2025

HDFC BANK

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Capstone Project Report : Digital - KYC

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PROGRAM ROLL NO – DT.32

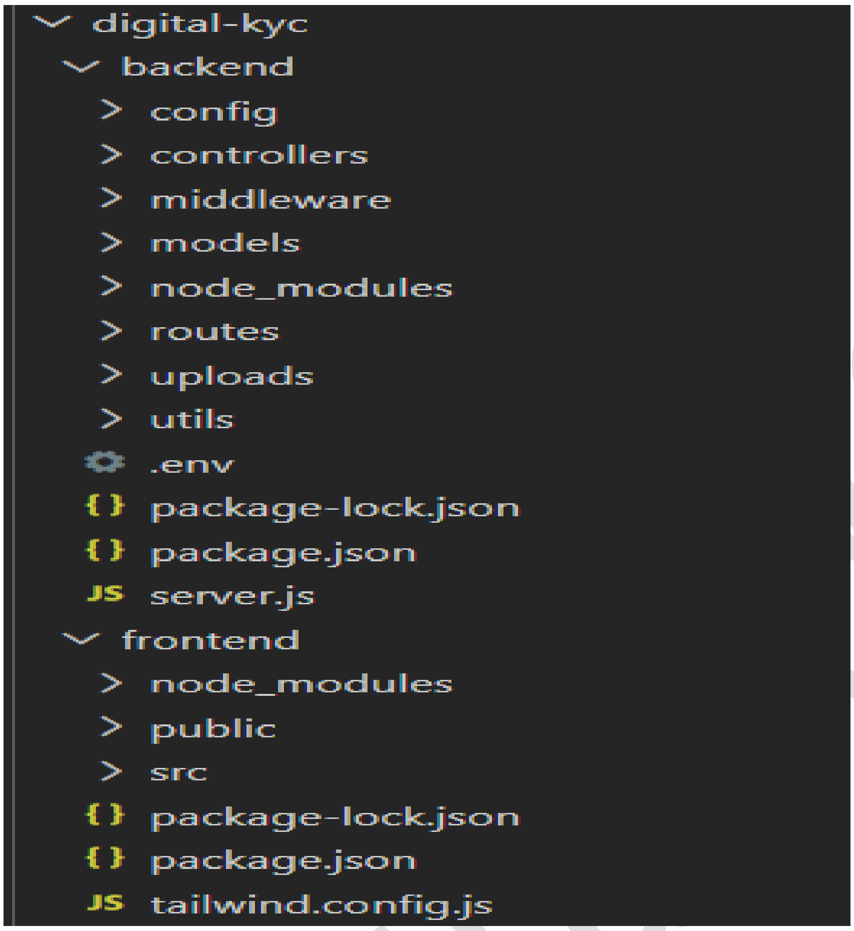
Introduction

- The Digital KYC (Know Your Customer) system is designed to simplify and modernize the customer onboarding process for financial services such as banking.
- Traditional KYC methods are slow, paper-based, and require physical verification, leading to delays and high drop-off rates.
- This project aims to create a **fully digital, secure, step-by-step KYC workflow** that users can complete from any device.
- The system includes multi-step forms, document uploads, identity verification, and automated progress tracking.
- A responsive and user-friendly React frontend ensures smooth navigation across the entire KYC journey.
- A Node.js + Express backend handles authentication, document processing, storage, and business logic.
- The system improves accuracy, reduces manual effort, and accelerates account creation while maintaining high security.
- The solution uses modern UI/UX principles, automated validation, and seamless PDF confirmation generation.
- The final KYC status and user information are displayed in a secure customer dashboard.
- Overall, this Digital KYC solution increases onboarding efficiency and enhances customer experience.

Objectives

• Reduce customer drop-off during onboarding
• Provide a clean, step-by-step KYC journey
• Enable secure document uploads with validation
• Auto-generate confirmation PDF upon completion
• Provide a professional, bank-like dashboard

Project Structure



```
digital-kyc
  backend
    config
    controllers
    middleware
    models
    node_modules
    routes
    uploads
    utils
    .env
    package-lock.json
    package.json
    server.js
  frontend
    node_modules
    public
    src
    package-lock.json
    package.json
    tailwind.config.js
```

Tech Stack

Frontend

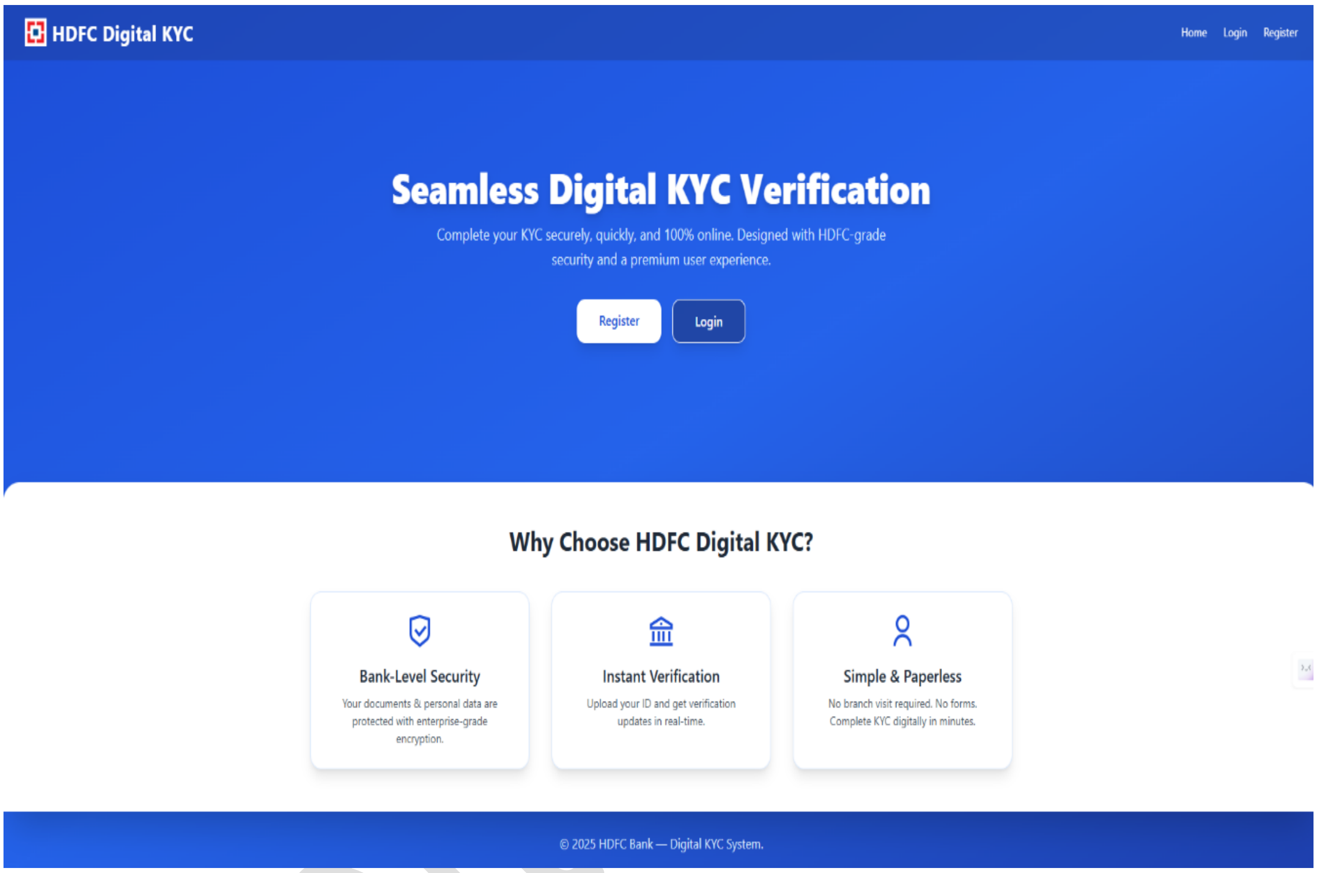
- React.js
- React Router
- TailwindCSS
- Framer Motion
- Axios
- jsPDF + html2canvas

Backend

- Node.js
- Express.js
- Sequelize ORM
- MySQL
- Multer (file uploads)
- JWT authentication

Project Workflow

1.Opening Page



HDFC Digital KYC

Home Login Register

Seamless Digital KYC Verification

Complete your KYC securely, quickly, and 100% online. Designed with HDFC-grade security and a premium user experience.

Register Login

Why Choose HDFC Digital KYC?

Bank-Level Security

Your documents & personal data are protected with enterprise-grade encryption.

Instant Verification

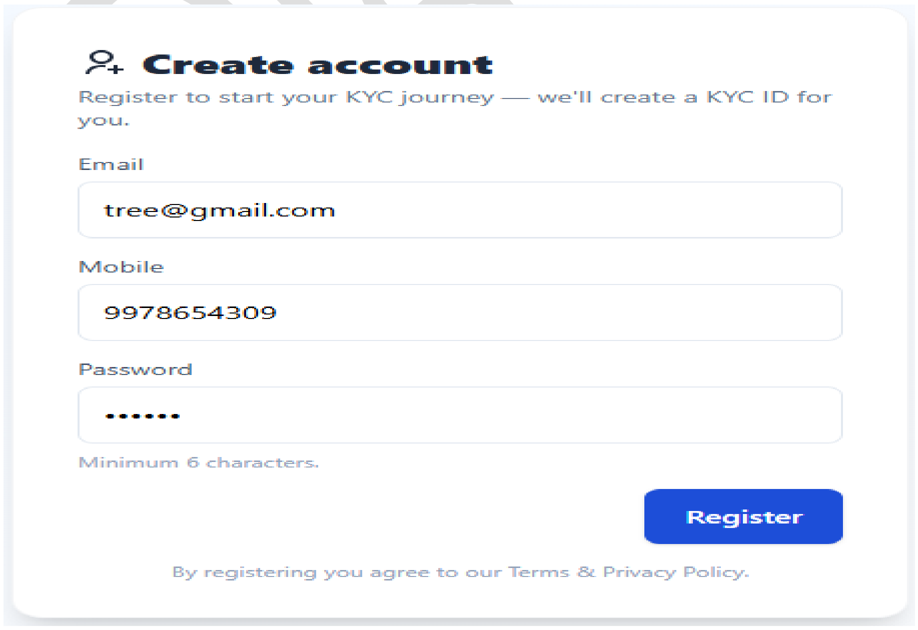
Upload your ID and get verification updates in real-time.

Simple & Paperless

No branch visit required. No forms. Complete KYC digitally in minutes.

© 2025 HDFC Bank — Digital KYC System.

2. Registration Page after clicking on **Register** button



Create account

Register to start your KYC journey — we'll create a KYC ID for you.

Email

tree@gmail.com

Mobile

9978654309

Password

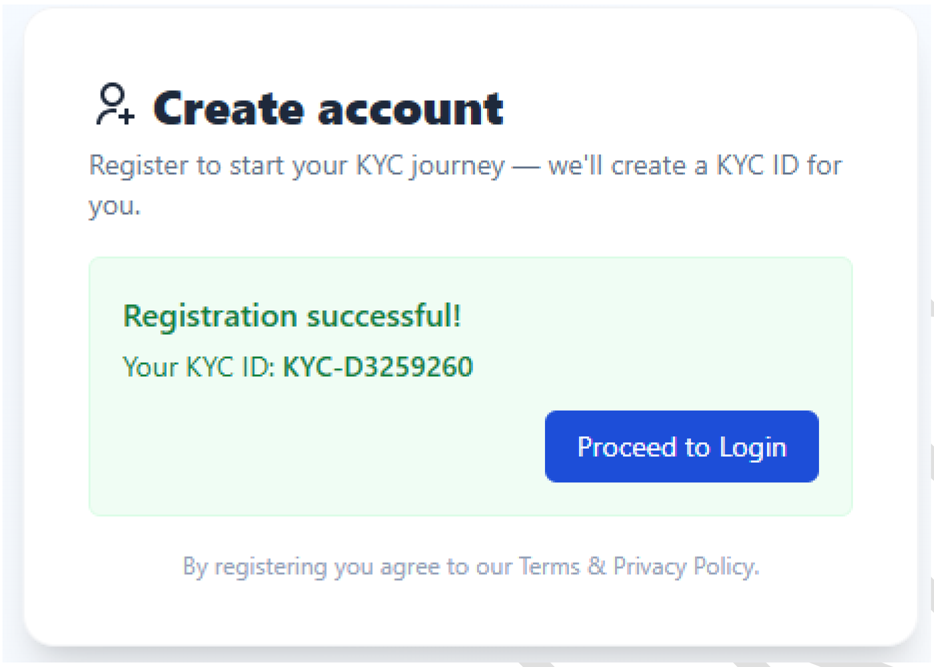
••••••

Minimum 6 characters.

Register

By registering you agree to our Terms & Privacy Policy.

3. Registration successful.



Create account

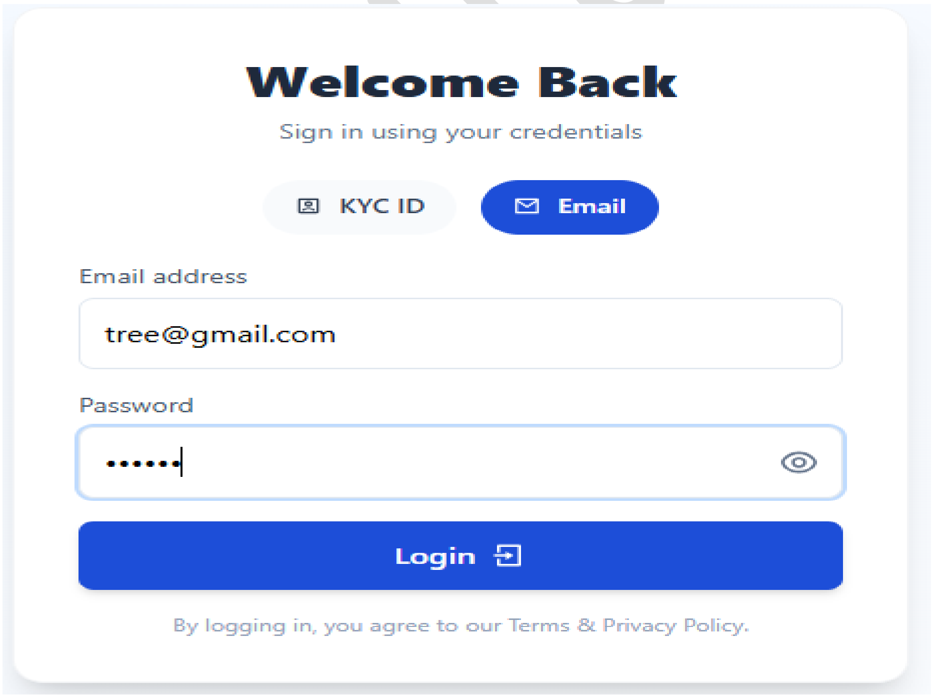
Register to start your KYC journey — we'll create a KYC ID for you.

Registration successful!

Your KYC ID: **KYC-D3259260**

By registering you agree to our Terms & Privacy Policy.

4. Login page after clicking on the **Proceed to Login** button.



Welcome Back

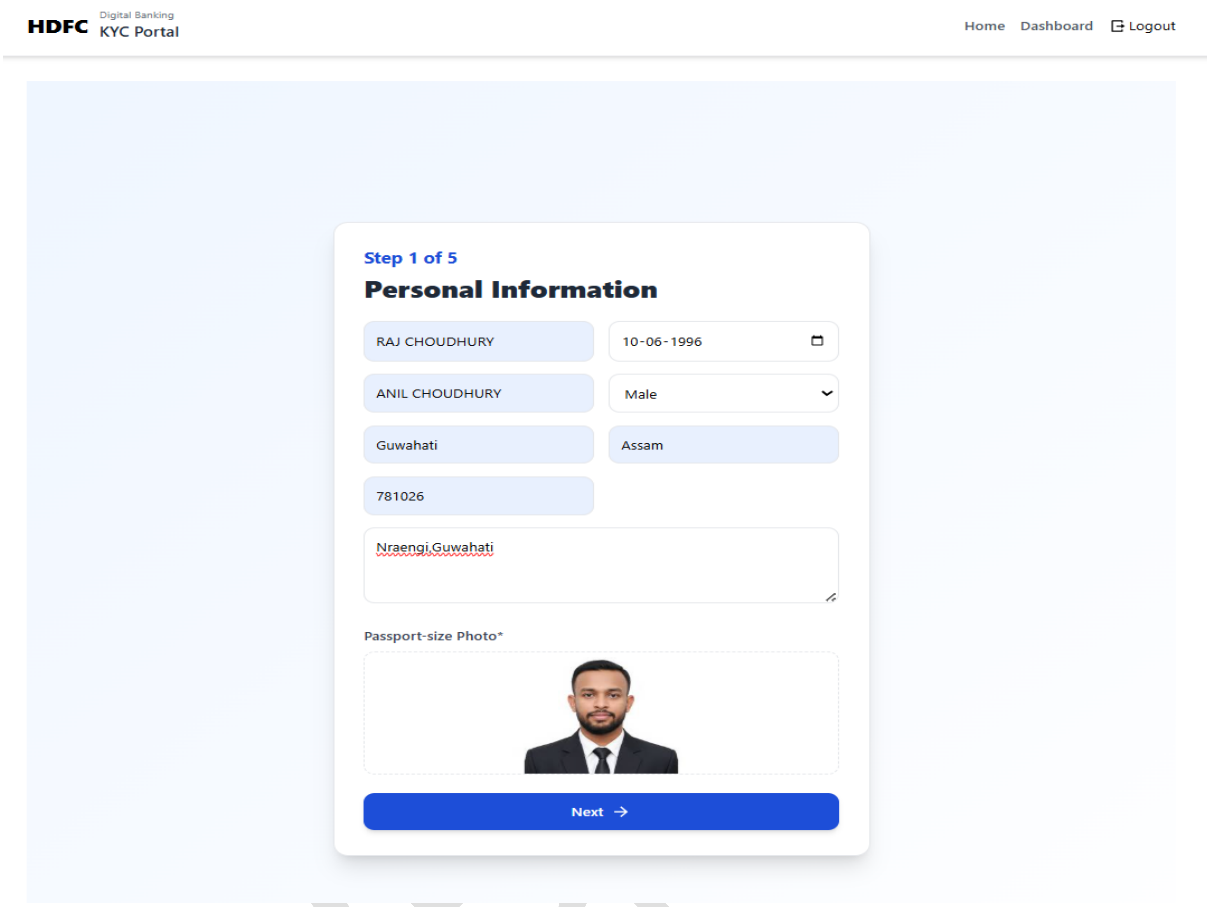
Sign in using your credentials

Email address: tree@gmail.com

Password: ••••••

By logging in, you agree to our Terms & Privacy Policy.

5. After successful login, the window of first step of the KYC opens. Here, we need to fill the personal Information.



HDFC Digital Banking KYC Portal

Home Dashboard Logout

Step 1 of 5

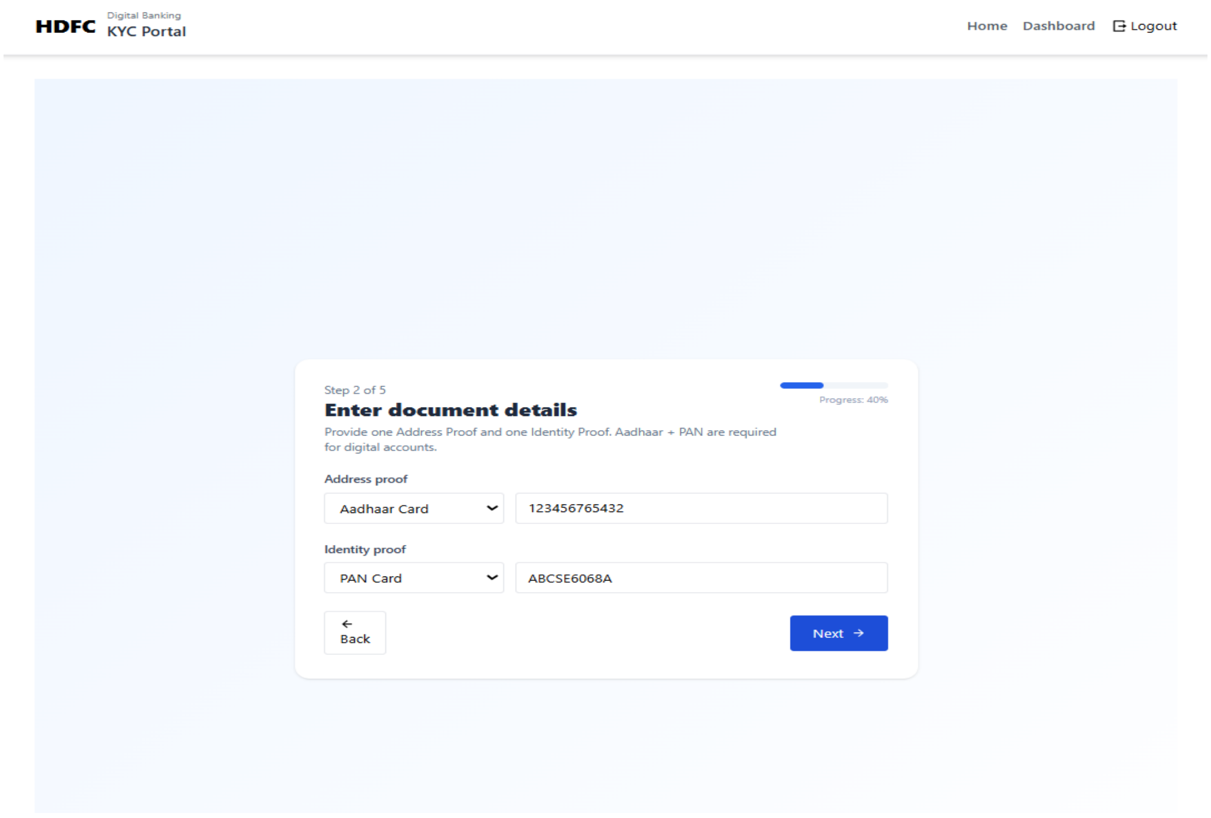
Personal Information

RAJ CHOUDHURY
10-06-1996
ANIL CHOUDHURY
Male
Guwahati
Assam
781026
Nraengi,Guwahati

Passport-size Photo*

Next →

6. KYC step 2 – Document Selection.



HDFC Digital Banking KYC Portal

Home Dashboard Logout

Step 2 of 5

Progress: 40%

Enter document details

Provide one Address Proof and one Identity Proof. Aadhaar + PAN are required for digital accounts.

Address proof

Aadhaar Card 123456765432

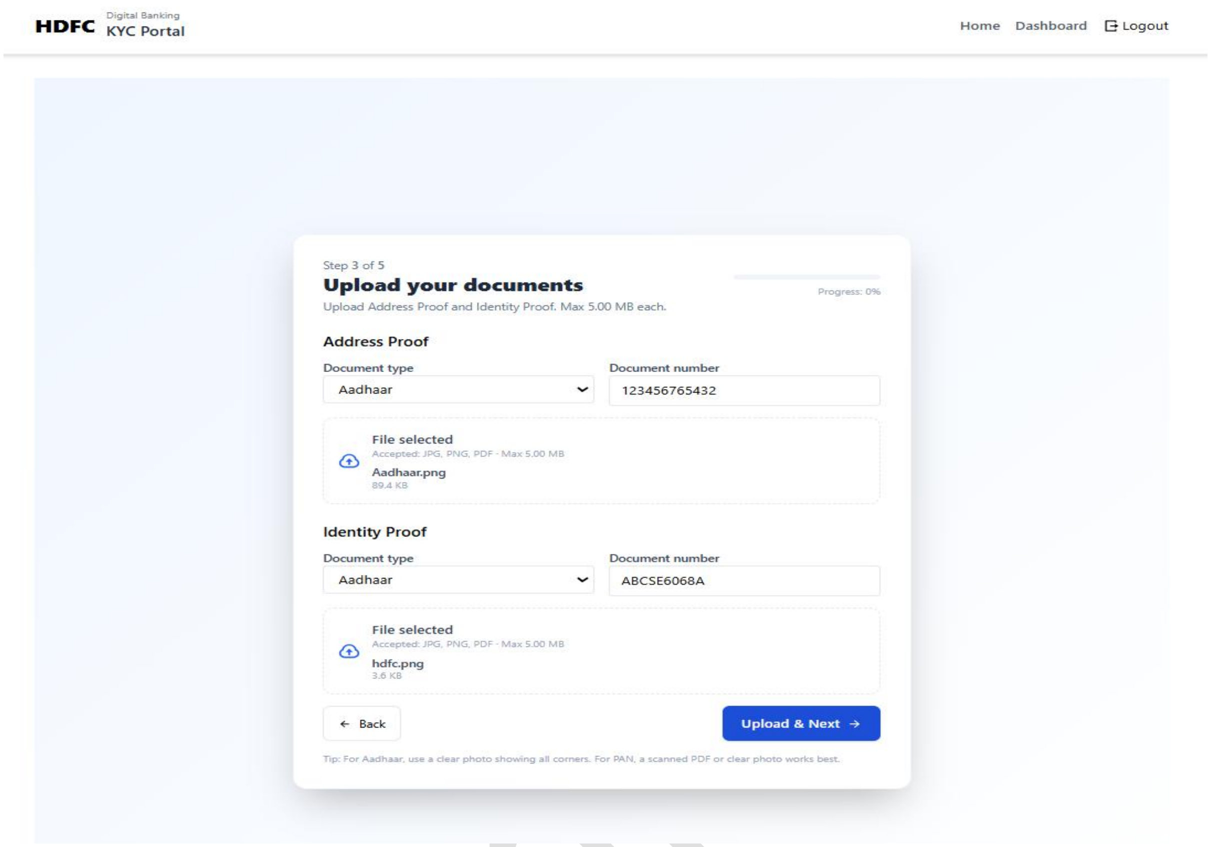
Identity proof

PAN Card ABCSE6068A

← Back

Next →

7. KYC Step 3 – Document Upload



Step 3 of 5

Upload your documents

Progress: 0%

Upload Address Proof and Identity Proof. Max 5.00 MB each.

Address Proof

Document type: Aadhaar
Document number: 123456765432

File selected
Accepted: JPG, PNG, PDF · Max 5.00 MB
Aadhaar.png
89.4 KB

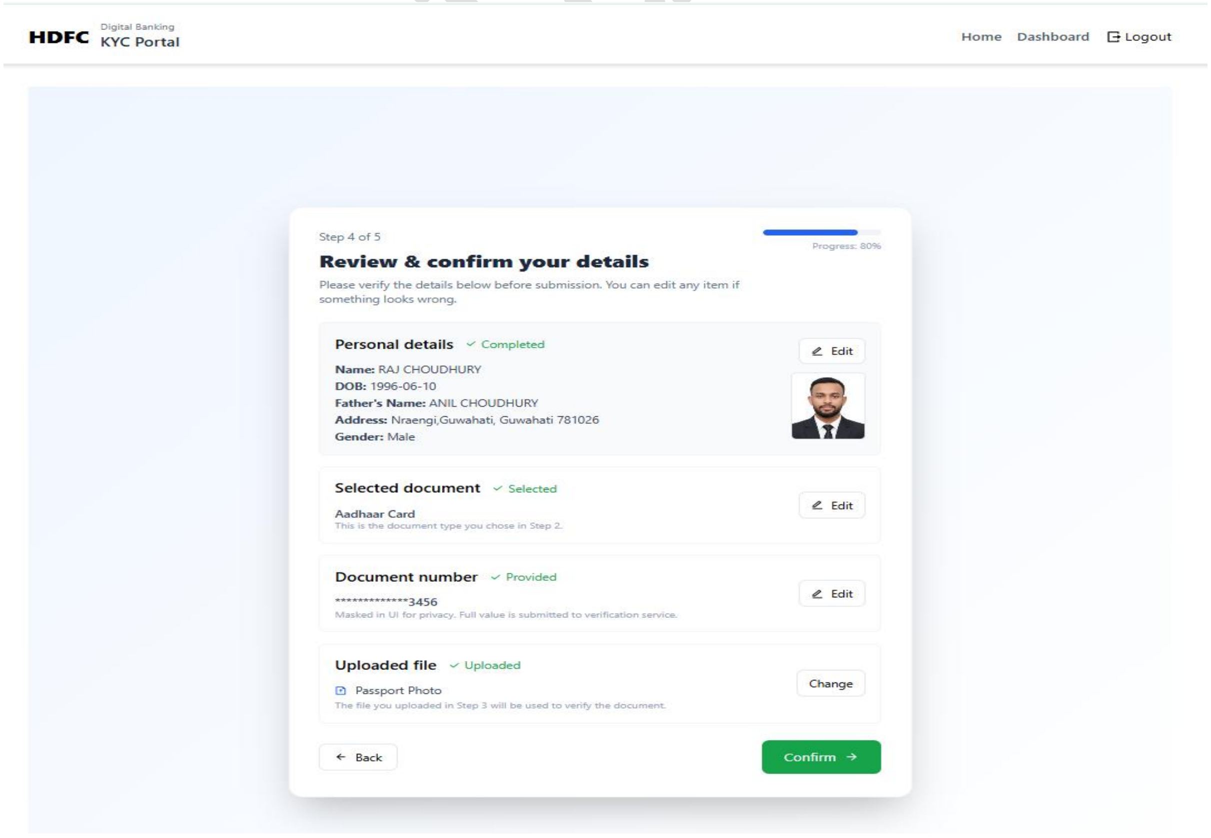
Identity Proof

Document type: Aadhaar
Document number: ABCSE6068A

File selected
Accepted: JPG, PNG, PDF · Max 5.00 MB
hdfc.png
3.6 KB

Tip: For Aadhaar, use a clear photo showing all corners. For PAN, a scanned PDF or clear photo works best.

8. KYC Step 4 – Review & Confirmation



Step 4 of 5

Review & confirm your details

Progress: 80%

Please verify the details below before submission. You can edit any item if something looks wrong.

Personal details ✓ Completed

Name: RAJ CHOUDHURY
DOB: 1996-06-10
Father's Name: ANIL CHOUDHURY
Address: Nraengi,Guwahati, Guwahati 781026
Gender: Male

Selected document ✓ Selected

Aadhaar Card
This is the document type you chose in Step 2.

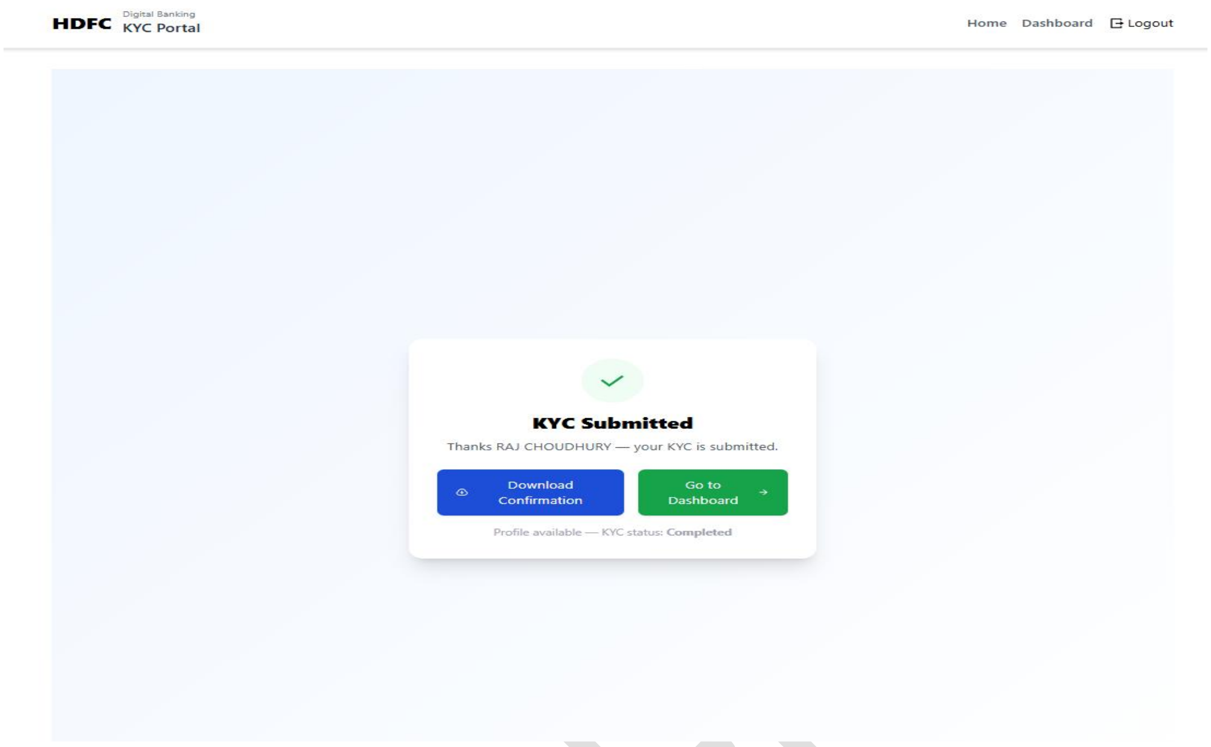
Document number ✓ Provided

*************3456
Masked in UI for privacy. Full value is submitted to verification service.

Uploaded file ✓ Uploaded

Passport Photo
The file you uploaded in Step 3 will be used to verify the document.

9. KYC Completed.

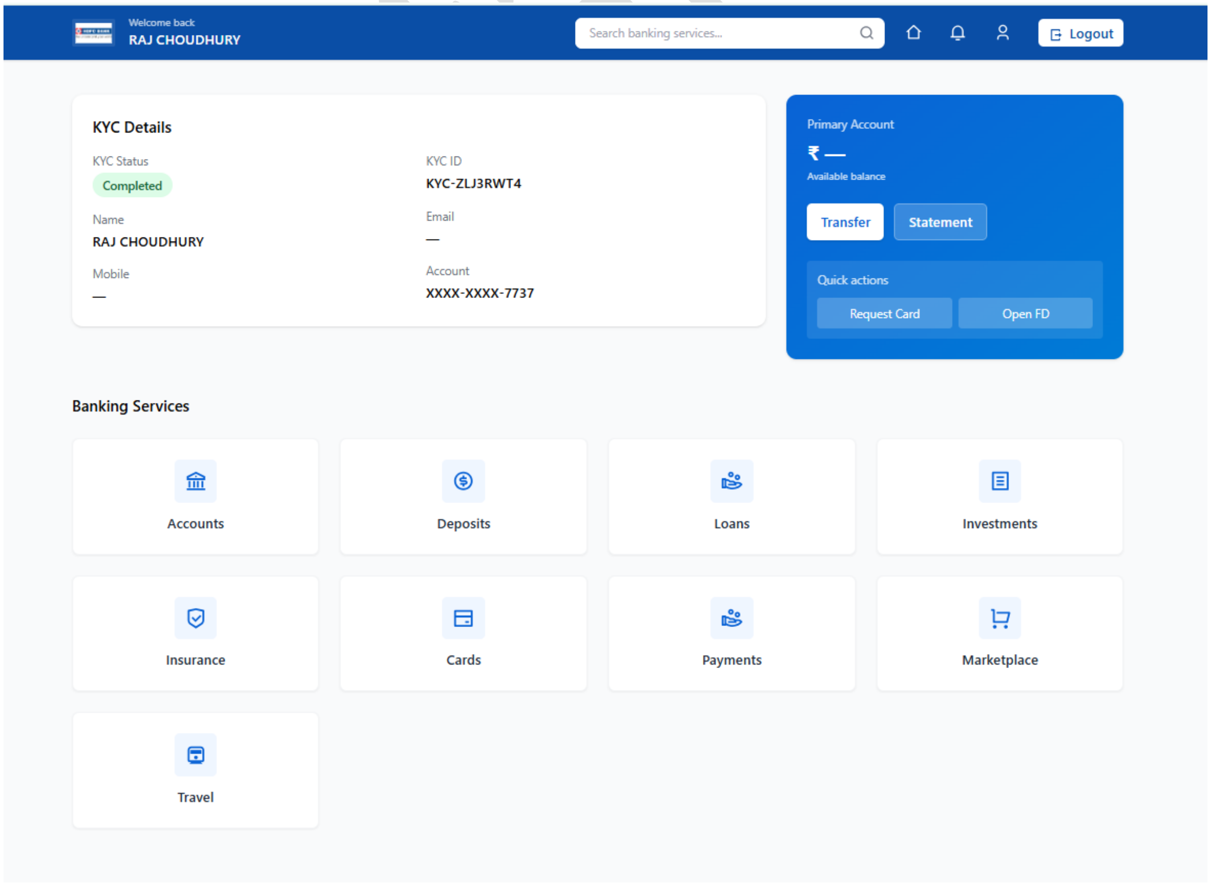


KYC Submitted

Thanks RAJ CHOUDHURY — your KYC is submitted.

Profile available — KYC status: Completed

10. The dashboard with the account details opens after clicking on **Go To Dashboard** button.



KYC Details

KYC Status Completed	KYC ID KYC-ZLJ3RWT4
Name RAJ CHOUDHURY	Email —
Mobile —	Account XXXX-XXXX-7737

Primary Account

₹ —

Available balance

Banking Services

Frontend Design

- **Framework & libraries**
  - React (functional components + hooks) for UI and state management.
  - React Router for client-side routing (multi-step KYC flow).
  - TailwindCSS for utility-first styling and rapid theming.
  - Framer Motion for smooth micro-interactions and step transitions.
  - Axios for API requests; jsPDF / html2canvas used for client-side PDF generation.
- **Overall structure**
  - Single-page app with route-based pages: Landing, Register, Login, KYC steps (1–5), Result, Dashboard.
  - Shared Layout component for global header/footer; some pages (landing/dashboard) may use full-bleed layouts.
  - Lazy-loaded pages (React.lazy + Suspense) to reduce initial bundle size.
- **State & data flow**
  - Local component state (useState) for form inputs and small UI state.
  - useContext (AuthContext) to hold auth token, role and login/logout helpers.
  - LocalStorage caching for KYC step persistence (draft autosave) so users can resume.
  - Centralized API service (services/api.js) wrapping Axios and applying auth header via setToken.
- **Forms & validation**
  - Per-step validation rules (Aadhaar 12 digits, PAN regex, passport formats, file type/size).
  - Immediate inline error messaging and disabled/guarded Next buttons.
  - Accessibility: labels, focus states, keyboard support for drag/drop areas.
- **File upload UX**
  - Drag & drop + click-to-select file zones with file preview / filename & size.
  - Per-file client-side checks: MIME type whitelist (jpg/png/pdf) and max size (5 MB).
  - Upload progress bars (mapped to overall KYC progress when multiple files).
- **KYC progress**
  - Persistent progress bar across steps showing completion % (e.g., step-based mapping).
  - Visual completion ticks for completed sub-steps (personal details, documents selected, uploads done).

- **PDF confirmation**
  - Client-side generation of confirmation PDF (jsPDF/html2canvas) using on-screen review content to avoid blank pages/popups.
  - Single-click download that triggers a Blob-download, no navigations.
- **Security & UX considerations**
  - Avoid storing sensitive data in plain text; only non-sensitive draft fields in LocalStorage.
  - Mask sensitive numbers (account numbers show last digits only) in UI.
  - Rate-limit retry attempts on UI with clear user messaging (attempts left).
- **Performance & production**
  - Code splitting, route-level lazy loading, and caching of static assets.
  - Use environment variables for API URL; build-time minification.
  - Responsive design tested at mobile/tablet/desktop breakpoints.
- **Testing & quality**
  - Unit tests for critical form validation functions.
  - Manual E2E test flows for KYC happy-path and failure-path.
  - Linting (ESLint) and Prettier for consistent code style.

Backend Design

- **Platform & libraries**
  - Node.js + Express for REST API server.
  - Sequelize ORM for relational DB access (MySQL).
  - Multer for multipart file handling (uploads).
  - bcrypt for password hashing; jsonwebtoken (JWT) for auth tokens.

- **High-level architecture**
  - Stateless REST API endpoints serving the React frontend.
  - Persistent relational DB for users, KYCApplications, Documents, Attempts.
  - Local file storage under /uploads (or S3 for production) with generated randomized filenames.

- **Core models / tables**
  - Users — id, name, email, mobile, passwordHash, role, kycId.
  - KYCApplication — id, userId, status, failureReason, accountNumber, progress.
  - Documents — id, kycId, type (address/identity/passport/etc.), filePath, isValidated.
  - Attempts — id, kycId, step, count (for limiting retries).
  - Optional audit/logs table for actions and timestamps.

- **Key API endpoints**
  - POST /api/auth/register — create user + KYCApplication.
  - POST /api/auth/login — authenticate and return JWT.
  - GET /api/kyc/dashboard — returns user KYC summary and masked account number.
  - POST /api/kyc/upload — authentication + multer; stores file metadata; returns attemptsLeft.
  - POST /api/kyc/photo-match — runs simulation; updates status or rejects.
  - GET /api/kyc/result — final KYC status and failure reason.

- **Upload handling & validation**
  - Multer storage with disk (or S3) and randomized filenames.
  - File-filter to accept only jpg/jpeg/png/pdf and file-size limit (5MB).
  - Server-side validation of file type + basic content checks.
  - Attempts counter: increment Attempts per upload step and reject after max (e.g., 3).

- **Authentication & authorization**
  - JWT tokens signed with secret, short expiration (e.g., 1 day).
  - Middleware auth decodes token, loads user and KYCApplication and attaches to req.user.
  - Role checks if admin endpoints are added.

- **Business logic**
  - KYC state machine: Started → Documents Uploaded → Under Review → Completed / Rejected.
  - On successful completion, generate account number (pseudo-random with masked display) and set status Completed.
  - Create final confirmation record retrievable for PDF data.

- **Security controls**
  - Hash passwords with bcrypt (salted).
  - CORS configured to allow only the frontend domain.
  - Input validation for all request bodies to prevent injection & malformed data.
  - Sanitize filenames and store file metadata rather than exposing raw paths.
  - Use HTTPS in production; secure JWT storage & rotate secrets per policy.

- **Logging, monitoring & error handling**
  - Centralized error middleware that returns consistent error payloads.
  - Structured logs (timestamp, userId, route, error) and optional integration with log services (Papertrail, Loggly).
  - Return helpful but non-sensitive errors to clients.
- **Testing & reliability**
  - Unit tests for controllers and validation logic.
  - Integration tests for file upload endpoints and KYC flows.
  - DB migrations via Sequelize and schema version control.
  - Backups and retention policy for uploaded documents.
- **Scalability & deployment**
  - Containerize server (Docker) and use process manager (PM2) or Kubernetes in production.
  - Move uploads to object storage (S3) with CDN for performance.
  - Use connection pooling for DB; horizontal scaling behind load balancer.
  - Add rate-limiting middleware on public endpoints to prevent abuse.
- **Operational considerations**
  - Background worker queue (e.g., Bull) for CPU/IO heavy tasks (OCR, face-match in future).
  - Admin dashboard or alerting for rejected KYCs and manual review flows.
  - Endpoint to regenerate/download confirmation PDF server-side if needed (secure, authenticated).

Conclusion

- The Digital KYC portal successfully transforms a traditionally complex process into a streamlined, online, and user-friendly workflow.
- By combining React, TailwindCSS, Node.js, Express, and secure document handling, the system ensures high performance and reliability.
- The multi-step guided flow reduces user confusion, minimizes drop-offs, and ensures accurate data submission.
- Automated validations, progress tracking, and instant PDF generation provide a modern and professional onboarding experience.
- The final dashboard gives users clarity on their account status and personal details, increasing transparency and trust.
- The use of JWT authentication, hashed passwords, and controlled file uploads ensures strong system security.
- The modular structure of the project makes it scalable for future enhancements such as OCR, facial recognition, or real-time verification.

- Overall, the project demonstrates how digital transformation can significantly improve operational efficiency in customer onboarding.
- The Digital KYC system provides a solid foundation for banks aiming to adopt fully paperless and automated onboarding workflows.
- This project proves the feasibility and benefits of adopting modern full-stack development practices in financial technology solutions.

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