Diet and Fitness App

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Contents

1. Project background and purpose

1.1. Introduction

This project aims to design and develop a cross-platform Diet and Fitness Planner mobile application that enables users to monitor their dietary intake, exercise routines, and health progress through a secure, interactive interface. The system will be built to ensure scalability and performance.

The increasing demand for digital health and wellbeing applications highlights the importance of creating reliable, evidence-based tools. The global market for fitness and nutrition applications continues to expand as users seek greater autonomy over personal health decisions (Harris, Duncan and Booth, 2020). However, many existing products, such as MyFitnessPal or Noom, have been criticised for usability issues, limited behavioural support, and data privacy concerns (Chen et al., 2019; Li et al., 2021). Research shows that effective dietary and exercise management applications must align with established behaviour-change frameworks and incorporate user-centred design (Abraham and Michie, 2008; ISO, 2019).

This project addresses these gaps by prioritising human-centred design, privacy-compliant architecture, and data-driven personalisation. Secure authentication will be implemented using industry-standard encryption and GDPR principles (European Union, 2018), ensuring the confidentiality of user data. An optional AI component will be explored to offer personalised nutrition recommendations, reflecting recent advances in artificial-intelligence-based dietary assessment and feedback systems (Park et al., 2022; Wang and Li, 2023; Nguyen et al., 2024).

Ultimately, the project seeks to produce a reliable, ethical, and accessible prototype that promotes healthier lifestyle management through evidence-based design and technology integration (Rahman et al., 2023).

1.2. Objectives

Primary Objectives

- Develop a cross-platform mobile application ensuring consistency, scalability, and efficient data management.
- Implement secure authentication and data storage in compliance with GDPR, ensuring confidentiality and ethical management of user information.
- Apply human-centred design principles to optimise usability, accessibility, and user engagement.
- Incorporate personalised dashboards for tracking nutrition and exercise, helping users visualise progress and set achievable goals.
- Evaluate system usability and effectiveness through user testing and the System Usability Scale (SUS).

Secondary Objectives

- Integrate an AI-driven nutrition suggestion module to provide personalised dietary advice, leveraging machine learning approaches explored by Wang and Li (2023) and Nguyen et al. (2024).

- Conduct comparative analysis of user experience and engagement against established diet-tracking applications.
- Explore sustainability principles in mobile app design to ensure long-term usability and minimal digital waste.

1.3. Scope

The core functionality of the system will include:

- Secure user registration and login.
- Meal logging and calorie tracking.
- Exercise tracking and daily activity summaries.
- Graphical dashboards displaying calorie balance and progress trends.
- GDPR-compliant data management.

The project will not include:

- Integration with external devices (e.g. Fitbit, Apple Health)
- Social or community networking features
- Advanced analytics or predictive modelling
- Large-scale user testing

1.4. Deliverables

Software Deliverables

1. Mobile Application Prototype. This will include:
    - User registration and authentication.
    - Meal and exercise tracking interfaces.
    - Data storage and retrieval.
2. Backend API and Database – A secure API responsible for managing user data, authentication, and application logic.
3. Optional AI Microservice – A microservice capable of generating simple personalised nutrition or activity suggestions.

Documentation Deliverables

1. Technical Documentation – Detailed system design, architecture diagrams, database schema, and implementation records.
2. User Documentation – A concise user manual outlining installation, features, and usage instructions.
3. Evaluation Report – A structured report summarising usability, performance, and security testing results, with analysis of user feedback.

The project will be considered successful if it meets the following measurable criteria:

- The mobile application functions reliably with minimal errors.
- Core features operate correctly and persist data through the backend.
- The SUS score from testing achieves a result of 70 or above.
- The project is fully documented and delivered by the April 2026 deadline.

1.5. Constraints

The project is subject to external constraints that will influence its development and evaluation.

1. Ethical and Legal Compliance – As the project involves the collection and storage of user data, it must comply with the UK GDPR and the University of Hull's Research Ethics Policy.

2. Time Constraints – The project must be completed by April 2026. This limits the scope of implementation, particularly for advanced features such as AI recommendations.

3. Resource Constraints – Development will rely on available personal hardware and open-source software tools, which may restrict the system's scalability and processing capacity.

1.6. Assumptions

Assumptions have been made to enable effective planning and development of the proposed system:

1. Users possess basic digital literacy.
   It is assumed that end users will be familiar with standard smartphone interactions such as installing apps, navigating menus, and entering basic data. This assumption is justified because the intended user group mirrors the public familiar with mobile health applications.

2. Testing participants will voluntarily provide consented data.
   It is assumed that the volunteers will be available and willing to provide anonymised data for usability testing. This is justified as the university routinely facilitates recruitment for project evaluations under ethical approval.

3. Stable development environment.
   It is assumed that open-source technologies will remain available and compatible throughout the project period. This is reasonable as all technology options are widely adopted and well-documented.

2. Project rationale and operation

2.1. Project benefits

The primary benefit is the availability of a free, cross-platform, and privacy-conscious mobile application that simplifies monitoring diet and physical activity without multiple apps or paid subscriptions. The project also benefits future developers and researchers by serving as a well-documented case study demonstrating how to combine usability, security, and ethical design in a digital wellness product.

2.2. Project operation

Development Methodology
Phase 1: PDD and Setup
Phase 2: Research & Requirements
Phase 3: System Design
Phase 4: Core Implementation
Phase 5: Frontend & Integration
Phase 6: Testing & Evaluation
Phase 7: Refinement & Finalisation

The success of the methodology will be measured through:

- Completion of deliverables within planned timelines.
- Achievement of all primary objectives.
- Positive feedback from test users.

2.3. Options

Frontend Options

- React Native (with Expo): Enables cross-platform mobile development using JavaScript, offering near-native performance and a large support community.
- Flutter: Provides strong performance and customisation using Dart but has a steeper learning curve and less mature third-party library ecosystem.
- Native Development (Java/Kotlin for Android, Swift for iOS): Offers maximum control and performance but would double development effort and reduce efficiency.

Backend Options

- Node.js with Express: Lightweight, scalable, and well-suited to RESTful APIs and asynchronous data handling.
- Django (Python): Provides built-in administrative and security features but introduces higher complexity and slower development for real-time interactions.
- Spring Boot (Java): Robust and enterprise-ready, but excessive for a small prototype.

Database Options

- PostgreSQL: Relational, open-source, and highly secure; supports complex queries and structured data integrity.

- MongoDB: Non-relational and flexible but less ideal for the structured data of calorie logs and workouts.
- SQLite: Simple but unsuitable for multi-user scalability.

Authentication and Security Options
Options included JWT-based authentication, OAuth 2.0, and session-based logins.

Each option will be evaluated based on:

- Compatibility with project goals and technologies.
- Ease of implementation within the available timeframe.
- Community support and documentation.
- Security and scalability.

2.4. Risk analysis and mitigation

Risk ID	Description	Likelihood (1–3)	Severity (1–5)	Impact (L×S)	Mitigation Strategy	Residual Risk
R1 – Data Loss or Corruption	Loss of project files due to hardware failure or accidental deletion.	2	4	8	Use GitHub and cloud backups; maintain local copies; test restores regularly.	Low
R2 – Ethical or GDPR Non-Compliance	User data not handled in line with GDPR or ethical approval requirements.	2	5	10	Obtain ethics approval; anonymise data; provide consent forms.	Low
R3 – Time Overrun / Missed Milestones	Underestimating workload or delays could push the project beyond deadlines.	3	4	12	Maintain Gantt chart; review with supervisor often.	Medium
R4 – Feature Creep (Scope Expansion)	Adding unplanned features that delay key functionality.	2	4	8	Prioritise core objectives.	Low
R5 – Illness or Personal Issues	Being unable to work for a period due to health or personal issues.	2	3	6	Build buffer time into schedule; adapt timeline if required.	Medium
R6 – Limited Access to Test Participants	Difficulty recruiting volunteers for usability testing.	2	3	6	Start recruitment early.	Low

2.5. Resources required

The project will rely on university-provided computing facilities and open-source software; however, additional resources are required to support development, testing, and evaluation:

1. Volunteer Test Participants
2. Ethical Approval Documentation
3. Cloud Storage and Version Control Access
4. Testing Devices
5. Optional Machine Learning Libraries

Overall, all resources are either already available or obtainable through open-source or university-supported platforms.

2.6. Ethical and legal considerations

Ethical considerations include:

- Informed Consent: All test participants will be fully informed of the project's purpose, the nature of the data collected, and their right to withdraw at any time without penalty.
- Data Anonymisation: Any user data collected during usability testing will be anonymised before analysis to protect participant identity.
- Participant Wellbeing: The app will not provide medical advice or diagnose conditions.

The project must follow these UK laws and regulations:

- UK GDPR and Data Protection Act 2018: Compliance will be ensured through consent screens, secure authentication, and data export/deletion options.
- Computer Misuse Act 1990: Network connections and databases will be confined to local or controlled environments.
- Copyright, Designs and Patents Act 1988: All third-party materials will be appropriately licensed under open-source terms and cited where necessary.

2.7. Commercial considerations

Project Costs
The project will have minimal direct financial cost, as it will rely on open-source software and university-provided resources. Indirect costs may include personal hardware use and electricity or data expenses.

Commercial Potential
The project has potential for commercial development as a freemium health and lifestyle application. Potential revenue models could include:

- Optional premium subscriptions.
- Partnerships with health or wellness organisations for data-driven insights.
- Non-intrusive in-app advertising.

Target Market and Competitors
The target audience includes individuals aged 18–45 who are health-conscious but prefer simple, low-cost tracking tools.

Key competitors include:

- MyFitnessPal
- Cronometer
- Noom

3. Project methodology and outcomes

3.1. Initial project plan

3.2. Tasks and milestones

Phase 1: PDD and Setup

- PDD preparation
- Ethics application preparation
- Ethics submission
- Setup GitHub repo

Phase 2: Research & Requirements

- Literature & competitor review
- Requirements specification
- Initial wireframes & UX sketches

Phase 3: System Design

- System architecture & ERD
- API design & endpoints spec
- UI mock-ups

Phase 4: Core Implementation

- Implement backend
- Backend tests

Phase 5: Frontend & Integration

- Implement core frontend screens
- Integrate frontend ↔ backend
- Prototype

Phase 6: Testing & Evaluation

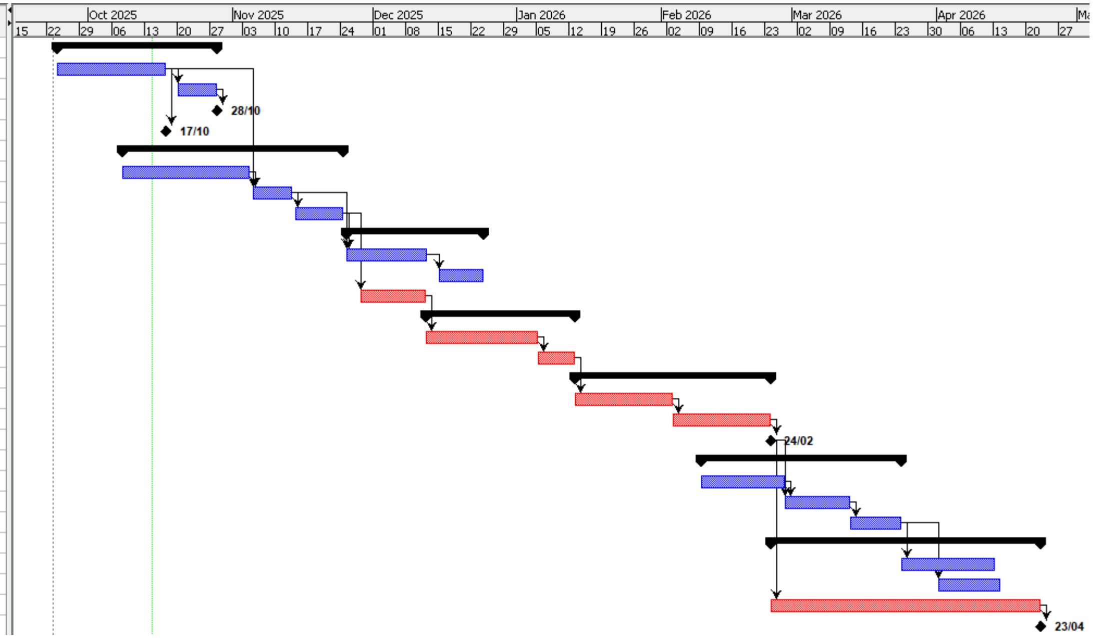
- Usability test planning & recruit participants
- Conduct usability tests
- Analyse test results & SUS scoring

Phase 7: Refinement & Finalisation

- Bug fixing & performance optimisation
- Prepare documentation
- Final report writing & presentation prep
- Final submission

3.3. Schedule Gantt chart

	Name	Duration	Start	Finish	Predecessors
1	**PDD and Setup**	25 days?	**24/09/2025, 08:00**	**28/10/2025, 17:00**	
2	PDD preparation	18 days?	24/09/2025, 08:00	17/10/2025, 17:00	
3	Ethics application preparation	7 days?	20/10/2025, 08:00	28/10/2025, 17:00	2
4	Ethics submission	0 days?	28/10/2025, 17:00	28/10/2025, 17:00	3
5	Setup GitHub repo	0 days?	17/10/2025, 17:00	17/10/2025, 17:00	2
6	**Research & Requirements**	34 days?	**08/10/2025, 08:00**	**24/11/2025, 17:00**	
7	Literature & competitor review	20 days?	08/10/2025, 08:00	04/11/2025, 17:00	
8	Requirements specification	7 days?	05/11/2025, 08:00	13/11/2025, 17:00	2;7
9	Initial wireframes & UX sketches	7 days?	14/11/2025, 08:00	24/11/2025, 17:00	8
10	**System Design**	22 days?	**25/11/2025, 08:00**	**24/12/2025, 17:00**	
11	System architecture & ERD	14 days?	25/11/2025, 08:00	12/12/2025, 17:00	8;9
12	API design & endpoints spec	8 days?	15/12/2025, 08:00	24/12/2025, 17:00	11
13	UI mockups	10 days?	28/11/2025, 09:00	12/12/2025, 09:00	9
14	**Core Implementation**	22 days?	**12/12/2025, 09:00**	**13/01/2026, 09:00**	
15	Implement backend	16 days?	12/12/2025, 09:00	05/01/2026, 09:00	13
16	Backend tests	6 days?	05/01/2026, 09:00	13/01/2026, 09:00	15
17	**Frontend & Integration**	30 days?	**13/01/2026, 09:00**	**24/02/2026, 09:00**	
18	Implement core frontend screens	15 days?	13/01/2026, 09:00	03/02/2026, 09:00	16
19	Integrate frontend ↔ backend	15 days?	03/02/2026, 09:00	24/02/2026, 09:00	18
20	Prototype	0 days?	24/02/2026, 09:00	24/02/2026, 09:00	19
21	**Testing & Evaluation**	31 days?	**09/02/2026, 09:00**	**24/03/2026, 09:00**	
22	Usability test planning & recruit participants	14 days?	09/02/2026, 09:00	27/02/2026, 09:00	
23	Conduct usability tests	10 days?	27/02/2026, 09:00	13/03/2026, 09:00	20;22
24	Analyse test results & SUS scoring	7 days?	13/03/2026, 09:00	24/03/2026, 09:00	23
25	**Refinement & Finalisation**	42 days?	**24/02/2026, 09:00**	**23/04/2026, 09:00**	
26	Bug fixing & performance optimisation	14 days	24/03/2026, 09:00	13/04/2026, 09:00	24
27	Prepare documentation	10 days?	01/04/2026, 08:00	14/04/2026, 17:00	24
28	Final report writing & presentation prep	42 days?	24/02/2026, 09:00	23/04/2026, 09:00	20
29	Final submission	0 days?	23/04/2026, 09:00	23/04/2026, 09:00	28



3.4. Project control

Project control will be maintained through structured planning and continuous monitoring of progress. The project will follow an agile-inspired approach with defined phases and regular reviews to ensure objectives are met on time and within scope.

All project activities will be managed using a planning board (e.g. Trello). Tasks will be prioritised according to project phase, with clear deliverables. Supervisor meetings will take place regularly to review progress.

Project performance will be tracked through:

- Milestone reviews.
- Testing outcomes.
- Documentation updates.

3.5. Project evaluation

The project will be evaluated through technical testing, user evaluation, and qualitative feedback to assess whether the artefacts meet the objectives and the success criteria.

Each software artefact will be evaluated using the following criteria:

Artefact	Evaluation Method	Success Measure
Frontend	Functional and usability testing	All primary features operate correctly with minimal bugs.
Backend	Integration and load testing	Stable API performance with no critical errors and average response times under 500ms.
Database	Data validation and query testing	Accurate data storage and retrieval; relational integrity maintained.
Authentication	Security testing and validation	Secure login and logout; no unauthorised access detected.
Documentation	Supervisor review	Clear and comprehensive technical and user documentation submitted.

Usability testing will be carried out with volunteer participants. The following evaluation methods will be used:

1. System Usability Scale (SUS):
   Participants will complete the standard 10-item SUS questionnaire, producing a usability score from 0–100.
2. Observation and Task Completion Rates:
   Observations will capture points of confusion, task completion times, and any errors encountered.

3. Qualitative Feedback:
   A short interview or survey will gather subjective feedback on clarity, design, and perceived usefulness.

Upon completion, results from both technical and user evaluations will be analysed against the project objectives and deliverables. A final evaluation report will summarise:

- Achievement of functional and non-functional requirements.
- Measured usability (SUS score).
- Identified improvements and limitations.
- Reflection on the chosen methodology's effectiveness.

This structured evaluation approach ensures that the project's success is measurable, evidence-based, and ethically conducted.

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