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- Module: Changemakers: Creativity & Value Creation
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1. Creativity, Innovation, and Societal Value Creation

Creativity and innovation serve as fundamental engines for economic, cultural and technological progress, transforming abstract ideas into tangible societal value. While creativity represents the cognitive generation of novel and useful concepts, innovation constitutes the practical implementation of these ideas to address real-world challenges. Higher education institutions and technological disciplines play a critical role in fostering creative environments that empower individuals to solve complex, "wicked" societal problems (Buchanan, 1992).

In the domain of computing and software engineering, innovation extends beyond technical architecture; it requires human-centered design thinking- an approach prioritizing empathy, iterative prototyping, and end-user engagement (Panke 2019). Reflecting on my personal field of study (computing) and personal interests in artificial intelligence, Three prominent innovation areas were explored during the ideation phase:

- **Cybersecurity Literacy Platforms:** Developing gamified training software to build individual resilience against social engineering and cyber threats.
- **Sustainable Cloud Computing Metrics:** Creating optimization algorithms that reduce server energy consumption and lower carbon footprints in digital infrastructure.
- **AI Study Assistant for University Students:** Designing an intelligent, context-aware study companion that assists undergraduates with personalized study planning, concept breakdown, and real-time self-assessment.

2. Selected Project Idea & Value Creation

From the initial ideation process, the project idea selected to take forward is: **"Developing an AI Study Assistant for University Students to Enhance Self-Regulated Learning and Academic Performance."**

Justification and Alignment with Module Objectives

Higher education undergraduates frequently encounter cognitive overload, time-management struggles, and difficulty navigating dense academic materials, which can lead to academic distress and disengagement (Tight, 2020). Traditional virtual learning environments (VLEs) function primarily as static content repositories rather than interactive learning aids.

By synthesizing human-centered design thinking with conversational AI and machine learning techniques, this project directly addresses these challenges:

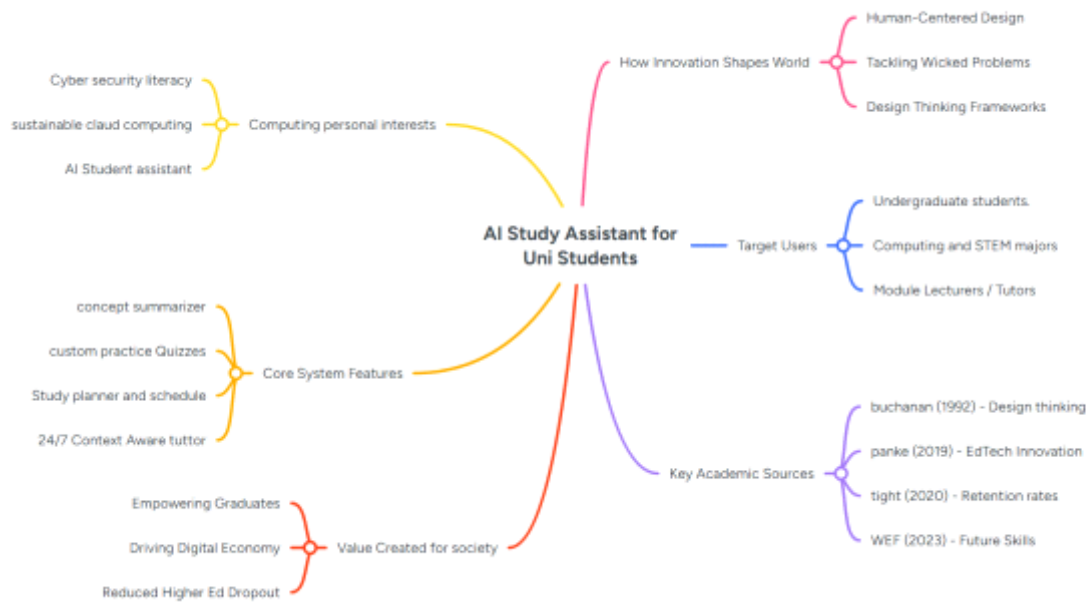
- **Individual Value (Self):** Students gain a 24/7 personal study partner that breaks down complex technical topics, generates custom practice quizzes, and encourages self-regulated learning habits. This boosts academic confidence, autonomy, and reduces study stress.
- **Societal Value:** Empowering university students with accessible AI tools equips broader society with a higher volume of capable, tech-literate graduates, directly driving innovation in the digital economy (World Economic Forum, 2023).
- **Institutional Value:** By providing students with personalized learning support, universities can improve student satisfaction and reduce non-continuation rates in challenging computing and STEM modules.

This selected project acts as a direct bridge to the final-year Independent Project, establishing a foundation for system prototyping, user interaction testing, and qualitative evaluation.

Reference List

- **Buchanan, R. (1992)** 'Wicked problems in design thinking', *Design Issues*, 8(2), pp. 5–21.
Link: <https://doi.org/10.2307/1511637>
- **Panke, S. (2019)** 'Design thinking in education: Perspectives, opportunities, and challenges', *Open Education Studies*, 1(1), pp. 281–306.
Link: <https://doi.org/10.1515/edu-2019-0022>
- **Tight, M. (2020)** 'Student retention and degree completion in higher education: A systematic review of literature', *Research Papers in Education*, 35(6), pp. 695–704.
Link: <https://doi.org/10.1080/02671522.2019.1600808>
- **World Economic Forum (2023)** *The Future of Jobs Report 2023*. Geneva: World Economic Forum.
Link: <https://www.weforum.org/reports/the-future-of-jobs-report-2023/>

Mind map:



Link: <https://mm.tt/map/4059235354?i=kgOCsJlqj>

Task 2: Aim & Objectives and Research Area

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1. Project Aim and Objectives

- **Project Aim:** To design, model, and evaluate an AI Study Assistant software prototype aimed at enhancing self-regulated learning, study efficiency, and academic engagement among undergraduate university students.
- **Project Objectives:**
 1. **Critically review existing literature** on artificial intelligence in education (AIED), self-regulated learning frameworks, and human-computer interaction (HCI) in virtual learning environments.
 2. **Gather and analyze user requirements** through a mixed-methods investigation involving undergraduate students and university module leaders to identify key academic pain points.
 3. **Develop a low-to-medium fidelity functional prototype** of an AI Study Assistant capable of generating personalized study schedules, context-aware summaries, and interactive self-assessment quizzes.
 4. **Evaluate the proposed prototype** through usability testing and heuristic evaluation to assess user satisfaction, system accuracy, and perceived pedagogical value.

2. Research Philosophy

This project adopts a **Pragmatist research philosophy**. As explored in Unit 1 Topic 2 (*How Do YOU Solve a Problem?*), research paradigms shape how knowledge is gathered and interpreted. Pragmatism asserts that the choice of research approach should be determined by the practical problem being solved rather than an exclusive commitment to either Positivism or Interpretivism (Saunders, Lewis and Thornhill, 2019).

Because the creation of an AI Study Assistant focuses on solving a real-world human challenge through design thinking, pragmatism enables a **mixed-methods approach** (Creswell and Creswell, 2018).

Quantitative methods (e.g., system usability scores and feature usage metrics) will evaluate performance and engagement, while qualitative methods (e.g., student focus groups and open-ended feedback) will capture nuanced user experiences and learning behaviors.

3. Search Tools, Databases, and Search Strategies

To conduct a thorough and systematic literature search for known facts and theoretical frameworks (Unit 1 Topic 3: *Known Knowns*), specific academic tools and electronic databases will be used:

- **Primary Academic Databases:**
 - **IEEE Xplore & ACM Digital Library:** Key technical platforms for retrieving literature on machine learning architectures, conversational AI, and educational technology user interfaces.
 - **Google Scholar & Scopus:** Interdisciplinary databases utilized for identifying peer-reviewed studies on educational psychology, student retention, and self-regulated learning.

Search Strategies & Boolean Logic

To filter irrelevant results and isolate high-quality, peer-reviewed sources, structured Boolean search strings will be deployed across these databases:

- ("AI Study Assistant" OR "Conversational AI" OR "Generative AI") AND ("Higher Education" OR "University Students") AND ("Self-Regulated Learning" OR "Academic Performance")
- ("Educational Technology" OR "Virtual Learning Environment") AND ("Design Thinking" OR "User-Centered Design")

Search Filters Applied

To maintain academic rigor, search criteria will enforce the following filters: **Peer-Reviewed Journals and Conference Proceedings**, **Publication Date (2021–2026)** to reflect recent advances in AI, and **Full-Text Accessibility**.

Reference List

- **Creswell, J.W. and Creswell, J.D. (2018)** *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. 5th edn. London: SAGE Publications. Link: <https://www.sagepub.com/en-us/nam/research-design/book255675>

- **Luckin, R., Holmes, W., Griffiths, M. and Forcier, L.B. (2016)** *Intelligence Unleashed: An Argument for AI in Education*. London: Pearson Education. *Link:* <https://openknowledge.worldbank.org/handle/10986/24706>
- **Saunders, M., Lewis, P. and Thornhill, A. (2019)** *Research Methods for Business Students*. 8th edn. Harlow: Pearson Education. *Link:* <https://www.pearson.com/en-gb/subject-catalog/p/research-methods-for-business-students/P200000003157>
- **Zawacki-Richter, O., Marín, V.I., Bond, M. and Gouverneur, F. (2019)** 'Systematic review of research on artificial intelligence applications in higher education – Where are the educators?', *International Journal of Educational Technology in Higher Education*, 16(1), pp. 1–27. *Link:* <https://doi.org/10.1186/s41239-019-0171-0>

Task 3: Research Strategies

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1. Validity, Reliability, Generalisability, and Ethics

To ensure academic rigor, empirical research must address key methodological quality criteria (Unit 2 Topic 2: *Finding a Needle in a Haystack*):

- **Validity:** Construct validity will be established by triangulating quantitative survey metrics with qualitative thematic interviews, ensuring the research measures actual student engagement rather than superficial usage. Internal validity will be preserved by using standardized questionnaires like the System Usability Scale (SUS) (Brooke, 1996).
- **Reliability:** Data collection processes will follow standard, repeatable protocols. Survey instruments will use consistent Likert scales to allow future researchers to replicate the findings under similar university conditions.
- **Generalisability:** Because the sample will consist of undergraduate computing students from a single institution, results will be interpreted as a contextual case study rather than universal law (Flyvbjerg, 2006).
- **Ethical Considerations:** All primary research will follow strict ethical guidelines. Participants will receive informed consent forms detailing the study's purpose, their right to withdraw at any time, and assurances of full data anonymization in compliance with GDPR.

2. Research Strategies, Data Collection & Pilot Feedback

A **mixed-methods exploratory design** will collect both numerical and qualitative data:

1. **Quantitative Data:** A structured online survey using 5-point Likert scales to measure student study habits, time spent searching for course materials, and satisfaction with existing virtual learning tools.
2. **Qualitative Data:** Semi-structured interviews with module tutors to gather insights on common student learning gaps and institutional feasibility.

Pilot Data Collection & Refinement

A pilot 4-question survey was administered to a small peer group ($N = 4$) to test clarity and construct validity (see **Appendix A**).

Pilot Feedback Received:

- *Peer Comment 1:* "Question 2 asks if I feel overwhelmed *and* if I struggle with time management at the same time—it's double-barreled."
- *Peer Comment 2:* "It's unclear whether 'AI Assistant' means an automated search tool or an interactive tutor."

Action Taken: Question 2 was separated into two distinct statements. An explicit definition of the "AI Study Assistant" was added to the survey preamble, defining it as an *interactive tool providing customized study plans and real-time concept summaries*.

3. Quantitative and Qualitative Data Analysis

As explored in Unit 4 Topics 1 & 2 (*It's All In The Numbers & There's a Theme Here*), raw data will be systematically analyzed:

- **Quantitative Analysis:** Descriptive statistics (mean, median, standard deviation) will summarize baseline student frustration levels and system usability scores. Inferential statistics (e.g., paired *t*-tests) will analyze pre- and post-interaction engagement scores (Field, 2018).
- **Qualitative Analysis:** Interview transcripts will be analyzed using **Thematic Analysis** following Braun and Clarke's (2019) 6-phase framework: familiarization, initial coding, searching for themes, reviewing themes, defining themes, and reporting findings.

Reference List

- **Braun, V. and Clarke, V. (2019)** 'Reflecting on qualitative research in psychology', *Qualitative Research in Psychology*, 16(4), pp. 587–597.
Link: <https://doi.org/10.1080/14780887.2019.1587645>
- **Brooke, J. (1996)** 'SUS-A quick and dirty usability scale', *Usability Evaluation in Industry*, 189(194), pp. 4–7.
Link: <https://scholar.google.com/scholar?q=SUS-A+quick+and+dirty+usability+scale+Brooke>
- **Field, A. (2018)** *Discovering Statistics Using IBM SPSS Statistics*. 5th edn. London: SAGE Publications.
Link: <https://www.sagepub.com/en-us/nam/discovering-statistics-using-ibm-spss-statistics/book257622>
- **Flyvbjerg, B. (2006)** 'Five misunderstandings about case-study research', *Qualitative Inquiry*, 12(2), pp. 219–245.
Link: <https://doi.org/10.1177/1077800405284363>

Appendices

Appendix A: Pilot Survey & Feedback Log

1. Initial Draft Pilot Questions

1. *How many hours per week do you spend revising technical course content outside of class?* [*<2 hrs / 2–5 hrs / 5+ hrs*]
2. *Do you find course modules overwhelming and difficult to organize?* (Note: Marked as double-barreled during pilot)
3. *Would an AI tool that summarizes lectures into bite-sized quizzes improve your study routine?* [Strongly Disagree to Strongly Agree]
4. *How likely are you to use an automated AI study companion?* [Scale 1–5]

2. Pilot Feedback & Refinement Summary

Participant	Identified Issue / Feedback	Revision Implemented
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Peer 1	Question 2 was double-barreled.	Split into two questions: one for "workload volume" and one for "time management."
Peer 2	Ambiguous term "AI tool."	Added clear preamble defining the AI Study Assistant features.
Peer 3	Response options for Q1 were too narrow.	Added extra time ranges (5–10 hrs, 10+ hrs).