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Project Proposal: Innovation & Research Student

Name: PAUL CYRUS ABODERIN

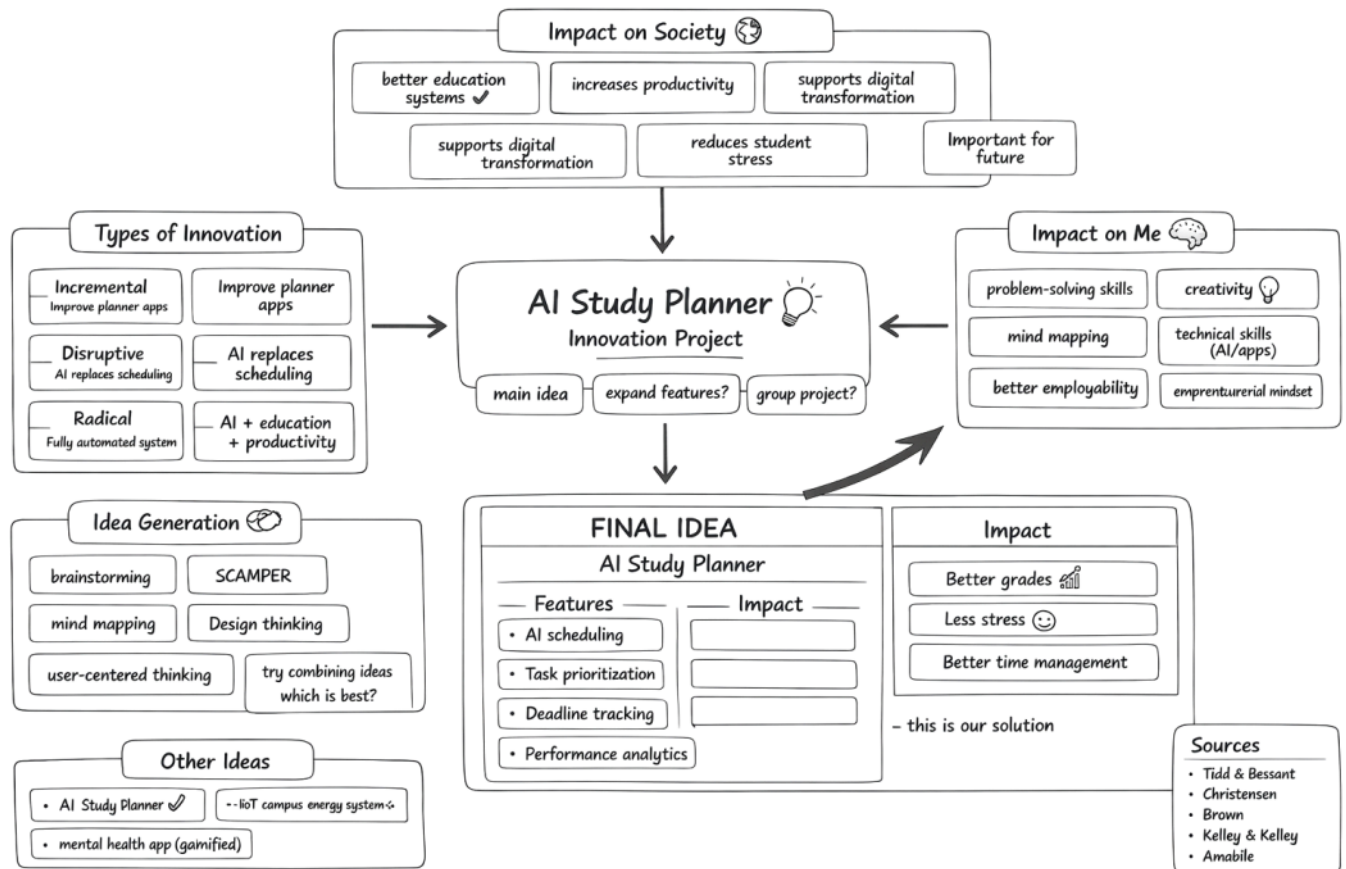
Student ID: 2423978

Course: BSc (Hons) Computing Module: Changemakers: Creativity and Value Creation (ACCA5033)

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Task 1 - Ideation & Mind Map

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The purpose of this mind map is to visually explore the relationship between established innovation concepts and potential project ideas within the field of computing. The creative process began with divergent thinking, brainstorming broad areas of personal interest related to my program of study, such as artificial intelligence, the Internet of Things, and gamification. These ideas were then mapped against core innovation theories covered in Unit 1, Topic 1 of the module, allowing for a structured analysis of their potential value.

Innovation is not merely about novelty; it is a critical driver of societal and personal development. As Tidd and Bessant (2021, p. 4) articulate, innovation is "the process of turning opportunity into new ideas and of putting these into widely used practice." This definition highlights the dual focus on creativity and practical application. The mind map explores this through three key branches. First, it categorizes types of innovation. For instance, the concept of a gamified mental health app represents an incremental innovation—improving upon existing wellbeing applications—while an AI-powered study planner could be considered disruptive (Christensen, 2016), as it fundamentally changes how students approach independent learning and time management.

Second, the map connects innovation to its role in society. Here, innovation is understood as a primary engine for economic growth and a tool for solving complex social problems, such as improving educational outcomes. This perspective aligns with Brown's (2009) argument that design thinking, a human-centered innovation process, can transform organizations and societies by generating solutions that are both desirable and viable. Third, the map considers

innovation's role in self. Engaging with the process of ideation and project development fosters essential personal competencies, including creative confidence (Kelley & Kelley, 2013) and advanced problem-solving skills.

Three project ideas emerged from this brainstorming phase. The first was an IoT-Based Campus Energy Management System, which aligns with incremental innovation in sustainability. The second was a Gamified Mental Health App, a socially valuable incremental innovation. The third, which I have selected to take forward, is the **AI-Powered Study Planner**.

This project was selected because it sits at a compelling intersection of technological possibility and demonstrable user need. It has the potential to be a radical innovation for its target user group by personalizing the study process in ways traditional planners cannot. By using machine learning to analyze a user's habits, deadlines, and performance, the application can provide tailored study schedules and predictive insights. This moves beyond simple scheduling to actively support self-regulation, a key predictor of academic success (Broadbent & Poon, 2015). Furthermore, it provides a suitable scope for a final-year project, allowing for a manageable development cycle and a clear evaluation phase, thereby fulfilling the module's aim to lay the groundwork for a substantive final-year endeavor.

Task 2 – Aim & Objectives and Research Area

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Project Title

Development and Evaluation of an AI-Powered Study Planner Application to Enhance Student Academic Performance and Self-Regulation.

Aim

To design, develop, and evaluate a prototype AI-powered study planner application in order to improve student self-regulation and academic performance within a higher education context.

Objectives

- 1) To conduct a systematic literature review on the application of artificial intelligence in education, study habits, and academic self-regulation.
- 2) To identify and validate the key features and user requirements for an AI-powered study planner through a mixed-methods approach with undergraduate students.
- 3) To design and develop a functional, interactive prototype of the application using a suitable cross-platform framework.
- 4) To evaluate the prototype's usability and its perceived impact on user study habits via a pilot usability study and qualitative feedback.
- 5) To formulate a set of recommendations for the future development, feature refinement, and potential wider implementation of the application.

Research Philosophy

For this project, a Pragmatist research philosophy is most appropriate. Pragmatism is not committed to a single system of philosophy or reality and allows the researcher to use a variety of approaches to answer the research question (Saunders, Lewis & Thornhill, 2019, p. 151). Given that my project involves both the objective development of a software artefact and the subjective experiences of its users, a pragmatist stance is ideal. It permits the use of quantitative data (e.g., system usability scores, feature ranking from surveys) to assess the prototype's functionality, alongside qualitative data (e.g., interview feedback) to understand the user's lived experience. This mixed-methods approach is central to answering the overarching question of whether the application is both functional and valuable to its intended audience. This philosophy aligns with the practical, problem-solving nature of a computing project, where the primary concern is the effectiveness of the created solution.

Search Tools and Strategies

To identify relevant research, a systematic approach will be employed using specific academic databases and a structured search strategy.

Databases:

The primary databases for this project will be:

- ✓ **IEEE Xplore:** For technical literature on AI algorithms, machine learning applications, and software architecture.
- ✓ **ACM Digital Library:** For research on human-computer interaction (HCI), user experience (UX) design, and educational technology.
- ✓ **ScienceDirect:** For broader social science and psychology literature on academic self-regulation, study habits, and the impact of digital tools on learning.
- ✓ **Google Scholar:** To provide a broad search across all disciplines and track citation networks.

Search Strategy:

A search string using Boolean operators will be constructed to ensure comprehensive results. The initial search string will be:

("artificial intelligence" OR "AI" OR "machine learning") AND ("study planner" OR "time management" OR "study habits") AND ("education" OR "students" OR "academic performance") AND ("self-regulation" OR "self-regulated learning").

To refine the results, the following strategies will be applied:

- **Phrase searching:** Using quotation marks to find exact phrases (e.g., "self-regulated learning").
- **Truncation:** Using an asterisk to find multiple word endings (e.g., educat* to find education, educational, educator).
- **Filters:** Results will be filtered by publication year (2019–2026) to ensure currency, and by document type (Peer-reviewed journals, conference proceedings) to maintain academic credibility. This systematic approach will ensure a thorough and focused review of the existing literature.

Task 3 – Research Strategies

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Validity, Reliability, Generalizability, and Ethics

Ensuring the quality and integrity of the research is paramount.

Validity will be addressed by using established instruments where possible. For the quantitative survey, validated scales like the System Usability Scale (SUS) will be used to measure usability. The interview questions will be developed directly from the themes identified in the literature review, ensuring they are conceptually aligned with the research objectives. The pilot study (see appendix) will further enhance validity by testing the clarity and relevance of all data collection tools.

Reliability refers to the consistency of the research. For the qualitative interviews, a standardized interview protocol with a set of core questions will be used for all participants. Thematic analysis will be conducted in a systematic, transparent manner, with a clear audit trail of codes and themes to allow for verification of the process (Braun & Clarke, 2006).

Generalizability is a recognized limitation for a project of this scale. The findings will be based on a small, non-random sample of students from a single institution. Therefore, the results will not be statistically generalizable to the wider student population. However, the study aims for transferability by providing a rich, thick description of the context, participants, and design, allowing readers to assess the applicability of the findings to their own contexts.

- **Ethical Considerations** are central to this project. Before any data collection, ethical approval will be sought from the university's ethics committee. Key ethical principles to be followed include:
- **Informed Consent:** All participants will be provided with a detailed information sheet and will sign a consent form. They will be clearly informed of their right to withdraw at any point without penalty.
- **Anonymity and Confidentiality:** All data will be anonymized. Participants' names will not be recorded; they will be assigned participant numbers. Data will be stored on a secure, password-protected university OneDrive account.
- **Data Storage and Security:** All collected data, including interview recordings and transcripts, will be stored securely. Data will be retained only for the duration of the project and will be securely destroyed upon its completion.
- **Minimizing Harm:** Participants will not be exposed to any physical or psychological risk. Interview questions will be non-intrusive and focused on their experience with the application.

Data Collection Methods

Two primary data collection methods will be employed:

1. **Quantitative – Online Survey:** An online survey (using Microsoft Forms) will be distributed to undergraduate students in the School of Computing. The survey will gather demographic data, assess current study habits, gauge interest in an AI-powered

study planner, and ask participants to rank the importance of potential features (e.g., task prioritization, progress tracking, predictive scheduling). The sample size will target between 40 and 60 respondents to allow for basic statistical analysis.

- 2. Qualitative – Semi-Structured Interviews:** Following the survey, a smaller sample of 6–8 participants will be invited to take part in semi-structured interviews. This method is chosen to gain deep, contextual insights into the challenges students face with time management and to explore their perceptions of an AI-driven solution. The interviews will be audio-recorded, transcribed verbatim, and analyzed using thematic analysis (Braun & Clarke, 2006). This will allow for the exploration of emerging themes and nuances that cannot be captured by a survey alone.

Data Analysis Methods

Quantitative Analysis (Unit 4, Topic 1): Survey data will be analyzed using descriptive statistics. Frequencies and percentages will be calculated for categorical data (e.g., preferred features), while measures of central tendency (mean, median) will be calculated for Likert-scale questions to identify overall trends. The SUS scores will be calculated to provide a standardized measure of usability.

Qualitative Analysis (Unit 4, Topic 2): Interview transcripts will be analyzed using thematic analysis. This involves a six-phase process: 1) familiarization with the data through repeated reading; 2) generating initial codes from interesting features of the data; 3) searching for themes by collating codes; 4) reviewing themes to ensure they accurately represent the dataset; 5) defining and naming themes; and 6) producing the final report with compelling excerpts to illustrate each theme. This rigorous approach will ensure a rich and detailed account of the user experience.

Appendices

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Appendix A: Pilot Study Feedback

Purpose of Pilot: To test the clarity, relevance, and flow of the semi-structured interview questions with two peers before the main study.

Feedback Summary:

- Pilot Participant 1: Found the question "How do you feel about technology mediating your study habits?" to be too broad. Suggested rephrasing to focus on specific aspects like planning and monitoring.
- Pilot Participant 2: Noted that one question about "data privacy concerns" was double-barreled, asking about both data storage and data usage simultaneously.
- General Feedback: Both participants agreed the overall duration of 15-20 minutes was appropriate.

Changes Implemented:

- The broad question was replaced with two more specific questions: "What specific aspects of your study planning would you feel comfortable having a technology manage?" and "What aspects would you insist on managing yourself?"
- The double-barreled question was split into two: "How concerned are you about where your study data would be stored?" and "How concerned are you about how that data would be used to make predictions or suggestions?"
- Minor phrasing was adjusted for clarity (e.g., changing "algorithm" to "the app's logic") to make the interview more accessible to non-technical participants.

Appendix B: Evidence of Team-Working

[Screenshot of a forum post where the student engaged in a discussion about AI in education with classmates.]

Appendix C: Tutorial Activity Answers

[Notes and answers from the Unit 1, Topic 2 "How Do YOU Solve a Problem?" activity, showing engagement with the problem-solving process.]

References

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