

Assignment 1: Innovation & Research

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Task 3: Research Strategies Your answers to the questions bellow should refer to a project/research area of your choice

Introduction

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This project explore how a personalised study-support app, guided by simple machine-learning technique, could help first-year computing students manage the demands of their course. Many students entering university for the first time struggle with organising deadlines, understanding new technical concepts and maintaining steady study habits.

A digital tool that adapts to individual learning patterns may offer a more tailored and supportive experience. The research therefore aims to understand the challenges students face and gather insight into how a personalised system could be designed to meet their needs.

To achieve this, the study draws on a combination of survey, pilot feedback and literature on digital learning and student development.

Task1: Ideation and Mind Map Answer the following questions to create a Mind Map

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Mind Map (Computing and IT) - Innovation, Creativity and Project Idea

Central Node: Innovation in a Digital World



1. Creativity in Computing

▪ Concept

Creativity in IT involves designing novel digital solutions, algorithms and interface that solve real-world problems in new ways. It is not only artistic but also analytical and technical. [1]

▪ Relevance to Tech

- Software design often begins with imaginative exploration.
- Creative thinking helps developers approach technical constraints differently.

▪ Personal Development

Building creative confidence allows IT professionals to experiment, take risks in design and generate unconventional solutions.

▪ Examples

- Designing new UX approaches
- Creative use of APIs
- Writing innovative automation scripts

2. Innovative and Its Role in Technology

▪ Definition

Innovation is the process of transforming creative concepts into functioning digital products or systems that deliver new value.

▪ Types of Innovation in IT

- Technical innovation: new architectures, programming models or networks.
- Process innovation: agile methodologies, DevOps, automation pipelines.
- User-focused innovation: apps, platform, interactive systems.

▪ Importance in Society

Modern economic and social systems rely heavily on digital innovation cloud computing, cybersecurity infrastructure, AI-supported services and digital communication networks.

3. How Digital Innovation Shapes Society

- **Social Transformation**
 - Digital systems reshape how people work, learn, access services and communicate.
 - Remote work and online education demonstrate society's reliance on computing innovation.
- **Economic Impact**
 - Tech innovation creates new industries such as fintech, blockchain and extended reality.
 - Automation increases efficiency while requiring new skillsets. [3]
- **Ethical Dimensions**
 - Issues of data privacy, algorithmic bias and responsible AI.
 - Ethical innovation requires transparency and user protection.

4. Innovation and Personal Growth in IT Students

- **Skill Development**
 - Learning to innovate strengthens problem analysis, system design, debugging and experimentation.
- **Professional Growth**

Employers seek graduates who can combine creativity with technical proficiency.
- **Mindset**

Approaching challenges experimentally, embracing failure and iterating ideas leads to better digital solutions.
- **Alignment with the Field**

Computing evolves constantly, so personal adaptability is essential. [2]

5. Programme-Relevant Concept Areas (Computing and IT)

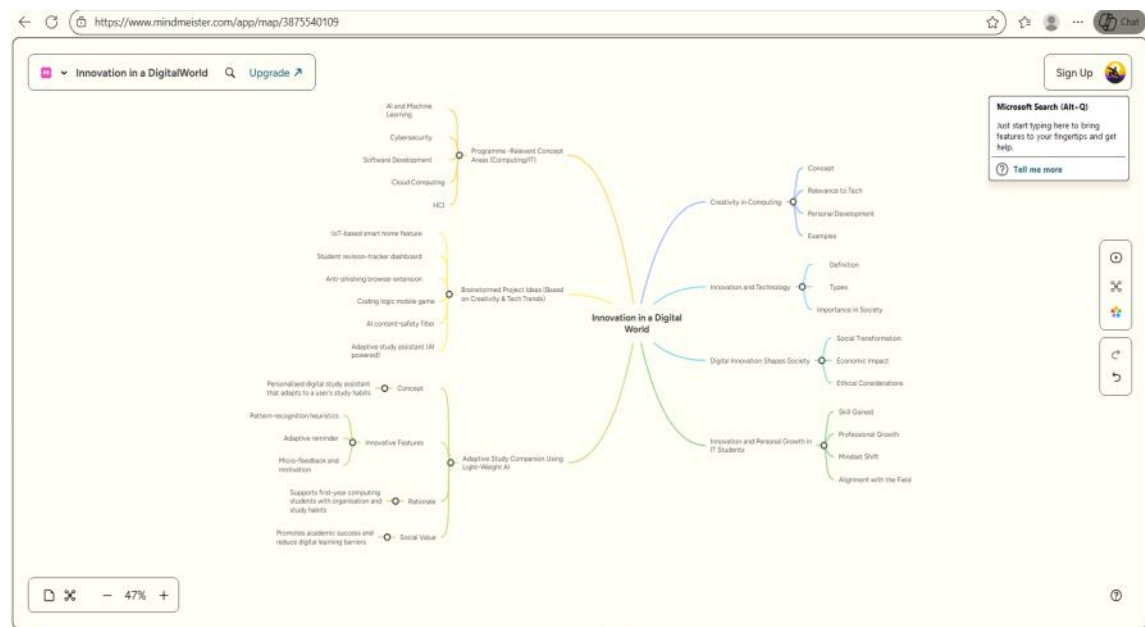
- **Artificial Intelligence and Machine Learning**
 - Intelligent decision-making systems
 - Natural language processing
- **Cybersecurity**
 - Protecting critical systems
 - Ethical hacking
- **Software Development**
 - Full stack design
 - Mobile and web application development
- **Cloud Computing**
 - Scalable services
 - Distributed architecture

- **Human-Computer Interaction (HCI)**

- Designing usable interfaces
- User-centred design principles

6. Brainstormed Project Ideas (based on creativity and tech trends)

- Smart home automation using IoT devices
- A personalised revision-tracking dashboard for students
- A browser plugin that detects phishing elements on websites
- A mobile game teaching basic coding logic
- A minimal-AI model for detecting harmful content in chat platforms.
- An adaptive study assistant that learns a user's habits. [4]



7. Selected Project Idea (Q2)

- **Concept Summary**

A mobile or web-based companion app that adjusts reminders, micro-lessons and difficulty levels based on user interaction.

- **Innovative Elements**

- Uses machine-learning heuristic to recognise study patterns
- Provides personalised task lists
- Offers micro-feedback and motivational nudges

- **Rationale**

First-year computing students often struggle with time management and adjusting to technical learning. A personalised digital support system would reduce cognitive overload and increase engagement. [5]

- **Value to Society**

This system could support equity by helping students with varied learning background access structured support.

References:

- [1] A. Norman Donald, *The design of everyday things*, MIT Press, 2013
- [2] E. Von Hippel, *Democratizing innovation*, the MIT Press, 2006
- [3] J. Tidd, "Integrating technological market and organizational change," *Managing innovation*, 2005
- [4] L. Floridi and J. Cows, "A unified framework of five principles for AI in society," *Machine learning and the city: Applications in architecture and urban design*, pp.535–545, 2022
- [5] M. A. Boden, *The creative mind: Myths and mechanisms*, Routledge, 2004

Task2 : Aim and Objectives and Research area Your answers to the following questions, should refer to a project / research area of your choice (related to your programme of study)

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- **Q1.** Create and document a single Aim, and several Objectives for your project

Aim :

To explore how a personalised study-support app powered by simple machine-learning technique, could help first-year computing students manage their workload, reduce stress and stay with their studies.

Objectives:

1. To examine existing literature a versatile learning tools and digital support systems used in higher learning.
2. To identify the most common academic and organisational challenges faced by first-year computing students.
3. To outline a design concept for an app that adapts reminders, short lessons and difficulty levels based on individual study habits.
4. To investigate machine-learning approaches that could recognise learning patterns and support personalised recommendations.
5. To assess the potential educational value and practical limitations of such a system through academic evidence and real world examples.

These objectives keep the project focused on understanding both the technical background of adaptive systems and the everyday struggles students face when transitioning into computing programmes.

- **Q2.** Identify, an suitable research philosophy for your project

Research Philosophy

A practical research-philosophy is the best fit for this project. Pragmatist focused on finding the most useful way to answer a question, rather than committing to one strict philosophical viewpoint. This is important here because the project sits at the intersection of technology and student experience.

On one hand, machine-learning methods and digital tool design lend themselves to a more scientific measurable approach. On the other hand, understanding how students study, cope with workload or respond to digital support is more interpretive and human centred. Pragmatism allows the project to draw from both sides without forcing the research into a single methodological box. [1]

This approach makes it possible to use technical evidence such as how adaptive algorithms work, while also considering educational insights about motivation and learning behaviour. Pragmatism is commonly used in studies involving technology in education because it supports mixed methods, flexible thinking and practical problem-solving. It enables the research to focus on what actually helps answer the research question, rather than being restricted by philosophical boundaries. [2]

• **Q3.** Select, and document appropriate search tools, including some particular research-databases to recognise research related to your project area and use search strategies to spot relevant research related to your project.

To gather reliable material for the project, a combination of wide-reaching search tools and specialised academic databases will be used.

Search Tools:

- Google Scholar - useful for quickly finding a board range of academic papers on digital learning and machine learning.
- Semantic Scholar - helps locate influential studies and provides recommendations based on previous searches. [3]

Academic Databases:

- IEEE Xplore - ideal for technical papers on machine learning, algorithms and system design.
- ACM Digital Library - a key resource for computing education studies, especially research on beginner programmers and learning technologies.
- ERIC -provides a strong base of educational literature, particularly studies focusing on student learning challenges.
- ScienceDirect - covers wider research in educational psychology and technology-enhanced learning.

Search Strategies:

Boolean searching will be used to narrow down results and keep them relevant, like:

- ♦ "adaptive learning" and "machine learning" and "higher education"
- ♦ "study support tools" or "learning companion apps"
- ♦ "first-year computing students" and " time management"
- ♦ "personalised learning systems" not "secondary school" [5]

Filters such as publication year, peer-reviewed and discipline-specific categories will help ensure quality. [4] In addition, reviewing the reference lists of useful articles, often called

citation chasing, will help uncover further relevant sources that may not appear in the first round of searches.

References :

- [1] A. Jeilani and S. Abubakar, "Perceived institutional support and its effects on student perceptions of AI learning in higher education: the role of mediating perceived learning outcomes and moderating technology self-efficacy," *Frontiers in Education*, 2025
- [2] M. Saunders, P. Lewis and A. Thornhill, *Research methods for business students*, Pearson education, 2009
- [3] C. Dell and A. Bevilacqua, "EMBRACING OR RESISTING? EXPLORING PRE-SERVICE TEACHERS' ENGAGEMENT WITH GENERATIVE ARTIFICIAL INTELLIGENCE IN MULTIMEDIA REPRESENTATIONS," *EDULEARN25 Proceedings*, 2025
- [4] R. Luckin, *Machine Learning and Human Intelligence. The future of education for the 21st century*, UCL institute of education press, 2018
- [5] L. Pugliese, "Adaptive learning systems: Surviving the storm," *EDUCAUSE Review (Online)*, 2016

Task3 : Research strategies your answers to the questions bellow, should refer to a project / research area of your own choice

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- **Q1.** Consider and document strategies to increase validity, reliability, generalisability and ethical considerations. Online section: Unit 2 Topic 2: "Finding a needle in a haystack"

For a project exploring a personalised study-support app, it is important that the research method used are credible and fair.

VALIDITY can be improved by making sure the questions genuinely reflect what the project is trying to understand mainly how first-year computing students manage their workload and how they feel about digital support. One way of doing this is by basing the questions on issues already highlighted in previous studies on student transition and digital learning. Asking clear, neutral questions and avoiding technical jargon also helps students give honest and accurate responses. [1]

RELIABILITY to be improved, the research tools must be used consistently. Every participant should receive the same set of instructions and the same wording of questions. A short pilot test of the questionnaire can also reveal where students get confused or misinterpret items, which allows changes to be made before proper data collection begins. Reliability essentially comes from being methodical and ensuring that someone else could repeat the study and get similar results.

GENERALISABILITY can be more challenging because the project focuses on first-year computing students. However, inviting students with different backgrounds, ages and levels of confidence can help ensure the finding reflect a boarder mix of experiences. Although the study is small in scale, linking the results to existing research on student support and digital learning can help show how the findings may still apply beyond the immediate group. [2]

ETHICAL considerations are essential especially when working with students who may already feel overwhelmed. Participants should know exactly what the study involves, that their involvement is voluntary and that they can stop at any time. No sensitive information should be collected and all responses must be stored securely. It is also important to reassure students that taking part will not affect their academic standing. Ethical approval from the institution should be in place before any data is gathered to ensure the study meets proper standards.

- **Q2.** Select research strategies / data collection methods you would use to collect data for your project.

Design a pilot data collection method appropriate for your project, and obtain some feedback, to improve the focus of your project (include in an appendix section / page and refer to in the main body of the proposal).

For this project, a combination of online survey and short optional interviews would work well. Surveys are useful for gathering data from a wider group and identifying common learning challenges. They also suit students who prefer quick, anonymous participation. Interviews, even if very short, can offer more detailed insight into how students manage their study time and what they think a personalised learning app could offer.

To make sure the survey works as intended, a **pilot version** will be given to a small group of first-year computing students around three of five individuals. The aim of the pilot is not to collect data but to test whether the questions make sense, flow well and feel relevant. [3]

Participants will be asked in small cases like:

- Whether any questions felt unclear

- If the survey took too long
- And whether there were topics they expected but did not see.

Their comments will be used to adjust the wording and structure of the survey before it is used for the main study

• **Q3.** Shape at least one variety of quantitative and qualitative analysis

The project can make use of both quantitative and qualitative approaches, depending on the data gathered. For the survey, simple quantitative technique such as percentages, averages or charts can show common patterns for example, how many students struggle with deadlines or how often they feel overloaded. Even basic descriptive statistics can provide a clear picture of the main issues. [4]

For qualitative data such as comments from interview or open-ended survey responses, **thematic analysis** is appropriate. [5] This involves reading through the responses and identifying recurring ideas, such as difficulties with programming concepts, poor time management or the desire for more structured guidance. Themes do not need to be complicated, they simply help organise the material so it becomes easier to interpret.

Using both types of analysis gives a more rounded understanding of the challenge and fits well with the practical problem-solving nature of this project.

References:

[1] A. Field, *Discovering statistics using IBM SPSS statistics*, Sage publications limited, 2024

[2] J. W. Creswell, "Research designs. Qualitative, quantitative, and mixed methods approaches," 2009

[3] A. Bryman, *Social research methods*, Oxford university press, 2016

[4] V. Braun and V. Clarke, "Thematic analysis: A practical guide," 2021

[5] R. Race and C. Vidal-Hall, "No title," *The BERA/SAGE handbook of educational research—Volumes 1 and 2*, 2019

Conclusion

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In summary this project sets out to understand how a personalised, machine-learning driven study-support app could make a meaningful difference to first-year computing student. The research strategies selected, supported by careful attention to validity, reliability and ethics, aim to produce findings that genuinely reflect students experiences and needs.

By combining quantitative insights from survey data with richer, qualitative perspective, the study builds a balanced view of the challenges students face when adjusting to technical learning.

The pilot stage has already helped refine the research tools and ensure they are clear, relevant and sensitive to the student context. Although the project is small in scale, the evidence gathered will contribute to a more informed design of an adaptive support system that can encourage better study habits, reduce stress and promote academic confidence.

Ultimately, this research highlights the potential for thoughtfully designed digital tools to provide more personalised and equitable support for learners as they navigate their first year of computing studies.