Architectural Framework for Scalable On-Demand Service Aid Platform

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This innovative web-based platform is designed to connect skilled workers with service seekers, addressing challenges such as accessibility, affordability, and trustworthiness in the skilled labor market. The platform provides a seamless experience for users, enabling them to post job requirements, browse available professionals, and hire based on specific needs, all within an intuitive interface. Built with modern technologies, the platform's front end is developed using HTML, CSS, JavaScript, and Bootstrap, ensuring responsiveness and ease of use. The back end, powered by Java with Spring Boot and integrated with a robust MySQL database, ensures efficient data management and secure user interactions. The platform's architecture facilitates smooth navigation and quick access to essential features. Service seekers can easily sign up and explore a pool of skilled workers categorized by their expertise, location, and ratings. The system includes a user feedback mechanism that enhances trust by allowing users to rate and review workers based on their experiences. Workers, in turn, benefit from consistent job opportunities and the ability to showcase their skills to a wider audience. This project also addresses the unique challenges of underserved regions, such as Hyderabad, where digital platforms for hiring local services are scarce. By providing a comprehensive solution that caters to diverse household needs, from plumbing to carpentry, the platform bridges the gap between demand and supply in the skilled labor market. The research stands out as a transformative tool, creating economic opportunities for skilled workers while offering service seekers a reliable and efficient solution for their everyday needs. It fosters a sense of empowerment and convenience, making it a vital contribution to the digital transformation of the Labor market.

Keywords: Empowerment, Machine Learning, MongoDB, Labor.

Introduction:

Technology has progressed at an incredible rate in recent decades. Innovations like cell phones, the internet, cloud computing, and other digital technologies have reshaped our everyday lives so profoundly that it's almost impossible to picture a day without them. The rapid growth of technology has given rise to a new wave of businesses across multiple industries, such as finance, transportation, and home services. One of the most significant developments in this evolving landscape is the rise of the on-demand economy, which serves both service providers and consumers by delivering a wide range of essential services with convenience and flexibility. Particularly noteworthy in this context is the home care sector, which has experienced substantial growth by directly linking skilled professionals—such as electricians, plumbers, and carpenters—with consumers in need of their services. The increased use of e-commerce and mobile commerce platforms is creating a trend, where customers are able to access services with a few taps on their smartphones. This is an era where on-demand home services are thriving and have gained significant popularity, especially among millennials who value convenience and quick access to skilled professionals. This application serves as a crucial intermediary, bridging the gaps left by traditional offline services and ensuring timely delivery of assistance precisely when customers need it most [1].

Today, we live in an era where technology plays a vital role in nearly every aspect of life—from education, business, and finance to entertainment—shaping how we learn, work, manage resources, and relax. Much of this has been accomplished by using a smartphone with various OS platforms. More than 2 billion users are there on Facebook, and it is in the same class as all other social media. According to, the smartphone industry is growing day by day in Pakistan. Almost 72% of mobile users are using smartphones and 52% access the internet on edge, 3G, and GPRS. Due to the extensive applications of smartphones, all types of businesses are progressively shifting to the latest gadgets. Nowadays, with just a few taps on a smartphone, orders can be placed effortlessly, and the desired items are delivered right to one's doorstep. People in Pakistan also actively use a variety of smartphone apps that are widely popular across different domains, including Foodpanda for food delivery, Careem and Uber for ride-hailing services, and Daraz.pk for online shopping, among many others. In today's gadget-friendly environment, people are seeking the job and consumers are looking out for services directly via smartphones. The mobile industry is now a major source of employment opportunities [2].

The most important factor in the economy of any country is its daily wage laborers and skilled workers [3]. Such is the case in Pakistan, where a large segment of the workforce survives solely on daily wages. Some of these workers include electricians, plumbers, carpenters, and all-purpose laborers forming the backbone of many industries and households. However, they often face issues of financial exploitation, irregular job availability, and less direct access to their clients. A large number of highly skilled workers are at the mercy of other intermediaries and contractors who always cannot ensure fair compensation and working conditions [3].

Novelty Statement:

Most digital job platforms overlook illiterate users, especially in cities like Hyderabad. The research introduces an inclusive web app with intuitive, icon-based, and voice-supported interfaces. It empowers low-literacy skilled workers to showcase their abilities and access job opportunities. The solution bridges the digital divide, promoting employment and inclusive economic growth.

Objectives:

1. To build a user-friendly web platform that connects service seekers with qualified service providers, with easy job posting, browsing, and booking functionalities.

2. To introduce features including rating systems and user feedback mechanisms to encourage trust and transparency in the community of service seekers and providers.
3. To conduct usability testing and feedback-gathering to iteratively improve the design, functionality, and general user experience of the platform.

Literature Review:

This literature review aims to evaluate and analyze the current body of research concerning the intersection of skilled labor, technology, and economic development, with a particular focus on the challenges workers face in accessing job opportunities. As the demand for skilled labor grows across various sectors, understanding the factors that facilitate or hinder employment becomes crucial. This review investigates the role of digital platforms in connecting skilled workers with clients, examines the impact of technological change on labor markets, and highlights the relationship between improved job access and poverty reduction. Furthermore, it identifies gaps in existing research and sets the foundation for the proposed study, which seeks to develop an innovative approach to improving accessibility and efficiency in the skilled labor market [4][5][6][7].

Skilled labor significantly contributes to economic growth, especially in innovation-driven economies. Studies show that skilled workers enhance productivity and that advanced countries attract such talent, whereas less developed nations face brain drain. Improving labor quality through education and training is key for countries like Pakistan to enhance total factor productivity. Skilled trades like electricians and carpenters play a direct role in economic growth. Addressing wage inequality requires greater investment in skill development, helping bridge the gap between skilled and unskilled labor [7][8][9][10].

Technological advancements have shifted job demands toward analytical skills, reducing the need for routine work and increasing the importance of education. While innovation generates jobs, it also risks worker displacement. Digital platforms like Fiverr and Upwork offer new opportunities and flexibility for skilled workers but also demand continuous upskilling and policy support to adapt to evolving labor market dynamics. Several digital platforms like Karsaaz (Lahore), Kaam Daam (Karachi), Instrafix (Lahore), and WIP (Sialkot) connect service professionals to customers. Among them, Karsaaz is noted as the most functional, reflecting both the potential and challenges of such solutions. Employment is essential for poverty alleviation, but the quality of jobs matters. Growth alone does not reduce poverty unless jobs are stable, well-paid, and accessible to vulnerable communities [11][12][13][14][15][16].

Methodology:

In this research, we focused on a range of services including electrician, plumbing, and mechanical support. For designing the user interface and user experience (UI/UX), we utilized Figma. Visual Studio Code (VS Code) was employed for front-end development, while the back-end functionality was implemented using Java. This development follows the Agile model; the most popular iterative model that has been widely adopted by various software development companies worldwide for its flexibility in dealing with software development. It splits the research into easily managed small tasks, allowing regular review and adaptation. This approach enables the platform to evolve based on feedback from users and stakeholders, resulting in a more user-centered design that adapts effectively to real-world needs and demands. Each development phase delivers incremental improvements to the functionality of the platform. The process started with the determination of the core features of the platform, including user profiles, service categories, job posting, and search functionalities. Subsequently, the process moved on to developing wireframes and prototypes, which served as blueprints for the final design layout and functionality.

Work Flow Activity Diagram:

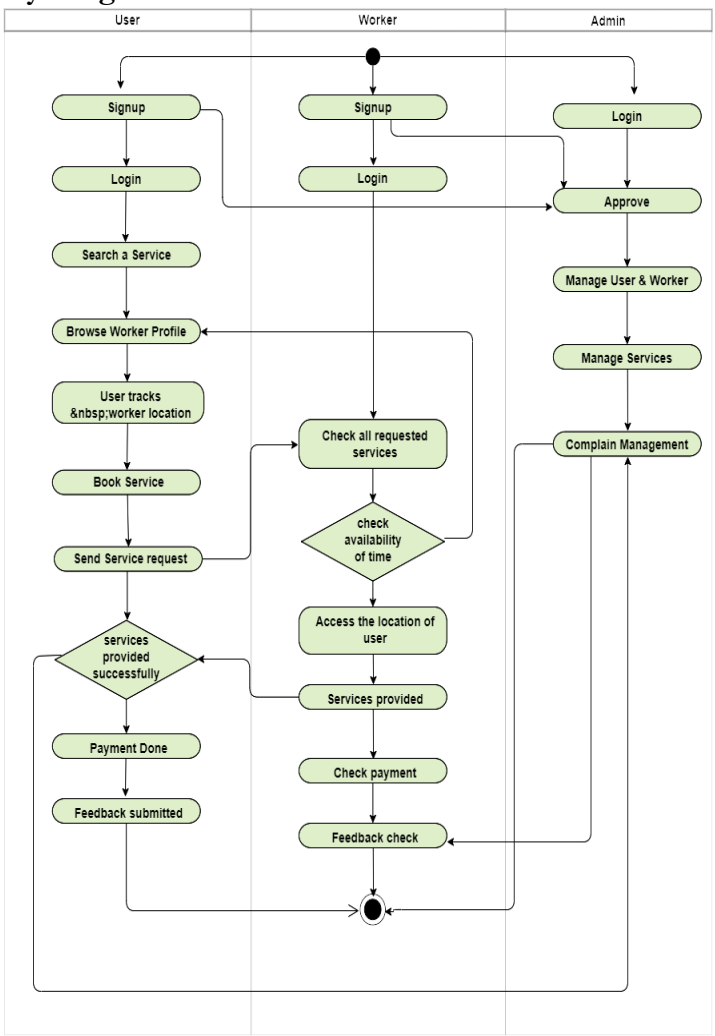


Figure 1. Activity Diagram

Figure 1 illustrates the workflow activity diagram. This diagram graphically demonstrates the dynamic flow of processes across the platform. Furthermore, the various activities that the user has undertaken to accomplish a range of functions are shown in this figure. These include registering and signing up, browsing and booking services, and even giving feedback. Moreover, it illustrates the flow of control between activities, decisions, and action sequences, hence achieving an excellent user experience.

Component Diagram of ProConnect:

To begin with, the component diagram effectively represents the system architecture by mapping out key components and how they interact within the platform as represented in Figure 2. The system involves three main actors User, Worker, and Admin each interacting with multiple components to perform specific tasks. As mentioned earlier, some examples include the User browsing features to make appointments under Book Service and using the feature of Feedback to assign ratings or reviews. Moreover, Location Provision then ensures that the service delivered is at the desired location of the user. Furthermore, data such as service requests, user profiles, and feedback is stored in a central data management hub—the *Database*—allowing for smooth access and retrieval. In addition, components like Manage Requests and Providing Services in Worker ensure that the workers can manage their services effectively and respond to user demands. However, the admin has control of the management of the profiles of Worker/User and Services so that they can update, oversee, and make sure

everything goes smoothly on the platform. As a result, figure 2 illustrates the interplay between all components and the flow of information that ensures the platform operates efficiently while serving all involved parties.

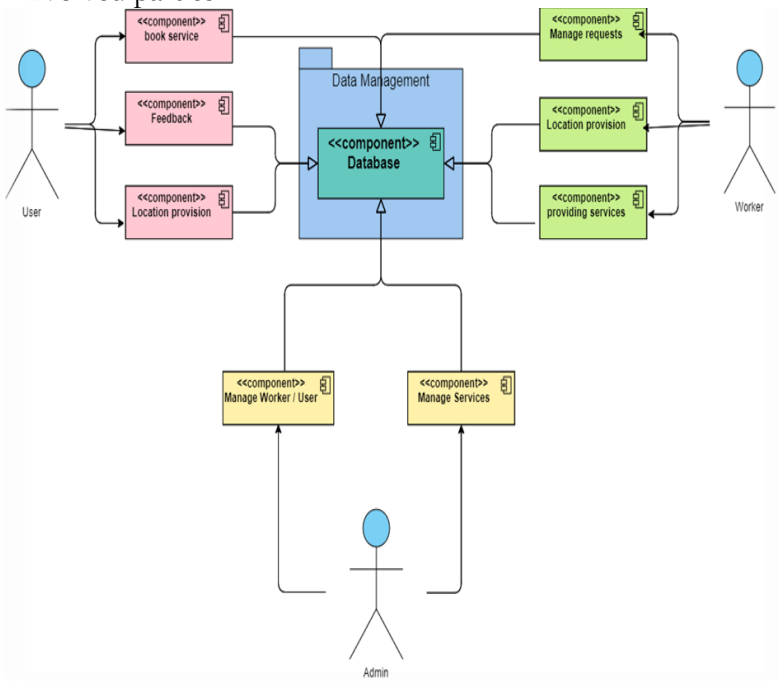


Figure 2. Component Diagram for ProConnect

Results:

Platform Testing Results:

The functionality, usability, and reliability of the web application were tested by carrying out platform testing. The test process was divided into three phases including unit testing, system testing, and user acceptance testing. The following results describe the findings:

Performance Testing:

The platform was subjected to intense performance testing to ascertain its response times and the number of user interactions it could handle. The outcome was that the platform was efficient and scalable, ensuring smooth user experiences even under demanding conditions.

Table 1. Performance Testing

Test Case	Metric	Result	Description
User Login	Accuracy Latency Performance	98% 1.2 sec Excellent	245/250 successful logins. Quick response time for login requests. Efficient handling of concurrent login attempts. 190/200 successful postings.
Job Posting	Accuracy Latency Performance	95% 1.8 sec Good	Minimal delay in posting jobs. Handles multiple postings without slowdown.
Search Skilled Worker	Accuracy Latency Performance	96% 2.0 sec Very Good	192/200 successful searches. Responsive search results even with filters. Quick processing of complex queries.
Service Booking	Accuracy Latency Performance	93% 2.3 sec Good	186/200 successful bookings. Real-time booking confirmations. Effective handling of booking requests.
Feedback Submission	Accuracy Latency Performance	99% 1.0 sec Excellent	198/200 successful feedback entries. Instant feedback recording. Reliable and smooth feedback process.

Usability Testing:

The usability of the platform was also tested to ensure that users could gain access to the features with minimal hassle. Findings indicate a very positive user experience, respectively, about the intuitive design and user-centric functionality of the platform.

Table 2. User Testing Results+

User Category	Number of Users	Feedback Summary
Skilled Workers	100	Appreciated the direct connection; and suggested adding a calendar for availability.
Housewives/Working Women	60	Valued trustworthiness; requested emergency service options.
Students	40	Liked cost transparency; suggested e-wallet integration.
Elderly Citizens	30	Found it helpful but suggested a voice-assist feature.
Other Users	20	Praised versatility; recommended first-time user discounts.

The system underwent a series of stress tests to evaluate its performance under various conditions. It successfully handled 500 concurrent users (ST-01) and managed 1,000 concurrent users with minor warnings (ST-02). However, it failed under a heavy load of 5,000 database queries per second (ST-03), indicating a limitation in query handling. The platform passed the test for managing 1,000 service bookings per minute (ST-04), demonstrating strong transaction processing capabilities. Conversely, it failed to maintain functionality during network disruptions in the booking process (ST-05), highlighting a need for improved fault tolerance represented in Table 4.

Load Testing:

This was done using J-Meter whereby several users interacted simultaneously with the platform. This was to test how well the platform would handle large numbers of concurrent users with no performance degradation. The test came out positive, and indeed, the system could withstand the user load as expected.

Table 3. Load Testing

Test Scenario	Number of Users	Outcome
Simultaneous Job Postings	50	Successful, with minor latency observed.
Concurrent Profile Searches	100	Handled efficiently without server crashes.
Parallel Service Bookings	75	Smooth processing with response time under 2 seconds.
Simultaneous Feedback Submissions	40	Managed without errors, response time slightly increased.

Stress Testing:

It pushed the platform beyond a typical load to test its breaking point. In this respect, it allowed us to learn some vulnerabilities and hardened the system so that extreme stress could not be felt. The system showed stability under increased loads but has opened avenues for future optimizations.

Latency Measurement:

Through J-Meter, latency measurements were taken in order to assess the response times of the platform under certain operations. The test provided a measure of the number of seconds taken from initiating a request to receiving a response. The platform managed to maintain relatively acceptable levels of latency, meaning there was a smooth user experience at the end.

Table 4. Stress Testing

Test Case ID	Test Description	Load Condition	Result	Issues Found
ST-01	Simulate 500 concurrent users	500 users accessing the platform	Passed	No issues
ST-02	Simulate 1000 concurrent users	1000 users accessing the platform	Passed with warnings	Minor delays in response time
ST-03	Test system with excessive database queries	5000 queries per second	Failed	Database overload, slow response
ST-04	Simulate the maximum number of concurrent service bookings	1000 bookings per minute	Passed	Minor latency observed
ST-05	Simulate network failure during the booking process	Network disruption during transaction	Failed	Booking process failed

Figure 3. J-Meter testing results

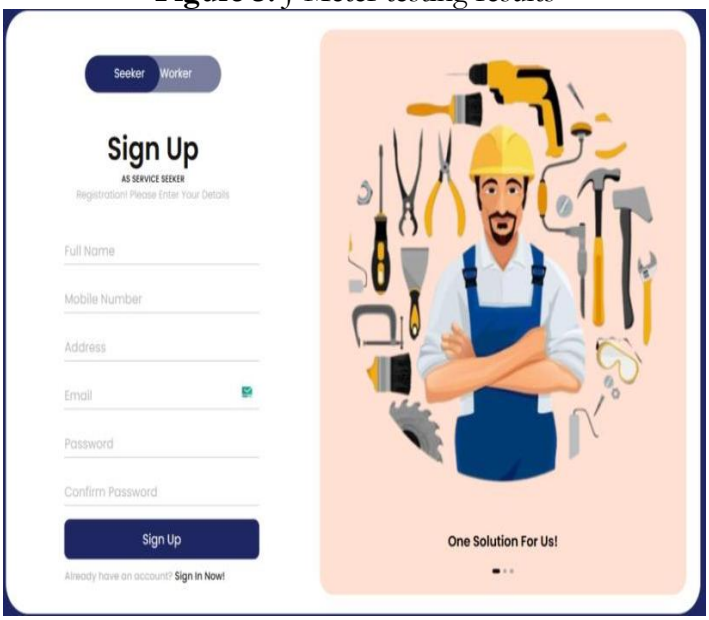


Figure 4. Sign-Up Page

User Interface:

To provide a clearer understanding of the platform's operation and features, a series of screenshots and diagrams were included to visually demonstrate its functionality in action. These visuals not only highlight the overall user experience but also demonstrate how various components of the platform seamlessly interact. Consequently, the platform becomes simple and intuitive for both skilled workers and service seekers to navigate and use effectively. This ensures that users can efficiently manage their work needs, streamline service requests, and ultimately enjoy an enhanced overall service experience.

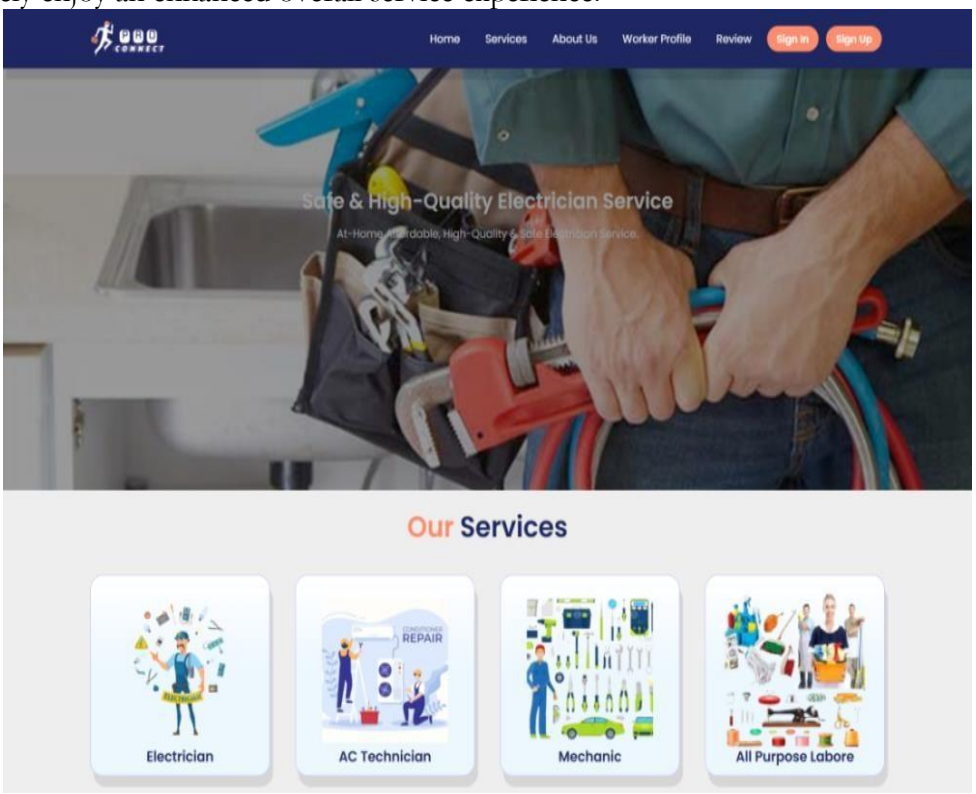


Figure 5. Home Page

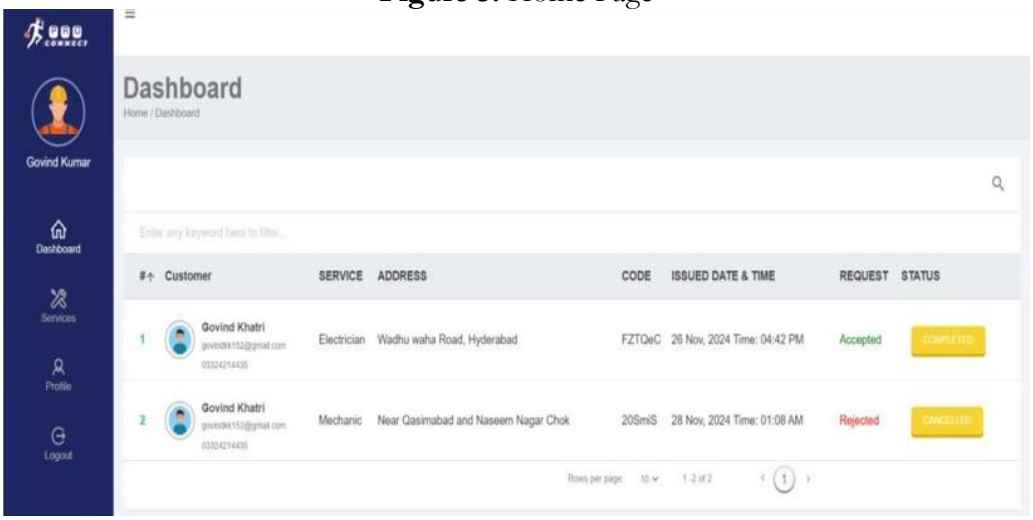


Figure 6. Worker Dashboard

Figure 7. Jobs & Booking

Figure 8. Rating and Feedback

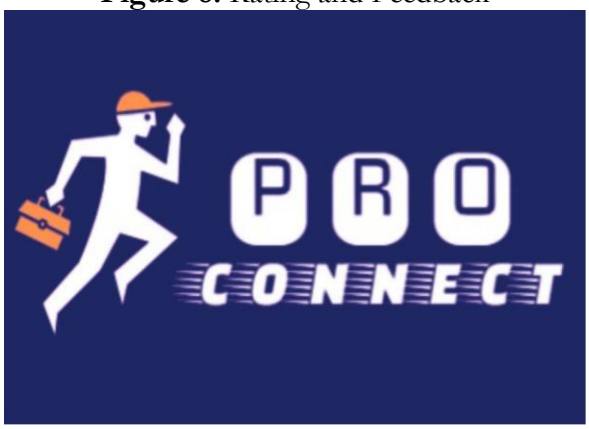


Figure 9. ProConnect Logo

Figure 10. Landing Page

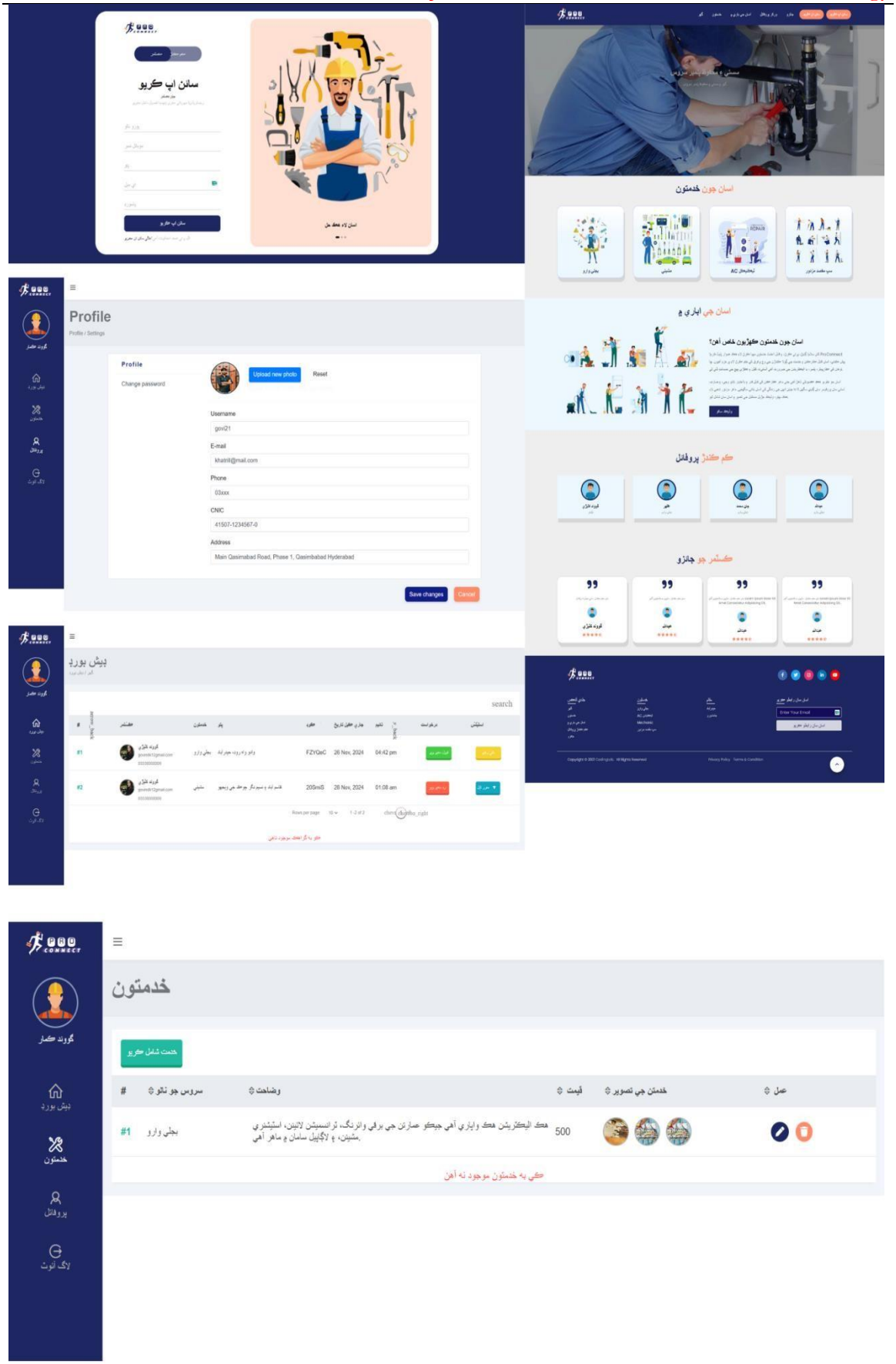
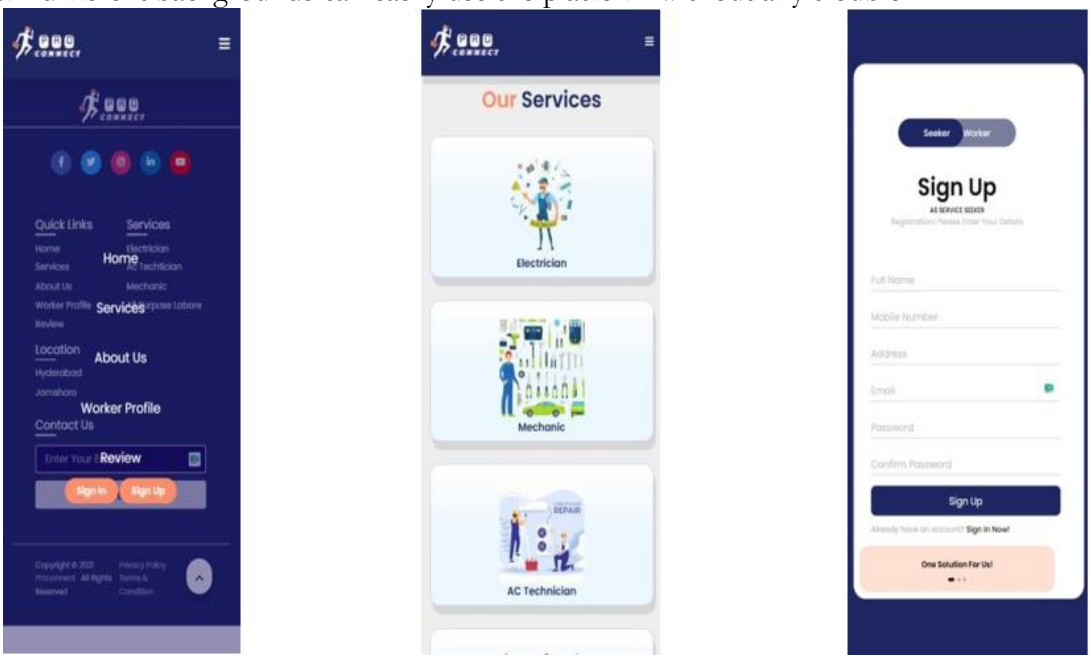


Figure 11. Sindhi User Interface

Figure 11 shows the user interface of the platform in the Sindhi language. The platform supports multiple languages including English, Urdu, and Sindhi. This way, people from different backgrounds can easily use the platform without any trouble.



(a) (b) (c)

Figure 12 (a, b, c). Website Responsiveness

Conclusion:

This research focused on developing a web-based platform that connects skilled workers with service-seeking users, addressing key gaps in the skilled labor market. It aimed to enhance access, affordability, and reliability ultimately promoting consistent employment for workers and convenience for users, unlike traditional job boards or generic service apps, this platform offers tailored features like proximity-based matching and transparent pricing. It focuses specifically on skilled labor, ensuring both accessibility for users and consistent work for service providers.

Key outcomes highlighted the value of user-friendly features such as seamless booking, location-based searches, and transparent pricing, which addressed major concerns like availability, proximity, and cost. However, the platform initially fell short in supporting multi-skilled workers for diverse tasks like housekeeping or moving. Beyond being a tech solution, the project also served as a social initiative aligned with global Sustainable Development promoting decent work (SDG 8) and contributing to poverty reduction (SDG 1). It demonstrated the potential of technology to tackle systemic labor market issues and offered a model for similar efforts elsewhere.

Testing and real-life use confirmed the platform's practical relevance. Features like nearby worker sourcing and review systems proved effective in building trust and ensuring positive user experiences.

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