

Innovation & Research

15 May 2025 21:26

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Q1 | Aim & Objectives of Project

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Overview

Developing suitable aims and objectives require time and careful consideration. Previous studies in the field should be analysed to gain an idea of how other researchers frame their aims and objectives. Demonstrating draft aims and objectives to colleagues and friends and ask them to provide criticism. Project objectives should demonstrate the work required to complete the project in contrast to research objectives which showcase the foundational knowledge the project aims to build upon. [6]

Project Aim

To successfully integrate a university's student information system with the UK Government's learner database via its API, automating the import of missing student qualification records to significantly enhance data quality, reduce manual workload for HESA returns, and minimize data entry errors.

Project Objectives

1. **Baseline Documentation:** Document the current manual process for identifying and inputting missing student qualification data for HESA returns, including an estimate of associated time, effort, and typical error rates.
2. **System Design & Development:** Design, develop, and build a secure and robust solution that connects a university's student information system with the UK Government's learner database API for automated qualification import.
3. **System Implementation & Deployment:** Implement and deploy the automated qualification import system within a university's operational environment, ensuring seamless integration with existing student record systems.
4. **Operational Performance & Efficiency:** Achieve a reduction in the manual time and effort currently expended on HESA returns related to qualification data.
5. **Data Quality Improvement:** Increase the accuracy and completeness of student qualification records through the automated import process, particularly for records that were previously missing or incorrectly entered.

Q2 | Research Philosophy

20 May 2025 18:20

This project will adopt a pragmatistic research philosophy. This choice of research is driven by its focus on solving a real-world problem and the inherent flexibility of the philosophy; pragmatism is focused on the practical utilization of knowledge and how well a solution achieves the desired outcomes. The project's aim of reducing manual workload for HESA returns and improving data quality directly correlates to the problem-centric nature of pragmatism.

The project requires a flexible approach rather than purely adhering to quantitative or qualitative methods. The successful retrieval and formatting of data from the API does offer objective verification, however the success of the project also relies on the understanding of its practical implications, challenges and opportunities within the university's operations. Some facts such as how much time is saved or the improvement in the quality of data may initially be driven from stakeholder experience over purely statistical data.

Embracing both methods is crucial as it permits the integration of objective assessments of improvement in data quality, while also providing qualitative insights into the user experience and the impact on staff workflows. By utilizing pragmatism, it ensures the evaluation of the project is grounded in its practical impact and its ability to provide tangible improvements. Pragmatism prioritizes the research question and the potential utilization of the findings, enabling the project to improve data management practices and potentially advance best practices within higher education. [7-8]

Q3 | Search Tools

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There are a multitude of different research tools and databases available to be utilized for research:

- The IEEE Xplore digital library provides access to over 4.7 million scholarly articles, conference papers and technical standards in electrical engineering and computer science.
- The ACM digital library is a leading database for computer science and contains access to more than 0.54 million full text articles and greater than 2.8 million bibliographic entries. [9]
- The University of Wales Trinity Saint David's LibrarySearch platform offers access to a great range of academic resources with the inclusion of articles, journals and e-books across various subject areas.

Additionally there are multiple effective search strategies that can be utilized to maximize precision and relevance to the desired subject area. Boolean operators such as AND, OR, NOT alongside phrase searching and truncation can be utilized to refine queries. Filters can be applied to the resources such as:

- a publication date before 2019 AND after 2000,
- a more precise subject area such as data quality. NOT in the private sector,
- peer reviewed articles OR academic journals.

Using Truncating to Expand Word Endings			
government*	promot*	technolog*	"fossil fuel*"
government	promote	technolog	"fossil fuel"
government	promoting	technolog	"fossil fuels"
governmental	promoted	technological	
	promotes		

The above image demonstrates the usefulness of truncation. It allows expansion of the search parameters with ease by allowing for the search of different words that have slight alterations to each other, but still describe the same subject area. [11]

These filters help to narrow results to high-quality sources. Citation chaining can also be implemented, which refers to the examining of the references of the article. By examining these articles, additional relevant studies can be discovered with ease. [10] Implementing these tools and techniques enables a comprehensive review of the academic subject area which can lead to a greater understanding of research gaps in the project area.

Q1 | Strategies for Research Enhancements

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Validity

Validity is achieved through an analysis of the appropriateness of the research design, sampling and data analysis methods. Techniques such as triangulation, audit trails and respondent validation can be utilized to ensure findings are credible and contextually correct and relevant.

Reliability

Reliability on the other hand is supported by systematic procedures, comprehensive data usage and including cases that do not fit the emerging patterns of the research. Reliability can be reinforced by maintaining a transparent and well-documented research process.

Generalisability

Though generalisability is not typically expected in some research methods such as qualitative, it can be approached through two means:

- **Analytical Generalisation**
Prior studies should be assessed to discover whether the theoretical insights developed from prior studies can be applied in differing contexts that share similar theoretical frameworks.
- **Transferability**
Generating rich and detailed descriptions of the research context, participants and processes that allow the readers to determine whether the findings can be applied to their own contexts. [12]

Ethical Considerations

Researches must uphold multiple ethical principles that are foundational to the research process. Principles such as informed consent, confidentiality and anonymity is important to ensuring the research is both sound in its methodology and ethically responsible. It is important for researchers to uphold these ethical principles while undertaking other social actions such as fostering respectful and non-coercive communication with participants through transparency, trustworthiness and avoidance of conflict of interests. [13]

Q2 | Strategies for Collecting Data (and Pilot Data Design)

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Overview

The project will utilize a pragmatist research strategy and select data collection methods that are flexible, and outcome orientated. Given the small sample size and applied nature of the research / project, two qualitative methods will be utilized: semi-structured interviews and a case study. Implementing these methods into the research will allow exploration of the practical implications of the API solution implementation through capturing data around measurable outcomes and the individual user experiences. Additionally, a pilot study will be conducted to ensure these approaches are contextually and methodologically relevant.

Semi-structured interviews

Semi-structured interviews offer flexibility of exploring stakeholder experiences / perspectives while focusing on important attributes such as workload, data quality and system usability.

Case study

The case study will provide useful documentation on the current workflow within departments associated with the manual qualifications on entry inputting, which in-turn will allow in-depth evaluation of how the API will affect staff workload, data accuracy and overall efficiency. [14]

Pilot study

A pilot study with two participants (n=2) will be conducted to ensure the research methodology is sound and contextually relevant to the project. These participants include the researcher and one other stakeholder. Over the course of the pilot study, both the clarity and suitability of the interview questions will be assessed, alongside the case study framework structurization. This process will assist in identifying any limitations in the methods and provide insights for improvement, demonstrating the contextual relevance of the methods. Careful preparation and evaluation are critical at this stage as emphasized in qualitative research. The feedback provided from this pilot study will encourage modifications that support the structural integrity of the study's research design. [15]

Q3 | Types of Quantitative and Qualitative Analysis

20 May 2025 18:45

Qualitative and quantitative research demonstrate two different methods of investigation. Qualitative methods have a social emphasis, focusing on areas such as human experience, perception and social processes. Techniques such as interviews, ethnography, grounded theory and narrative analysis permit researchers to derive detailed meaning and context. A qualitative approach is interpretive and iterative, focusing on depth, nuance and the perspective of the participant(s) over pure statistics. [16]

Alternatively, quantitative methods place a focus on utilizing numerical data for measuring variables and testing relationships. Techniques such as surveys and experiments produce data that can be used for statistical analysis. The mean and standard deviation can be derived from this data, which can be used to summarize patterns, while t-tests, ANOVA and regression can lead to factual conclusions. The quantitative approach instead prioritises precision, replicability and objectivity from the use of designs that are randomized, or methods that are structured with the goal to ensure reliability and validity. [17]

Both approaches have strengths and can be used together or separately. Qualitative analysis reveals the why behind behaviour, whereas quantitative demonstrates the how much or how often. Integrating both methods can provide detailed insights into research questions, and each are chosen by researchers based on their questions, goals and nature of the research context. [16-17]

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Tutorial Answers

Tuesday, August 12, 2025 2:37 PM

These were done in word and copied to here, so the formatting might be weird.

Unit 1

Topic 1

section 1

5 Things Used / Activities Engaged in That Would not have been Around 10 years ago.

1. ChatGPT
2. Amazon Alexa
3. Virtual Reality Headsets
4. TikTok
5. 5G Networking

ChatGPT allows for me to find information quickly before conducting further research and allows for easy debugging, while Amazon Alexa lets me quickly turn on and off appliances. Whereas VR headsets and TikTok are great entertainment tools, and 5G Networking has sped up internet over mobile data.

Best Innovations of All Time

1. Fire
2. Sailboat
3. The wheel
4. Alphabet
5. Number system
6. Democracy
7. Internal combustion engine
8. Binary system
9. Relativity and quantum theory
10. Vaccines
11. Water purification

Which has had the biggest impact?

Alphabet, it allows us to communicate with the present and future humans alongside the preservation of knowledge and transmission of information over long distances to multiple sources.

Do you still think it after ending?

Yes.

Section 2: Onward March of Technology

NOTE: The industrial revolutions interest me and gene editing.

Which Technologies listed by the World Economic Forum will have the biggest impact in your discipline in the next 3-5 years?

Big data, it will lead to greater AI implementations and greater understanding of our world.

Section 3: Creativity and You

Are you a creative person?

I think it depends on the definition of creativity. I think my greatest skill is in general problem solving, so if you showed me a problem, I would try a wide range of different avenues to try and solve it alongside new approaches. I enjoy experimenting with different methods in my passions such as cooking and will try to alter the taste to likings. I believe I am logically creative but not so artistically creative.

Do we get educated out of creativity?

When did you feel discouraged / encouraged to be creative?

I do not think I have ever been discouraged or encouraged to be creative, I think I have always naturally endeavoured to be creative when I believe I have had the resources to do so. As a result, perhaps I felt most discouraged to be creative when my understanding of a subject was lacking.

Why is creativity important in software engineering?

It is important because as a software engineer you might have to think of a new process for something that has not been done a lot of times, whether for your company or at all. You might be asked to create an

application for a new service with little guidelines or prior development.

Topic 2

Section 1: Why we all need to spend time being creative

When did you last feel creative?

I feel creative often in my job as it requires me to think of unique ways to solve problems. I love being creative and enjoy trying to innovate, it makes me feel dedicated and committed.

NOTE: Creativity is good for mental wellbeing. A study by BBC Arts Great British Creativity test acts as a distraction and contemplation tool and allows self-development. Varying activities is more beneficial than doing the same activity for prolonged periods of time.

Section 2: How your philosophy impacts your research

Forms of Philosophy

Ontology: Who are we and what are we here for? Do we make freewill choices? Most shown in group studies vs individual studies.

Objective

Subjective

Epistemology: How do we know what we claim to know? Most commonly displayed in methods.

Foundationalism

Coherentism

Pragmatism

Axiology: What do we value, what should guide our research? Are we biased?

Ethics

Aesthetics

Section 3: Identify your research philosophy

Positivism: Led by science, only one truth.

Critical Realism: Does not require proof but is derived from positivism.

Interpretivism: Access to reality is only through social constructions.

Postmodernism: Challenge existing thinking.

Pragmatism: Can be multiple realities and no single point of view and ever explain the entire picture.

What aspects do you agree with? Why support these choices more than others?

I think going based off facts and data is the best way to establish any sort of true understanding of a subject but also understand it can be hard to get a definitive answer, and it is important to challenge what we think we already know. However, I think although we are social creatures, our being has evolved much beyond that and a lot of what makes us human is our intellectual and rational ability.

Topic 3

Section 1: Selecting an appropriate database

C: How recent is the material

R: Is it relevant

A: Is it credible

A: Is it accurate

P: What is the purpose of the material

ERIC

Google Scholar

Internet Archive Scholar

JSTOR

Project Gutenberg

PubMed

ResearchGate

Semantic Scholar

Section 2: Using Boolean search strategies for identifying research

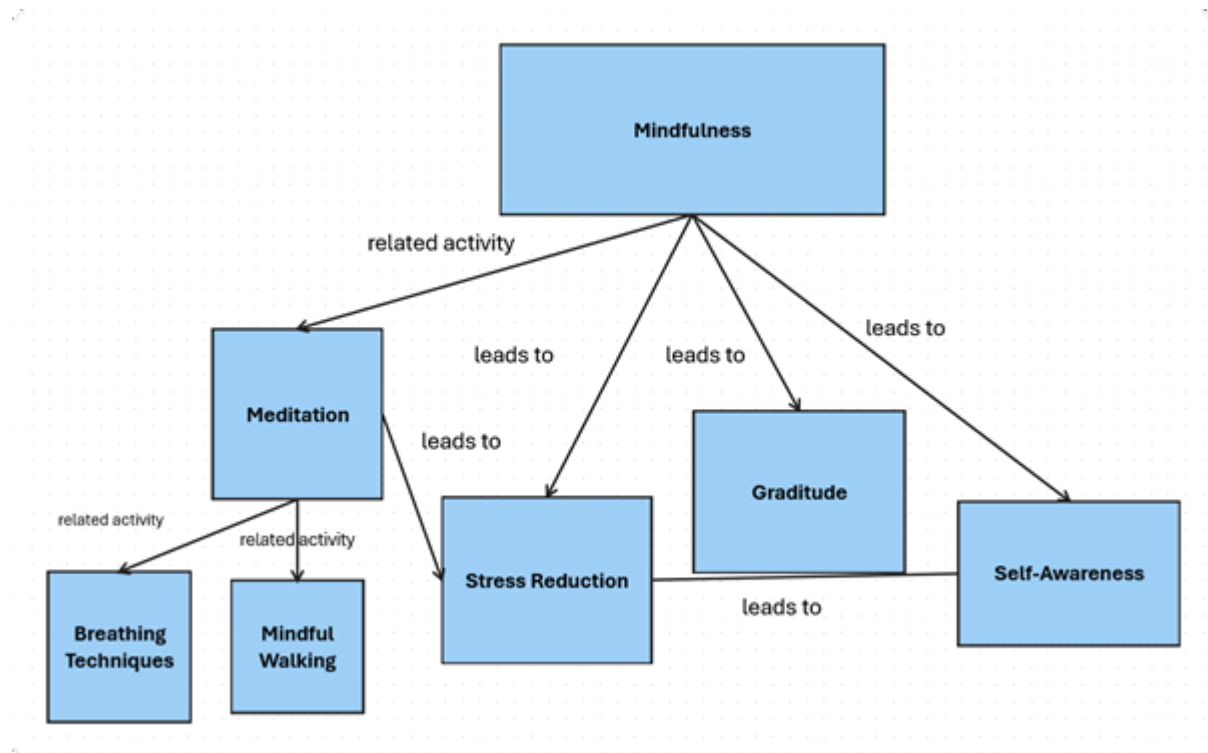
Use ' , * , AND OR NOT

A keyword is all the above. (on the player)

Key words can be located by removing superfluous words

Section 3: Develop a systematic approach to identifying themes for literature search

Concept Map



What is a focus question that can outline what is going to be in or out of scope of research?

How can the LRS API be leveraged to improve data accuracy and streamline the retrieval of student qualifications within a university system, while addressing potential limitations and challenges in integration?

Topic 4

Section 1: Finding Themes from your literature review

Coding interested me since I was young as I love problem solving and creating things

My research at the university will be made meaningful as I wish to further increase the knowledge within the coding field.

Section 2

Before buying a car, I researched heavily the most fuel efficient and reliable cars by years, models and real-world anecdotes. Before parting with my money, I looked within to see how I really felt about the decision, and concluded I was happy and gave the car a test drive to see how the car felt.

Integrating the GOV.UK LRS API into the university system will significantly improve the accuracy and efficiency of student qualification records by reducing manual data entry errors and streamlining retrieval processes

Section 3

I love learning something new, it makes me feel excited.

When I'm told I'm wrong it depends on who's saying it and how. I can either feel indifferent or bad.

The last time I had feedback from someone did improve my idea, it helped refine the design.

Unit 2

Topic 1

Section 1: Awareness of investigative approaches

I aim to take the third route of reviewing several solutions to an observation and choosing the best fit.

Section 2

When I have received a good mark on a piece of work it has because I applied my knowledge to a problem that I have observed

Make sure your problem state:

- Is specific.
- Is clear.
- Refers to the phenomenon.
- Reflects the intervention in experimental research.
- Notes the target group of participants.

Explaining and testing initially attract me for pro-forma question formats in my subject.

Section 3

In technology I think the predominant method of research is quantitative, whereas in education I think there is more balance between quantitative and qualitative.

Qualitative: Ask how she would deal with some differing customer scenarios.

Quantitative: Ask her to define book genres and different types of material.

Topic 2

Section 1: Awareness of different research choices and data collection methods

Section 2: Develop appropriate sampling strategies to enhance validity, reliability and generalisability

Section 3: Design a data collection method appropriate to investigate a given problem

The data collection plan will require both quantitative and qualitative data.

Quantitative for measuring improvements in data accuracy, efficient and error reduction.

Qualitative for gathering user feedback on usability and challenges.

This can be achieved via

Surveys

System logs

Interviews

Observation

The sample size will be

100-1000 records of qualifications to review their quality.

1-3 university staff who have worked with the current system.

Data collection methodology will include

Collecting data on manual data entry, errors & processing time

Survey the administration staff

Conduct interviews with structured questions

Case studies of specific student records

Topic 3

Section 1

What you can use a house brick for:

Jack stand for a car without a wheel

Phone stand

Weight to hold something down

Carve into it to make a phone protector

Split it in half, put two anchors into it, a wire, and you have brick nun chucks.

Three examples and how SCAMPER applies:

Virtual Reality: Coming out with new ways to simulate a world we've never seen before.

Reliable cars: Plan the design of cars in such a way that they are more mechanically sound.

Games: Improving upon existing systems by reimagining how controls affect the game.

Section 2

Famous person who is a divergent thinker: Einstein

Section 3

Gawain wanted to feel confident and look professional.

Topic 4

Section 1

They criticize so much that they miss a key part of being human.

His campaign is deeply personal, and he is trying to help fight a key part of our history, and he's trying to improve the lives of many people, and campaigning to raise awareness.

Section 2

It takes only a small amount of time before organized becomes disorganized.

Section 3

I prefer the Lackeus' framework as in my view it provides more of a landscape for deriving value.

Unit 3

Topic 1

Section 1

Networking can help with making a breakthrough as new perspectives can offer valuable information. Some people I know have gotten jobs via personal connections.

Section 2

Section 3

High Low = Boss

High High = Clients, LRS

Low Low = Other Staff

Low High = Friends

TOPic 2

Section 1

When I needed funding support, I approached a bank as they can provide a lot of money without any personal ties.

Accelerators	a small seed investment with a period of mentoring
Incubators	where entrepreneurs can develop their ideas
Angel investors	investment during their early stages of growth
Venture philanthropy	an approach to funding charities or social enterprises
Loans	convenient financing for almost any purpose
Bootstrapping	funding the business via the use of personal funds
Crowdfunding	the best ways to test an idea in the market/gain funds
Venture capital	a person or a firm that offers funds for % of ownership

Section 2

Section 3

Topic 3

Section 1

I would give it a 5 for both narrative coherence & fidelity, the video builds up the message well and accurately portrays struggles of the modern day with technology and social media, can't rate on the slides. I wouldn't say it really had any weaknesses.

Section 2

Section 3

Topic 4

Section 1

Prototyping is the conversation you have with your ideas means you are trying to figure out the practicality and usability of your ideas, moving from theory to practise.

Section 2

A lot of agile methodology has already been built into my workflow as part of my apprenticeship; it has improved it by simplifying aspects of the projects I have worked on and made it more iterative.

Unit 4

Topic 1

Section 1

"Quantitative research in software development uses numerical data and statistical analysis to measure and analyse relationships between variables in the software development process. It aims to identify independent and dependent variables, reduce complexity, and test hypotheses. This approach is particularly useful for describing the current state of software-related characteristics, monitoring progress, anticipating problems, and predicting project parameters like cost, time, and quality." From Google AI, alongside lots of different research articles.

Section 2

Authors present data in charts and graphs, and I have also done so, it can make data easier to visualise in comparison to tabular format if the data is complex or large in volume.

I would use a line graph to describe the correlation between academic success to students reading age results as you have two variables that can correlate together on a large spectrum of potential values for academic success.

Section 3

I think it is both the inward and outward appearance, if the outward appearance did not catch your attention, you would not have afforded yourself the opportunity to look inward.

Again, from information is beautiful, they are both works of art and convey more meaning due to the way they have been drawn; it is not a mutually exclusive relationship.

Topic 2

Section 1

There may be some scenarios where quantitative research is hard to get or data around a subject is hard to quantify for a certain subject due to the practicality of the subject. It can provide research with not as hard facts but still can provide a good image of a problem when it is hard to extract statistical information from a topic. Both qualitative and quantitative methods have their place in research.

Organizing qualitative data before collection helps clarify your research focus, design better questions, and ensure consistency in how data is gathered. It also supports ethical planning and makes analysis easier later. By thinking ahead, you can avoid collecting irrelevant or overwhelming data, saving time and effort. This preparation improves the quality of your findings and helps future research run more smoothly, with clearer methods and better use of resources.

SECTION 2

A theme or pattern is something that has a consistency and similarity and can be compared with other objects to analyse if they are of the same pattern or theme.

Section 3

Topic 3

Section 1

Failure is a learning opportunity that allows us to grow. I haven't had any real mistake that has set me back, I try my best to adapt and learn from every failure, which leads to growth.

When I bumped my car after first passing, I learned to be more careful while parking and to spend extra time on parking.

Section 2

Section 3

I cannot think of anyone famous that seems to have been successful from being lucky, it might be an aspect for every famous person.

Topic 4

Section 1

I am studying so I can get a certificate in my subject to demonstrate my expertise. It is so I can easily demonstrate to employers my expertise. One word, Demonstration.

Section 2

I think I could do this for my work, yes.