

Designing an Automated Timesheet Management System

Rachid Aboulachouaq

University of Wales Trinity Saint David



Prifysgol Cymru

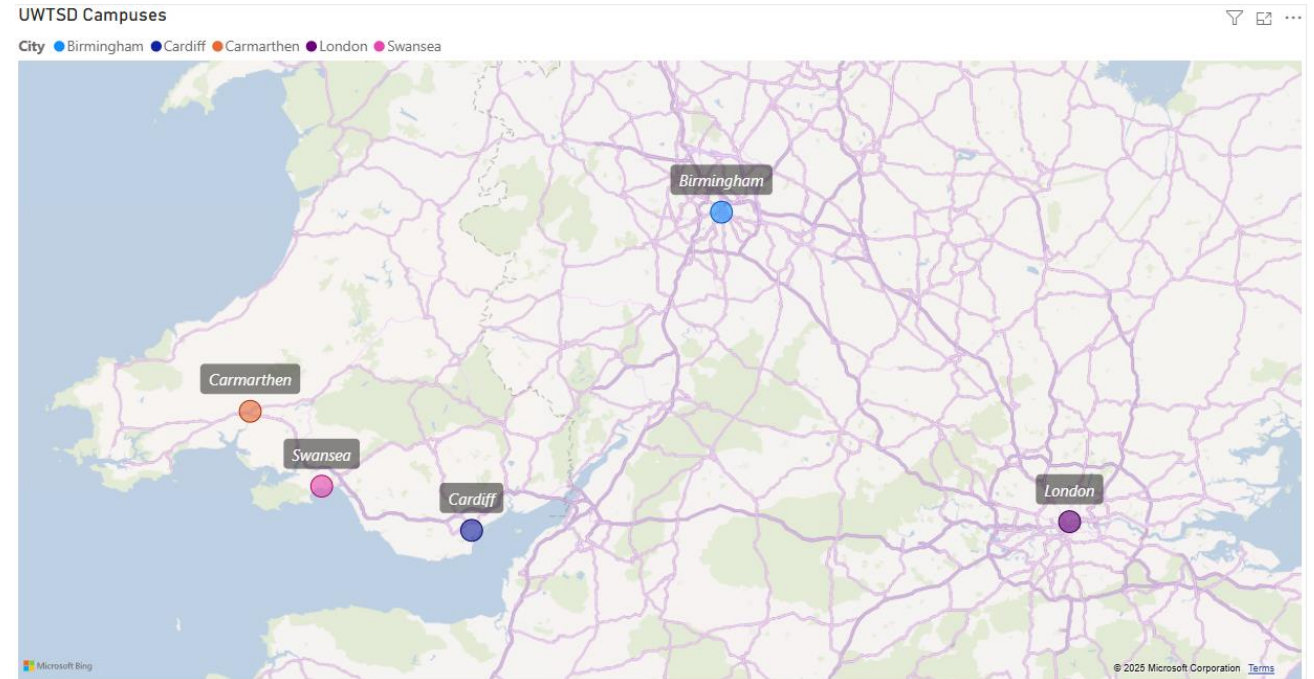
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Research context

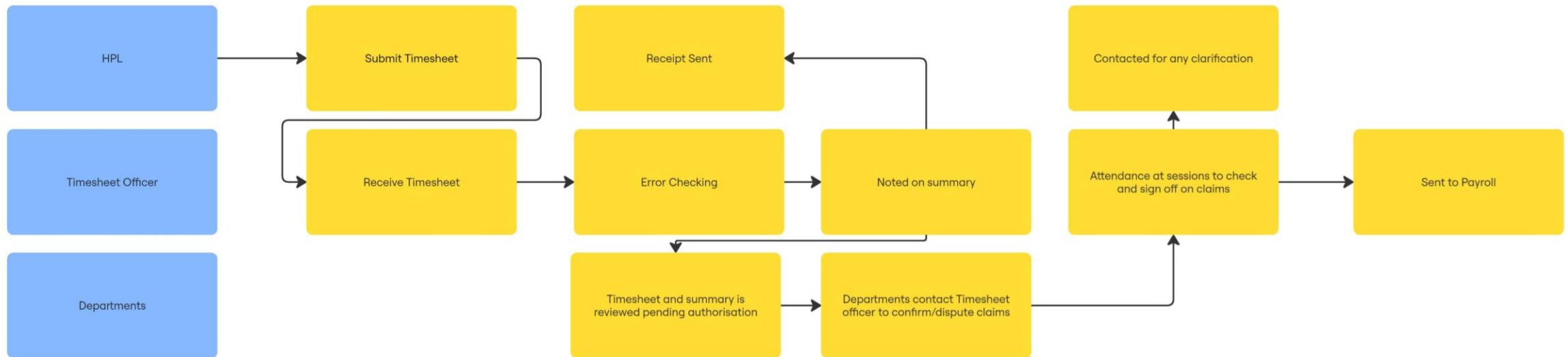
- UWTSD is a fairly large higher education provider in the UK, with several campuses located across the country.
- Some administrative operations are centralised, as such the management systems for the university need to be robust and scalable to maintain, and improve, efficiency of it service to staff and pupils



Visual created with Power BI

The Issue Identified

- In a cursory review of aspects of the university systems, an issue that was brought to attention was the use of multiple timesheets in a workflow for payroll processes regarding hourly-paid lecturers (HPLs). As such there is a reliance on this timesheet process currently in the organisation
- The current process is laborious one



The Problems

- The problem with this is that manual processes are slow and prone to error
- Common errors identified include:
 - Clashing entries (Duplicate claims)
 - Incorrect information (filename, template, information location)
 - Inflated claims
 - Missing information (attachment, signature etc)
 - Sent to wrong contact emails (Delays and security concern) [1]

This has a detrimental effect on organisational efficiency by affecting payroll accuracy and compliance with the organisation and GDPR data policies, as well as scalability [2].



The Costs

Payroll inaccuracies, if not identified, can put additional financial burden on the organisation

The fact that there is data sent to incorrect email addresses is a massive concern for data compliance in the organisation and could harm trust between the university and staff.

The overall administrative burden of this process can cause delays and put stress on other functions of the organisation, which resources can be put to better use elsewhere [2]

Research Problem

- Organisations often rely on manual or semi manual timesheet process that are inefficient and error prone. Processes such as these can create bottlenecks in the university, taking valuable time away from all those involved in the process
 - The current process is inefficient, inaccurate and error prone and has potential to be streamlined
 - Application of a comprehensive automated solution can help to mitigate issues.

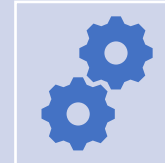
Research Aim

- Aim
 - To design a new comprehensive management system for timesheet submission that utilises automation to streamline workflow, verification and oversight.

Research Objectives



Investigate current system and identify challenges in submission and authorisation processes



Identify areas where automation can be implemented to reduce manual workload, data entry errors and delays in the workflow



Design a system architecture that uses automated submission, verification and notification processes



Implement a prototype system that satisfies core automation requirements

Literature Review

- A review of academic and industry literature highlights gaps in timesheet management, barriers to automation adoption, and effective practices in system design. These insights form the theoretical basis for defining system requirements, with particular emphasis on three core areas of timesheet management and automation.
 - Data quality
 - Automation
 - Process management systems

Data Quality

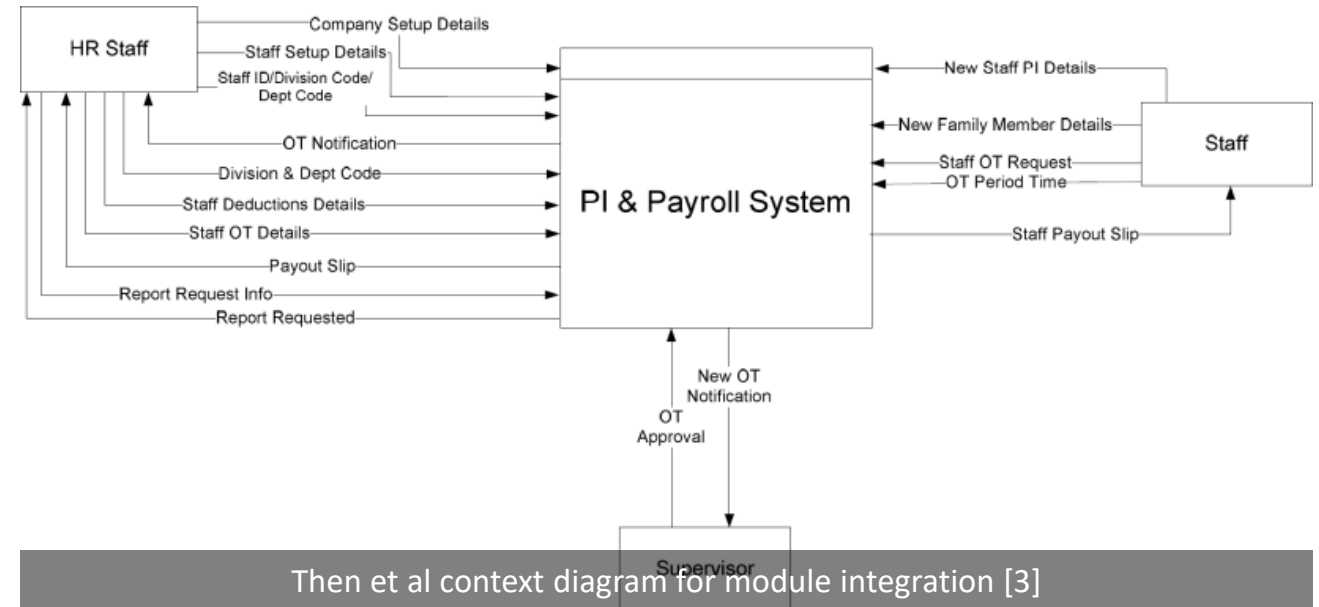
- Data quality is the measure of how suitable data is for its intended purpose. High-quality data is accurate, complete, consistent, timely, valid, unique, and reliable, ensuring that it can be trusted and effectively used.
- Haug et al perform a theoretical review on existing research on data quality. They highlight the economic cost associate with poor data quality, such as inaccurate data and provide a framework detailing direct, in-direct and hidden costs [2]
- Supporting literature can be found linking data quality further to enterprise systems alongside other technologies. More and Mucherla emphasise the importance of master data management (MDM) within enterprise resource planning (ERP) in their 2025 conference [3].

Hidden costs	E.g. long lead times, data being registered multiple times, employee dissatisfaction, etc.	E.g. focus on wrong customer segments, poor overall production planning, poor price policies, etc.
Direct costs	E.g. manufacturing errors, wrong deliveries, payment errors, etc.	E.g. few sales, low efficiency, problems in keeping delivery times, etc.
	Effects of poor quality data on operational tasks	Effects of poor quality data on strategic decisions

Data Quality Cost Framework [2]

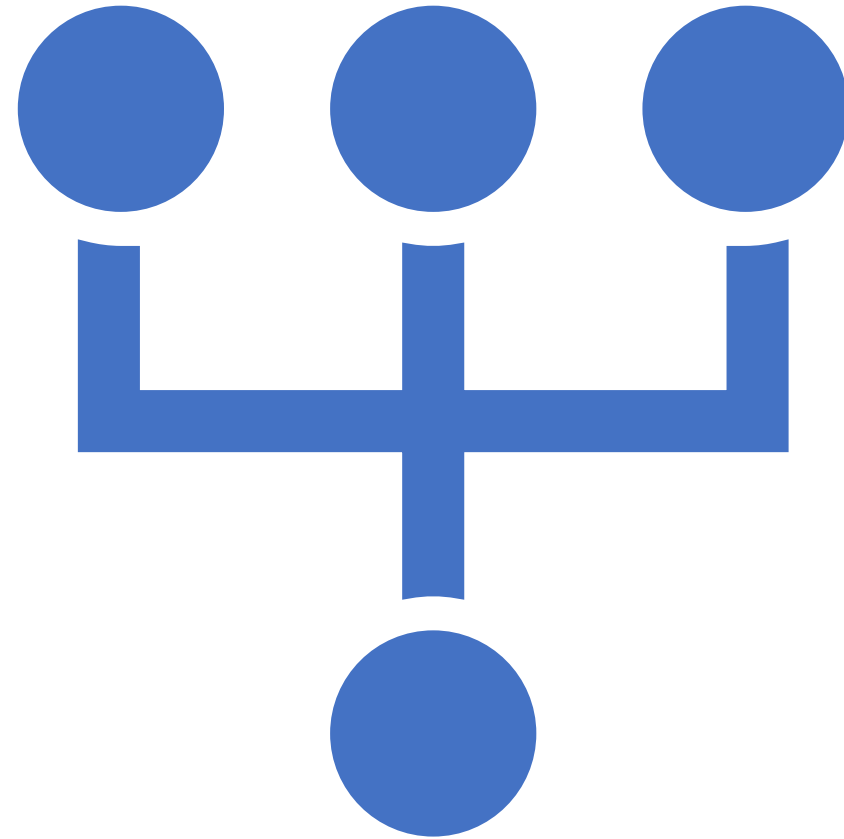
Automation

- The automation of payroll and enterprise systems is well established, with existing studies showing how design improves accuracy, minimises errors, and broadens accessibility across functions.
- However, while payroll and enterprise automation has been extensively studied and shown to improve accuracy, reduce errors, and enhance accessibility, similar attention has not been given to timesheet management. Nonetheless, design principles such as web-based access and modular integration, identified in previous research, provide a foundation for adapting these advances to timesheet submission systems [4][5][6].
- For example, Bao et al (2023) proposed a software management system for automation in construction, highlighting the value of automation in complex workflows by reducing human error [4]



Process Management Systems

- Literature on process management systems (Bartlett et al., 2023; Moreira et al., 2024; Uskenbayeva et al., 2019) identifies key considerations around organisational structure, scalability, and adoption hurdles. Drawing on these findings will support the project in addressing challenges like resource limitations and integration with legacy systems [7][8][9].
- This will assist particularly in the design aspect of the management system





Research/Development Methodologies

- This project adopts a pragmatic philosophy, as it seeks to address a real-world problem and deliver a practical solution. Pragmatism allows methodological flexibility, enabling the use of both quantitative and qualitative techniques, such as Boolean unit testing and end-user interviews.
- Issues such as research quality and researcher bias may affect the project. These risks will be managed by defining requirements early and employing an agile development approach with the client, helping to ensure that the final system meets user expectations.
- The project takes a deductive approach, using existing research in automation, data management, and design to shape the system. However, during development, inductive reasoning will be used to refine features iteratively, ensuring continuous improvement agile development cycles.

Software Development Strategy

- A prototype will be developed following modular architecture principles to create a minimum viable product. Core functionalities will include automated submission checks, rule-based verification, escalation workflows, and reporting dashboards. Iterative refinement will be guided by agile development practices.
- Why Agile?
 - Flexible, supports continuous feedback and iterative improvement.
 - Enables rapid development of a minimum viable product (MVP) for early testing.
 - Well suited to a single-researcher project.
 - Regular updates with supervisor ensure feedback and ongoing refinement.
 - Aligns with the project's inductive approach and pragmatic research philosophy.

Action Research Strategy



The prototype will be evaluated through an action research strategy. This will be achieved through:



Usability testing

A sample of users will be used to assess the efficiency, accessibility and user experience of the product



Performance metrics

Quantitative metrics to measure product performance
Reduction in approval time, error rates, compliance with GDPR



Feedback

Feedback through short interviews and surveys

Limitations, Risks and Ethical Issues

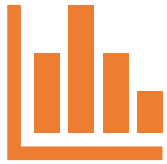
Limitations

- Integration challenges: Legacy systems and multi-department authorisations may restrict data access for automation.
- Feedback integration: Combining user feedback with quantitative data may be difficult; novelty bias may also influence responses as it is a solution the issue (i.e. beggars can't be choosers)
- Lack of standards: No clear quality benchmarks for evaluating such a system.
- Time constraints: Single-researcher project may limit scope, though mitigated by structured planning and scheduling.

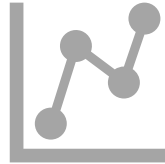
Ethical Issues

- Consent: All participants in usability testing and interviews will provide informed consent and retain the right to withdraw.
- Data protection: Sensitive data will be anonymised where possible; mock data will be used in early development.
- Compliance: Project will follow GDPR, institutional policies, and UWTSD ethics guidelines.

Data Collection



Data will be evaluated using a mixed methods approach



Quantitative

Quantitative data from system logs will be analysed with descriptive and comparative statistical techniques to identify improvements in efficiency and accuracy. Visualisations will be produced to highlight development trends, and measures of central tendency (mean, median, mode) will provide an overall summary of results.



Qualitative

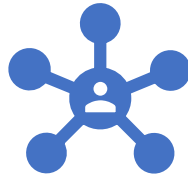
User interviews will be categorised by theme, such as usability and interface design. This analysis will reveal challenges and opportunities not shown in system metrics. Together with quantitative results, these insights will form a comprehensive assessment of performance and acceptance.

Resources/Materials



Resources used in this project will be minimal and will consist of open-source tools and software appropriate for the task, and software and tools that UWTSD already have licenses/subscriptions of.

As such, the highest cost associated with this project will be the actual development time involved.



Hardware Resources

- Development and testing on institute-provided work laptop (MS Surface Pro) with internet and organisational network access.
- Ability to connect to database servers and cloud resources to support development.
- Hardware must be capable of running required development software.
- Access to existing systems (e.g. HR information, academic departments, Celcat) for data extraction and workflow implementation.



Software Resources

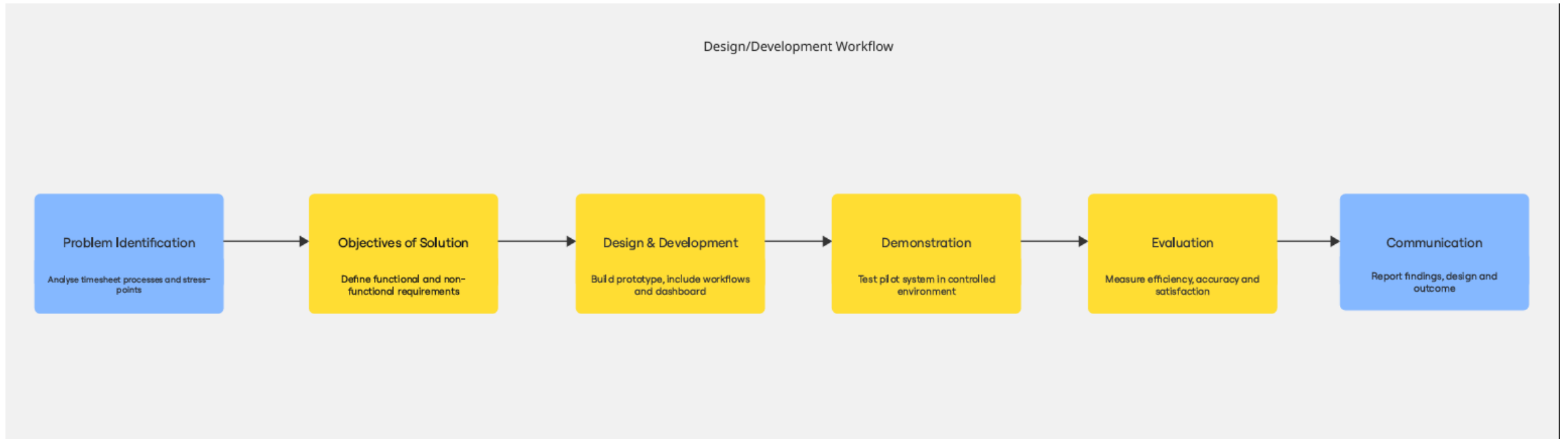
SQL Server Management Studio – SQL queries and data extraction.

Microsoft Visual Studio 2022+ – C# development environment.

Microsoft Fabric – Workflow engine for managing automation.

Power BI – Data visualisation and reporting dashboards.

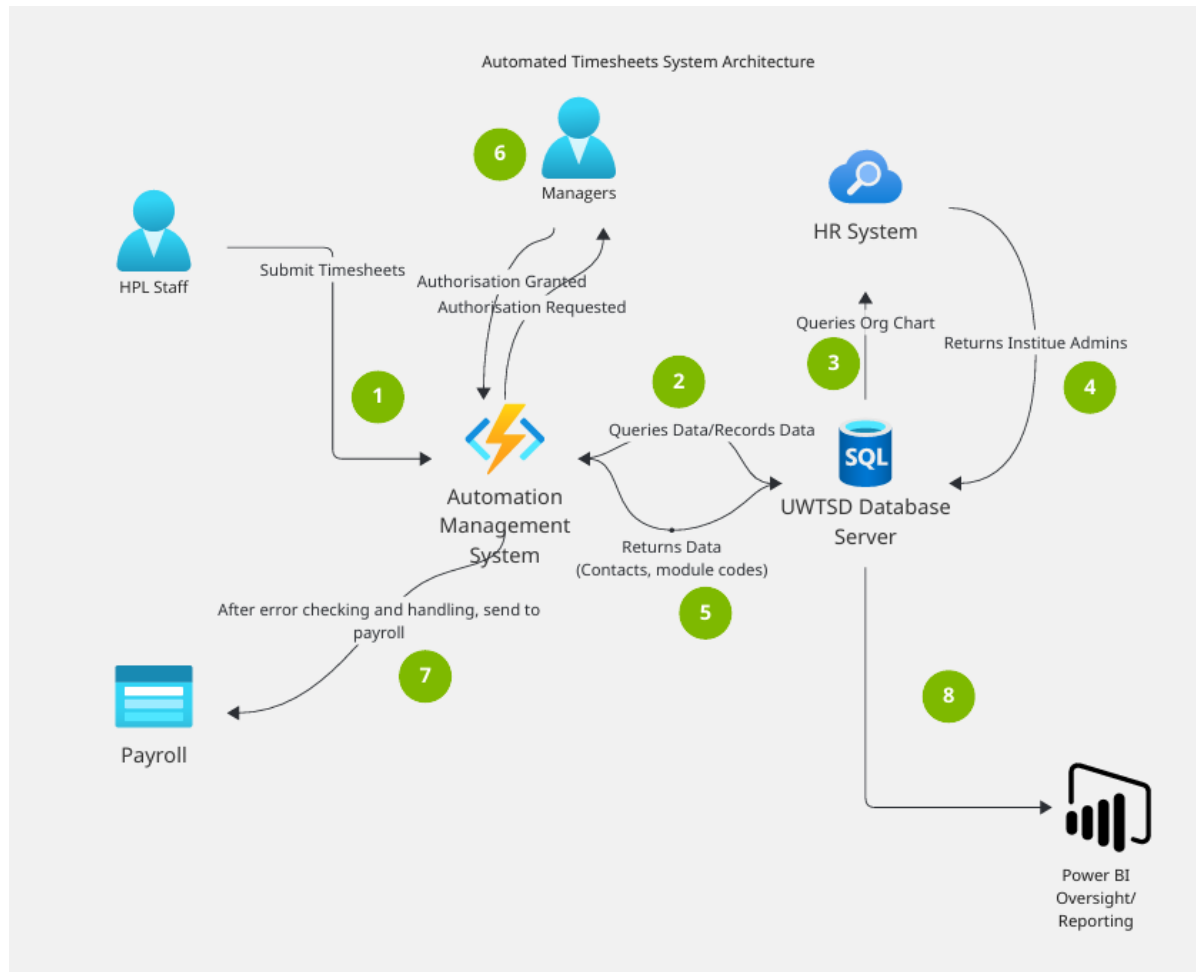
Project Plan



Workflow produced with Miro

The project will follow a phased approach, defined by the above stages. Each phase will aim to contribute a deliverable aspect to the project.
Further detail on the next slide

Project Plan

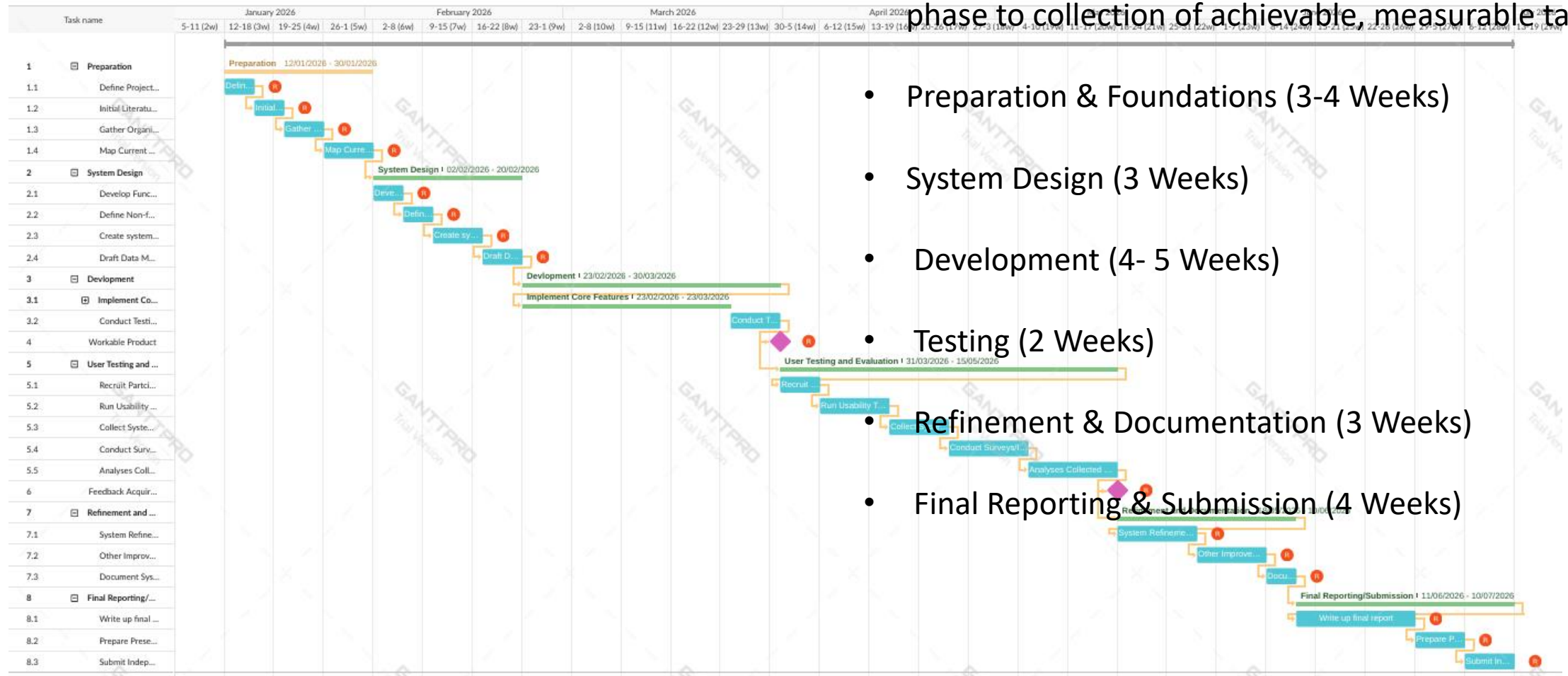


System Architecture Diagram Produced with Miro

- An initial system architecture designed to visualise the components of the system and to assist with module integration, drawing foundation on More et al's conference paper [2].
- Retains aspects of the current workflow, but attempts apply automated functions to certain aspects to address the stress points identified

Project Plan

My Team | IBR_Timesheet_Automation



- Again, utilising a phased approach and reducing each phase to collection of achievable, measurable tasks.

- Preparation & Foundations (3-4 Weeks)

- System Design (3 Weeks)

- Development (4- 5 Weeks)

- Testing (2 Weeks)

- Refinement & Documentation (3 Weeks)

- Final Reporting & Submission (4 Weeks)

Project Plan (Summary)



The project plan maps tasks across six months, from requirements gathering to final report submission, with key milestones and a phased structure to track progress.



This systematic approach demonstrates the project's viability and provides a clear path to achieving the research objectives.

References

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