Healthcare Kiosk for Intel Unnati

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1 Introduction

Healthcare Kiosks represent a transformative opportunity in the rapidly growing Digital Health Market,whose size was estimated at USD 288.55 billion in 2024 and is projected to reach USD 946.04 billion by 2030, growing at a CAGR of 22.2% from 2025 to 20301. Our project, featuring comprehensive functionalities including vitals monitoring, video conferencing, appointment booking, voice chatbot, face ID login, and disease prediction, positions itself strategically within this expanding market. With the integration of advanced technologies and a robust go-to-market strategy, this project demonstrates significant potential for both clinical impact and commercial viability.

The healthcare industry is experiencing an unprecedented digital transformation, driven by the need for accessible, cost-effective, and efficient healthcare delivery systems. Healthcare kiosks have emerged as a critical component in this ecosystem, serving as self-service terminals that bridge the gap between patients and healthcare providers.

India's healthcare landscape presents a compelling opportunity, with the digital healthcare market. The government's Ayushman Bharat Digital Mission (ABDM), launched with a budget of Rs.1,600 crore for five years, demonstrates strong institutional support for digital health initiatives. The mission has already created over 17 million health accounts and registered thousands of healthcare professionals and facilities.

The healthcare kiosk's align perfectly with these market trends and government initiatives, offering a comprehensive solution that addresses multiple healthcare touchpoints in a single platform.

2 Methodology

The project employs a multi-layered technological approach combining both hardware and software components.

2.1 Frontend Technologies

- Modern web frameworks for user interfaces.
- Responsive design for optimal user experience across devices, i.e. even when the user isn't physically near a kiosk.
- Real-time communication capabilities for video conferencing.

2.2 Backend Infrastructure

- Node.js for primary application logic
- Python for specialized face recognition and AI-powered disease prediction
- Clerk authentication system for secure user management
- Neon database for reliable data storage

2.3 Advanced Features

- Voice recognition with potential OpenAI Whisper integration
- Facial recognition for biometric authentication
- AI-driven symptom analysis and disease prediction
- Real-time vitals monitoring integration
- Seamless appointment booking system

2.4 Deployment Stratergy

- Render hosting platform for scalable cloud deployment
- Multiple backend services coordinated for optimal performance
- Free-tier implementations for cost-effective development and testing

3 System Architecture and Implementation

3.1 Core Functionalities

User Authentication and Onboarding
Users can register using Google or manually with email and phone number. OTP verification is enforced for both. Upon successful verification, users complete their profile to access the platform. New users are prompted to choose a role—either *Doctor* or *Patient*—which determines their available features and interface.

Patient Portal
Once the user selects the Patient role, the following features become available:

- **Hospital Discovery:** View hospitals under the Ayushman Bharat program. Data is currently statically sourced from Excel to JSON. Clicking "Get Location" redirects to Google Maps.
- **Medical Document Management:** Upload medical documents for personal record-keeping and doctor consultations.
- **Doctor Discovery and Booking:** Browse doctors based on specialty and view their profiles. Appointments can be booked only after successful payment via Razorpay.
- **Appointment Management:** Patients can view or cancel upcoming appointments.
- **Video Consultations:** Attend virtual appointments securely through Vonage-powered video calls.

Doctor Portal
When users select the Doctor role, they are initially placed in an unverified state:

- **Unverified Doctors:** See a "Waiting for Verification" screen until approved by an admin.

Once verified, doctors access the full portal:

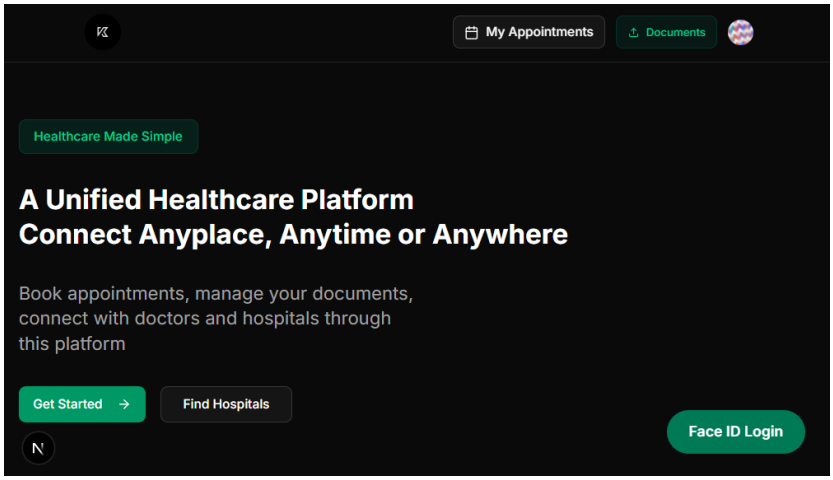

Figure 1: Main landing page of the website.

- **Set Availability:** Define daily time slots to accept appointments.
- **Appointment Management:** View, accept, or cancel patient appointments.
- **Video Consultations:** Conduct real-time virtual consultations using Vonage.

Admin Panel
Admins maintain oversight of the platform with the following controls:

- **Verify Doctors:** Approve or reject doctor registration requests.
- **Suspend Doctors:** Temporarily remove doctors from the platform if necessary.
- **View Doctors:** Access the list of all verified doctors on the platform.

Kiosk-Specific Features
Beyond the application roles, the kiosk system includes several health-tech innovations:

- **Vitals Monitoring:** Real-time collection of essential health data like blood pressure, heart rate, temperature, and oxygen saturation. This extends the platform's functionality to frontline diagnostic use cases.
- **Ready Reckoner System:** Provides on-demand access to medical guidelines and health education materials to empower users with relevant knowledge.
- **Voice Chatbot:** Voice-enabled interaction improves accessibility for users with literacy or physical limitations.
- **Face ID Login:** Biometric authentication using facial recognition eliminates the need for traditional logins, enhancing both security and user convenience.
- **Disease Predictor:** AI-driven analysis enables users to enter symptoms and receive potential diagnoses or health recommendations, aiding in early detection and preventive care.

3.2 Technical Infrastructure

- The website is built using Next.js, React, Python, Clerk, Neon PostgreSQL
- The main Landing page of the app is as can be seen in Figure 1, using Clerk we can authenticate and log users in using either their Google account or the by entering all their information as seen in Figure 2.
- There is also an option to Login with Face ID to detect your face and login directly as can be seen in Figure 3.

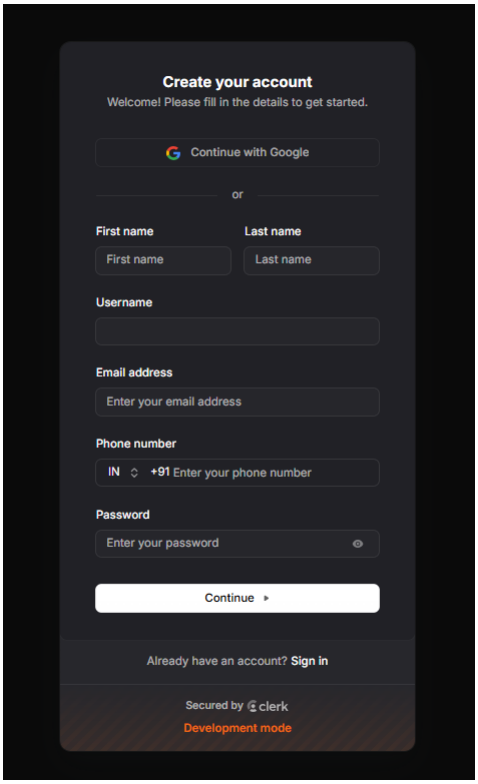

Figure 2: Sign Up

- We can find all the nearby hospitals using the Hospitals page, it gives all the hospitals close to you in the Ayushman Bharat PMJAY (Figure 4)

- You can book appointments with doctors according to specialty as seen in Figure 5
- You can do the appointment booking on a Voice Chatbot which is also multilingual, created using and LLM as seen in Figure 6

- A disease predictor is also trained using data from a Kaggle Dataset and Random Forest, using symptom weights as seen in figure 8
- Users can also upload and view their documents, which also helps doctors to get direct access to medical documents. This can be implemented nationwide for standardization, so that a doctor can make a very educated diagnosis(Figure 9 & 10).

- Users can join video calls at with the booked doctor (Figure)
- Payment Integration is done with Razorpay (Figure)
- Admin has the power to approve and manage doctors on the site (Figure)
- Doctors can choose their free timeslots and make them available for booking (Figure)

3.3 Technology Stack

Authentication System (Clerk)
Pricing: Free tier for up to 10,000 Monthly Active Users (MAUs), Pro plan at $25/month with $0.02 per additional MAU

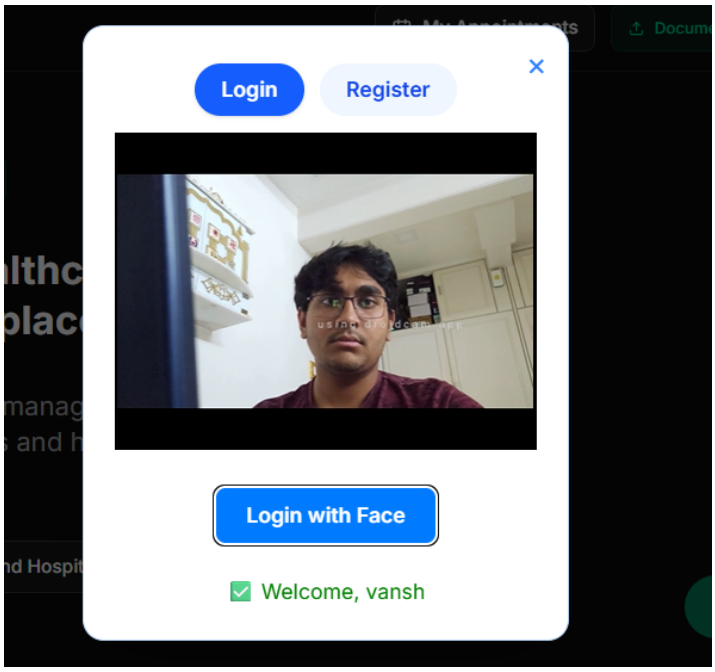

Figure 3: Face ID Login

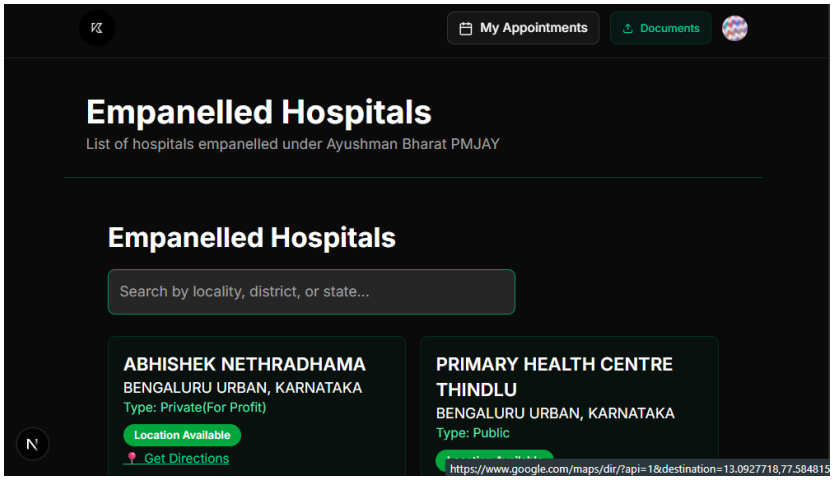

Figure 4: Search and Find Nearby Hospitals

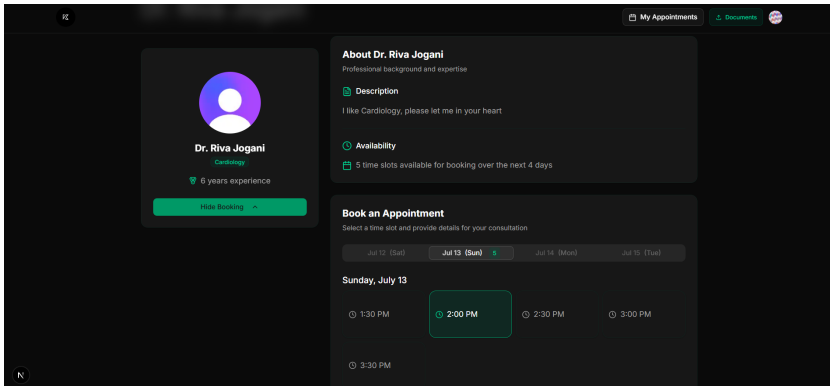

Figure 5: Appointment Booking

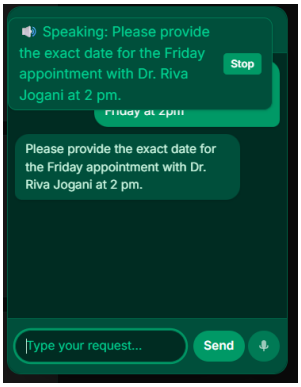

Figure 6: Text and Voice Chatbot

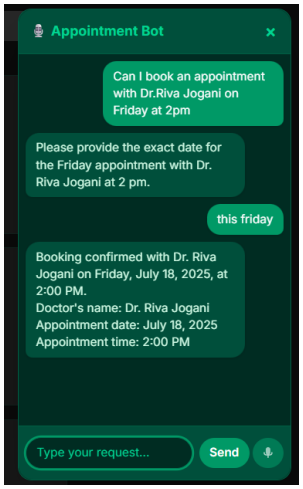

Figure 7: Booking Confirmed on the Chatbot

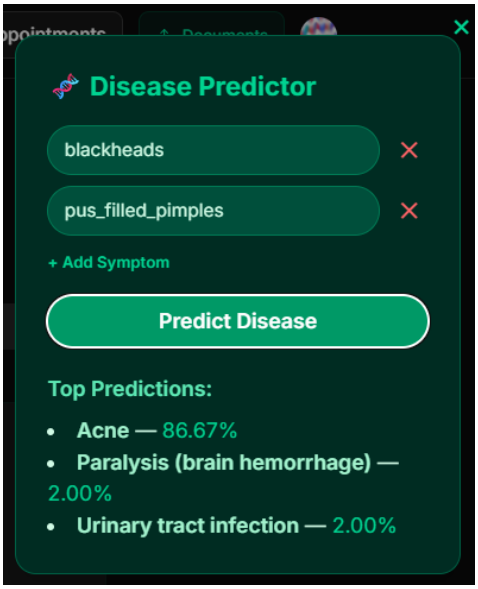

Figure 8: Disease Prediction

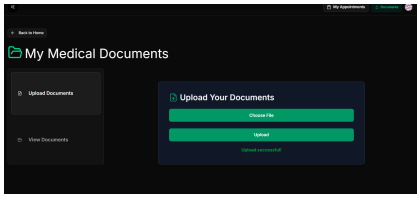

Figure 9: Uploading Documents

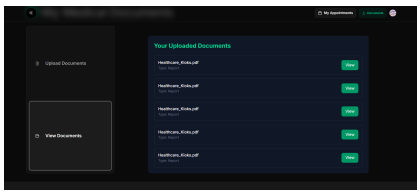

Figure 10: Viewing of the Documents only you uploaded

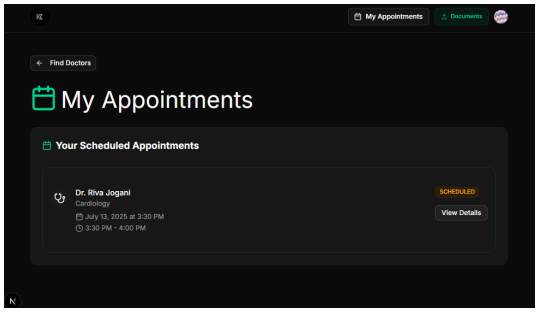

Figure 11: View Appointments (Patient side)

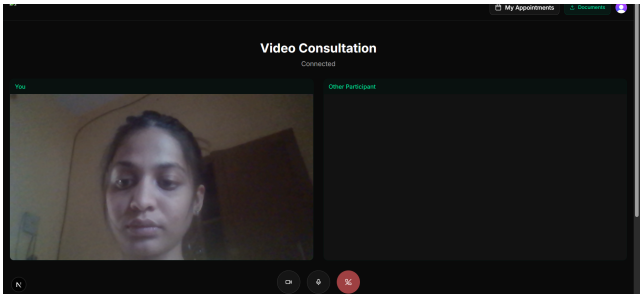

Figure 12: Video Call

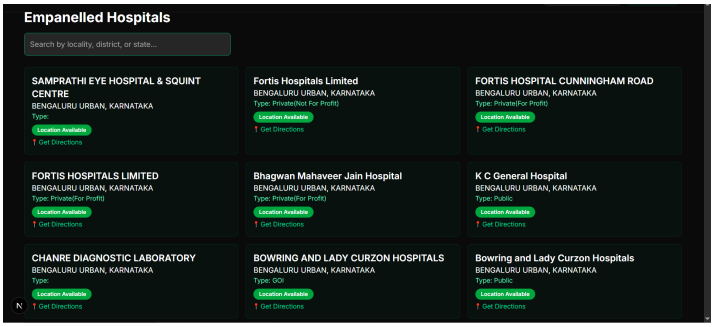

Figure 13: Hospital Finder

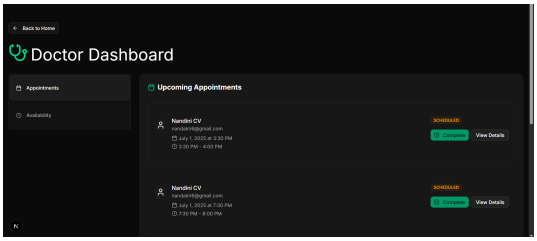

Figure 14: View Appointment (Doctor Dashboard)

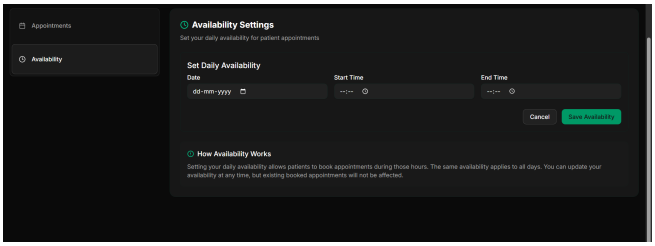

Figure 15: Set Availability for Appointment (Doctor Dashboard)

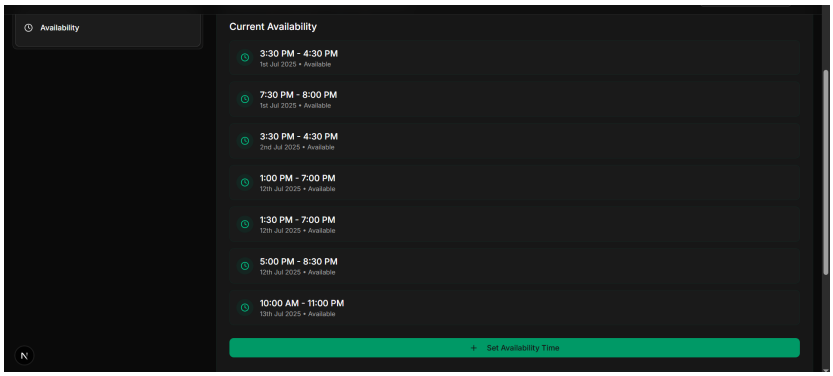

Figure 16: Availability List (Doctor Dashboard)

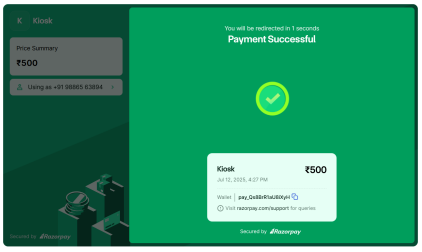

Figure 17: Rupay Gateway

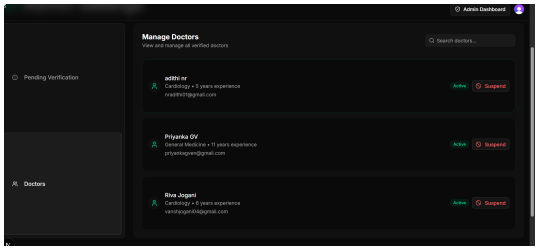

Figure 18: Approved Doctors List (Admin Dashboard)

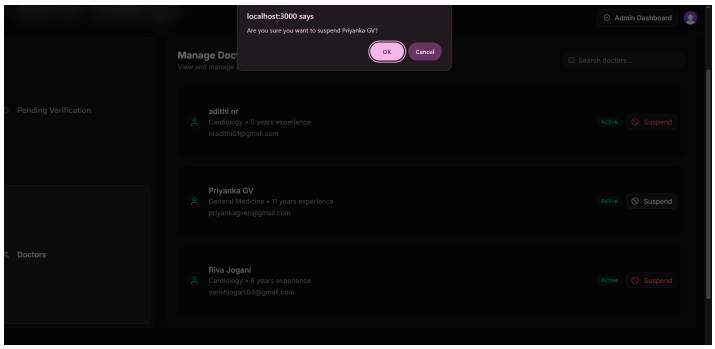

Figure 19: Suspending Doctor (Admin Dashboard)

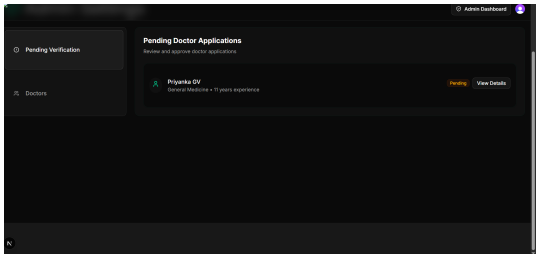

Figure 20: Pending Doctor List (Admin Dashboard)

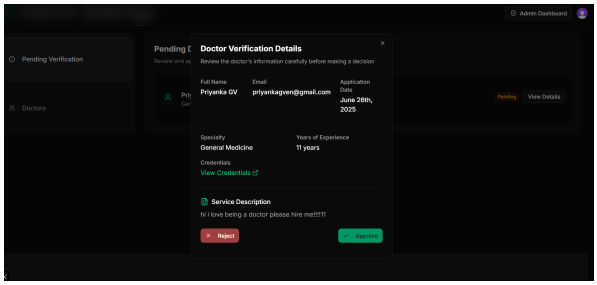

Figure 21: Verifying the Doctor (Admin Dashboard)

Benefits: Comprehensive authentication with support for Google login, OTP verification, and secure session handling
Scalability: Excellent for growing user bases with built-in role and session management

Database (Neon PostgreSQL)
Pricing: Free tier with 0.5GB storage, Launch plan starting at $19/month for 10GB
Benefits: Serverless PostgreSQL with auto-scaling capabilities
Features: Point-in-time recovery, branching, read replicas, and high availability

ORM and Data Handling (Prisma)
Pricing: Open-source and free
Benefits: Type-safe database queries and schema management with seamless PostgreSQL integration
Features: Data validation, auto-generated queries, and simplified migration system

File Uploads (Multer)
Pricing: Open-source and free
Benefits: Efficient middleware for handling multipart/form-data
Use Case: Enables secure and scalable file uploads for medical documents

Video Calling (Vonage)
Pricing: Offers a free tier with limited minutes; paid plans available based on usage
Benefits: Real-time audio/video communication with encryption support
Use Case: Facilitates remote doctor-patient consultations via secure video calls

Payment Gateway (Razorpay)
Pricing: 2% per transaction for domestic payments
Benefits: Secure, developer-friendly payment infrastructure
Use Case: Handles patient payments for booking appointments, with future integration for doctor payouts

Deployment (Render)
Pricing: Free tier available; paid plans starting at $7/month
Benefits: Easy-to-use hosting platform with automatic deployment from GitHub
Features: Continuous deployment, custom domains, background workers, and managed databases

4 Market Analysis and Competitive Landscape

4.1 Market Size and Growth

The healthcare kiosk market demonstrates robust growth across multiple forecasts:

- Global market size: $1.3-1.5 billion in 2024, projected to reach $3.76-4.0 billion by 2030-2032
- Growth rate: Consistent CAGR of 13.3-15.3% across various reports
- Indian market: Expected to reach $114.8 million by 2030

4.2 Key Market Drivers

Technological Advancement
Integration of AI, IoT, and telemedicine capabilities is driving market expansion. The incorporation of 5G networks enabling real-time teleconsult represents a significant growth driver with +2.1% impact on CAGR forecast.

Government Support
India's digital health initiatives provide substantial market support. The Department of Health and Family Welfare's FY 2024-25 budget was Rs.87,656.90 crore, reflecting a 12.93% increase.

Post-COVID Demand
The pandemic accelerated adoption of contactless healthcare solutions, making self-service kiosks essential tools for reducing infection risk.

4.3 Competitive Analysis

Major Players

- Clinics on Cloud: Holds 80% market share in India
- Olea Kiosks: Leading provider of self-service kiosks for healthcare
- XIPHIAS Software Technologies: Offers comprehensive kiosk solutions
- Meridian Kiosks: Specializes in custom healthcare kiosk solutions

Competitive Advantages of Your Solution

- Comprehensive Integration: Unlike many competitors focusing on single functionalities, your solution combines multiple healthcare touchpoints
- Advanced AI Features: Disease prediction capabilities differentiate from basic screening-only solutions
- Modern Technology Stack: Use of contemporary frameworks and cloud-native architecture
- Cost-Effective Development: Leveraging free tiers and open-source technologies reduces initial investment

5 Go-to-Market Strategy

5.1 Target Market Segmentation

5.1.1 Primary Markets

- Rural Healthcare Centers: Address the 65% of India's population living in rural areas with limited healthcare access
- Corporate Wellness Programs: Target companies seeking employee health monitoring solutions
- Pharmacy Chains: Partner with retail pharmacies for customer health services
- Educational Institutions: Schools and colleges for preventive health screening

5.1.2 Secondary Markets

- Private Hospitals: Supplement existing infrastructure with self-service capabilities
- Government Health Initiatives: Align with ABDM and state health programs
- Senior Living Communities: Specialized deployment for elderly care

5.2 Revenue Models

5.2.1 Direct Sales

- Hardware: Healthcare kiosk systems priced competitively with market standards ($20,000-$600,000 range based on complexity)
- Software Licensing: Subscription-based model for software features and updates
- Maintenance Contracts: Ongoing support and hardware maintenance services

5.2.2 Service-Based Revenue

- Per-Transaction Fees: Revenue sharing with healthcare providers for consultations
- Data Analytics: Aggregated health insights for public health organizations
- Telemedicine Partnerships: Commission from remote consultation services

5.2.3 Partnership Revenue

- Pharmaceutical Integration: Medicine dispensing and prescription management
- Insurance Partnerships: Health screening data for policy assessments
- Government Contracts: Public health initiative implementations

5.3 Market Entry Strategy

5.3.1 Phase 1: Pilot Deployment

- Deploy 10-20 kiosks in select urban and rural locations
- Partner with existing healthcare providers for validation
- Gather usage data and user feedback for optimization

5.3.2 Phase 2: Regional Expansion

- Scale to 100+ kiosks across multiple states
- Establish maintenance and support networks
- Develop partnerships with regional healthcare organizations

5.3.3 Phase 3: National Presence

- Achieve 1000+ kiosk deployment
- Integrate with ABDM and other national health initiatives
- Explore international expansion opportunities

6 Advantages Over Current Solutions

6.1 Technological Superiority

Comprehensive Integration
Most existing solutions focus on single functionalities. Your platform combines vitals monitoring, telemedicine, appointment booking, and AI-powered diagnostics in one integrated system.

Advanced AI Capabilities
While most kiosks offer basic health screenings, your disease prediction feature using symptom analysis provides significant added value for early detection and preventive care.

Modern Architecture
Cloud-native deployment and modern technology stack provide better scalability, reliability, and maintenance compared to traditional hardware-centric solutions.

6.2 Cost Effectiveness

Development Efficiency
Leveraging free tiers of Clerk, Neon, and Render significantly reduces initial development and deployment costs compared to custom-built solutions requiring significant upfront investment.

Operational Advantages

- Reduced staffing requirements: Self-service functionality reduces need for dedicated personnel
- 24/7 availability: Unlike staffed services, kiosks provide continuous access to healthcare services
- Scalable deployment: Cloud-based architecture enables rapid expansion without proportional infrastructure investment

6.3 ROI Potential

Healthcare kiosks demonstrate strong return on investment:

- Payback period: 14 months for strategically placed units
- Revenue generation: Studies show 677% ROI for retailers deploying health information kiosks
- Cost savings: Healthcare providers report significant labor cost reductions and improved efficiency

7 Raw Materials and Manufacturing

7.1 Hardware Components

Essential Components

- Display: Interactive touchscreen (15-27 inches) - $500-2000
- Computer System: Industrial PC with adequate processing power - $800-1500
- Medical Devices: Blood pressure monitor, thermometer, pulse oximeter, weight scale - $1000-3000
- Enclosure: Steel/aluminum housing with powder coating - $500-1500
- Connectivity: Ethernet, WiFi, cellular modem - $200-500
- Security: Locks, tamper protection, surveillance camera - $300-800
- Power Supply: UPS backup system - $200-500

Optional Components

- Printer: Receipt and report printing capability - $200-500
- Card Reader: Payment and ID card processing - $150-400
- Biometric Scanner: Fingerprint or facial recognition - $300-800
- Audio System: Speakers and microphone for voice interaction - $100-300

Total Hardware Cost Range: $3,650-10,300 per unit depending on configuration

7.2 Supply Chain Considerations

7.2.1 Local Manufacturing

India has a strong manufacturing base for kiosk components:

- Chennai and Pune: Major hubs for electronics manufacturing
- Delhi NCR: Significant presence of kiosk manufacturers
- Cost advantage: Local manufacturing reduces import duties and shipping costs

7.2.2 Quality Standards

- Medical device certification: FDA/CE certification for medical components
- Safety standards: UL certification for electrical components
- Environmental compliance: IP ratings for dust and water resistance

8 Future Enhancement Opportunities

8.1 OpenAI Whisper Integration

Technical Benefits

- Multilingual support: Whisper supports 99 languages, crucial for India's diverse linguistic landscape
- High accuracy: Achieves near state-of-the-art speech recognition performance
- Cost-effective: At $0.006 per minute, significantly more affordable than many alternatives

Implementation Strategy

- Phased rollout: Start with English and major regional languages
- Quality improvement: Enhance voice chatbot accuracy and user experience
- Accessibility: Improve access for users with limited literacy

8.2 Advanced AI Features

Predictive Analytics

- Enhanced disease prediction using larger datasets
- Population health insights for public health planning
- Personalized health recommendations

Integration Capabilities

- ABDM Integration: Connect with India's national digital health infrastructure
- Electronic Health Records: Seamless patient data management
- Prescription Management: Integration with pharmacy networks

8.3 Doctor Payment Integration

- Implement functionality for doctors to receive payments directly through the platform.
- Payment model: 2 credits per appointment, valued at 500.

8.4 Dynamic Hospital Data Retrieval

- Replace the current static hospital list sourced from the Ayushman Bharat Excel-to-JSON conversion with dynamic data fetching via authorized APIs.
- Overcome current permission restrictions to enable real-time updates and expanded hospital listings.

8.5 Medical Document Viewing by Doctors

- Enable verified doctors to view medical records and documents uploaded by patients who have booked appointments with them.
- Enhance consultation accuracy and patient care through better information access.

8.6 Medical Document Viewing by Patients

- Implement viewing functionality for patients to access their uploaded medical documents within the platform.

8.7 Automated Refund Processing

- Develop an automated system to process refunds when patients cancel appointments.
- Improve user trust and satisfaction by ensuring seamless financial transactions.

9 Implementation Roadmap

9.1 Development Phase (Months 1-6)

- Complete core feature development and testing
- Optimize AI models for disease prediction
- Implement OpenAI Whisper for enhanced voice recognition
- Conduct pilot testing with select healthcare partners

9.2 Market Validation (Months 7-12)

- Deploy pilot kiosks in 5-10 strategic locations
- Gather user feedback and usage analytics
- Refine features based on real-world deployment
- Establish partnerships with healthcare providers

9.3 Scale-up Phase (Months 13-24)

- Manufacturing partnerships for hardware production
- Regional expansion to 50-100 kiosks
- Team expansion for sales and support
- Integration with government health initiatives

9.4 Growth Phase (Months 25-36)

- National expansion targeting 500+ kiosks
- International market exploration
- Advanced AI feature rollout
- Strategic partnerships and acquisitions

10 Risk Analysis and Mitigation

10.1 Technical Risks

- Hardware reliability: Partner with established manufacturers for quality assurance
- Software bugs: Implement comprehensive testing and phased rollouts
- Connectivity issues: Design offline-capable features for areas with poor internet

10.2 Market Risks

- Competition: Focus on unique value proposition and continuous innovation
- Regulatory changes: Maintain compliance with healthcare regulations and data privacy laws
- Economic downturns: Develop flexible pricing models and government partnership opportunities

10.3 Operational Risks

- Maintenance challenges: Establish local service networks and remote monitoring capabilities
- User adoption: Invest in user education and intuitive interface design
- Data security: Implement robust cybersecurity measures and regular audits

11 Conclusion

This healthcare kiosk project represents a significant opportunity in the rapidly expanding digital health market. With comprehensive features, modern technology architecture, and strategic positioning within India's digital health transformation, the project demonstrates strong potential for both social impact and commercial success.
Key Success Factors:

- Market Timing: Aligns with government initiatives and post-pandemic healthcare digitization trends
- Comprehensive Solution: Integrated approach addresses multiple healthcare needs in single platform
- Cost-Effective Development: Leveraging free tiers and modern cloud technologies reduces barrier to entry
- Scalable Architecture: Cloud-native design enables rapid expansion
- Strong ROI Potential: Healthcare kiosks demonstrate proven return on investment

Strategic Recommendations:

- Immediate Focus: Complete pilot deployment and gather real-world usage data
- Partnership Development: Establish relationships with healthcare providers and government agencies

- Technology Enhancement: Implement OpenAI Whisper for improved multilingual capabilities
- Market Validation: Demonstrate measurable improvements in healthcare access and outcomes
- Funding Strategy: Leverage initial success for scaling investment and expansion capital

The healthcare kiosk market's robust growth trajectory, combined with India's supportive digital health policies and your project's comprehensive feature set, positions this initiative for significant success in transforming healthcare accessibility and delivery.