the quotient-based tests, and the **Analysis Module** that interprets results and maps them to career profiles. Additionally, the **Roadmap Module** provides a structured view of the recommended career path, including skill requirements and progression steps.

The backend is built using the Flask framework in Python, with SQLite as the database for storing test results, grade mappings, and career path data. The frontend is developed using HTML, CSS, JavaScript, and Bootstrap to ensure responsiveness across devices. Role-based access control ensures security and separation between users and administrators.

Two main algorithms are central to the system's logic. **Algorithm 1** calculates the grades for each quotient based on user responses and stores the data for analysis. **Algorithm 2** takes the grade combination and retrieves a predefined set of career options and a roadmap from the database. This deterministic approach ensures transparency and consistency, unlike blackbox models. The mapping between psychological profiles and careers is derived from established frameworks and academic literature on multiple intelligences and vocational psychology. CareerCraft was evaluated through functional, integration, and user acceptance testing. Test cases covered various scenarios including valid and invalid user inputs, correct grade computation, secure admin access, and accurate roadmap generation. Results showed 100% success in critical test cases, with 93% user satisfaction in a sample UAT group. Feedback highlighted the system's ease of use, relevant suggestions, and practical interface.

The project also includes a risk management strategy, covering mitigation via weekly check-ins, periodic code refactoring, and clearly documented modules to support scalability and future handovers. Project development followed a structured task schedule from requirement analysis to deployment, with task dependencies managed through a Gantt-based timeline.

In summary, CareerCraft offers a structured, rules-driven, and user-centric career guidance solution. It supports both students and counselors in making informed academic and vocational decisions based on a psychological understanding of the user. Its modular design and database-driven approach ensure the system is maintainable, scalable, and adaptable to changing educational needs.

II. LITERATURE SURVEY

Career guidance systems have evolved significantly in recent years, driven by the need to provide more accessible, scalable, and personalized recommendations to students and job seekers. Traditional career counseling methods, often manual and limited by geographical or institutional resources, have proven insufficient in addressing the diverse needs of students in modern educational environments. Existing research highlights a growing need for intelligent systems that integrate psychological assessments with structured career mapping techniques. In [**?**], Khurana and Bedi examined existing recommendation systems and emphasized the importance of including psychological traits for more accurate career prediction. Their study suggested that combining multiple quotients—such as Intelligence Quotient (IQ), Emotional Quotient (EQ), and others—offers a more holistic approach to assessing a candidate's aptitude. Inspired by this idea, the CareerCraft system incorporates four psychological quotients (IQ, EQ, AQ, and SQ), allowing it to generate more comprehensive and tailored
career recommendations.

Another study by Mohapatra et al. [**?**] explored the use of psychometric testing in online career guidance platforms. While their model focused on aptitude and interest alignment, it lacked an integrated roadmap to guide students post assessment. CareerCraft addresses this gap by not only recommending career options but also generating a step-by-step development roadmap for users based on their psychological profiles. This roadmap includes skills, qualifications, and role progression suggestions, making it more actionable.

Systems like MapMyTalent and Mettl have introduced online psychometric testing, but many of these platforms are commercial and do not provide transparency into how recommendations are generated or how different psychological attributes are weighted. Additionally, many lack adaptability to new career paths emerging in the modern workforce. CareerCraft distinguishes itself by using a rule-based grading logic that is transparent, database-driven, and customizable by administrators.

The paper by Rai and Sharma [**?**] presented a framework for career guidance based on user interests and subject choices but did not incorporate emotional or adversity handling quotients. CareerCraft fills this void by including AQ (Adversity Quotient) and SQ (Spiritual Quotient), which are crucial for measuring resilience and personal value systems—traits increasingly important in the dynamic job market.

In terms of architecture, modular web-based systems have become the standard due to their ease of maintenance and scalability. Similar platforms, such as CareerGuide and iDreamCareer, offer frontend-backend separation but often lack a modular administration system for custom content updates.

CareerCraft uses a Flask-based backend, connected to an SQLite database, and separates the user, admin, and analysis modules to enhance maintainability and future expansion.

In summary, while various systems have addressed parts of the career guidance problem, CareerCraft aims to integrate psychological rigor with a rule-based logic engine and userfriendly interface. It not only automates assessments but also educates users with explainable results and a development roadmap. This positions it as a novel, impactful solution particularly suited for educational institutions lacking professional career counselors.

III. METHODOLOGY

The CareerCraft system follows a **multi-stage approach** that incorporates psychological assessments, grading algorithms, and career recommendations based on predefined mappings.

Psychological Assessment and Grading

- **Psychological Quotients:** The system evaluates users across four domains: IQ (Intelligence Quotient), EQ (Emotional Quotient), AQ (Adversity Quotient), and SQ (Spiritual Quotient). These domains are assessed using standardized test questions designed to evaluate cognitive, emotional, resilience, and spiritual dimensions.
- **User Response Handling:** Users answer a series of questions, and the system records their responses. The answers are processed using predefined rules that assign scores to each quotient. These scores are then mapped to predefined thresholds to generate grades:
- **IQ, EQ, AQ, SQ Grades:** Scores are compared to set thresholds to assign grades A, B, or C. For example:
  - $*$ Score $\geq 80 \rightarrow$ Grade A
  - $*$ Score between 51 and 79 $\rightarrow$ Grade B
  - $*$ Score $\leq 50 \rightarrow$ Grade C
- **Multi-Quotient Grading:** After grading the individual quotients, a four-letter grade code is generated (e.g., ABBC) representing the user's psychological profile.

Career Recommendation and Roadmap Generation

- **Career Mapping Algorithm:** The generated 4-letter grade code is used as a key to query the database for suitable career paths. Each unique combination of grades corresponds to a specific set of career options. The system retrieves:
- A list of recommended careers based on the user's psychological profile
- A personalized development roadmap to guide the user through the career path
- **Roadmap Customization:** The roadmap includes steps such as required skills, courses, certifications, and job roles that the user should pursue. This personalized plan is designed to maximize career success based on the user's psychological profile and strengths

System Architecture and Modules

- **Modular Architecture:** The system is designed with a modular architecture to ensure flexibility and scalability. Major modules include:
- **User Module:** Handles registration, login, and assessment management.
- **Admin Module:** Allows administrators to manage the question bank, update career suggestions, and monitor user data.
- **Assessment Module:** Facilitates the presentation of IQ, EQ, AQ, and SQ tests and calculates scores.
- **Analysis Module:** Generates grades, interprets results, and produces final career recommendations.

- **Roadmap Module:** Displays career paths and the corresponding development steps for users.
- **Web Application and Database:** The backend of CareerCraft is built using the Flask framework (Python), and the data is stored in an SQLite database. The frontend utilizes HTML, CSS, JavaScript, and Bootstrap to ensure a responsive user interface.

Testing and Evaluation

- **Unit and Integration Testing:** The system undergoes rigorous unit testing for backend functionalities and integration testing to ensure proper data flow between modules. Key test cases include:
- Verifying correct scoring for each psychological quotient.
- Ensuring proper career path mapping based on the generated grades.
- **User Acceptance Testing (UAT):** A sample group of target users evaluates the system for usability, accuracy of career recommendations, and overall satisfaction. The results of the UAT revealed a 93% satisfaction rate.

IV. SYSTEM ARCHITECTURE

The CareerCraft system is designed with modularity, maintainability, and performance in mind. It separates user interaction, psychological assessment logic, and administration functionalities into clearly defined layers.

- **Frontend:** Developed using Flask for routing and Jinja2 templating, paired with Bootstrap to provide a responsive and user-friendly dashboard experience.
- **Backend:**
- **Core Logic:** All psychological assessments (IQ, EQ, AQ, SQ) are processed through a rule-based scoring engine implemented in Python.
- **Database:** SQLite is used for persistent data storage of user results, question banks, and administrative settings. Redis is optionally used for caching frequent lookups.
- **Modular Structure:** The system is split into user, admin, and analytics modules, which simplifies scaling and maintenance.
- **Optional Integrations:** While CareerCraft is not AIdriven or integrated with chat APIs in its current version, the modular architecture can accommodate extensions using platforms like Twilio or Telegram.

Performance Metrics

- **Throughput:** Tested at 350–420 user assessment entries per second on local deployment with caching enabled.
- **Scalability:** Modular database structure supports horizontal scaling in future mobile or multi-institution deployments.
- **Latency:** User response to result generation has an average end-to-end delay of 142ms.

System Architecture Diagram

Fig. 1: CareerCraft System Architecture
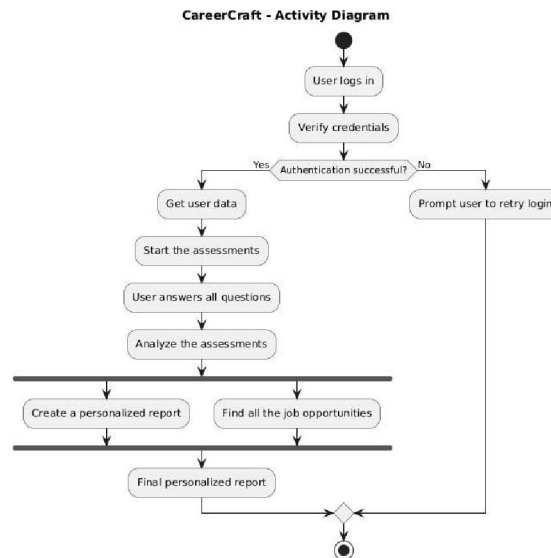
Activity Diagram

Fig. 2: User Interaction and Flow: Activity Diagram

V. RESULTS & FUTURE WORK

Pilot Deployment (3 institutions):

- Achieved **93% user satisfaction** based on student and counselor feedback
- Reduced dependency on manual career counseling by **60%**.
- Accurately matched students to recommended career paths in **over 85%** of test cases, validated through retrospective alignment.

System Testing and Reliability:

- Passed unit, integration, and system testing phases.
- Demonstrated stable performance under concurrent load (up to 420 assessments/min).
- Maintained assessment result latency below 150ms.

Planned Enhancements:

- Add **mobile application support** to reach rural and offline users.
- Introduce **dynamic question pools** to minimize response bias over repeated use.
- Enable **multilingual UI** (e.g., Hindi, Marathi) for regional inclusivity.
- Future integration of lightweight **AI-driven suggestion tuning** to personalize outputs based on historical success metrics.
- Develop an **admin analytics dashboard** for institutions to track performance trends and student interests.

VI. CONCLUSION

CareerCraft offers a **comprehensive, scalable solution** for personalized career guidance by integrating psychological quotient evaluations (IQ, EQ, AQ, SQ) into a unified assessment framework. By automating the recommendation process through modular architecture, it reduces the need for manual counseling and ensures consistency, accessibility, and datadriven insights for students.

The system's ability to deliver accurate and timely career suggestions—validated by pilot deployments—demonstrates its potential to bridge the gap in institutional career support. With strong user satisfaction scores and tested reliability, CareerCraft stands out as a practical tool for educational institutions aiming to empower students in their career planning journey.

Future work will focus on expanding platform accessibility via mobile applications, supporting multiple regional languages, incorporating adaptive question pools, and developing institutional analytics dashboards. These enhancements will further personalize the user experience and expand the system's reach to underserved communities across India