Research Article

Electronic Appliances Repair Tracking Portal

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ARTICLE INFO	ABSTRACT
	A Electronic Appliances Repair Tracking Portal is designed to help in digital ERA for repair services of Next Generation, better Efficiency and Transparency, It's a win-win situation. With the rising demand for home services that can be delivered instantly, these two have opened a portal connecting customers with different electronic repairs service through which you get all fixes at one user-friendly platform. With advanced e-service methods, the system enables smooth exchanges between customers and repair experts for real-time monitoring of repairs history and instant orders. The portal also highlights data privacy, an issue that previous research has shown is a major concern among both technicians and drivers in having to leave their cars unlocked or at dealer service centers during repair. The intuitive design with embedded Pervasive Computing technology helps consumers track their appliances during the repair process generating a strong bond of trust and satisfaction. This research indicates that a tracking system capable of supply chain visibility not only enhances operational efficiency but also increases sales volume. **Keywords:** Electronic Appliances, Repair Tracking, E-Service.

INTRODUCTION

The increasing reliance on electronic appliances in everyday life, such as air conditioners, washing machines, televisions, and refrigerators, underscores the critical role these devices play in enhancing convenience and comfort in modern households. However, as these appliances age or encounter technical issues, the demand for efficient, trustworthy, and timely repair services becomes vital. In recent years, several digital solutions have been developed to cater to such demands, making the process more streamlined and accessible for both customers and service providers.

With the rapid expansion of technology, home service platforms have gained popularity, connecting skilled technicians with customers for various services, including plumbing, electrical repairs, and electronics maintenance. The rise of on-demand home service systems demonstrates a growing shift towards technology-driven service delivery models that provide convenience and efficiency by allowing customers to book and track services online. Such platforms not only help individuals find trusted technicians but also help Techniciansreach a broader clientele [1].

Appliance repair services are now essential, given the widespread use of electronic devices across households. Maintaining and repairing these devices is critical to ensuring smooth operations and reducing the inconvenience caused by malfunctions. As noted, electrical appliances like mixers, water heaters, computers, and mobile phones require periodic maintenance to avoid sudden breakdowns [2]. With the growing demand for electronic repair services, there is an increasing need to digitize the service process to offer quick, reliable solutions to consumers.

The adoption of e-services for electronic repair businesses has transformed the traditional repair industry by integrating modern communication tools and online platforms. This not only helps in reaching a wider customer base but also simplifies service operations. Implementing information systems (IS) within repair services can significantly improve decision-making, streamline operations, and enhance customer experience [3]. However, while the benefits of these e-services are clear, privacy concerns in the electronics repair industry remain an unresolved issue. Service technicians often gain access to personal data stored on customer devices during repairs, raising privacy and data

protection concerns. Cases of technicians violating customers' privacy have highlighted the need for stringent data protection protocols and monitoring within the repair service sector [4].

The importance of tracking systems has also emerged in other sectors, such as courier services. Efficient tracking ensures timely delivery and enhances customer satisfaction by providing real-time updates on order status. Similar concepts can be applied to electronic appliance repair services, where tracking systems would allow customers to monitor the repair progress of their devices. Such systems, integrated with modern technologies like GPS and cloud services, can optimize service delivery routes and improve overall efficiency [5]. Furthermore, integrating mobile technologies with database systems enables real-time order tracking and enhances the interaction between Techniciansand consumers [6].

LITERATURE REVIEW

This paper aims to develop an "Electronic Appliances Repair Tracking Portal," a solution designed to address the growing need for efficient, transparent, and customer-centric repair services. By integrating modern communication tools, mobile technologies, and tracking systems, the portal will allow users to book, track, and manage their repair services seamlessly. The project contributes to the field by proposing a system that not only improves the efficiency of repair services but also addresses customer concerns related to privacy, transparency, and service quality.

As household appliances have become essential to modern living, the need for effective repair services has grown significantly. These appliances, including washing machines, refrigerators, and air conditioners, are prone to malfunctions due to wear and tear. This literature review explores existing online home service systems and frameworks that can inform the development of an Electronic Appliances Repair Tracking Portal.

A. Importance of Appliance Repair Services

The increasing complexity In today's modern world, home appliances play a crucial role in making daily tasks more convenient and efficient. However, with the increasing complexity of these appliances, driven by technological advancements such as Internet of Things (IoT) integration, smart automation, and AI-driven functionalities, repair and maintenance have become more challenging.[7]

Unlike traditional appliances, smart devices require specialized technical expertise for troubleshooting and repairs. Issues such as software malfunctions, connectivity problems, and sensor failures demand skilled professionals who can diagnose and fix them efficiently. As manufacturers continue to introduce cutting-edge technology, the need for trained repair technicians has become more critical than ever.

Additionally, the rising ownership of high-end home appliances, such as smart refrigerators, washing machines, air conditioners, and ovens, has significantly increased the demand for repair services. This trend is particularly evident in urban areas, where people lead busy lifestyles and prefer professional maintenance services rather than attempting DIY repairs. Regular servicing and timely repairs help extend the lifespan of appliances, ensuring optimal performance and reducing electronic waste.

Moreover, with sustainability becoming a global concern, appliance repair services contribute to environmental conservation by promoting repair over replacement. Fixing a faulty appliance instead of discarding it reduces electronic waste and lowers the overall carbon footprint.

Thus, the importance of appliance repair services extends beyond convenience—it supports sustainability, enhances the longevity of appliances, and ensures that smart technologies function efficiently in modern households.

B. Existing Online Home Service Systems

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➤ Urban Pro: Initially aimed at connecting learners with mentors, this platform has expanded to offer various home services.

➤ Time Saverz: This service rewards customers for using their platform and offers refunds for unsatisfactory experiences, operating in major urban centers like Delhi, Noida, and Bangalore .[8]

➤ Urban Clap: Known for its innovative service offerings, Urban Clap has trained over 10,000 professionals and primarily serves cities like Mumbai and Delhi .[9]

➤ Helpr: Provides a comprehensive solution for domestic service needs, available on-demand or through annual maintenance contracts.

➤ Zimmber: Focuses on urban areas like Pune and Bangalore, acting as both a service provider platform and a hiring solution for professionals .

➤ House Joy: A rapidly growing service provider that offers free insurance and rework guarantees, enhancing customer loyalty. It has successfully raised significant funding and reported substantial revenue growth .

These platforms illustrate the shift towards digital solutions in the home service industry, emphasizing convenience and accessibility for consumers.

Research by J. Kim et al. emphasizes the importance of a structured service design framework for home appliance repair services that includes:

Customer Needs Analysis: Understanding consumer requirements to tailor services effectively.

➤ Service Blueprinting: Mapping out service processes to enhance efficiency and customer experience.

➤ Service Evaluation: Assessing service quality to identify areas for improvement.

This framework is essential for improving customer satisfaction and operational efficiency within the appliance repair industry.[10]

PROPOSED METHODOLOGY

The proposed system is an Electronic Appliances Repair Tracking Portal designed to streamline the repair process for customers and service providers. It allows users to submit repair requests, track the progress of repairs, and provide feedback upon completion. The system aims to improve efficiency, transparency, and customer satisfaction by the repair tracking process.

A. System Components:

The Electronics Appliances Repair Tracking Portal consists of several key components that work together to ensure a seamless and efficient repair management process. Below is an overview of the system components:

1. User Interface (UI):

➤ **Customer Portal:** Allows users to submit repair requests, schedule pickup/drop-off, track repair status, and provide feedback.

➤ **Technican Portal:** Enables Techniciansor admins to manage requests, update statuses, and generate repair quotations.

2. Backend:

Database: Stores user information, product details, repair requests, and service status. Business Logic Layer: Handles the repair workflow, from request submission to completion, including notifications, approval processes, and status tracking.

3. Notification System:

Provides email updates to users about the status of their repair requests.

4. Payment Gateway Integration:

Allows users to approve service quotations and make payments online (optional).

B. Technology Stack:

To implement the Electronic Appliances Repair Tracking Portal efficiently, we have utilized the following technologies:

1) Frontend Framework and Build Tools

- React (18.3.1): Main frontend framework for building the user interface.

- Vite (5.4.1): Build tool and development server.

- TypeScript (5.5.3): Type-safe JavaScript development.

- React Router DOM (6.26.2): Handles client-side routing.

2) Styling and UI Components

- Tailwind CSS (3.4.11): Utility-first CSS framework for styling.

- Shadcn/UI: Component library built on Tailwind CSS, providing:

- Form components (forms, inputs, buttons)

- Navigation components (navbar, menus)

- Feedback components (toasts, alerts)

- Layout components (cards, containers)

- Lucide React: Icon library.

- Class Variance Authority: For managing component variants.

- Tailwind Merge: For handling Tailwind class conflicts.

3) Backend Services

- Supabase: Backend-as-a-service platform.

- PostgreSQL Database: Hosted on Supabase with tables for:

- profiles: User profile information.

- repair_requests: Service request details.

- Authentication: Supabase Auth with:

- Email/password authentication.

- Role-based access control (User/Technician roles).

- Row Level Security (RLS) for data access control.

- Edge Functions: Custom server-side logic.

4) State Management and Data Fetching

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- @tanstack/react-query: Server state management and data fetching.

- React Hook Form: Form state management and validation.

- Zod: Schema validation library.

5) Development Tools

- ESLint: Code linting.

- TypeScript ESLint: TypeScript-specific linting rules.

- SWC: Fast JavaScript/TypeScript compiler (via Vite).

6) Feature-Specific Technologies

- Authentication Module: Supabase Auth for user management, role-based access control, and protected routes.

- Service Request System: React Hook Form for handling requests, Zod for validation, and Supabase for storage.

- User & Technician Dashboard: React Query for data fetching, Shadcn/UI for UI components, and RLS policies for security.

- Notification System: Toast notifications using Shadcn/UI and real-time updates.

C. Proposed Architecture:

The Fig.1 represents the workflow of an Electronic Appliances Repair Tracking System. It outlines the step-by-step process from user login to feedback collection. Here's a breakdown:

1. User Roles:

Customers: Register/log in to submit and track repair requests.

Technicians: Manage and process repair requests, provide service quotations, and update repair statuses.

2. Functional Flow:

Step 1: User Login / Service Provider Login

The system supports separate login interfaces for customers and service providers.

User authentication is handled through a secure login system (username/email and password).

Step 2: User Submits Repair Request

Users can submit repair requests, providing the following details:

 - Product Type (required)

 - IMEI/Product Number (required)

 - Model Name (required)

 - Purchase Information (required)

 - Pincode and Address (required for pickup/delivery)

Step 3: Admin Accepts Request

Admin reviews and accepts the request. Notifications are sent to the user confirming the acceptance.

Step 4: Pickup Schedule or Self-Visit

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The system allows users to choose between scheduling a pickup or visiting the service center.

Step 5: Diagnosis and Initial Inspection

The service provider inspects the product and diagnoses the issue. An initial report is generated and sent to the user for approval.

Step 6: Service Quotation and Approval

The admin provides a repair cost estimate. The user reviews and approves the quotation for the repair to proceed. If denied, the repair request is closed.

Step 7: Repair Process Begins

Once approved, the repair process is initiated. The user can track the status through the portal.

Step 8: Tracking Service Status

Users receive real-time updates on the status of their repair, including notifications at each stage of the repair process.

Step 9: Repair Completion

Upon successful repair, the system marks the request as completed, and the user is notified.

Step 10: Delivery or Pickup Notification

The system informs the user when the product is ready for delivery or pickup.

Step 11: Feedback and Review

After receiving the repaired product, the user can submit feedback or a service review.

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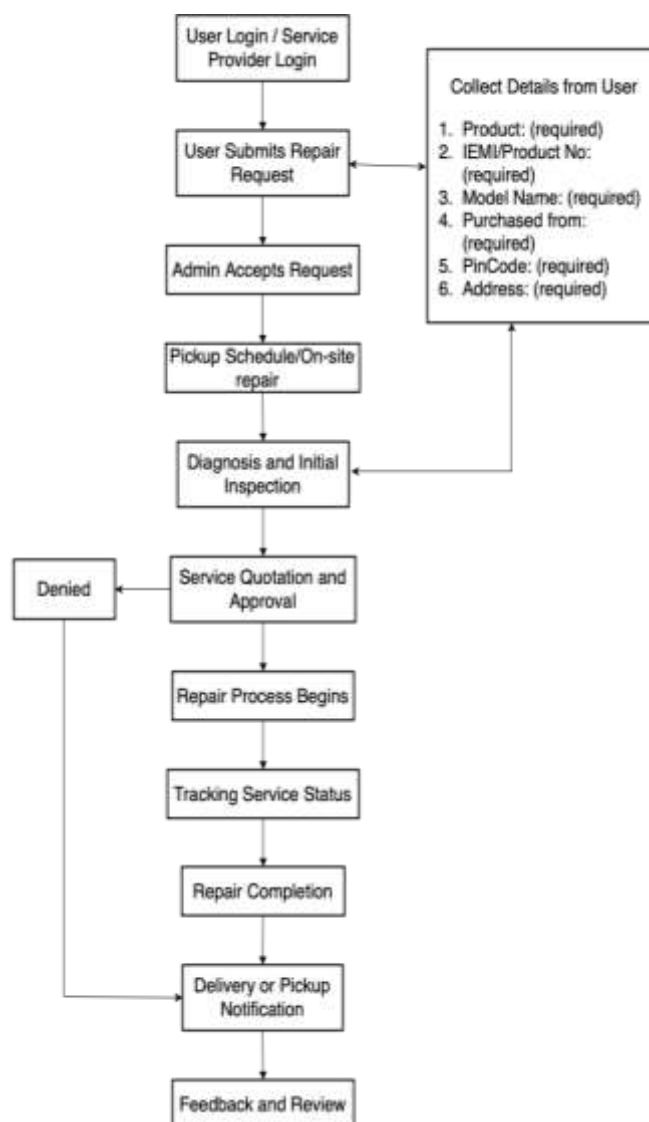
Fig.1: Block Daigram for Electronic Appliances Repair Tracking Portal

RESULT

The Electronic Appliances Repair Tracking Portal, named "**RepairJunction**", was successfully developed with a user-friendly interface and efficient functionality for both Users (Customers) and Technicians. The system enables smooth management of repair services while ensuring transparency, convenience, and structured workflows.

➢ **User Side**

1. Homepage:

- A clean and intuitive interface providing quick navigation to services, repair requests, and tracking.

Fig 2: Homepage

2. Services Page:

- Displays a list of repair services for different electronic appliances.
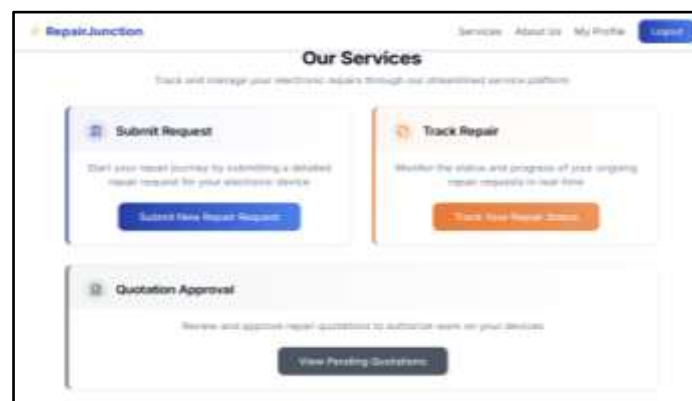
Fig 3: User Service Page

3. Tracking Page:

- Allows users to monitor the real-time status of their repair requests.
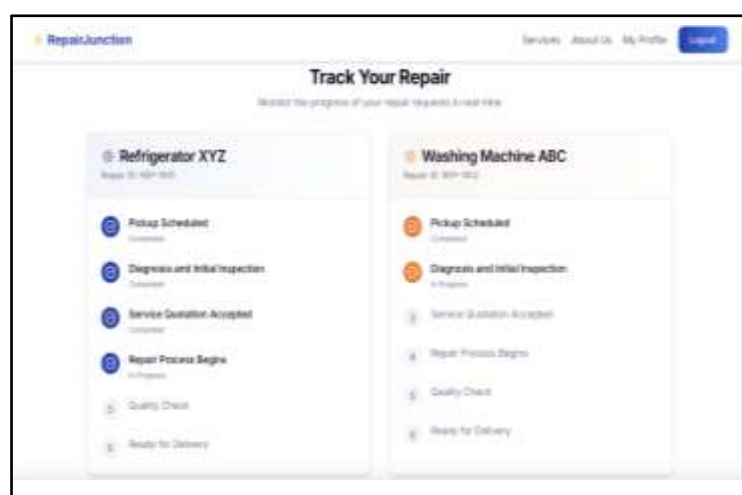
Fig 4: Tracking Page

4. Submit Repair Request Page:

- Users can submit repair requests by providing appliance details and issues.

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- Customers can select their preferred service type:

- Onsite Repair: A technician will visit the customer's location to perform the repair.

- Appliance Pickup: The appliance will be picked up for servicing and returned after repair.

- This flexibility ensures convenience and tailored repair solutions for users.

5. Quotation Approval Page:

- Displays a detailed repair quotation, including diagnosis fees, repair costs, and part replacements.

- Users can accept or reject the quotation, ensuring transparency in the repair process.

6. My Profile Page (User Side):

- Stores personal details of the user, ensuring quick and easy access to their information:

- Name

- Address

- Phone Number

- Email ID

- Helps in maintaining consistent user records for better service and communication.

➢ **Technician Side**

1. Homepage:

- Provides an overview of assigned repair tasks, pending services, and completed jobs.

2. Service Management Page:

- Technicians can efficiently handle repair jobs through four key sections:

- Request Management: Handles and reviews repair requests from customers.

- Track Management Service: Updates the status of ongoing repair jobs, ensuring real-time tracking.

- Quotation Management: Generates and sends repair quotations to customers.

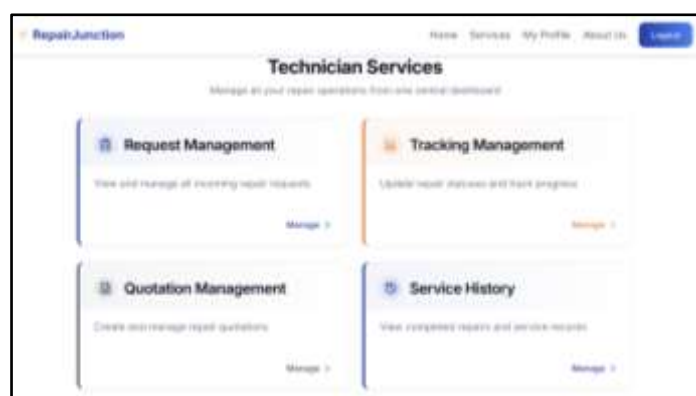- Service History: Stores past repair jobs handled by the technician.

Fig 5: Service Management Page

3. My Profile Page (Technician Side):

- Stores essential personal and professional details of the technician:

- Name

- Address

- Phone Number

- Email ID

- Skills/Specialization: Lists the technician's expertise areas, helping in job allocation.

- Ensures an efficient technician database for managing services and assigning jobs based on specialization.

DISCUSSION

The results demonstrate that the Electronic Appliances Repair Tracking Portal significantly improves repair service management by:

1. Enhanced Customer Experience

- ❖ Users can quickly submit requests, track progress, approve quotations, and manage their profile information in one place.

- ❖ The addition of Onsite Repair and Appliance Pickup options ensures customer convenience and service flexibility.

- ❖ The tracking feature improves transparency and reduces service delays.

2. Structured Technician Workflow

- ❖ The Service Management Page allows technicians to organize, prioritize, and track their tasks efficiently.

- ❖ My Profile Page helps in better job allocation based on skills and expertise, ensuring specialized repairs.

3. Seamless Communication and Transparency

- ❖ Users and technicians can update and retrieve their profile details easily, minimizing the need for repeated data entry.

- ❖ The quotation approval system eliminates communication gaps, ensuring customers approve costs before the repair begins.

4. Future Enhancements and Scalability

- ❖ The current system can be further improved by integrating:

- ❖ Automated appointment scheduling based on technician availability.

- ❖ AI-powered fault prediction for common appliance issues.

CONCLUSION

This research highlights the pressing need for a digitized and transparent electronic appliance repair system that enhances user experience and operational efficiency. The proposed Electronic Appliances Repair Tracking Portal serves as a practical solution to streamline the repair service process, providing benefits for both consumers and service providers. Our analysis reveals that integrating modern technologies such as mobile tracking, cloud services, and real-time updates can significantly improve the speed and reliability of appliance repair services. Additionally, addressing privacy concerns is critical, as safeguarding customer data must be a priority within the repair industry.

While our work offers several advantages, there are some limitations, particularly in terms of cost and implementation of privacy safeguards. Future research can focus on refining privacy protocols, expanding the service coverage, and introducing more advanced features like predictive maintenance and scheduling. Moreover, further exploration of the integration of Internet of Things (IoT) devices within repair tracking systems could lead to more intelligent and efficient solutions.

Acknowlegement:

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