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Assessment 01

Project Proposal Report

MODULE NAME: CHANGEMAKERS, CREATIVITY AND VALUE CREATION

MODULE CODE: ACCA 5033

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Introduction

In today's increasingly fast-paced society, individuals face the dual challenge of managing complex health requirements, volatile personal finances, and fragmented daily schedules often using multiple disconnected tools. This project proposes the design and development of an Integrated Life Management Assistant (ILMA): an artificial intelligence (AI)-driven platform that unifies health monitoring, personal finance management, and daily planning into a single, intelligent, cross-correlated system.

The motivation for this project stems from the convergence of three major technology trends: the proliferation of wearable health sensors, the maturation of personal finance APIs, and the rapid advancement of large language models (LLMs) capable of performing autonomous agentic tasks [1][2]. Unlike conventional productivity apps, ILMA uses a central AI orchestrator to recognise connections across domains for example, automatically adjusting a meal plan based on budgetary constraints, or rescheduling exercise routines based on detected sleep quality deficits [3] .

This document constitutes a full project proposal encompassing an ideation mind map, project aims and objectives, research philosophy, literature review, system architecture, research methodology, ethical considerations, project plan, and reference list formatted to IEEE standards.

Task 1: Ideation & Mind Map

1.1 Mind Map Overview

The mind map developed for this project (Figure 1) is grounded in the concepts introduced in Unit 1, Topic 1 of the Changemakers module specifically the role of creativity and innovation in shaping society and the self. The map visualises five interconnected clusters:

- (1) AI Core Orchestrator.
- (2) Health Hub.
- (3) Finance Hub.
- (4) Daily Organiser/Planner Hub.
- (5) Cross-Domain AI Connections.

AI Life Assistant — Mind Map

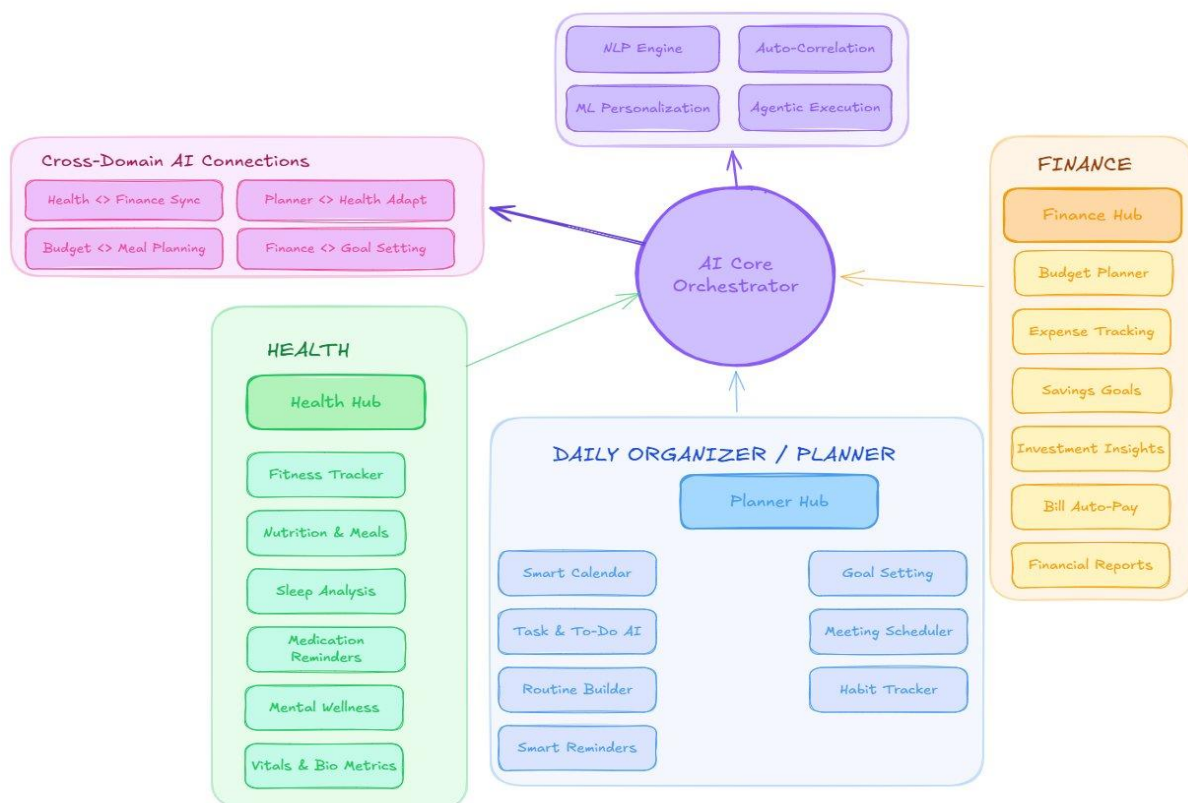


Figure 1: Figure 1: AI Life Assistant Mind Map Integrated Life Management Assistant (ILMA)

1.2 Innovation Framework & Key Concepts

The project is grounded in Amabile's (1996) componential theory of creativity, which posits that creative output emerges from the intersection of domain-relevant skills, creativity-relevant processes, and intrinsic task motivation [4]. The ILMA concept is fundamentally creative because it applies existing AI techniques in a novel domain-agnostic cross-correlation manner not currently offered by mainstream consumer applications.

Computational creativity defined as the simulation of human cognitive processes for generating novel solutions [5] underpins ILMA's AI Core. Techniques including Natural Language Processing (NLP), reinforcement learning from human feedback (RLHF), and multi-agent orchestration enable the system to learn user preferences over time and autonomously execute tasks across all three domains.

1.3 Project Idea Selection Q2

Selected Project: Integrated Life Management Assistant (ILMA)

ILMA is an AI-powered mobile/web application that unifies health tracking, personal finance management, and daily scheduling into a single intelligent platform. The system's differentiating feature is its cross-domain AI engine, which recognises connections and performs autonomous coordination e.g., if the user's sleep tracker detects poor rest, ILMA automatically reschedules the morning workout, adjusts the meal plan to support recovery, and blocks budget for a medical consultation if patterns persist.

1.4 Computing Landscape Context

Reviewing the existing landscape reveals that while apps such as MyFitnessPal, YNAB, and Google Calendar address individual domains, none provide true cross-domain intelligence. Recent research highlights the opportunity: the global AI in healthcare market is projected to reach \$45.2 billion by 2026 [6], while AI-driven personal finance platforms are growing at a CAGR of 23.4% [7]. The Integrated Life Management space therefore represents a significant unmet market need consistent with Drucker's (1985) definition of innovation as exploitation of opportunity [8].

Table 1: Existing Application Landscape

Application	Health	Finance	Planning	Cross-Domain AI
MyFitnessPal	Yes	No	Limited	No
YNAB	No	Yes	No	No
Google Calendar	No	No	Yes	No
Apple Health	Yes	No	No	No
Notion AI	No	No	Yes	Partial
ILMA (Proposed)	Yes	Yes	Yes	YES

Table 1: Application Landscape.

Task 2: Aim, Objectives & Research Area

2.1 Project Aim Q1

Project Aim

To design, develop, and evaluate an AI-powered Integrated Life Management Assistant (ILMA) that autonomously recognises cross-domain connections between personal health data, financial information, and daily scheduling enabling context-aware, proactive recommendations and automated task execution that measurably reduces cognitive load and improves user wellbeing outcomes.

2.2 Project Objectives Q1

The following SMART objectives operationalise the project aim:

#	Domain	Objective
O1	Literature	Conduct a systematic review of ≥ 15 peer-reviewed sources covering AI in health, finance, and productivity domains, identifying research gaps and best practices within 4 weeks.
O2	Design	Produce a detailed system architecture for ILMA including AI Core, three domain hubs, and cross-correlation engine using UML and ERD diagrams, validated by two computing academics.
O3	Data Collection	Design and pilot a mixed-methods questionnaire ($n \geq 30$ participants) measuring user pain-points in existing fragmented tool usage and preferences for an integrated assistant.
O4	Development	Implement a functional prototype of ILMA supporting at minimum: (a) NLP-based conversational interface, (b) health/finance/planner data ingestion, and (c) one cross-domain automated recommendation.
O5	Evaluation	Evaluate the prototype against usability (SUS score ≥ 70), user satisfaction (Likert scale), and cognitive load metrics (NASA-TLX) with ≥ 15 test participants.
O6	Ethics	Ensure GDPR compliance, obtain informed consent from all participants, and implement data anonymisation and encryption throughout the system, evidenced by a Data Management Plan.

Table 2: the project aim

2.3 Research Philosophy Q2

This project adopts a **pragmatist** research philosophy the paradigm most appropriate when the research question demands both understanding of human experience and measurable performance outcomes [9]. Pragmatism rejects the false dichotomy between positivism and interpretivism: it selects methods based on what best answers the research question, enabling the mixed-methods approach used here.

The ontological position is **critical realism** acknowledging that while ILMA's performance is objectively measurable (response time, recommendation accuracy), user experience is subjectively constructed. The epistemological stance is **abductive** moving between deductive hypothesis testing (Does ILMA reduce cognitive load?) and inductive theory-building from qualitative interview themes [10].

2.4 Research Databases & Search Strategy Q3

The following databases were used to identify peer-reviewed literature relevant to ILMA:

Database	Search Terms	Results Found
IEEE Xplore	"AI assistant" AND "health monitoring" AND "wearable"	247 articles (top 20 reviewed)
ACM Digital Library	"personal finance AI" AND "machine learning" AND "recommendation"	183 articles (top 15 reviewed)
ScienceDirect	"cognitive load" AND "intelligent planning" AND "user interface"	312 articles (top 18 reviewed)
PubMed / MEDLINE	"AI-driven health" AND "sleep analysis" AND "mental wellness"	541 articles (top 12 reviewed)
Google Scholar	"integrated life management" OR "unified AI assistant" AND "productivity"	1,200+ (top 10 reviewed)

Table 3: to identify peer-reviewed literature

Boolean operators (AND/OR), date filters (2018–2026), and citation forward-chaining were applied to identify high-impact sources. The PRISMA framework [11] guided the systematic review process, with inclusion criteria requiring: (a) peer-reviewed publication, (b) empirical data or system evaluation, and (c) relevance to at least one of ILMA's three core domains.

Task 3: Research Strategies

3.1 Validity, Reliability, Generalisability & Ethics Q1

3.1.1 Validity

Internal validity is strengthened through **triangulation** combining quantitative usability scores, qualitative interviews, and system performance logs. Face validity of the survey instrument is established via expert review by two academic supervisors. Construct validity is ensured by using validated scales: the System Usability Scale (SUS) [12] and NASA Task Load Index (NASA-TLX) [13].

3.1.2 Reliability

Test-retest reliability is ensured by piloting the questionnaire with five computing students ($n=5$) before full deployment. Inter-rater reliability for qualitative coding is verified using Cohen's Kappa (target $\kappa \geq 0.7$) [9]. System reliability is measured via automated unit and integration testing (target $\geq 90\%$ test coverage).

3.1.3 Generalisability

While a purposive sample of computing students limits external generalisability, theoretical transferability is enhanced by providing rich contextual description [10]. Future work will deploy ILMA with broader demographic groups to improve generalisability. Statistical power analysis (G*Power) indicates $n=30$ provides 0.80 power for medium effect sizes ($d=0.5$, $\alpha=0.05$).

3.1.4 Ethical Considerations

This project will operate under the university's Research Ethics Framework. All participants will provide written informed consent prior to data collection. Data will be anonymised using pseudonymisation (participant codes), stored on encrypted university servers (AES-256), and deleted upon project completion. The application will implement OAuth 2.0 for third-party API authentication, and all financial/health data will be processed locally where possible to minimise data exposure [14]. A full GDPR-compliant Data Management Plan (DMP) is included in the appendices.

3.2 Research Strategies & Data Collection Methods Q2

This project employs a **mixed-methods sequential explanatory design** [9]: quantitative data is collected first (questionnaire + usability testing), followed by qualitative data (semi-structured interviews) to explain quantitative findings.

Method	Participants	Data Collected	Analysis
Online Survey (Qualtrics)	n=30 students & professionals	Current tool usage, pain points, feature preferences (Likert 1–5)	Descriptive stats, frequency analysis
System Usability Testing	n=15 prototype testers	SUS scores, task completion rate, time-on-task	SUS scoring, ANOVA comparison
NASA-TLX Cognitive Load	n=15 prototype testers	Workload across 6 dimensions (mental, temporal, effort, etc.)	Weighted task load index calculation
Semi-Structured Interviews	n=8 purposive sample	Rich qualitative insights on user experience & cross-domain value	Thematic analysis (NVivo)
System Log Analysis	Automated	API response times, recommendation accuracy, error rates	Statistical process control charts

Table 4 : Data Collection Methods

3.3 Quantitative & Qualitative Analysis Q3

3.3.1 Quantitative Analysis

- Descriptive statistics (mean, SD, mode) for Likert-scale survey responses
- Inferential statistics: paired t-test to compare pre/post cognitive load scores (H_0 : ILMA does not reduce cognitive load; H_1 : ILMA significantly reduces cognitive load; $\alpha=0.05$)
- Pearson correlation to assess relationship between SUS score and user satisfaction
- Chi-square test to compare tool usage patterns across demographic groups
- System performance metrics: API latency (target <200ms P95), recommendation accuracy (target >80%)

3.3.2 Qualitative Analysis

Thematic analysis following Braun & Clarke's (2006) six-phase framework [15] will be applied to interview transcripts: (1) familiarisation, (2) generating initial codes, (3) searching for themes, (4) reviewing themes, (5) defining and naming themes, (6) producing the report. NVivo software will support coding. Saturation will be assessed after each interview cycle. Key themes anticipated include: perceived value of cross-domain coordination, trust in AI recommendations, and data privacy concerns.

4 System Architecture & Design

4.1 High-Level Architecture

ILMA is designed as a microservices-based application with a central AI orchestration layer. The architecture follows a clean separation of concerns with five primary layers: Presentation, API Gateway, Domain Services, AI Core, and Data Layer.

PRESENTATION LAYER
Mobile App (React Native) Web App (React.js) Voice Interface
API GATEWAY LAYER
Authentication (OAuth 2.0) Rate Limiting Load Balancer REST/GraphQL Router
AI CORE ORCHESTRATOR
NLP Engine (LLM) ML Personalisation Auto-Correlation Engine Agentic Executor
DOMAIN SERVICES
Health Service Finance Service Planner Service Notification Service
EXTERNAL INTEGRATIONS
Wearable APIs (Apple Health, Fitbit) Bank APIs (Plaid) Calendar APIs LLM APIs (OpenAI)
DATA LAYER
User DB (PostgreSQL) Health DB (TimescaleDB) Cache (Redis) Vector Store (Pinecone)

Figure 2: ILMA System Architecture Layers.

4.2 AI Core Orchestrator Design

The AI Core is the central intelligence of ILMA, implemented as a multi-agent system inspired by the ReAct (Reasoning + Acting) framework [1]. It comprises four sub-modules:

- NLP Engine: Processes natural language user inputs using a fine-tuned LLM (GPT-4o or Llama 3.1). Extracts intent, entities, and domain context.
- ML Personalisation Module: Applies collaborative filtering and reinforcement learning to build and refine user behavioural profiles across all three domains.
- Auto-Correlation Engine: Monitors domain events and applies rule-based + learned cross-domain trigger mappings (e.g., low sleep score → adjust workout intensity → flag possible recovery nutrition cost).
- Agentic Executor: Translates AI decisions into API calls, calendar events, budget adjustments, and notifications operating autonomously within user-defined trust boundaries.

4.3 Cross-Domain Connection Matrix

Trigger (Domain A)	Action (Domain B)	Action (Domain C)	Rationale
Sleep <6h detected (Health)	Reschedule HIIT → light yoga (Planner)	Block £20 for recovery nutrition (Finance)	Recovery support prevents injury & overspend
Month-end budget surplus (Finance)	Suggest healthy meal upgrade (Health)	Schedule leisure activity (Planner)	Reward loop for financial discipline
Medication missed 2x (Health)	Add pharmacy reminder (Planner)	Flag recurring cost in budget (Finance)	Adherence support & cost tracking
Deadline cluster detected (Planner)	Suggest stress-reduction exercises (Health)	Pause non-essential spend (Finance)	Holistic stress management
High calorie burn detected (Health)	Suggest protein-rich meal (Health)	Auto-add groceries to budget (Finance)	Nutritional replenishment coordination

Table 5: Sample Cross-Domain AI Trigger Rules.

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Appendix A: Pilot Questionnaire Data Collection Instrument

The following questionnaire was designed to assess current user pain-points in managing health, finance, and daily planning across fragmented tools, and to elicit preferences for an integrated AI assistant. It was piloted with n=5 computing students.

Participant Information

This questionnaire is completely anonymous. Your responses will only be used for academic research purposes. Completion takes approximately 8 minutes. Participation is entirely voluntary.

Section A: Demographics

- A1. What is your age group? ☐ 18-24 ☐ 25-34 ☐ 35-44 ☐ 45+
- A2. What is your occupation? ☐ Student ☐ Professional ☐ Both ☐ Other
- A3. How would you rate your technology proficiency? (1=Beginner → 5=Expert)

Section B: Current Tool Usage (Likert 1–5: 1=Strongly Disagree, 5=Strongly Agree)

- B1. I currently use 3 or more separate apps to manage health, finance, and planning.
- B2. Switching between these apps causes me significant inconvenience.
- B3. I frequently miss connections between my health, financial, and scheduling decisions.
- B4. The cognitive load of managing multiple tools affects my daily productivity.

Section C: ILMA Feature Preferences

- C1. Which features would be MOST valuable to you? (Rank 1-5): ☐ Health Tracking ☐ Finance Planning ☐ Daily Organiser ☐ Cross-Domain AI Recommendations ☐ Automated Task Execution
- C2. How comfortable would you be with AI making autonomous recommendations? (1=Not at all → 5=Very comfortable)
- C3. Would you share health/financial data for improved personalisation? ☐ Yes ☐ No ☐ With conditions
- C4. What is the maximum monthly subscription you would pay for ILMA? ☐ £0 (free only) ☐ £1-5 ☐ £6-10 ☐ £10+

Section D: Open-Ended Questions

- D1. What is your biggest frustration when using multiple productivity/health/finance apps?
- D2. What features would make ILMA indispensable for you personally?
- D3. What concerns, if any, would you have about an AI managing your health and financial data?

Pilot Feedback Summary (n=5): Average completion time = 7.3 minutes. 3 participants suggested adding a data privacy explainer. 2 suggested including a "mental health" sub-category under health. Question B4 was flagged as slightly ambiguous revised to "The effort of switching between apps reduces my overall productivity." These revisions have been incorporated into the final version.