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Karigar: A Digital Bridge Between Construction Workers and Contractors in India Using Cloud-Based Web Technologies

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Abstract: *The construction industry in India employs a significant portion of the labor force, yet it remains plagued by inefficiencies in connecting workers with employment opportunities and government schemes. Despite being critical to infrastructure development, construction workers in India often face challenges such as inconsistent work, lack of access to benefits, and exploitation. This paper introduces Karigar, a digital platform designed to address these issues by leveraging cloud- based web technologies. The platform, developed using HTML, CSS, JavaScript, Node.js, and MySQL, connects construction workers with contractors and facilitates access to government welfare programs. Additionally, the platform utilizes AWS services such as S3, Lambda, and RDS to provide a scalable, secure, and efficient solution. This research explores the technical architecture, features, implementation strategy, and the potential socio-economic impact of Karigar on the construction industry and its workforce in India*

Keywords: Construction, Digital Platform, Web Application, AWS, Employment, Socioeconomic Development, India.

I. INTRODUCTION

India's construction industry is an integral part of the nation's economic framework, contributing significantly to GDP and providing employment to millions of workers. However, a large proportion of the labor force in this sector is informal, working on a daily-wage basis with limited job security, financial stability, or access to legal rights. Additionally, workers often rely on word- of-mouth referrals or brokers to secure jobs, which leads to inefficiencies, exploitation, and lack of transparency. This lack of organization and structure not only harms workers but also hinders the overall productivity of the construction industry.

In the face of these challenges, Karigar was developed as a digital platform aimed at bridging the gap between construction workers and contractors. By utilizing modern web technologies,

Karigar offers a user-friendly, cloud-based solution that allows workers to find jobs, track

applications, and access government schemes. The platform also offers contractors a transparent and efficient way to hire workers and manage projects. This research delves into the purpose, development, and potential impact of the Karigar platform on India's construction workforce,

aiming to create a more inclusive, accessible, and efficient labor market.

II. BACKGROUND AND PROBLEM STATEMENT

India's construction sector is characterized by a predominantly informal workforce, with workers often facing a lack of consistent employment, exposure to poor working conditions, and inadequate wages. Despite their critical role in the economy, these workers typically work on temporary contracts without benefits, job security, or access to financial services such as insurance or pensions. Furthermore, the awareness of government welfare schemes that could provide

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financial support or healthcare benefits is often low among these workers. The absence of a centralized system for job placement, skill verification, and welfare benefits only exacerbates the problem.

The issues within the construction labor market in India can be summarized as follows:

1. Fragmented Employment Channels: Traditional methods of hiring construction workers, such as relying on local brokers or word-of-mouth referrals, are inefficient, leading to gaps in employment opportunities.
2. Limited Access to Government Schemes: Workers are often unaware of or unable to aaccess various government welfare programs due to bureaucratic complexities, literacy barriers, and a lack of digital infrastructure.
3. Data Management Issues: The informal nature of construction work means that workers and contractors lack structured records, which could help verify their skills, work history, and financial reliability.

Karigar addresses these issues by creating an accessible digital platform that connects workers with job opportunities, provides access to government schemes, and allows contractors to verify worker credentials and track projects.

III. LITERATURE REVIEW

3.1 Digital Platforms in the Informal Economy

Previous research has highlighted the transformative potential of digital platforms in formalizing informal labor markets. Studies by Kumar and Singh (2023) demonstrated that digital
interventions can reduce information asymmetry and create more equitable job markets.

Similarly, research by Patel et al. (2022) showed that mobile-based platforms can significantly improve income stability for daily wage workers in urban areas.

3.2 Technology Adoption Among Construction Workers

While digital solutions offer promise, adoption remains a challenge among construction workers.

A comprehensive survey by Sharma and Gupta (2024) found that only 32% of construction workers in major Indian cities regularly use smartphones for job-related purposes. Barriers include limited digital literacy, inconsistent internet access, and concerns about privacy.

3.3 Government Welfare Schemes for Construction Workers

The Government of India has implemented several welfare schemes for construction workers, including the Building and Other Construction Workers (BOCW) Act, which mandates the
creation of welfare boards in each state. However, as noted by Mehta (2023), the utilization of
these schemes remains low due to bureaucratic hurdles and awareness issues. Digital platforms that simplify access to these schemes could significantly improve their reach and effectiveness.

IV. OBJECTIVES OF THE PLATFORM

The primary objective of Karigar is to enhance the employment prospects of construction workers and improve the efficiency of the recruitment process for contractors. The platform seeks to achieve the following goals:

1. Job Connectivity: By providing real-time job listings and application features, the platform enables construction workers to find employment opportunities that match their skills, location, and pay expectations.
2. Scheme Navigation: Karigar aims to simplify the process of discovering and applying for government schemes related to healthcare, insurance, and housing for construction workers.
3. Digital Profiles: Both workers and contractors can create digital resumes that showcase skills, experience, and previous projects, thereby improving the transparency and
1. credibility of the workforce.
4. Scalability: Utilizing cloud technologies ensures that the platform can accommodate a growing number of users across different regions in India.
5. Inclusivity and Accessibility: The platform's multilingual interface and easy-to-navigate design make it accessible to a diverse user base, including those with limited literacy and technical skills.

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The platform's overarching goal is to create a more organized and formalized construction labor market, thereby improving workers' quality of life and economic stability.

V. RESEARCH METHODOLOGY

The development of Karigar involved an iterative process based on the principles of design thinking. The research and design phases included several steps:

5.1 Empathy Mapping

In-depth surveys and interviews were conducted with construction workers and contractors to understand their pain points and needs. These sessions helped identify challenges such as
difficulty in finding work, limited access to benefits, and lack of job security. The research team interviewed 150 construction workers and 45 contractors across five major cities in India (Delhi, Mumbai, Bangalore, Chennai, and Kolkata) to ensure diverse perspectives.

5.2 Problem Definition

The primary problems identified were the fragmentation of the labor market, the lack of
transparency in recruitment, and the workers' limited access to government welfare schemes.
Analysis of the interview data revealed that 78% of workers found jobs through informal
networks, with only 12% using any form of digital platform. Furthermore, 67% of workers were unaware of at least half of the government schemes for which they were eligible.

5.3 Ideation

During this phase, various features of the platform were brainstormed, including job search filters, profile creation, and the integration of government schemes. The team also discussed
potential solutions for ensuring the platform's accessibility for illiterate or semi-literate workers. Features such as voice recognition, pictorial interfaces, and regional language support were prioritized.

5.4 Prototyping

Initial wireframes and UI/UX designs were created using Figma and Canva. These designs focused on simplicity, with large buttons, clear navigation, and minimal text. The prototype included
features for job listings, worker profiles, contractor verification, and government scheme access.

5.5 Testing

A prototype was created and tested with a small group of users (50 workers and 20 contractors). Feedback was collected and used to improve the platform's functionality, user interface, and features. Usability issues were identified and addressed through iterative design improvements.
This iterative approach helped refine the platform and ensured that it met the real needs of its target users.

VI. TECHNICAL ARCHITECTURE

The Karigar platform was built using a modern web stack, leveraging several cloud-based technologies to ensure scalability, reliability, and security.

6.1 Frontend Development

The frontend of Karigar was built using HTML5, CSS3, and JavaScript. HTML and CSS were used for structuring and styling the pages, while JavaScript and jQuery were used to add interactivity, such as form validation, dynamic content loading, and live search features. The platform is responsive, meaning that it adapts to different screen sizes, ensuring usability on both desktop and mobile devices.
Key frontend features include:

• Responsive design that works across devices with different screen sizes

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• Multilingual support for Hindi, English, Bengali, Tamil, and Marathi
• Ofline functionality for essential features using Service Workers
• Progressive Web App (PWA) capabilities for mobile-friendly access

6.2 Backend Development

Node.js, a JavaScript runtime, was used to build the backend of Karigar. The backend handles all server-side logic, including user authentication, job posting management, and profile updates. Express.js, a web framework for Node.js, was used to streamline the development process and manage routing efficiently.

MySQL was chosen as the relational database management system (RDBMS) to store data such as user profiles, job listings, applications, and transaction records. AWS's RDS (Relational
Database Service) was utilized to manage the MySQL database in a scalable, secure environment.

6.3 AWS Cloud Integration

Karigar leverages several Amazon Web Services (AWS) to ensure high availability, security, and cost-efficiency:
• Amazon S3: Used to store documents such as worker resumes, profile images, and project photos.
• AWS Lambda: Handles serverless functions, such as sending email notifications to users when a new job is posted or when a scheme becomes available.
• Amazon RDS: Hosts the MySQL database, ensuring that data is stored securely and is easily accessible by the platform's backend.
• Amazon CloudFront: Provides content delivery network (CDN) capabilities to ensure fast loading times across different geographical regions.
• AWS Cognito: Manages user authentication and authorization, providing secure access to the platform.
• Amazon SNS: Enables push notifications for mobile users, alerting them about new job opportunities or application status updates.

This modular architecture ensures that Karigar can scale as more workers and contractors join the platform, while also maintaining high levels of security and performance.

VII. KEY FEATURES

7.1 Job Listings and Matching

The core feature of Karigar is its job listing and matching system. Contractors can post job openings, specifying the skills required, the project duration, and the pay rate. Workers can
search for jobs based on these parameters, and the platform recommends job opportunities that best match their profile. This feature reduces the reliance on brokers and increases the efficiency of job placement.

The matching algorithm considers several factors:
• Proximity to job location
• Skill match percentage
• Previous ratings and reviews
• Availability during the project timeline
• Wage expectations

7.2 Digital Resumes and Portfolios

Karigar allows workers to create and maintain digital profiles that include their work history, skills, certifications, and photos of previous projects. This increases transparency and helps contractors assess the qualifications of workers before hiring them. Workers can update their profiles in real-time, making it easier for them to showcase new skills or experience.

Digital profiles include:
• Verified skill certifications
• Work history with ratings from previous employers

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- Portfolio of completed projects with images
- References and testimonials
- Availability calendar
- Preferred job types and locations

7.3 Government Scheme Integration

One of the most innovative aspects of Karigar is its integration with government welfare schemes. The platform provides information about various schemes, such as the Pradhan Mantri Awas Yojana (PMAY), Employee State Insurance (ESI), and the Construction Workers Welfare Fund. It also assists workers in completing the necessary forms and submitting applications. By helping workers access these programs, Karigar improves their financial stability and well-being.

The platform simplifies access to schemes by:

- Providing simplified explanations of eligibility criteria
- Pre-filling application forms using profile data
- Tracking application status
- Sending reminders for renewals and updates
- Connecting workers with local facilitation centers for document verification

7.4 Communication Tools

The platform includes real-time chat functionality, enabling direct communication between workers and contractors. This feature ensures that both parties can discuss job details, clarify expectations, and negotiate terms before formalizing a contract. The chat system is powered by AWS Lambda, ensuring fast response times.

Additional communication features include:

- Voice messaging for users with limited literacy
- Automated translation between regional languages
- Contract negotiation templates
- Payment milestone tracking
- Dispute resolution workflows

VIII. IMPLEMENTATION DETAILS

The development of Karigar followed an agile methodology. The project was divided into multiple phases, each focusing on a specific feature. During the early stages, the team concentrated on creating a simple yet functional platform, while later phases involved adding advanced features like job matching algorithms and government scheme integration. The platform's backend was hosted on AWS to ensure scalability, while the frontend was built to be lightweight and responsive.

8.1 Development Phases

Phase 1: Core Platform Development (Months 1-3)

- User registration and profile creation
- Basic job listing and search functionality
- Simple matching algorithm based on location and skills Phase 2: Enhanced Features (Months 4-6)
- Advanced matching algorithm with machine learning components
- Digital portfolio creation
- Rating and review system
- Real-time chat functionality

Phase 3: Government Scheme Integration (Months 7-9)

- Integration with major government welfare schemes

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• Automated eligibility checking
• Application tracking system
• Document digitization and verification

Phase 4: Security and Scalability Enhancements (Months 10-12)
• Implementation of advanced security protocols
• Performance optimization
• Multi-language support
• Mobile responsiveness improvements

8.2 Deployment Strategy

The platform was initially deployed in Delhi NCR as a pilot program, with gradual expansion to other major cities. A phased rollout allowed the team to gather feedback and improve the platform before wider deployment.

Timeline and Milestones

Phase	Timeline	Key Deliverables	Stakeholders
I	Months 1-3	Core Platform	Dev Team, UX Designers
II	Months 4-6	Enhanced Features	Dev Team, Contractors
III	Months 7-9	Govt. Integration	Dev Team, Govt. Agencies
IV	Months 10-12	Security & Scale	Dev Team, Security Experts

IX. RESULTS AND EVALUATION

Early testing of the platform revealed several positive outcomes. Workers reported that the platform was easy to navigate and helped them find jobs faster than traditional methods. Contractors appreciated the streamlined recruitment process and the ability to view worker profiles online. The integration of government schemes was particularly well-received, as it helped workers access financial assistance programs they were previously unaware of.

9.1 User Adoption Metrics

After six months of deployment in the pilot regions:
• 5,200+ construction workers registered on the platform
• 420+ contractors actively using the system
• 3,800+ jobs successfully matched through the platform
• 65% reduction in time to find employment compared to traditional methods
• 78% of workers reported improved income stability

9.2 Challenges and Limitations

Despite the overall positive reception, several challenges were identified:

1. Digital Literacy: Many workers struggled with complex features, necessitating simplified interfaces and more extensive onboarding.
2. Trust Building: Both workers and contractors initially showed reluctance to rely on digital profiles and online negotiations.
3. Connectivity Issues: Inconsistent internet access in certain areas limited the platform's effectiveness.
4. Verification Challenges: Verifying the authenticity of skills and certifications required additional partnerships with training institutes and government bodies.

These challenges are being addressed in subsequent iterations of the platform.

X. SOCIAL AND ECONOMIC IMPACT

By digitizing the construction labor market, Karigar has the potential to significantly improve the livelihoods of workers in the sector. The platform provides workers with better access to job

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opportunities, job security, and government schemes. It also enables contractors to hire qualified workers more efficiently, reducing the risk of fraud and exploitation.

10.1 Worker Benefits

Initial data from the pilot phase indicates several positive outcomes for workers:

- 32% average increase in monthly working days
- 28% increase in average daily wages due to skill verification and transparent negotiations
- 45% increase in access to government welfare schemes
- 53% reduction in payment delays
- Creation of verifiable work histories that improve long-term employability

10.2 Contractor Benefits

Contractors also reported significant improvements:

- 40% reduction in time spent recruiting workers
- 35% decrease in project delays due to labor shortages
- 60% improvement in skill-job matching accuracy
- Access to a larger pool of verified workers
- Simplified compliance with labor regulations

10.3 Industry-Wide Impact

The broader construction industry stands to benefit from:

- Increased formalization of the workforce
- Better data on labor market trends and skill availability
- Improved compliance with labor laws and regulations
- Enhanced productivity through better skill matching
- Reduced exploitation and wage theft

Metric Before
Implementation After
Implementation % Change
Avg. job search time 8.5 days 3.0 days -65%
Avg. monthly
working days 18 days 23.8 days +32%
Govt. scheme
utilization 22% 67% +45%
Payment delay
incidents 47% 22% -53%
Contractor hiring
time 5.2 days 3.1 days -40%

XI. FUTURE SCOPE

Karigar is poised for significant growth and expansion. Future versions of the platform will incorporate mobile apps for Android and iOS, support additional languages, and offer AI-
powered job matching. The development team also plans to integrate financial services, such as loans and insurance, into the platform to further support workers.

11.1 Technological Enhancements

Planned technological improvements include:

- Machine Learning: Enhanced job matching algorithms using historical data to predict successful worker-contractor relationships
- Blockchain Integration: For secure, tamper-proof verification of credentials and employment history

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• Augmented Reality: To help workers visualize job sites and requirements before accepting positions
• Voice-First Interfaces: To improve accessibility for users with limited literacy

11.2 Feature Expansion

The roadmap includes several new features:
• Skill Development Module: Online training and certification programs to help workers upgrade their skills
• Financial Services: Microloans, insurance, and digital banking services tailored to construction workers' needs
• Supply Chain Integration: Connecting material suppliers with contractors to create an end-to-end construction marketplace
• Health and Safety Tools: Tracking and improving workplace safety conditions
• Labor Law Compliance: Automated tools to ensure compliance with changing labor regulations

11.3 Geographic Expansion

While initially focused on major urban centers, the platform aims to expand to:
• Tier 2 and Tier 3 cities across India
• Rural construction markets, particularly for government infrastructure projects
• Potential adaptation for other South Asian markets with similar construction industry challenges

XII. CONCLUSION

Karigar represents a significant step forward in addressing the longstanding challenges faced by India's construction labor market. By leveraging modern web technologies and cloud services, the platform creates a digital bridge between workers and contractors, while also facilitating access to government welfare schemes. Early results from pilot deployments indicate substantial benefits for all stakeholders, including increased employment opportunities, improved wages, and enhanced productivity.

The platform's user-centric design, combined with its scalable cloud architecture, positions it well for future growth and expansion. As Karigar continues to evolve, it has the potential to transform the construction industry in India, moving it toward greater formalization, transparency, and inclusivity. By addressing the fundamental issues of fragmentation, information asymmetry, and limited access to benefits, Karigar contributes to the broader goals of economic development and social welfare in India's construction sector.

While challenges remain, particularly in the areas of digital literacy and connectivity, the platform's initial success demonstrates the viability of technological solutions in addressing complex socio-economic challenges. As adoption grows and features expand, Karigar could serve as a model for similar interventions in other informal labor markets, both within India and beyond.

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