CAREERPATHAI: AN AI-POWERED PERSONALIZED CAREER GUIDANCE SYSTEM FOR RURAL AND UNDERSERVED STUDENTS

Karri Kartheeka Reddy

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Abstract

Career decision-making is one of the most critical phases in a student's life, yet millions of students in India—especially those from rural areas, Tier 2/3 towns, and low-income families—continue to make these choices with little to no professional guidance. Studies show that 93% of Indian students are aware of only a handful of traditional careers, and India has a severe shortage of career counsellors, with only 1 available for every 10,000 students. This project proposes an AI-powered Career Counselling Chatbot tailored to the needs of school students from underserved communities.

The chatbot will function via WhatsApp or mobile app and offer personalized career suggestions based on user inputs related to subject interest, academic strengths, and basic personality traits. It will use NLP, simple classification models, and career recommendation logic to suggest suitable paths.

The goal is to build a solution that is accessible, scalable, and culturally relevant—available in multiple Indian languages and aligned with the National Education Policy (NEP) 2020. The product will also include a practical monetization model and a clear MVP (Minimum Viable Product) roadmap to support its deployment across schools, NGOs, and local communities. This AI-driven system aspires to democratize career counselling and help students make confident, well-informed decisions about their future.

1. PROBLEM STATEMENT

In India, a vast number of students—especially those from rural areas, low-income families, and Tier 2/Tier 3 towns—lack access to proper career guidance. According to a 2022 survey by the IC3 Institute and Mindler, 93% of students aged 14–21 are aware of only seven career options, despite over 250 viable paths being available. Compounding the issue, the country has only about 5,000 certified career counsellors to serve millions of students. Without reliable guidance, these young individuals often follow conventional advice from family or peers, leading to uninformed and unsuitable career choices. The result: disengagement, underemployment, or long-term dissatisfaction. It's clear that lakhs of students are being affected each year without timely, informed interevent

2. MARKET / CUSTOMER / BUSINESS NEED ASSESSMENT

2.1. Market Context

India has a large student population, with over 11 crore school students according to UDISE+ 2022–23 data. A significant portion of these students come from rural or low-income backgrounds and have little access to structured career guidance. The traditional approach to career decision-making—relying on family opinions, peer pressure, or popular trends—often leads students to pursue paths that don't align with their actual interests or potential. The growing complexity of the job market and the emergence of new-age careers make this gap even more critical.

2.2. Gaps in Existing Solutions

Career guidance today is limited to elite urban schools or private consultants, both of which are inaccessible to rural and Tier 2/Tier 3 students. According to IC3 Institute (2022), 93% of students are aware of only 7 traditional careers, and India has only 1 certified counsellor for every 10,000 students—well below UNESCO's recommendation. While there are career portals and apps, they are rarely designed with language accessibility, cultural context, or affordability in mind for rural audiences.

2.3. Customer Segments

The primary users of this solution include:

- Students from Grades 8–12 in rural government and low-income private schools
- Parents and teachers who influence student decisions
- NGOs and small schools that lack full-time counselling resources

These users need a platform that is:

- Mobile-friendly
- Easy to use
- Available in regional languages
- Affordable or free

2.4. Business Need

There is a growing policy and ecosystem-level push for career guidance. The National Education Policy (NEP) 2020 encourages vocational and life-skills education starting from middle school. NGOs, state governments, and CSR programs are actively seeking scalable, cost-effective solutions. A low-cost AI-based chatbot that delivers career suggestions via WhatsApp or a mobile app fits perfectly into this space and addresses the needs of a large, underserved market.

3. TARGET SPECIFICATIONS AND CUSTOMER CHARACTERISTICS

3.1.Primary Target Audience

3.1.1. Students (Grades 8–12)

- **Age Group**: 13–18 years
- **Location**: Tier 2/Tier 3 towns and rural villages
- **Language Needs**: Prefer content in regional languages (e.g., Telugu, Hindi)
- **Technology Access**: Basic smartphones, mostly Android devices
- **Limitations**: Limited internet connectivity, low awareness of online tools
- **Needs**: Simple interface, personalized career suggestions, low data usage

3.1.2. Parents and Teachers (Influencers)

- **Role**: Strongly influence or make career decisions for students
- **Tech Literacy**: May not be highly tech-savvy
- **Needs**: Clear and trustworthy career suggestions, simplified guidance
- **Expectations**: Prefer career suggestions aligned with stability (e.g., Govt jobs)

3.2. Product Feature Requirements

To meet the needs of the target audience, the product should:

- Be mobile-friendly and compatible with low-end devices
- Function with limited internet access
- Provide content in multiple Indian languages
- Use simple, guided flows with visual or audio-based instructions
- Recommend career paths using academic inputs, interests, and basic profiling

3.3. Accessibility and Inclusion Considerations

- Voice-assisted features for students with reading or learning difficulties
- Easy-to-understand explanations of career options
- Allow support from parents or teachers during the process
- Recommend careers based on interests and hobbies, not just marks

4. EXTERNAL SEARCH

4.1 Career Counselling Access

- **Bharat Career Aspirations Report 2024**: <10% of students have professional counselling access; 80% know only 7 career options.
- **Edinbox (Oct 2024)**: 80% of those who receive counselling benefit, but 40% still lack any access.

4.2 Rural Youth Challenges

- **TRI/GDI 2024 Report**: ~378M youth, two-thirds in rural areas, remain disconnected from growth opportunities.
- 70–85% of rural youth want to change careers due to low earnings and lack of prospects.

4.3 EdTech + AI in Rural Learning

- **eVidyaloka AI BRAIN program**: implementing AI-based education in regional languages, but hindered by infrastructure gaps.
- **2025 study on LLMs**: finds AI tools promising, yet limited by poor connectivity, low digital literacy, and insufficient support.

4.4 Early Guidance Importance

- June 2025 article urging career counselling from Grade VIII, to help students explore interests before pivotal exam years.

5. BENCHMARKING ALTERNATE PRODUCTS / SERVICES

5.1. Existing Tools & Platforms

Several platforms currently provide career guidance and counselling, but they often cater to urban audiences or require high-end devices, English fluency, or paid subscriptions. Key players include:

1) **Mindler**
   - Offers psychometric tests and career assessments.
   - Used by many private urban schools.
2) **CareerGuide**
   - Focuses on assessments and mentoring sessions.
   - Content-rich but paywalled for many features.
3) **iDreamCareer**
   - Works with state governments and offers vernacular language support.
   - Growing fast but still limited in small-town penetration.
4) **Shiksha.com / Collegedunia**
   - Focus on college admissions, not career matching.
   - Not tailored to school-level career exploration.

5.2. Strengths and Limitations

Platform	Strengths	Limitations
Mindler	Detailed assessments, career libraries	Expensive, English-only, requires internet
CareerGuide	Mentorship access	Subscription required, not mobile-optimized for rural users
iDreamCareer	Localized content, government collaborations	Still limited in reach; depends on school partnerships
Shiksha.com	Vast college info	No actual career matching; just info-heavy

5.3. Differentiation Opportunity for CareerPathAI

Your proposed solution stands apart because it:

- Works on low-end smartphones and even WhatsApp
- Is free or low-cost, designed for rural/underserved students
- Provides career suggestions based on basic inputs (marks, interests, goals)
- Offers regional language support and voice/text options
- Doesn't rely on internet-heavy features like video calls or webinars

This makes CareerPathAI a more inclusive, accessible, and scalable solution that directly addresses the limitations of current tools.

6. APPLICABLE PATENTS

To ensure originality and avoid intellectual property infringement, a review of existing patents related to AI-driven career counselling platforms, chatbots, and recommendation engines was conducted using open patent databases (Google Patents, WIPO, Indian Patent Office).

6.1 Relevant Patent Observations

A few patents were found related to **AI-driven recommendation systems**, including:

- **US20190341293A1**: AI-based career path recommendation system using psychometric data.
- **IN202011021234A**: Conversational chatbot platform for educational queries.

6.2 Legal Clearance

The current solution, *CareerPathAI*, differs significantly:

- It uses **basic input-based recommendations** rather than detailed psychometric tests.
- It is **implemented via open-source NLP/chatbot tools** such as:
  - **Rasa** (Apache 2.0 licensed)
  - **Google Dialogflow** (available for public use with T&C compliance)
- No proprietary methods or patented algorithms are being reused directly.

6.3 IP Scope for Future

If developed as a full product, the following components can be considered for IP filing:

- The **regional-language career suggestion flow via WhatsApp**
- The **lightweight rural-focused UX framework**
- The **local academic + interest mapping algorithm**

Thus, the project maintains legal compliance and is eligible for IP protection in future stages of product development.

7. APPLICABLE REGULATIONS

The development and deployment of *CareerPathAI* must adhere to several government, educational, and digital regulations, especially because the solution targets **school-aged children** and uses **personal data** for personalized recommendations.

7.1. Data Privacy Laws

- **Digital Personal Data Protection (DPDP) Act, 2023 – India**: The system must comply with India's updated privacy law, which mandates that:
  - Students' and parents' data must be collected with consent
  - Data must be stored securely and only used for stated educational purposes
  - Children under 18 require guardian consent for data usage
- **Children's Online Privacy Protection Act (COPPA)** (International reference): Although this is a US regulation, it sets ethical guidelines for handling children's data which can be mirrored in design.

7.2. Educational Policies & Guidelines

- **National Education Policy (NEP) 2020 – India**: NEP recommends integrating career exposure and vocational training from Grade 6 onward, supporting the purpose of this project.
- **State Education Department Rules**: Career guidance tools must be compatible with regional curriculum standards, especially when used by public or aided schools.

7.3. Accessibility & Inclusion Standards

- The platform should support **local languages** to ensure inclusivity.
- Should follow **WCAG 2.1 guidelines** (where possible) for readability and interface design (especially if converted to an app or web interface).

7.4. Ethical Use of AI

- Recommendations should be transparent, non-biased, and explainable.
- No high-stakes decisions should be made without human involvement.
- The system must be clearly labelled as a guidance tool, not a decision-maker.

By ensuring alignment with these national and ethical standards, CareerPathAI can be deployed responsibly in public education environments and CSR-backed NGO initiatives.

8. APPLICABLE CONSTRAINTS

Despite the promising potential of *CareerPathAI*, several real-world constraints must be considered to ensure successful development and adoption, especially in rural and underserved communities.

8.1. Technical Constraints

- **Low-end Devices**: Most target users (students/parents) own basic Android smartphones with limited memory and outdated operating systems.
- **Internet Connectivity**: Rural regions may suffer from slow or unstable internet, affecting the availability of online tools and cloud-based chatbots.
- **Multilingual NLP**: Supporting Indian regional languages (Telugu, Hindi, etc.) for chatbot conversations requires training and adapting open-source NLP models, which can be resource-intensive.

8.2. Financial Constraints

- **Budget Limitations**: NGOs and government schools operate on tight budgets, making it necessary to keep the solution low-cost or freemium.
- **Sustainability**: Hosting costs (APIs, server load) may become challenging if usage scales up quickly without external funding.

8.3. User Adoption Constraints

- **Digital Literacy**: Some students, parents, and teachers may not be comfortable using chatbots or apps, especially if the interface isn't intuitive.
- **Trust Barrier**: Parents may not trust automated suggestions without a human counsellor or local school staff backing the recommendation.

8.4. Team & Development Constraints

- **Skilled Team Requirement**: Building a secure, multilingual AI chatbot and maintaining it over time would require a small but specialized team.
- **MVP Timeline**: Even a basic working version (chatbot + logic + backend) might take 2–3 months of focused work, plus testing.

These constraints will be addressed through careful product planning, the use of open-source tools, offline-first designs, and partnerships with local schools or NGOs for awareness and support.

9. BUSINESS MODEL (MONETIZATION IDEA)

CareerPathAI is designed to be an affordable and scalable solution that supports students from underserved communities. The product follows a hybrid monetization model that ensures sustainability while keeping the core service accessible to those who need it most.

9.1. Freemium Model

- **Free Tier**: Basic career suggestions based on academic interests and simple profile questions, available via WhatsApp or mobile app.
- **Premium Tier**: Includes additional features like:
  - In-depth psychometric assessments
  - Access to live counsellor chats
  - Downloadable reports for parents/teachers
  - Exam/career preparation resources

9.2. B2B Sales to Schools & NGOs

- The platform can be licensed to:
  - **Private low-cost schools**
  - **NGOs working in education/skill development**
  - **CSR-funded school programs**

- They can use CareerPathAI for group counselling or workshops in regional languages.

9.3 State Government Partnerships

- CareerPathAI can be pitched as a plug-and-play solution for:
    - Government career guidance schemes under NEP 2020
    - Digital India programs targeting rural education
    - Skill development programs run by state ministries

Sustainability Strategy

- Initial MVP development funded by grants, fellowships, or CSR funding.
- Revenue from NGO/school subscriptions used to scale infrastructure.
- Gradual rollout of premium features as user base grows.

This hybrid model ensures that the core mission of accessibility remains intact, while also supporting long-term growth and financial viability.

10. CONCEPT GENERATION

10.1 Origin of the Idea

Like many students, I found myself choosing engineering not out of strong personal passion, but because it was the most common and expected path in my surroundings. This experience made me deeply aware of how many students make critical career choices based on societal trends or family pressure, without access to proper guidance.
Even before this internship, I had thought about creating a career counselling platform that could help students explore paths aligned with their interests. This project offered the perfect chance to turn that idea into a working concept.

10.2 Research Validation

As I began researching, I discovered that over 93% of Indian students are aware of only 7 career options, and less than 10% have access to a certified career counsellor (IC3 & UNICEF 2024). These statistics matched my personal experience and confirmed the scale of the problem. National Education Policy (NEP 2020) also emphasizes the importance of career exposure starting from middle school.

10.3 Concept Evolution

The idea matured from a general “career counselling” platform to a specific solution: an AI-powered chatbot, accessible via WhatsApp, delivering personalized guidance in regional languages. The goal was to design something:

- Accessible on low-end phones
- Easy to use for students and parents
- Grounded in data, but not too complex

This thinking was supported by exploration of open-source tools like Rasa and Dialogflow, which allow development of multilingual conversational interfaces with basic AI logic.

11. CONCEPT DEVELOPMENT

The core objective of *CareerPathAI* is to deliver personalized, AI-powered career guidance to school students in rural and underserved communities, using platforms they already use and trust — primarily WhatsApp. This solution addresses the severe lack of access to trained counsellors, career awareness, and localized guidance options.

The initial version (Minimum Viable Product – MVP) will be developed as a WhatsApp-based chatbot, where students can interact in their preferred regional language and receive tailored career suggestions based on a short question-answer flow. The chatbot will be powered by a lightweight AI logic layer, built using open-source tools like Dialogflow or Rasa, and hosted on platforms like Twilio or WhatsApp Cloud API.

The product will:

- Collect simple inputs from the student (age, grade, favourite subjects, interests, etc.)
- Analyse them using rule-based logic and ML-assisted mappings
- Generate Top 3 personalized career suggestions, along with reasoning, subject focus, and next-step guidance

Future iterations may include a mobile app or web dashboard for schools/NGOs with extra features like:

- Progress tracking
- PDF reports
- Mentorship integration
- Exam/certification guidance

The concept combines inclusivity, accessibility, and practicality, with a focus on building trust among users and supporting long-term career growth in alignment with NEP 2020.

12. FINAL PRODUCT PROTOTYPE (ABSTRACT) WITH SCHEMATIC DIAGRAM

12.1 Abstract Product Description

CareerPathAI is an AI-powered career guidance system delivered through a WhatsApp chatbot interface, designed to help students from rural and Tier 2/3 backgrounds make informed career decisions.

The chatbot collects simple inputs through a question-based flow:

- Student's name, age, grade
- Subject interests and hobbies
- Self-assessed skills (e.g., communication, analytical thinking)
- Optional career inclinations (if any)

These inputs are processed by a career recommendation engine, which matches the student's profile to a curated knowledge base of careers using:

- Rule-based logic (mapping subjects/interests to clusters)
- Basic classification model (optional in MVP)
- Predefined thresholds and filters (e.g., academic level, exam requirements)

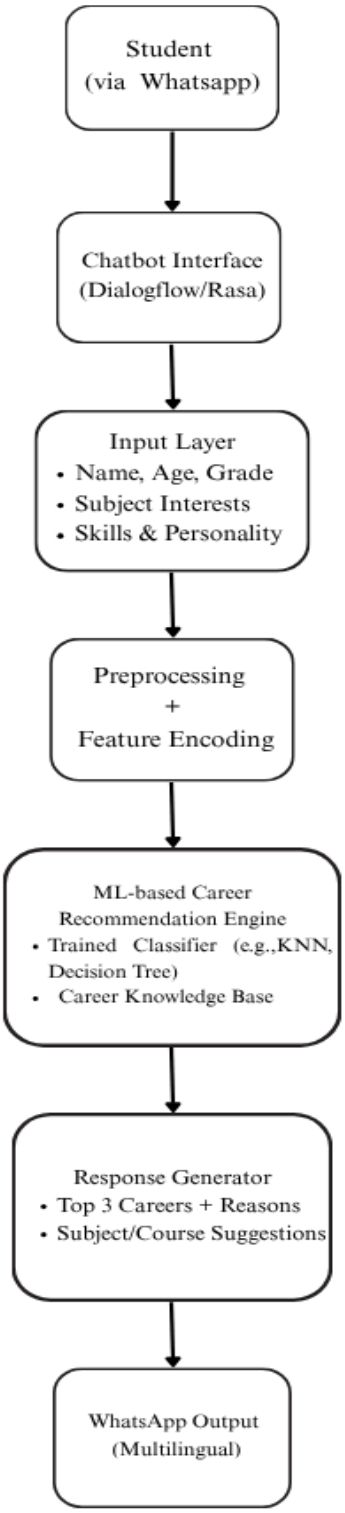
The output is:

- A list of Top 3 career suggestions
- A reason for each suggestion ("You enjoy science and helping others → Consider Pharmacy")
- Suggested next steps (courses, subjects to focus on)
- Optional local resources (colleges, online links, etc.)

The system is hosted on a backend using Dialogflow or Rasa, integrated with WhatsApp via Twilio or Meta's Cloud API. Future versions may add psychometric testing, live mentor access, or school dashboards.

12.2 Schematic Diagram

Here's a simple block diagram showing the high-level flow of CareerPathAI:



12.3 Prototype Status

The MVP version is designed to be deployed quickly using:

- Open-source tools (Rasa, Flask, etc.)
- Limited storage
- Local-language support
- Deployment-ready APIs (Twilio, WhatsApp Cloud API)

The prototype focuses on accessibility, regional relevance, and minimum technical overhead.

13. PRODUCT DETAILS

13.1 How Does It Work?

CareerPathAI functions as a conversational AI system deployed via WhatsApp, allowing students to receive career guidance in a familiar, accessible way. The student interacts with a chatbot that asks a series of simple, guided questions about their academic interests, self-assessed strengths, preferred subjects, and future goals.

The collected responses are transformed into a feature vector and passed to a Machine Learning-based recommendation engine. This engine uses a trained classifier (e.g., K-Nearest Neighbours, Decision Tree, or Naive Bayes) to predict the most suitable career clusters for the student based on past data and predefined mappings. The model is supported by a curated career knowledge base to ensure contextual accuracy.

The system then generates a response that includes:

- Top 3 career suggestions
- A simple explanation for each recommendation
- Relevant subjects, entrance exams, or vocational skills needed
- (Optional) local colleges or online resources to explore

13.2 Data Sources

The recommendation engine and chatbot content are built using the following data sources:

- Publicly available career path frameworks from NSDC, NCS Portal, and Skill India
- Academic and interest mapping datasets (synthetic + public)
- Localized lists of vocational courses and entrance exams
- Manually curated mappings of interests → skills → careers

13.3 Algorithms, Frameworks, and Software Used

Component	Technology/Tool Used
Chatbot Interface	Dialogflow or Rasa (NLP & response handling)
Messaging Platform	WhatsApp Business API via Twilio/Meta Cloud API
Backend & API Layer	Flask or Node.js
ML Model	scikit-learn (KNN / Decision Tree / Naive Bayes)
Data Preprocessing	pandas, NumPy
Visualizations (EDA)	matplotlib, seaborn
Storage (MVP)	Google Sheets or Firebase (temporary backend)

13.4 Team Required to Develop

Role	Responsibility
Machine Learning Engineer	Model training, testing, validation
Chatbot Developer	Dialogflow or Rasa bot creation, flow design
Backend Developer	API development and integration
Content Researcher	Career info curation, mapping and localization
UX/Language Designer	Interface tone, clarity, multilingual support

Initially, the MVP can be developed by a 2–3 member team with overlapping skill sets.

13.5 Estimated Cost (for MVP)

Resource	Estimated Cost (INR/month or one-time)
WhatsApp API (Twilio)	₹2,000 – ₹4,000/month (depends on usage)
Hosting (Heroku/Firebase)	₹500 – ₹1,000/month
Dialogflow (Free Tier)	₹0 (sufficient for MVP)
Development (Self-built)	₹0 (if student-led); else ₹10k–₹25k one-time
Total Estimated Cost	₹10,000 – ₹30,000 (for MVP phase)

The MVP is intentionally designed to be low-cost and scalable using open-source tools and cloud credits (if available via student/edu plans).

14. CONCLUSION

CareerPathAI was conceptualized to address the widespread lack of career guidance among students from rural and underserved regions in India. Through personal experience and extensive research, it became clear that the absence of structured counselling and awareness forces many students to make uninformed career decisions — often leading to long-term dissatisfaction and underemployment.

This project proposes a practical and scalable solution: an AI-powered WhatsApp chatbot that delivers personalized career suggestions based on student interests, subject preferences, and basic personality traits. By leveraging conversational interfaces and a machine learning-powered recommendation engine, CareerPathAI makes career exploration accessible even to students with limited internet access and digital literacy.

The product aligns with the goals of the **National Education Policy (NEP 2020)** and its ongoing implementation between 2023–2025, which promotes early exposure to vocational and career planning. The system has been designed with flexibility and low cost in mind, allowing it to be piloted in schools, NGOs, and CSR-backed initiatives.

Looking ahead, the platform can evolve into a full-featured application offering psychometric assessments, progress tracking, mentorship, and localized resources. CareerPathAI holds the potential to become a powerful enabler of self-driven, informed career planning for the next generation.

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