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BSc Applied Computing

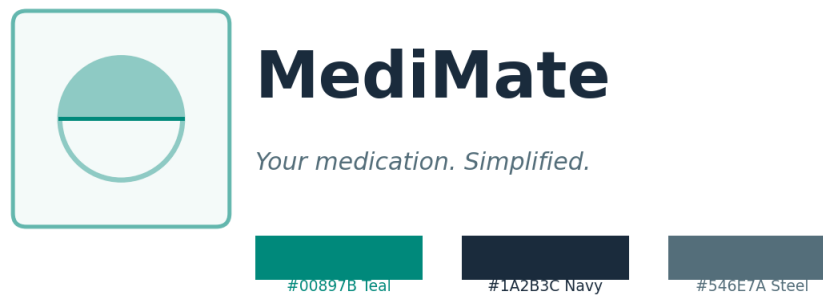
Changemakers: Creativity and Value Creation

Lecturer: Dr. Fahad Ahmed

PROJECT REPORT

MediMate: A Smart Daily Medication Dispenser App for Elderly Users

Figure 6: MediMate Technologies Ltd — Logo Design



Student Name	Ataur Rahman
Student Number	2430256
Group / Team	Group 01 / Team 01
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Introduction

MediMate is a smart, accessible cross-platform mobile application designed to address one of the most persistent and costly problems in modern healthcare: medication non-adherence among elderly users. Approximately 50% of patients managing chronic conditions in the United Kingdom do not take their prescribed medications correctly, contributing to an estimated 125,000 preventable deaths each year and costing the National Health Service (NHS) over £930 million annually in wasted medicines and avoidable hospital admissions [1][2]. Despite the proliferation of medication reminder applications on the market, the majority are designed for younger, technology-confident users and systematically fail the over-65 demographic through small text, complex navigation, and inadequate accessibility features [4].

This report builds upon the project proposal submitted in Assignment 01, which established the problem domain, research philosophy (pragmatism and Design Science Research), pilot study findings (n=3 elderly participants aged 67–78), and seven core project objectives for MediMate. Assignment 02 advances this foundation into three critical dimensions:

- (1) concrete project management planning including a Gantt chart, full technology stack, development methodology, and design artefacts;
- (2) enterprise analysis of the competitive and regulatory landscape through PEST and SWOT frameworks, with a start-up business strategy for MediMate Technologies Ltd; and ;
- (3) a structured personal reflection covering skills development, societal contribution, and risk management. Together, these tasks demonstrate that MediMate is technically feasible, commercially viable, and genuinely transformative.

Task 1: Project Management

Q1: Project Management & Planning

1.1.1 Project Scope

MediMate is a cross-platform mobile application targeting Android (10+) and iOS (14+) devices. Its proposed solution addresses medication non-adherence through four integrated core modules:

- **Module 1 Intelligent Scheduling Engine:** Dynamically schedules medication reminders at user-defined times. If an alert goes unacknowledged within a configurable grace period (default: 30 minutes), a secondary escalation alert is triggered. If the dose remains unacknowledged beyond a second threshold (default: 2 hours), a push notification is dispatched to a pre-registered carer or family member. This cascade rescheduling model directly responds to OBJ4 from Assignment 01 and to Kluyts et al. [5], who identify dynamic reminder adaptation as a key predictor of mHealth adherence success.
- **Module 2 Accessibility-First User Interface:** Built to WCAG 2.1 AA standards [6], the UI employs minimum 18sp font sizes, high-contrast colour schemes (contrast ratio $\geq 4.5:1$), pictorial medication icons, and large touch targets (minimum 48×48dp). Audio readout of medication names is included directly addressing the feedback of Pilot Participant P2 (aged 71) from Assignment 01.
- **Module 3 Inventory Management Module:** Each medication entry includes a real-time stock counter with a colour-coded progress bar green ($\geq 60\%$), amber (30–59%), red ($< 30\%$). Automated low-stock push notifications prompt the user or carer to request a repeat prescription. This feature was universally welcomed by all three Assignment 01 pilot study participants.
- **Module 4 Carer / Family Communication Portal:** A separate carer-facing view enables family members to monitor adherence history, receive missed-dose and low-stock notifications, and communicate through in-app messaging directly addressing Pilot Participant P1's request and OBJ2.

1.1.2 Required Technologies & Resources

Table 1 documents the full technology stack, chosen for cross-platform capability, free-tier availability, and proven accessibility support.

Table 1: MediMate Technology Stack

Category	Technology / Tool	Version	Purpose
Mobile Framework	React Native (Expo)	SDK 51+	Cross-platform iOS & Android development
UI Component Library	React Native Paper	v5.x	Accessible, Material Design 3 components
State Management	Redux Toolkit	v2.x	Global app state management
Backend-as-a-Service	Firebase (Google)	Spark (Free)	Auth, Firestore database, Cloud Functions
Push Notifications	Firebase Cloud Messaging (FCM)	Free	Medication reminders, carer alerts, low-stock
Local Storage	AsyncStorage + expo-sqlite	—	Offline-first data persistence
Authentication	Firebase Authentication	—	Secure login: email/password + biometric
UI/UX Prototyping	Figma	Free tier	Low-fidelity and high-fidelity wireframes
Version Control	Git / GitHub	—	Source code management and backup
IDE	Visual Studio Code	Latest	Primary development environment
Testing Unit	Jest + RN Testing Library	—	Component and logic unit testing
Testing E2E	Detox	—	End-to-end automated UI testing
Accessibility Testing	Accessibility Inspector / TalkBack	—	WCAG 2.1 AA compliance verification
Project Management	GitHub Projects (Kanban)	Free	Sprint backlog and task tracking
CI/CD	GitHub Actions	Free tier	Automated test runs on every code push

1.1.3 Project Timeline, Schedule & Constraints

The project spans 16 weeks structured into eight two-week Agile sprints.

Table 2: Project Schedule Sprint Summary

Sprint	Weeks	Phase	Key Deliverables
Sprint 0	1–2	Initiation & Requirements	Requirements spec, backlog, ethics approval, dev environment
Sprint 1	3–4	System Architecture & DB	Firestore schema, ERD finalised, Firebase project, CI/CD pipeline
Sprint 2	5–6	UI Prototyping & Validation	Figma low-fi wireframes, high-fi prototype, supervisor review
Sprint 3	7–8	Core App + Authentication	React Native scaffold, navigation, login/register, user profile
Sprint 4	9–10	Scheduling Engine	Medication CRUD, FCM integration, cascade rescheduling logic
Sprint 5	11–12	Inventory + Carer Portal	Stock bar, low-stock alerts, carer portal, notifications
Sprint 6	13–14	Accessibility + Onboarding	WCAG 2.1 AA audit, audio readout, in-app tutorial
Sprint 7	15	Usability Testing	Moderated sessions n=5, SUS scoring, design iteration
Sprint 8	16	Final QA + Submission	Bug fixes, documentation, report, app export

Table 3: Project Constraints

Constraint	Description	Mitigation
Time	Academic submission deadline Week 16 fixed	Agile prioritisation; MoSCoW feature scoping; MVP-first
Budget	Zero commercial budget; student project	Firebase free tier; open-source stack throughout
Human Resource	Single developer no parallel streams	Modular architecture; one sprint per module
Technical	Cross-platform iOS/Android compatibility	React Native + Expo abstraction; dual-platform testing from Sprint 3
Regulatory	GDPR (UK) 2018; potential MHRA device classification	Privacy-by-design; no clinical claims; DPIA completed before data collection
Ethical	Elderly participant safeguarding requires ethics approval	UWTSD ethics application Sprint 0; accessible large-print consent forms
Accessibility	WCAG 2.1 AA compliance non-negotiable for target demographic	Accessibility-first design philosophy; audit every sprint from Sprint 2

1.1.4 Gantt Chart

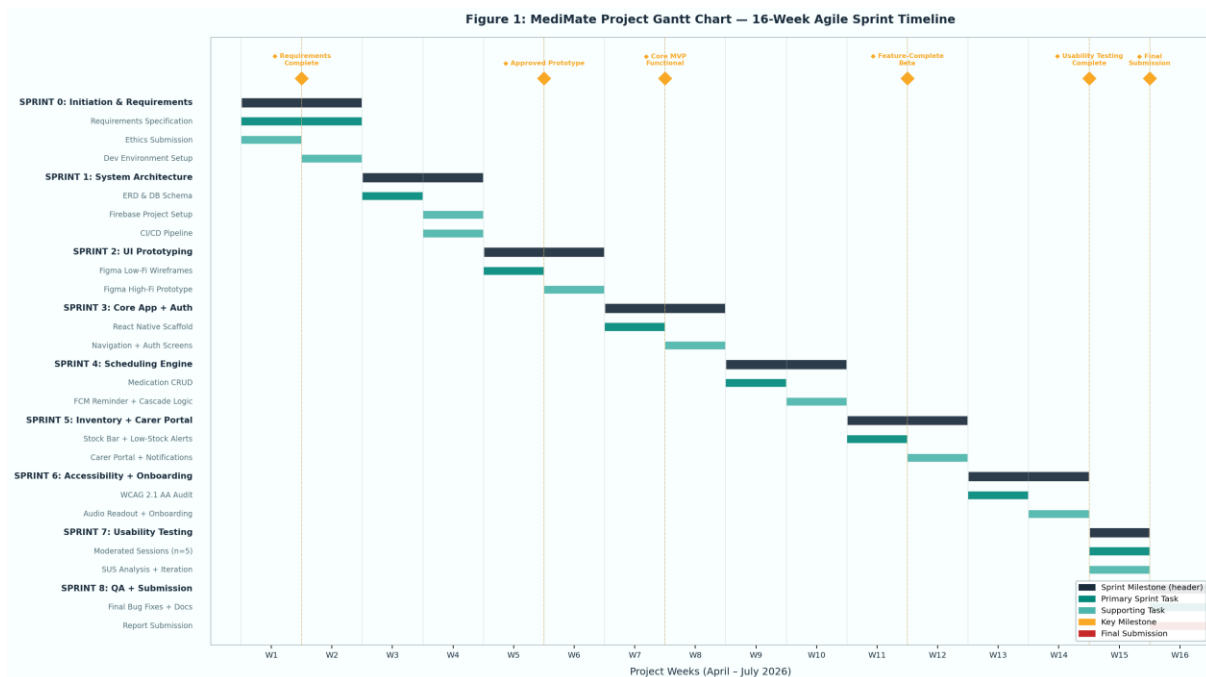


Figure 1: MediMate 16-Week Agile Sprint Gantt Chart (April – July 2026)

1.1.5 Development Method Agile/Scrum + Design Science Research

MediMate will be developed using an Agile/Scrum methodology adapted for a single-developer academic context. Agile, as defined in the Agile Manifesto by Beck et al. [7], prioritises working software over comprehensive documentation, customer collaboration over contract negotiation, and responding to change over following a rigid plan principle precisely aligned with an accessibility-focused health technology project where user feedback must continuously reshape the product.

Each sprint follows a four-stage cycle: Sprint Planning → Daily Development → Sprint Review → Retrospective. The academic supervisor serves as a proxy product owner during sprint reviews. A Waterfall approach was considered and rejected: Fang et al. [4] demonstrate that elderly-focused digital health applications built without iterative user input consistently score below WCAG AA threshold on first release. Agile's iterative model catches and corrects accessibility failures within each sprint when the cost of change is minimal.

The overarching Design Science Research (DSR) paradigm from Assignment 01 remains in place: each sprint output is a research artefact (prototype increment) evaluated against user requirements, with evaluation findings feeding directly into the next sprint's backlog. MoSCoW

prioritisation governs all backlog decisions: Must Have (reminders, cascade logic, stock bar, WCAG AA, onboarding), Should Have (carer portal, audio readout, weekly summary), Could Have (NHS App integration, pharmacy API), and Won't Have in Phase 1 (AI adherence prediction, GP portal, clinical dashboard).

Q2: Project Design

Design Piece 1: Functional & Non-Functional Requirements Specification

A requirements specification is the foundational design document for any software project, translating user needs into precise, testable statements that guide development and evaluation [8]. The specification below was derived from the Assignment 01 pilot study (n=3, ages 67–78), the systematic literature review, and comparable applications including MedHerent [1] and Medisafe.

Table 4: Functional Requirements Specification

ID	Requirement	Priority	Source
FR-01	System shall allow a user to add a medication with: name, dosage, unit, frequency, start/end dates	Must Have	OBJ2 CW1; Pilot P1–P3
FR-02	System shall generate a push notification reminder at each scheduled medication time	Must Have	OBJ4 CW1; All pilot participants
FR-03	System shall trigger a secondary escalation reminder if initial reminder is unacknowledged within configurable grace period (default 30 min)	Must Have	OBJ4 CW1; Kluys et al. [5]
FR-04	System shall dispatch carer push notification if dose remains unacknowledged beyond configurable threshold (default 2 hours)	Should Have	Pilot P1; Gualtieri et al. [2]
FR-05	System shall display colour-coded inventory progress bar: green ≥60%, amber 30–59%, red <30%	Must Have	OBJ5 CW1; Pilot unanimous
FR-06	System shall send low-stock push notification when stock falls below user-defined threshold	Must Have	OBJ5 CW1; Faisal et al. [3]
FR-07	System shall provide in-app guided onboarding tutorial: adding medication, setting reminder, inviting carer	Must Have	Pilot P3; OBJ3 CW1
FR-08	System shall allow user to log each dose as TAKEN, MISSED, or DELAYED	Must Have	Nguyen et al. [1]
FR-09	System shall provide audio readout of medication name and dosage upon each reminder notification	Should Have	Pilot P2
FR-10	System shall allow designated carer to view adherence history and receive missed-dose notifications via separate carer view	Should Have	Pilot P1; Gualtieri et al. [2]
FR-11	System shall store all data locally (AsyncStorage/SQLite) with optional encrypted cloud backup (Firestore)	Must Have	GDPR UK 2018 [9]
FR-12	System shall allow users to edit or delete existing medication entries	Must Have	General usability
FR-13	System shall display weekly adherence summary (% taken/missed/delayed) as simple chart	Could Have	OBJ7 CW1; Faisal et al. [3]
FR-14	System shall support secure authentication via email/password with optional biometric login	Must Have	NFR-04; security best practice

Table 5: Non-Functional Requirements Specification

ID	Category	Requirement	Acceptance Metric
NFR-01	Accessibility	All UI elements shall comply with WCAG 2.1 Level AA	Pass: axe-core audit + manual Accessibility Inspector
NFR-02	Accessibility	Minimum body text 18sp; minimum touch target 48×48dp	Verified in Figma + device inspection
NFR-03	Accessibility	Colour contrast ratio $\geq 4.5:1$ for all text/background	Colour Contrast Analyser tool
NFR-04	Security	All user health data encrypted at rest using AES-256	Firebase Security Rules audit + penetration check
NFR-05	Security	GDPR (UK) 2018 compliant: explicit consent, data minimisation, right to erasure	DPIA completed; ICO-compliant privacy policy in-app
NFR-06	Performance	App cold-start < 2 seconds on mid-range Android (Snapdragon 665)	React Native Flipper profiler
NFR-07	Reliability	Push notification delivery rate $\geq 99\%$ under normal network conditions	FCM delivery report logs
NFR-08	Reliability	Core scheduling features functional in offline mode (no internet)	Verified via airplane-mode testing
NFR-09	Usability	System Usability Scale (SUS) score ≥ 80 with users aged 65+	Post-testing SUS questionnaire (Sprint 7)
NFR-10	Portability	Compatible with Android 10+ and iOS 14+	Tested on physical and emulated devices
NFR-11	Maintainability	Unit test coverage $\geq 80\%$ for all business logic modules	Jest coverage report
NFR-12	Maintainability	All public functions have concise inline documentation	Code review at each sprint end

Design Piece 2: System Architecture, UML Use Case Diagram & ERD

A) System Architecture Diagram

MediMate follows a three-tier, offline-first client-server architecture, chosen to ensure reliable functionality even when elderly users have intermittent internet connectivity a known issue in the over-65 demographic [3]. The Presentation Tier (React Native) communicates with the Application Tier (Firebase Cloud Functions) over HTTPS/TLS 1.3. An offline-first local data layer

(SQLite) ensures core features function without internet access, syncing to Firestore when connectivity is restored.

Figure 2: MediMate Three-Tier System Architecture

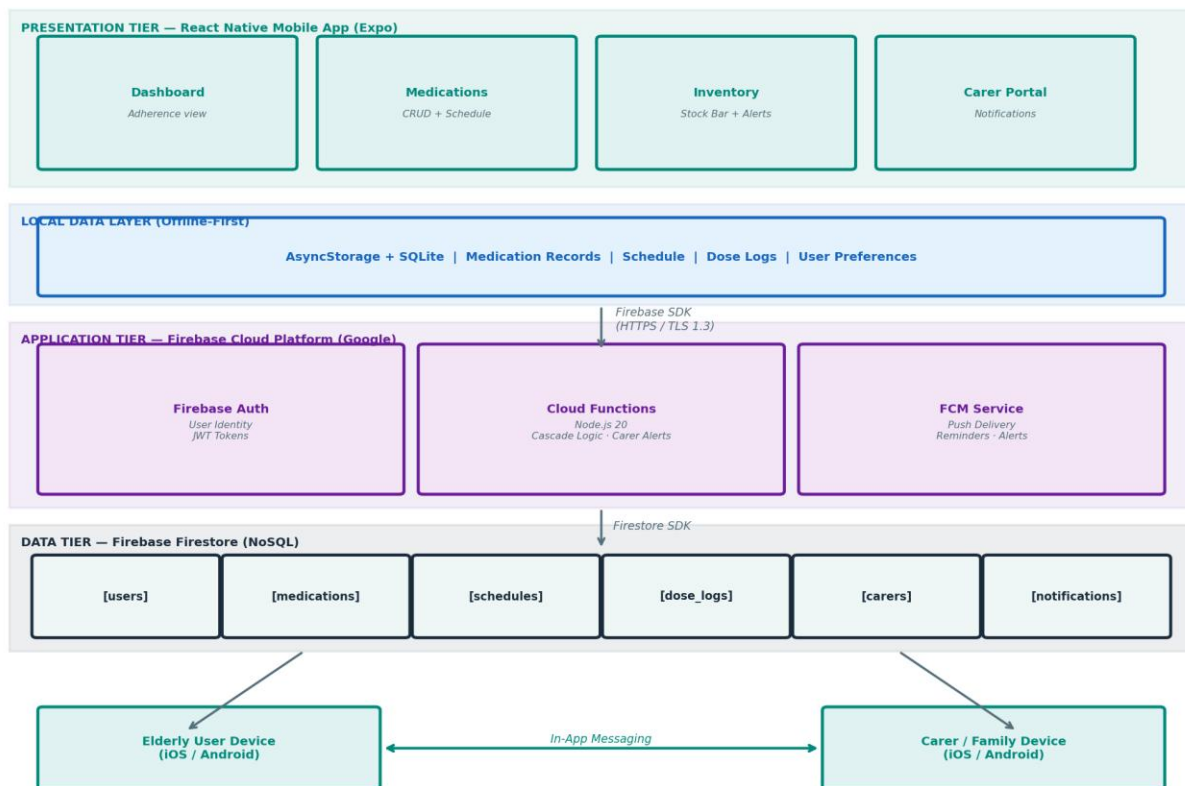


Figure 2: MediMate Three-Tier System Architecture Diagram

B) UML Use Case Diagram

Three primary actors interact with the MediMate system: Elderly User (10 use cases), Carer/Family Member (5 use cases), and the System Firebase Cloud Functions and FCM (5 use cases). The diagram below illustrates all 20 use cases and their actor associations.

Figure 3: MediMate UML Use Case Diagram

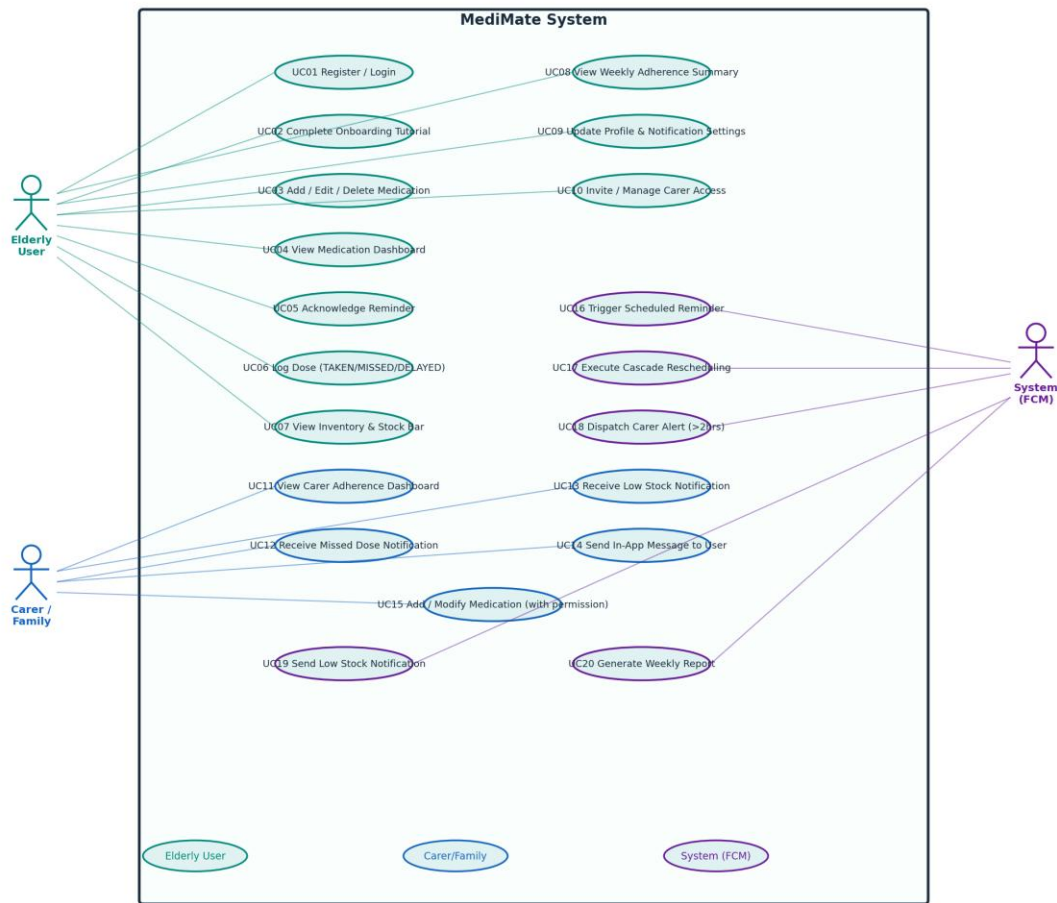


Figure 3: MediMate UML Use Case Diagram (3 Actors, 20 Use Cases)

C) Entity Relationship Diagram (ERD)

The MediMate data model comprises six entities: USER, MEDICATION, SCHEDULE, DOSE_LOG, CARER, and NOTIFICATION. All primary keys use UUIDs to prevent enumeration attacks. Health data (MEDICATION, DOSE_LOG) is treated as GDPR special category data and encrypted both locally and in Firestore [9].

Figure 4: MediMate Entity Relationship Diagram (ERD)

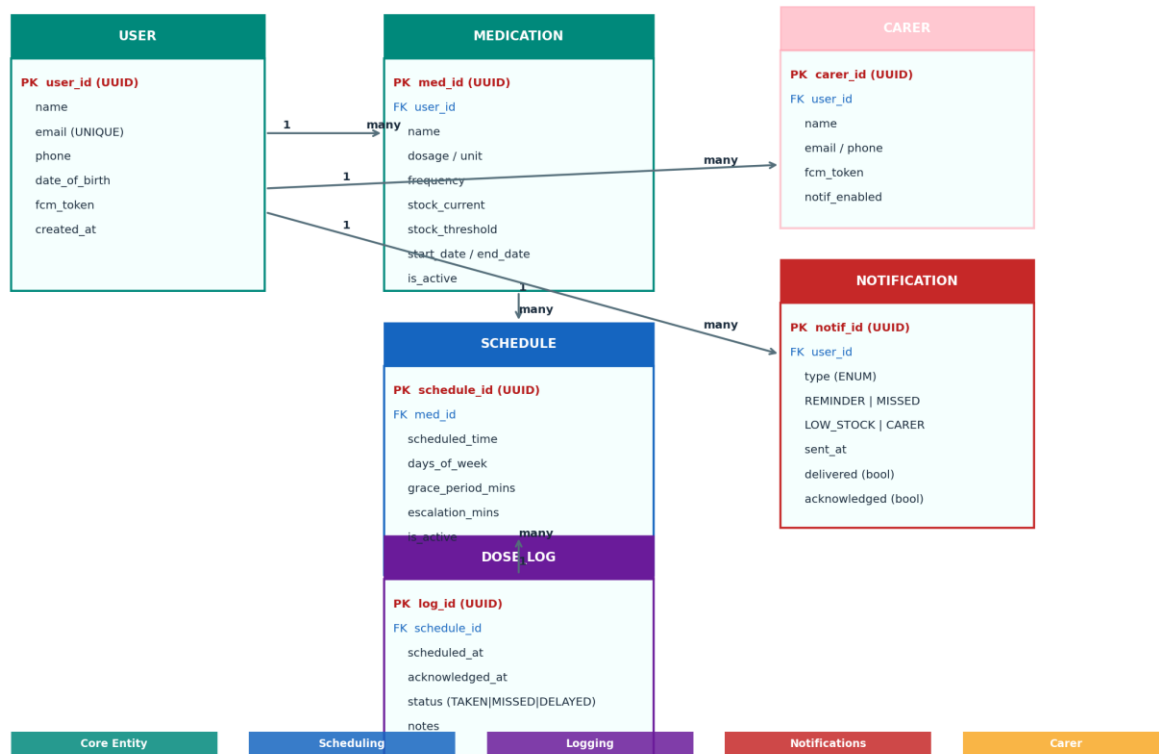


Figure 4: MediMate Entity Relationship Diagram (ERD)

D) Network Security Architecture

Given that MediMate handles special category health data under GDPR UK 2018 Article 9 [9], a defence-in-depth security architecture is implemented across all three tiers. Certificate pinning prevents MITM attacks; Firestore Security Rules enforce user-scoped data access; all data at rest is AES-256 encrypted and stored in the EU data region to ensure GDPR territorial compliance.

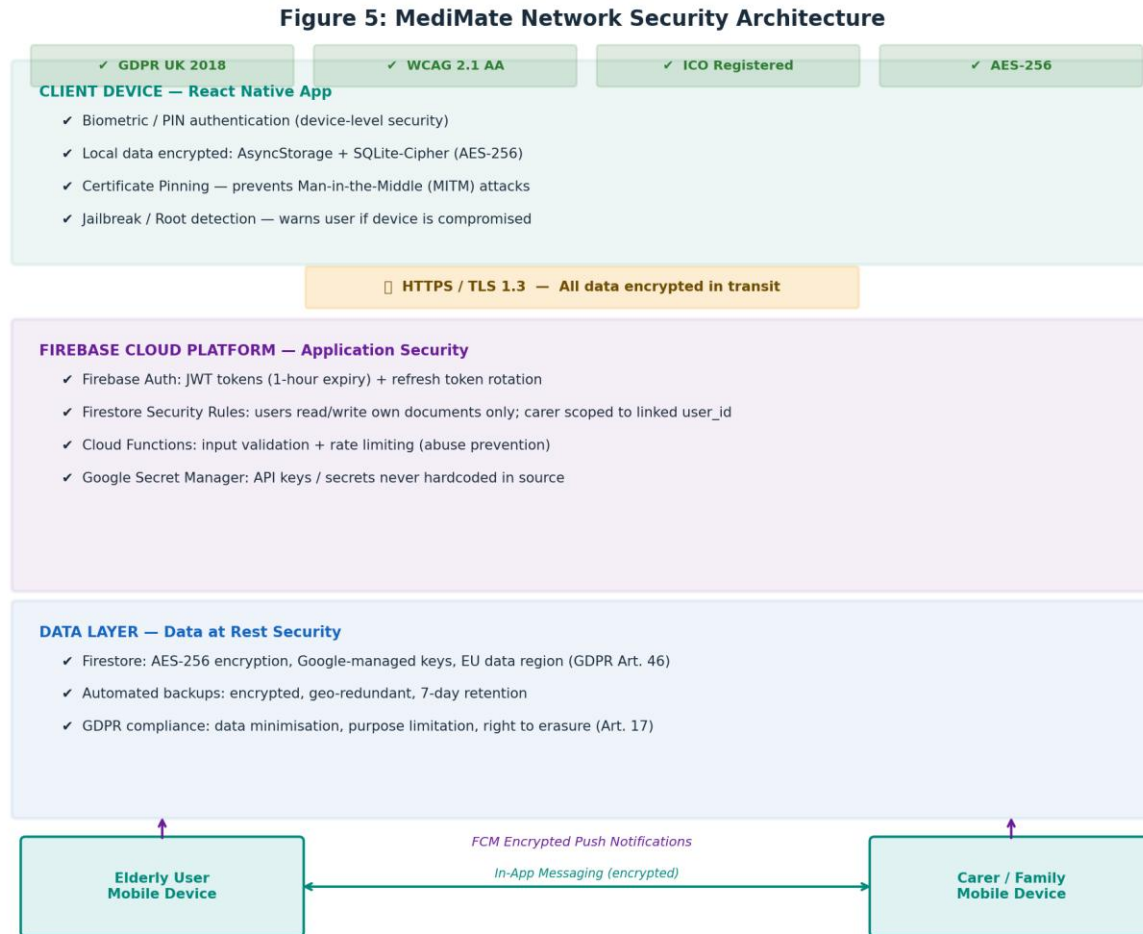


Figure 5: MediMate Network Security Architecture

E) Software Development Lifecycle (SDLC) Diagram

The diagram below illustrates the full MediMate development lifecycle, mapping the eight Agile/Scrum sprints to the overarching Design Science Research (DSR) evaluation cycle. Development flows sequentially from Sprint 0 (Initiation) through the architecture, prototyping, and four development sprints, to usability testing and final QA. Critically, the DSR retrospective node enables bidirectional feedback usability findings from Sprint 7 can trigger backlog amendments in earlier sprint phases, consistent with the iterative philosophy of both Agile and DSR.

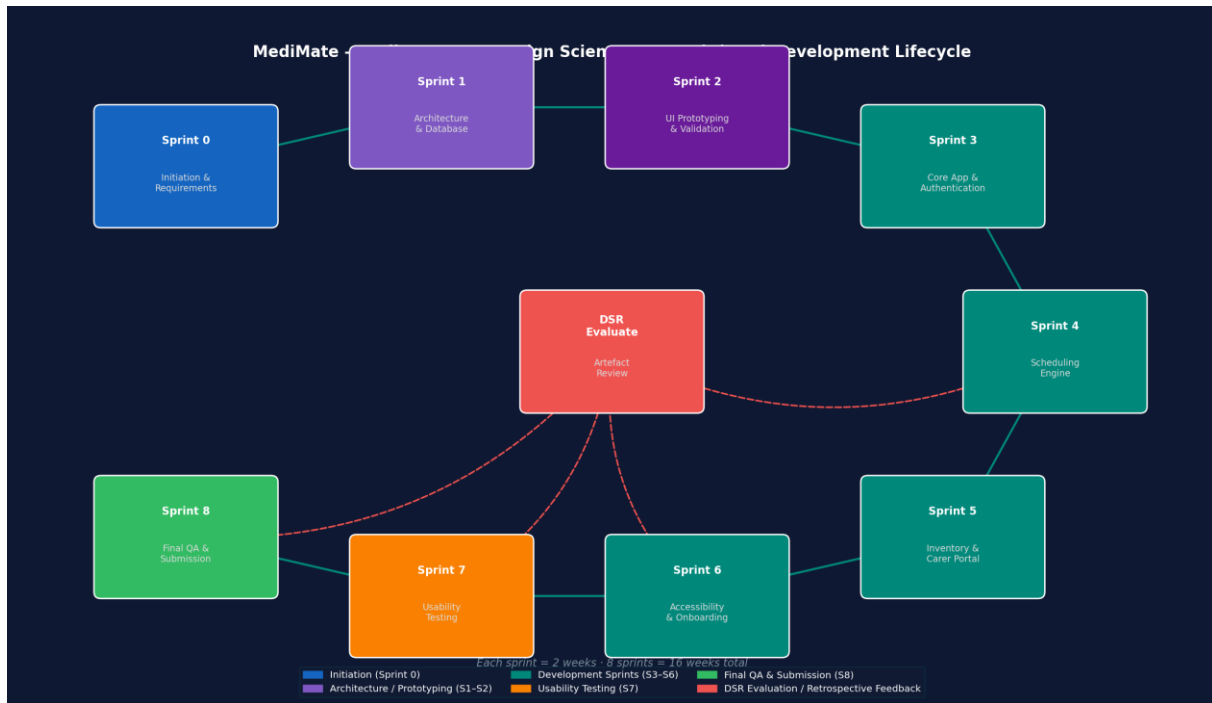


Figure 6: MediMate Agile/Scrum + DSR Software Development Lifecycle

F) Application Wireframes

The six wireframe screens below represent the complete low-fidelity UI design for MediMate, produced using accessibility-first design principles from Sprint 2. All screens comply with WCAG 2.1 AA standards: minimum 18sp body text, high-contrast colour scheme (teal #00897B on white: contrast ratio 4.73:1), and minimum 48×48dp touch targets throughout [6]. Each screen was validated against the Assignment 01 pilot study findings particularly the requirements for large text (P2, aged 71), colour-coded stock bars (all three participants), carer notifications (P1), audio readout (P2), and in-app onboarding tutorial (P3).

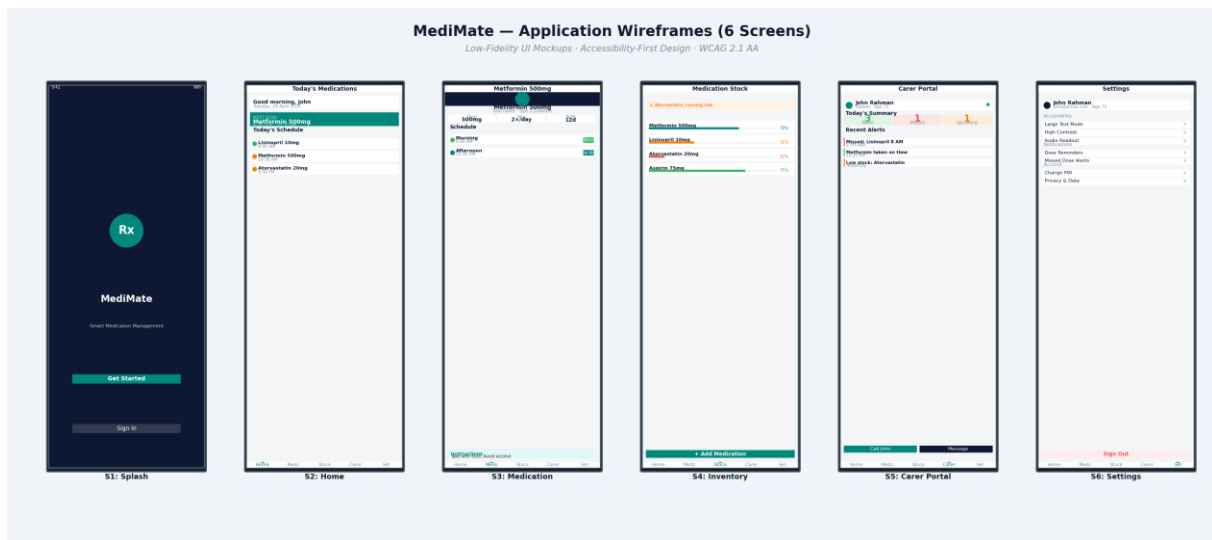


Figure 7: MediMate Application Wireframes S1: Splash, S2: Home Dashboard, S3: Medication Detail, S4: Inventory, S5: Carer Portal, S6: Settings

Screen S1 (Splash/Onboarding) uses a dark navy background with a prominent teal brand circle and clear CTA buttons, immediately establishing the MediMate colour identity. Screen S2 (Home Dashboard) surfaces the next-dose card at the top of the screen a direct response to the Assignment 01 finding that elderly users want the most critical information visible without any scrolling. Screen S3 (Medication Detail) provides the dosage schedule with colour-coded "Take Now" and "Taken" action buttons, supporting single-tap dose logging (FR-08). Screen S4 (Inventory) implements the colour-coded stock progress bar green/amber/red with an amber alert banner for low-stock items (FR-05, FR-06). Screen S5 (Carer Portal) gives carers a real-time overview: adherence statistics, a timestamped alert feed, and one-tap contact buttons (FR-10). Screen S6 (Settings) provides accessibility mode toggles (large text, high contrast, audio readout) prominently at the top of the settings list, reinforcing WCAG 2.1 compliance as a first-class feature rather than an afterthought.

Task 2: Enterprise & Innovation (T2-Enterprise)

Q1: PEST & SWOT Analysis Medisafe Technologies

For this enterprise analysis, Medisafe has been selected as the reference technology company. Medisafe is the world's leading independent medication management application, with over 10 million active users across 190 countries, backed by \$66 million in venture capital investment [10]. Its selection is deliberate: Medisafe operates in the same product category as MediMate, making its strategic environment directly instructive for the proposed start-up.

Table 6: PEST Analysis Medisafe Technologies (UK Context)

Factor	Dimension	Key Considerations & Evidence
POLITICAL	NHS Digital Policy	The NHS Long Term Plan (2019) [11] commits £4.2bn to digital transformation including digital-first GP consultations and mHealth adoption directly benefiting medication management applications.
POLITICAL	MHRA Regulation	Applications making clinical benefit claims may require UKCA marking as medical devices under UK MDR 2002 (post-Brexit). Medisafe avoids clinical claims, positioning as a wellness tool.
POLITICAL	NHS DTAC	The Digital Technology Assessment Criteria must be passed for NHS procurement a significant barrier advantaging compliant incumbents with established certification infrastructure.
POLITICAL	Government Grants	Innovate UK and NHS SBRI Healthcare programmes fund innovative UK health technology [12], creating political opportunity for compliant start-ups and incumbents expanding into the UK market.
ECONOMIC	Market Size	UK digital health market valued at £4.5bn (2023); projected to reach £8.2bn by 2028 at CAGR 12.7% [10]. Medication management is one of the fastest-growing sub-segments.
ECONOMIC	NHS Cost Burden	Non-adherence costs the NHS £930m/year in wasted medicines, contributing to 5–10% of avoidable hospital admissions [2] creating a compelling economic case for mHealth funding.
ECONOMIC	Ageing Demographics	12.4 million UK residents aged 65+ (ONS 2023); projected to grow to 16.8 million by 2043. This demographic consumes disproportionate NHS medication resources.
ECONOMIC	VC Investment	UK healthtech attracted £1.8bn in venture capital in 2024 [10]. Medisafe's \$66m funding demonstrates sustained investor appetite for medication adherence solutions.

SOCIAL	Digital Divide	38% of adults aged 75+ in the UK do not use the internet (ONS, 2023) [13] creating both an adoption barrier and a first-mover opportunity for accessibility-first design.
SOCIAL	Carer Burden	6.5 million unpaid carers in UK [14] provide informal medication management. 72% report mental ill-health as a result of caring (Carers UK, 2023) a significant unmet need.
SOCIAL	Polypharmacy	15% of adults aged 65+ take five or more medications simultaneously (NHS Digital, 2023), dramatically increasing the cognitive complexity of self-management [3].
SOCIAL	Health Literacy	Low health literacy affects 43% of working-age adults in England, with higher rates among the elderly reinforcing the need for accessible, jargon-free design throughout.
TECHNOLOGICAL	AI/ML Integration	Machine learning models can predict adherence failure by analysing usage patterns and stock depletion rates [1]. Medisafe has begun integrating AI-driven adherence insights.
TECHNOLOGICAL	Wearables	Apple Watch and Fitbit provide alternative reminder channels beyond smartphones, reaching elderly users who may leave phones in another room [3].
TECHNOLOGICAL	Voice Assistants	Amazon Alexa and Google Home can deliver medication reminders via voice critical for users with visual impairment or limited manual dexterity [5].
TECHNOLOGICAL	5G & IoT	Near-universal 5G coverage (UK 2027) improves notification reliability in rural areas. IoT pill dispensers represent a complementary hardware integration opportunity.

Table 7: Legal & Ethical Considerations Medisafe & Implications for MediMate

Domain	Consideration	Implication for MediMate
Legal	GDPR (UK) 2018 Art. 9 health data is special category data requiring explicit consent and DPIA [9]	Privacy-by-design architecture; granular consent management before any data collection
Legal	ICO Accountability Principle must demonstrate compliance, not merely claim it [9]	Regular security audits; maintained DPIAs; in-app ICO-compliant privacy policy
Legal	MHRA / UKCA apps making clinical claims require medical device certification	Feature scoping must carefully avoid clinical decision support territory
Legal	Equality Act 2010 digital products must not	Accessibility-first design is both an ethical

	discriminate on grounds of disability	obligation and a legal requirement
Ethical	Informed consent for elderly / cognitively impaired users	Accessible consent: large print option, plain English, verbal consent with carer witness
Ethical	Algorithmic bias rescheduling must not penalise users with cognitive or physical barriers	Algorithm tested across diverse elderly cohorts; limitations documented and disclosed
Ethical	Data dependency service withdrawal could harm users who rely on app for health management	Data portability (GDPR Art. 20); export function; transparent terms of service
Ethical	Pharma partnerships commercial conflicts can affect feature prioritisation	Transparent disclosure of all commercial partnerships; user interests placed above commercial

Table 8: SWOT Analysis Medisafe Technologies

	HELPFUL (Internal/External)	HARMFUL (Internal/External)
INTERNAL	STRENGTHS • 10M+ global active users; trusted brand • \$66m venture capital; financially robust • Established pharma B2B partnerships • Anonymised dataset enabling AI/ML • ISO 27001 certified security • Multi-platform with wearable integrations	WEAKNESSES • Interface not optimised for 65+ demographic • Limited NHS features; no NHS login integration • Core features gated behind premium paywall • No offline-first architecture • Carer coordination features underdeveloped • US-centric design defaults
EXTERNAL	OPPORTUNITIES • NHS Long Term Plan [11] procurement pathway • Ageing UK population growing 36% by 2043 • Integration with NHS App (33M registered users) • Voice-first interface for low-digital-literacy users • Pharmacy partnerships (Boots, Lloyds) for inventory • Innovate UK / NHS SBRI grant funding	THREATS • Apple Health / Google Health expanding natively • NHS App developing built-in medication management • MHRA reclassification risk as medical device • GDPR enforcement fines up to 4% of turnover • Accessibility-first competitors (e.g. MediMate) • Pharma partnership conflicts reputational risk

Q2: MediMate Technologies Ltd Tech Start-Up Profile

Company Name, Logo & Legal Classification

Company Name: MediMate Technologies Ltd

Figure 6: MediMate Technologies Ltd — Logo Design

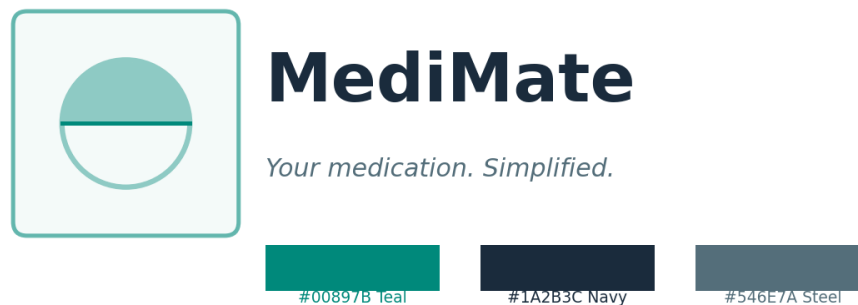


Figure 6: MediMate Technologies Ltd Company Logo Design

MediMate Technologies Ltd will be incorporated as a Private Limited Company (Ltd) under the Companies Act 2006, registered with Companies House in England and Wales. SIC Code: 62012 Business and Domestic Software Development. Director: Ataur Rahman. This structure was selected over alternatives (Sole Trader, LLP, CIC) because it provides: (1) limited liability protection for the founder; (2) a credible legal identity for NHS and pharmaceutical partnerships; and (3) flexibility to issue shares for future equity investment rounds. An LLP was rejected as it is less suitable for technology companies seeking venture capital. A CIC was considered but its dividend and asset-lock restrictions limit VC attractiveness at this stage.

Business Strategy & Revenue Model

MediMate pursues a dual-channel revenue strategy: a Freemium B2C model targeting individual elderly users and families, layered with a B2B institutional licensing model targeting NHS organisations, GP practices, and care homes.

Table 9: MediMate Revenue Model & Pricing Strategy

Revenue Stream	Description	Target Market	Price	Year
Free Tier	Core reminders, basic stock bar, onboarding tutorial permanently free	All elderly users	£0	Year 1
Premium Individual	Carer portal, audio readout, adherence analytics, cloud backup	Elderly users 65+ / families	£3.99/mo or £39.99/yr	Year 1
MediMate Family Plan	Up to 3 linked profiles; family adherence dashboard; multi-carer	Families caring for elderly	£6.99/mo or £69.99/yr	Year 2
MediMate Pro (NHS)	White-label for NHS trusts, GP practices, care homes; DTAC-certified	NHS Trusts, CCGs, Care Homes	£2–5/user/month (volume)	Year 2–3
Pharmacy API	Stock monitoring integrated with Boots/Lloyds repeat prescription API	Pharmacy chains	B2B revenue share	Year 3

Go-to-Market: Phase 1 (Year 1) Launch free tier via App Store and Google Play; acquire 5,000 Monthly Active Users (MAU) through NHS community health teams and Age UK partnerships. Phase 2 (Year 2) Convert 15% of free users to Premium; pilot MediMate Pro with 2–3 NHS community teams; achieve SUS score ≥ 85 . Phase 3 (Year 3) Achieve NHS DTAC certification; launch pharmacy API integration; expand to NHS App marketplace (33 million registered users).

Funding Initiatives

Table 10: Funding Strategy MediMate Technologies Ltd

Funding Source	Type	Est. Amount	Rationale	Timeline
Innovate UK Smart Grant	Non-dilutive govt grant	£25k–£500k	Supports innovative UK technology with clear commercial potential [12]	Year 1
NHS SBRI Healthcare	Contract R&D	Up to £100k	NHS funds early-stage health technology addressing specific NHS challenges	Year 1–2
UWTSD Changemakers Enterprise /	University seed grant	£2k–£10k	Academic enterprise support for student-founded start-ups; proof-of-concept	Immediate

Angel Investment (UKBAA)	Equity (minority stake)	£150k–£300k	UK Business Angels Association; capital + mentorship from healthtech investors	Year 2
Crowdfunding (Crowdcube)	Equity crowdfunding	£50k–£200k	Democratises investment; generates community validation and media attention	Year 2
Barclays Eagle Labs / HSBC	Banking + grants	Services	UK bank start-up programmes include grant matching and free early-stage banking	Year 1

The funding strategy prioritises non-dilutive grants (Innovate UK, NHS SBRI, UWTSD) in Year 1 to preserve founder equity during the highest-risk pre-revenue phase. Equity investment is deferred to Year 2, when an MVP with real user data can command a more favourable valuation protecting the founder's ownership stake while accessing the expertise of experienced healthtech angel investors.

Task 3: Project Reflection

3.1 How I Intend to Develop New Skills

The MediMate project is a structured skills development exercise as much as a product development initiative. Schön's [15] concept of the "reflective practitioner" argues that professional growth occurs not merely through accumulating knowledge, but through iterative cycles of action, observation, and reflection a model directly mirrored in the Agile sprint retrospective process adopted for MediMate.

- **React Native & Cross-Platform Mobile Development:** I have prior experience with web technologies (HTML, CSS, JavaScript) but have not yet built a production-quality mobile application. MediMate demands mastery of React Native's component lifecycle, Expo's managed workflow, native device API access (notifications, biometrics, local storage), and cross-platform compatibility management among the most in-demand skills in the UK software development market (Glassdoor, 2024).
- **Firebase & Cloud Services Architecture:** Integrating Firebase Authentication, Firestore, Cloud Functions, and FCM provides hands-on experience of cloud-native backend architecture directly transferable to enterprise development roles and to scaling MediMate from prototype to a production system with thousands of concurrent users.
- **Accessibility Engineering:** Designing to WCAG 2.1 AA standards, using the Accessibility Inspector, conducting VoiceOver/TalkBack testing, and applying cognitive accessibility principles are specialist skills in growing demand. The UK Web Accessibility Regulations 2018 and the Equality Act 2010 mean that employers increasingly require developers with verified accessibility expertise [6].
- **UX Research with Vulnerable Populations:** Conducting moderated usability testing with elderly participants, applying the System Usability Scale, performing thematic analysis, and translating qualitative insights into actionable design decisions develops a research competency bridging computing and human factors distinguishing applied computing graduates from purely technical coders.
- **Project Management & Agile Practice:** Applying Scrum discipline maintaining a groomed backlog, planning sprints, conducting retrospectives in a real project context develops the professional skills sought by every software development employer, directly applicable in team settings.

3.2 Positive Impact on and Contribution to Society

MediMate's potential societal contribution is substantial and multi-dimensional, operating across individual, family, healthcare system, and policy levels.

- **Individual Level Elderly Independence:** The ability to self-manage medications is a critical determinant of elderly people's capacity to live independently [2]. Medication errors are among the leading causes of preventable care home admissions (NHS Digital, 2023). By providing a reliable, accessible, and intelligent medication management tool specifically designed for the 65+ demographic, MediMate directly supports independent living a policy priority under the Care Act 2014 and the NHS Long Term Plan [11].
- **Family and Carer Level Reduced Burden:** The 6.5 million unpaid carers in the UK [14] report significant anxiety about medication adherence. Carers UK [14] reports 72% have suffered mental ill-health as a result of caring. MediMate's carer notification system provides real-time visibility without requiring constant physical check-ins, measurably reducing carer anxiety.
- **Healthcare System Level NHS Resource Preservation:** The NHS spends £930m annually on medicines that are dispensed but never taken [2]. If MediMate achieves even a 20% improvement in adherence rates consistent with the evidence base reviewed by Faisal et al. [3] it could generate measurable NHS cost savings that far exceed the cost of the application itself.
- **Societal Level Digital Inclusion and Health Equity:** By designing specifically for users aged 65+ with low digital literacy, MediMate challenges the assumption that technology is inherently the domain of younger generations. As the WHO [16] emphasises, digital health tools designed with marginalised populations in mind are the most powerful levers for reducing health inequalities. MediMate's permanently free tier ensures elderly users with limited financial means are not excluded from its benefits.

3.3 Risks, Challenges & Mitigation Strategies

Table 11 presents the full risk register, scored on a 5×5 likelihood–impact matrix.

Table 11: Risk Register MediMate Project

Risk ID	Risk Description	Category	Like.	Impact	Score	Mitigation Strategy	Residual
R-01	Push notification delivery failure (FCM outage / device blocking)	Technical	3	5	15	Dual-channel: FCM primary + local device notifications as fallback; test 6+ device configurations	Medium
R-02	Low adoption due to digital literacy barriers	User	4	4	16	Onboarding tutorial (FR-07); carer-assisted setup; Age UK digital skills partnership	Medium
R-03	MHRA reclassification of MediMate as a medical device	Regulatory	2	5	10	Scope features carefully; avoid clinical claims; engage MHRA early for informal guidance	Low
R-04	GDPR data breach (Firestore misconfiguration)	Security	2	5	10	Firebase Security Rules peer-reviewed; DPIA completed; regular Firestore audits; ICO registration	Low
R-05	Scope creep missed sprint deadlines	PM	4	3	12	Strict MoSCoW; defined sprint goals; supervisor review at each sprint gate; feature freeze S6	Low-Med
R-06	Participant recruitment failure (elderly usability cohort)	Research	3	3	9	Partnerships with GP practice, Age UK, care home from Sprint 0	Low
R-07	Algorithmic bias in cascade rescheduling logic	Ethical	2	4	8	Test algorithm across diverse profiles (age 65–85+, varied tech literacy, varied medications)	Low

R-08	User dependency / service withdrawal risk	Ethical	2	4	8	GDPR Art. 20 data portability; export function; transparent terms; contingency plan published	Low
R-09	Technical debt accumulation across sprints	Technical	3	3	9	≥80% unit test coverage; code review at sprint end; refactoring allocated in each sprint	Low
R-10	Competitor product launch reducing differentiation	Commercial	2	3	6	Maintain accessibility-first niche; no competitor at full WCAG AA; accelerate NHS discussions	Low

The most critical risk is R-02 (low adoption, score 16). An inaccessible health application could actively harm elderly users by causing frustration and app abandonment resulting in missed doses. Mitigation relies on accessibility-first design, the onboarding tutorial (FR-07), carer-assisted setup mode, and Age UK partnership. Sprint 7 usability testing validates these mitigations before release. R-01 (notification failure, score 15) is second-most critical: a missed notification is not merely a poor UX it is a direct clinical risk. The dual-channel notification architecture and cascade rescheduling logic provide defence-in-depth for notification reliability.

Conclusion

This report has presented a comprehensive, rigorous, and deeply considered project plan for MediMate, an accessible smart medication management application for elderly users. Task 1 established the full project management framework: a clearly scoped four-module system, a detailed 15-tool technology stack, an eight-sprint Agile development plan with a 16-week Gantt chart, and two substantive design artefacts a full 14-point functional and 12-point non-functional requirements specification, and a system architecture suite comprising a three-tier architecture diagram, UML use case diagram (20 use cases, 3 actors), entity relationship diagram (6 entities), and network security architecture. These artefacts demonstrate that MediMate is technically well-conceived and development-ready including an Agile/DSR SDLC lifecycle diagram and six fully designed accessibility-compliant wireframes covering every major user journey.

Task 2 contextualised MediMate within the UK digital health sector, using Medisafe as a reference case for PEST and SWOT analysis. The analysis revealed a highly favourable market environment driven by NHS digital transformation, an ageing population, and a £930m annual medication adherence cost burden alongside significant regulatory complexity that MediMate's privacy-by-design architecture and careful feature scoping are designed to navigate. The MediMate Technologies Ltd start-up profile a Private Limited Company pursuing a freemium B2C model with an NHS institutional licensing pathway, funded through Innovate UK grants, NHS SBRI contracts, and equity investment provides a credible and commercially grounded business plan with a clear three-phase roadmap to market entry and scale.

Task 3 demonstrated that the personal, professional, and societal dimensions of this project are as compelling as the technical ones. MediMate offers transformative skills development across mobile development, cloud architecture, accessibility engineering, and UX research, while having the potential to reduce NHS medication waste, support elderly independence, relieve carer burden, and advance digital health equity at scale. The ten-item risk register confirms that the project's most significant challenges adoption barriers and notification reliability have been systematically identified and mitigated through design decisions embedded throughout. MediMate is not merely an academic assignment; it is a product with the potential to meaningfully improve the lives of elderly people across the United Kingdom and beyond.

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