ISDM Project: AI-integrated Application System

TUTORIAL 7 GROUP 5

PROJECT BACKGROUND

Social Housing Allocation System - Overview

- ***Background***: Many applicants are dissatisfied with the current application process due to a lack of clarity and long wait times
- ***Objective***: Develop an AI-powered system to improve transparency and fairness while bolstering efficiency in the Netherlands social housing process
- ***Users***: Applicants, Government Officers, and AI System Developers

Product Description:

- A web-based portal to improve the end-user's experience of applying for social housing
- Provides tailored housing recommendations based on user information
- Offers real-time application tracking and status updates
- Facilitates secure document upload process and identity verification
- ***Features***: Explainable AI, user-centered design and accessibility for various users

Tim

CONSTRAINTS, RISKS AND TOLERANCES

Constraints

- ***Maintain compliance with Netherlands Housing Laws*** and EU data privacy laws (GDPR)
- ***Seamless system integration*** to existing housing and applicant databases
- ***Usable across a variety of devices and supports users*** of varied digital literacy and language requirements.

Tolerances

- ***Minor delays*** in non-core features (such as UI enhancements) and ***agile iteration changes*** are allowed
- Core ***functionality is unaffected*** without disrupting users
- ***Provided schedule and deadline is maintained***, the scope is tightly managed

Risks and MitIgation

- ***AI Bias in Decision Making***
  - Transparent logic, bias audits and officer override capabilities
- ***Public Distrust in Automation***
  - Explainable outcomes, clear appeal processes and human interference in system
- ***Data Inconsistency or Downtime***
  - Managed with backup protocols, early-stage API testing and fallback handling

Jason

INVESTMENT APPRAISAL

1) **Project Cost Breakdown**:
   1.1) ***$1.1M*** Development
   1.2) ***$400K*** Implementation
   1.3) ***$500K*** Maintenance
   1.4) **$2M** Total Project Cost

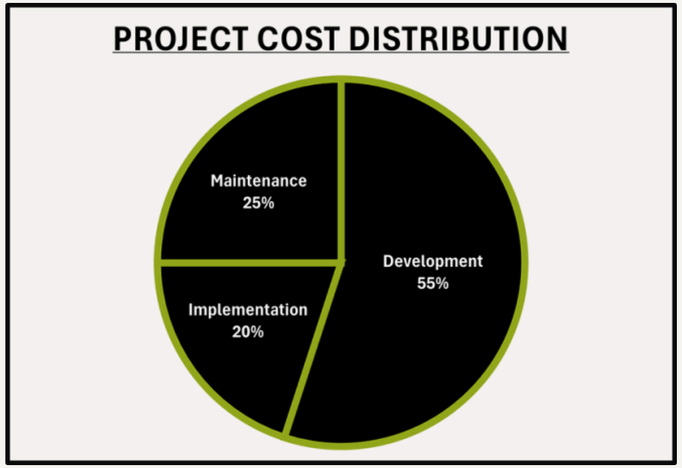


Figure 1 - Project Cost Distribution

2) **Total Annual Benefits**:
   2.1) ***$650K*** Cost Savings
   2.2) ***$350K*** Efficiency Value
   2.3) **$1M** Total Benefits

Total Annual Benefit = Annual Cost Savings + Efficiency Value
Total Annual Benefit = $650,000 + $350,000
Total Annual Benefit = $1,000,000

Figure 2 - Calculation of Total Annual Benefits

3) **Cash Flow Table (5-Year Period)**:
   → ***Positive cash flow turnover*** from Year 2

Year	Cash Flow ($)
0	-$2,000,000 (Investment towards new AI housing allocation system)
1	+$1,000,000 (Expected cash flow from AI Housing allocation system)
2	+$1,000,000 (Expected cash flow from AI Housing allocation system)
3	+$1,000,000 (Expected cash flow from AI Housing allocation system)
4	+$1,000,000 (Expected cash flow from AI Housing allocation system)
5	+$1,000,000 (Expected cash flow from AI Housing allocation system)

Figure 3 - Cash Flow Table

Key Financial Outcomes:

- ***Payback Period*** = 2 Years
- ***Conclusion*** → Fast ROI + Low Risk + Long-Term Value

PROJECT INITIATION - EMPATHY MAPS

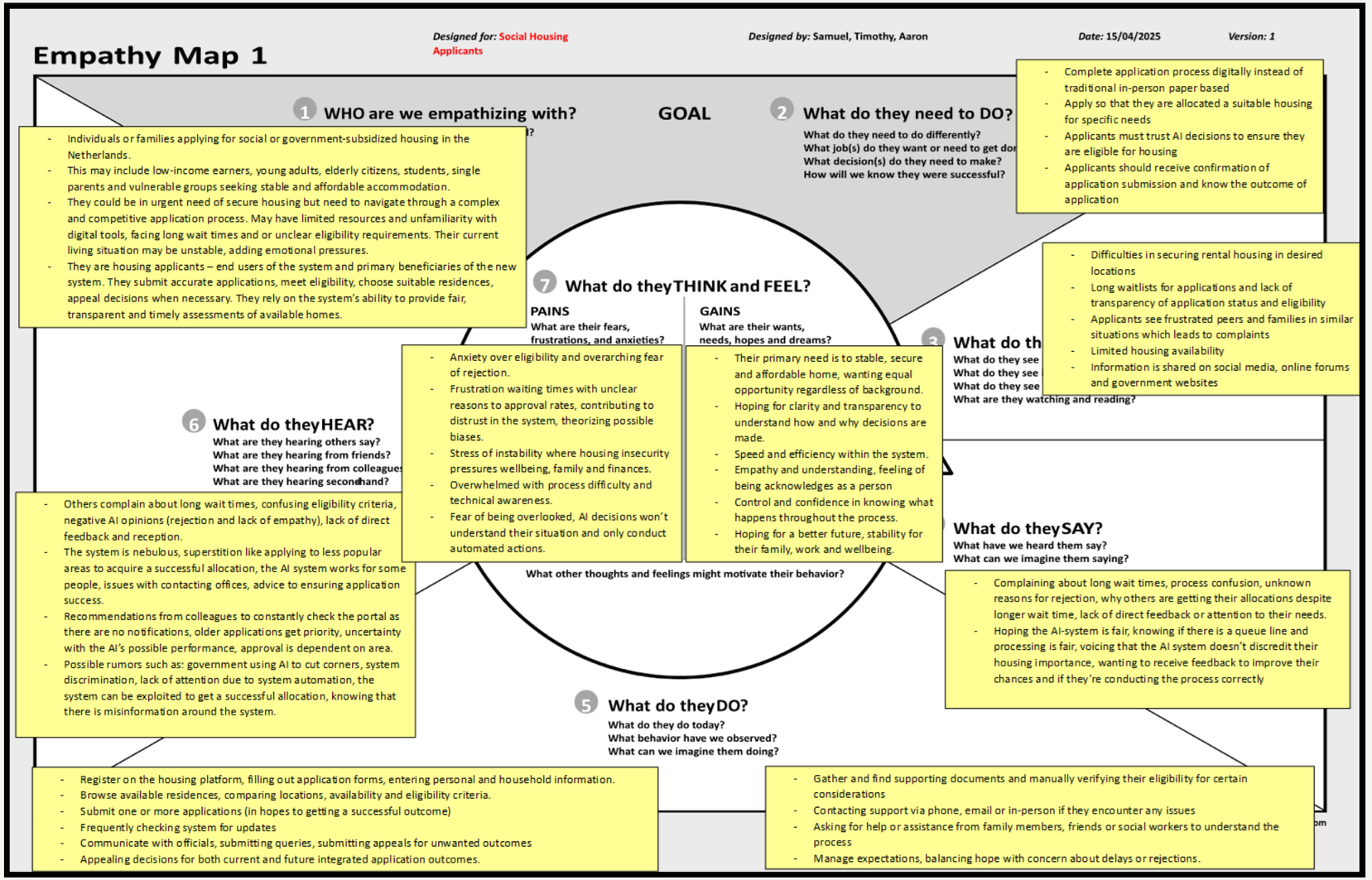


Figure 4 - 'Netherlands Social Housing Applicants' Empathy Map

PROJECT INITIATION - EMPATHY MAPS

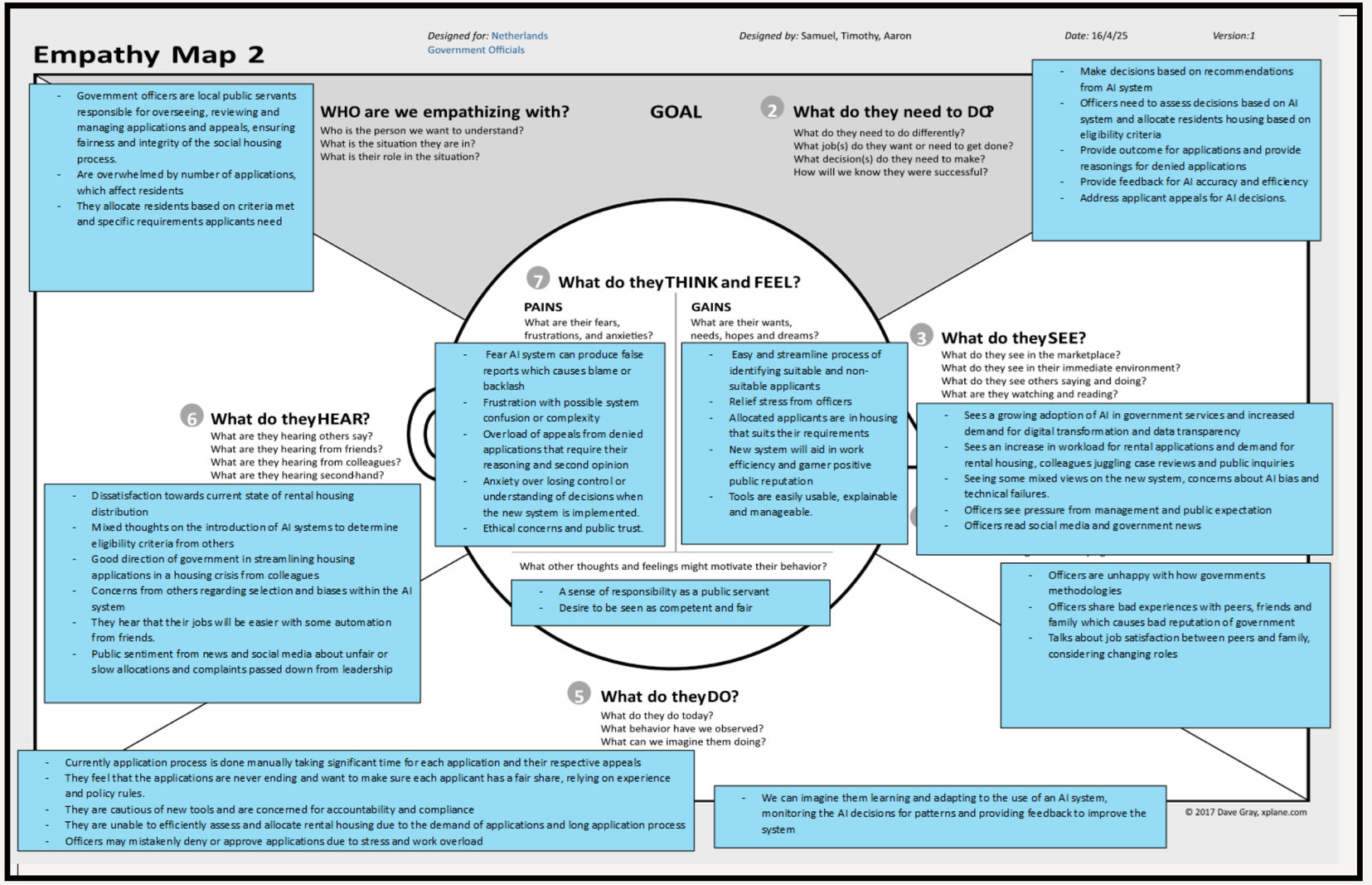


Figure 5 - 'Netherlands Government Officials' Empathy Map

PROJECT INITIATION - EMPATHY MAPS

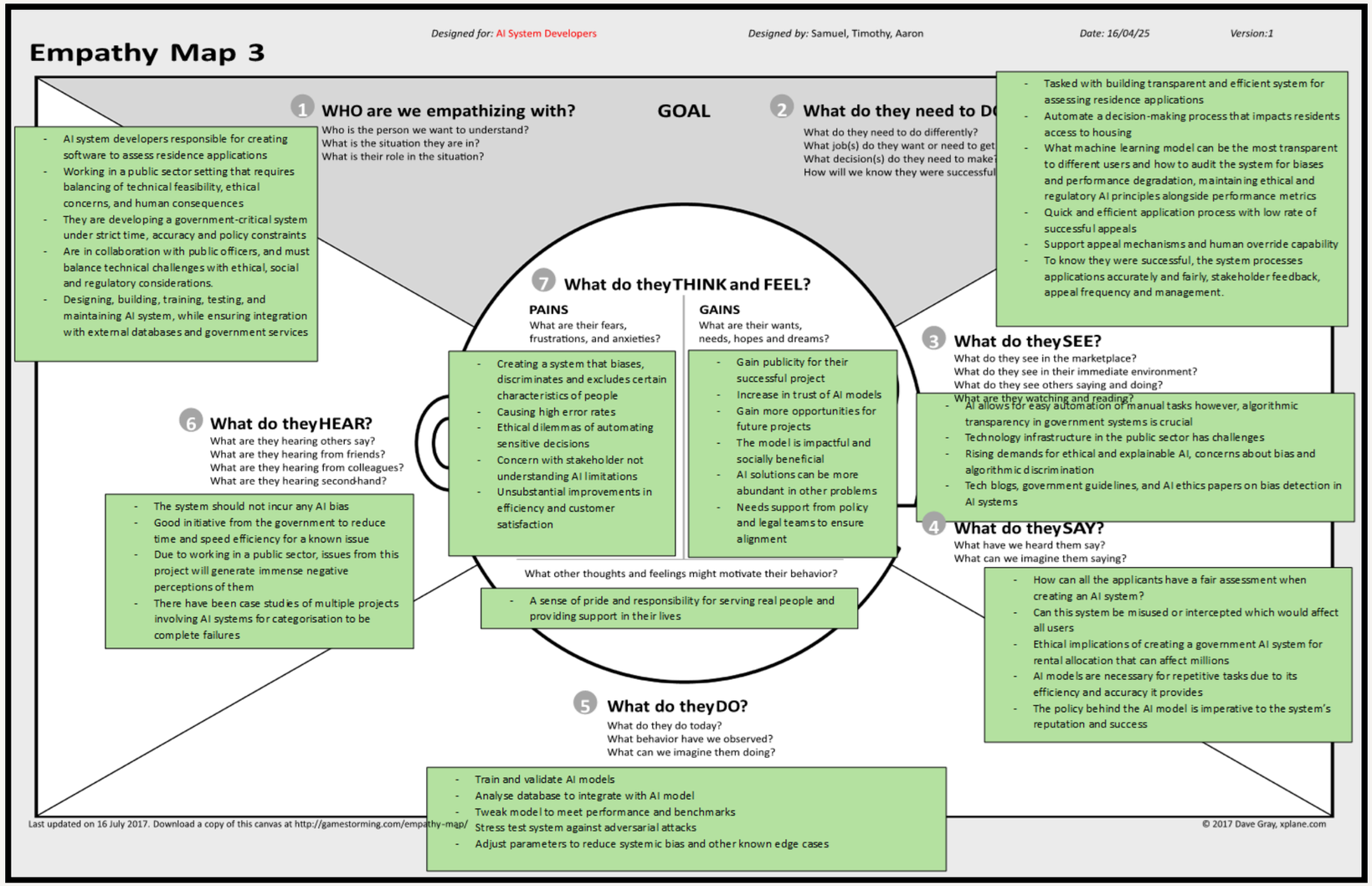


Figure 6 - 'AI System Developers' Empathy Map

PROJECT INITIATION - JOURNEY MAPS

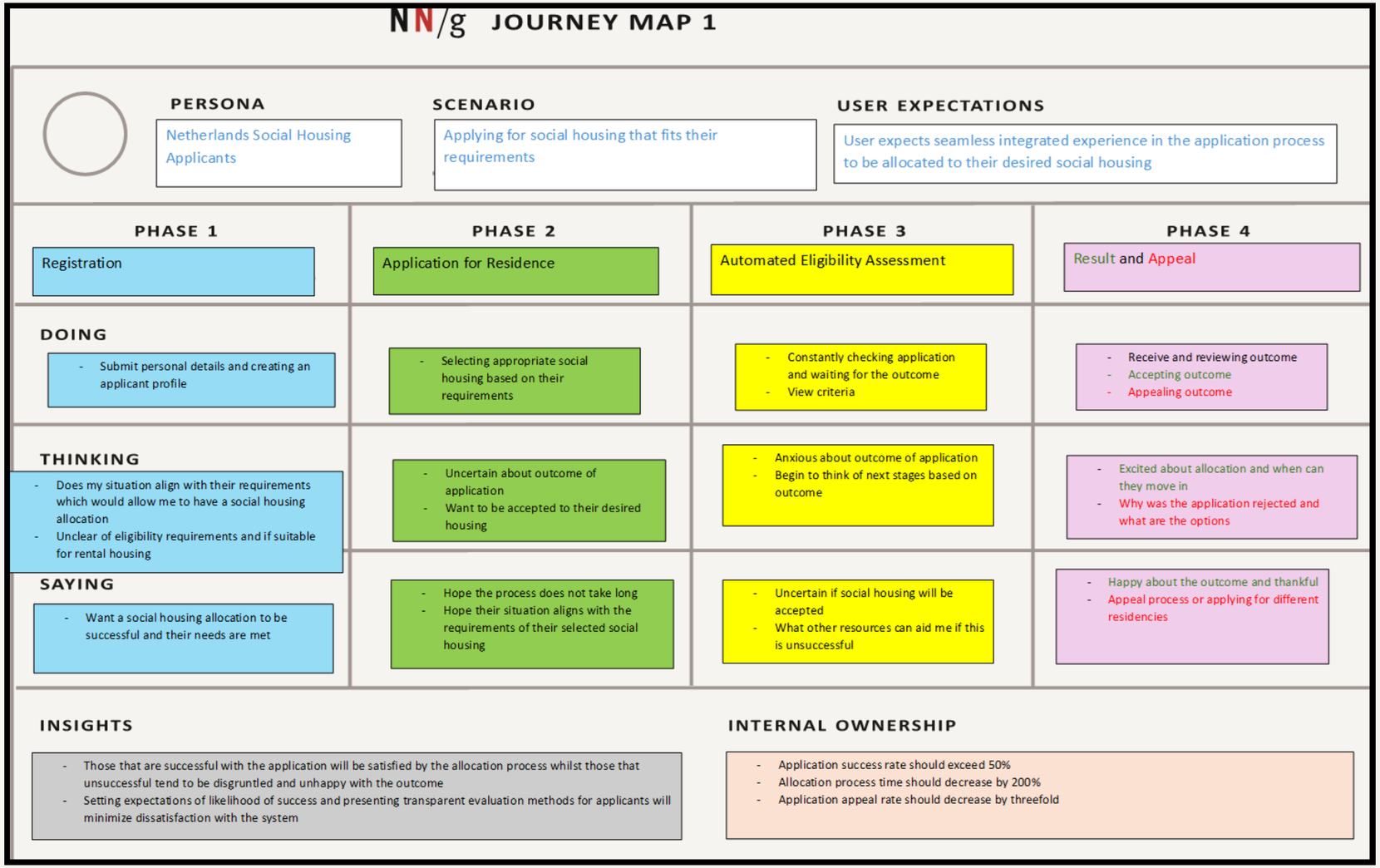


Figure 7 - 'Netherlands Social Housing Applicants' Journey Map

PROJECT INITIATION - JOURNEY MAPS

NN/g JOURNEY MAP 2

PERSONA
Netherlands Government Officials

SCENARIO
Reviewing and managing applications and appeals, ensuring fairness and integrity of the social housing process Applicants

USER EXPECTATIONS
Netherlands Social Housing Applicants

	PHASE 1	PHASE 2	PHASE 3	PHASE 4
	Review Application	Provide Outcome	Review Appealed Applications	Provide extra support
DOING	- Sort through applications - Review against eligibility criteria provided by system - Understanding applicant's situation	- Reviewing system results - Determining whether system evaluation is correct - Choosing successful applicants	- Sort through appealed applications - Reevaluate application against successful application - Cross evaluate with colleagues outcome - Provide further reasoning for denied applications	- Providing resources and other means of non-rental housing support - Advise on how to increase chances of success - Help them understand the system
THINKING	- Does this applicant meet the requirements - Has this applicant created similar requests before - Comparing with other applications, which one is more serious	- Is the chosen applicant the most suitable for this residence - Has the system corrected placed applicants as per the evaluation criteria - Will there be any changes to this decision	- Was this application denied with correct reasoning? - Was there bias in the decision making - Is there reasoning behind the appeal	- Will this denial affect the applicant significantly - Is providing support enough - Will providing support increase the applicants' chances of success
SAYING	- Theres too many applications and not enough available - This system has allowed for more eligible applicants to apply	- This system aids in evaluating applicants faster with ease - The applicant should be satisfied with their allocation - Those who are not successful should understand why	- There seems to be less appeals due to transparency in decision making - How can we still help the applicant in the event of unsuccessful housing allocation	- I hoped everyone was successful however there is not enough social housing - Everyone deserves a roof over their head

INSIGHTS
- Allows officers and applicants to understand the depth of government assistance regardless of approved or rejected applications
- Enables future development with automated AI systems
- AI systems have allowed resources to be reallocated to increase efficiency not just in the specified system

INTERNAL OWNERSHIP
- Government officials: Final outcome of applications and handles appeals

Figure 8 - 'Netherlands Government Officials' Journey Map

PROJECT INITIATION - JOURNEY MAPS

NN/g JOURNEY MAP 3

PERSONA

AI System Developer

SCENARIO

Building transparent and efficient system for assessing residence applications

USER EXPECTATIONS

Netherlands Social Housing Applicants

	PHASE 1	PHASE 2	PHASE 3	PHASE 4
	Understand Problem and Planning	Designing System	Building and Testing	Launch & Feedback
DOING	- Understanding requirements and eligibility rules - Discuss with stakeholders on requirements of the project	- Drafting system architecture - Defining rules for AI model - Designing integration with external databases	- Creating code that checks eligibility from the government rules - Running test case and debugging scenarios - Simulating applications for accuracy and fairness	- Deploy model and monitoring performance - Iterating model based on feedback or policy changes - Reviewing results from inaccurate evaluation and feedback
THINKING	- How is this project going to be designed? - How can this system be transparent - Is the budget and timeline proposed feasible	- Is the AI model unbiased? - Does the system architecture meet the governments requirements? - Is AI model a good approach? - Will the model be transparent and efficient with its decision making	- What happens if model doesn't perform as expected - How can outliers be controlled - How to secure system in the event of adversarial attacks - What can be implemented to ensure the model performs to its expectations with minimal downtime	- Will there be any criticism from the public from going live - Will this be scalable for future changes and regulations - Did our rigorous testing cover all current threat scenarios
SAYING	- This system will be designed with the intent to be unbiased, transparent and efficient - Working in a public sector will be different to previous projects	- This architecture is designed to be user friendly - We understand this model will not be 100% accurate however methods will be used to improve its capability over time	- Our rigorous testing and debugging ensures accuracy and fairness of the model - This model is prepared for a variety of threat scenarios	- This partnership with the government was a success - We encourage all feedback from others - This project will be continuously maintained and monitored - With the project success, we hope future collaborations will be possible

INSIGHTS

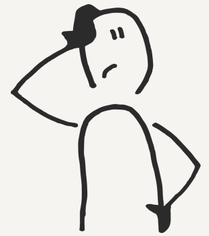
- Opportunities for further developments in the government sector
- Projects typically will not lead to expected end results however being prepared and understanding common oversights will ensure smooth integration

INTERNAL OWNERSHIP

- Software development Team: produces sufficient system that meets performance and efficiency
- Quality Assurance Team: Testing functionally and ensuring standards meet government guidelines
- DevOps Team: streamline development and deployment team

Figure 9 - 'AI System Developers' Empathy Map

PROJECT INITIATION-PROBLEM STATEMENTS(POV)



Sam

1.Housing Applicants
POV Statement: “As a housing applicant, I need a fair and fast process that helps me understand my eligibility and notified of my application status. This is because of my extenuating circumstances, stressful situations, and not knowing where I will be situated only adds additional stress and uncertainty to my life”.

2.Housing Officer
POV Statement: “As a housing officer, I need a system that I can easily learn to use, trust and easily audit, because I am responsible for ensuring fair decisions. Currently, I am spending too much time manually checking or responding to preventable appeals that could be avoided with better transparency throughout the process.”

3.AI Developers
POV Statement: “As a developer, I need access to reliable data and clearly defined ethical boundaries, because I am building a system that directly affects people’s lives, and I can’t be liable to risk unintended bias or decisions that no one can explain, defend or be held accountable later.”

PROJECT IDEATION

- The 4 key factors to create assumptions for the various tools used in our project so far

1. **Useability**

2. **Efficiency**

3. **Flexibility**

4. **Bias Mitigation**

PROTOTYPING - PHASE 1

Step 1 **Step 2** **Step 3** **Step 4**

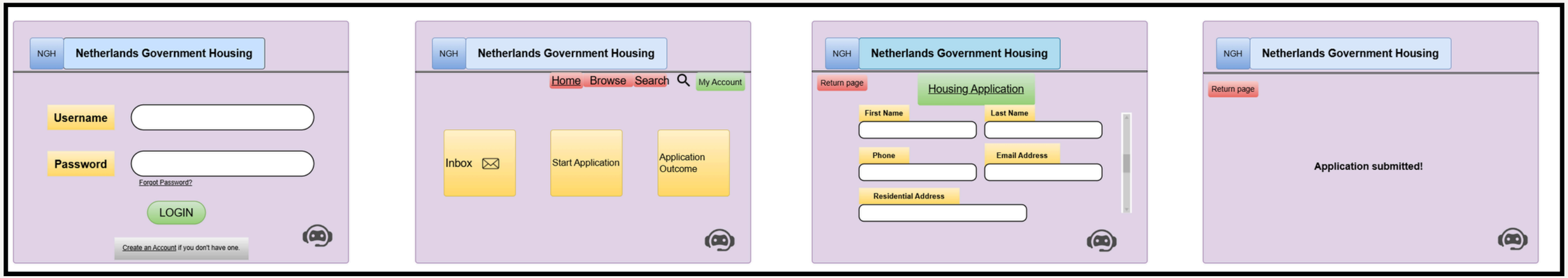


Figure 10 - Netherland Government Housing Application Process

(Wireframe 1)

PROTOTYPING - PHASE 2

Step 1 **Step 2** **Step 3** **Step 4**

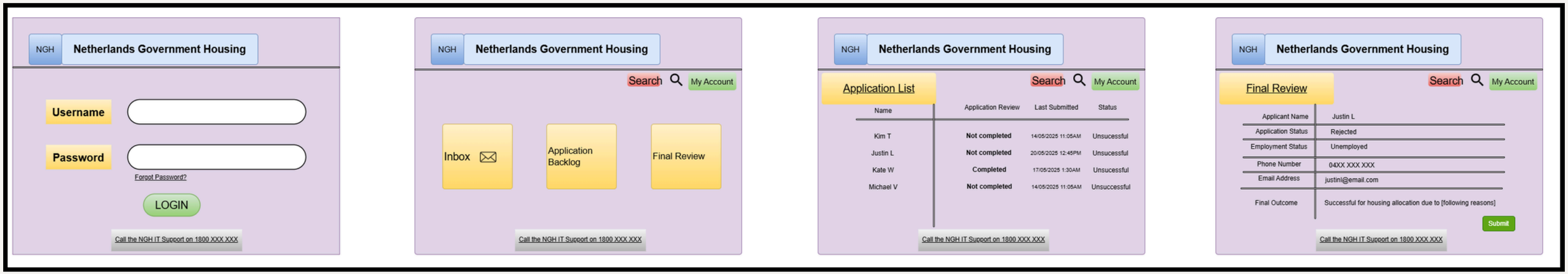


Figure 11 - Netherland Government Official Information Manual Review Process (Wireframe 2)

PROTOTYPING - PHASE 3

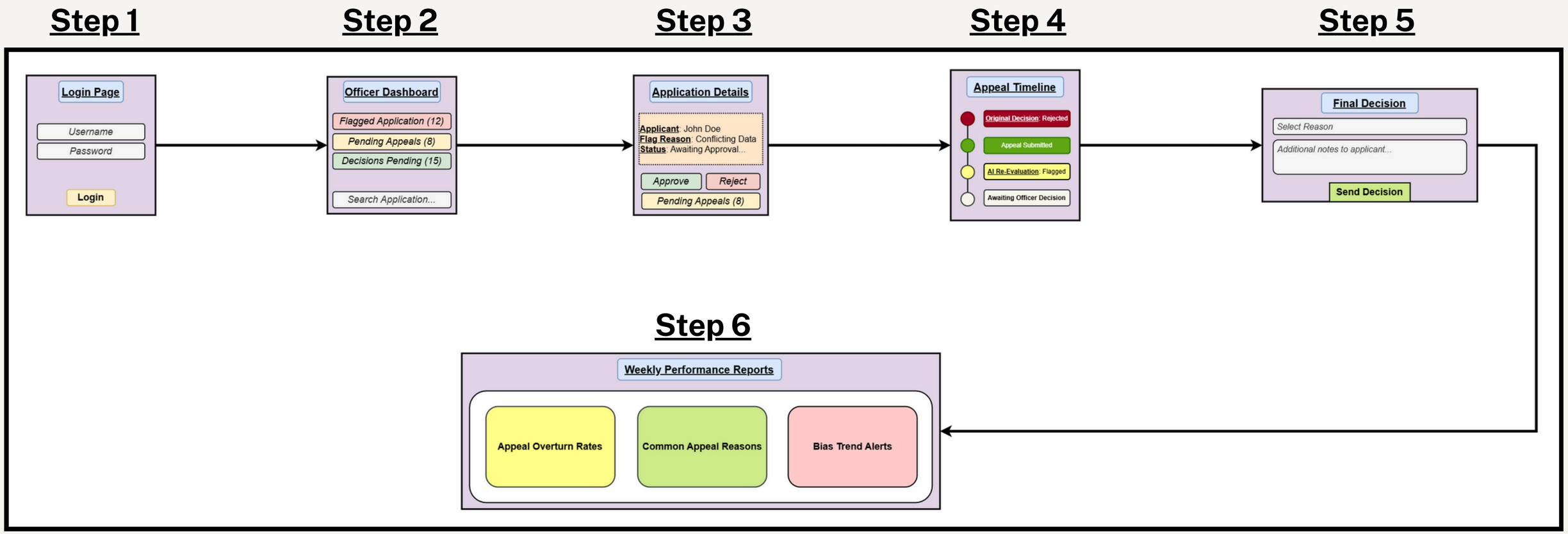


Figure 13 - Netherlands Government Officials Appeal Management and Decision Review (Wireframe 3)

PROTOTYPING - PHASE 4

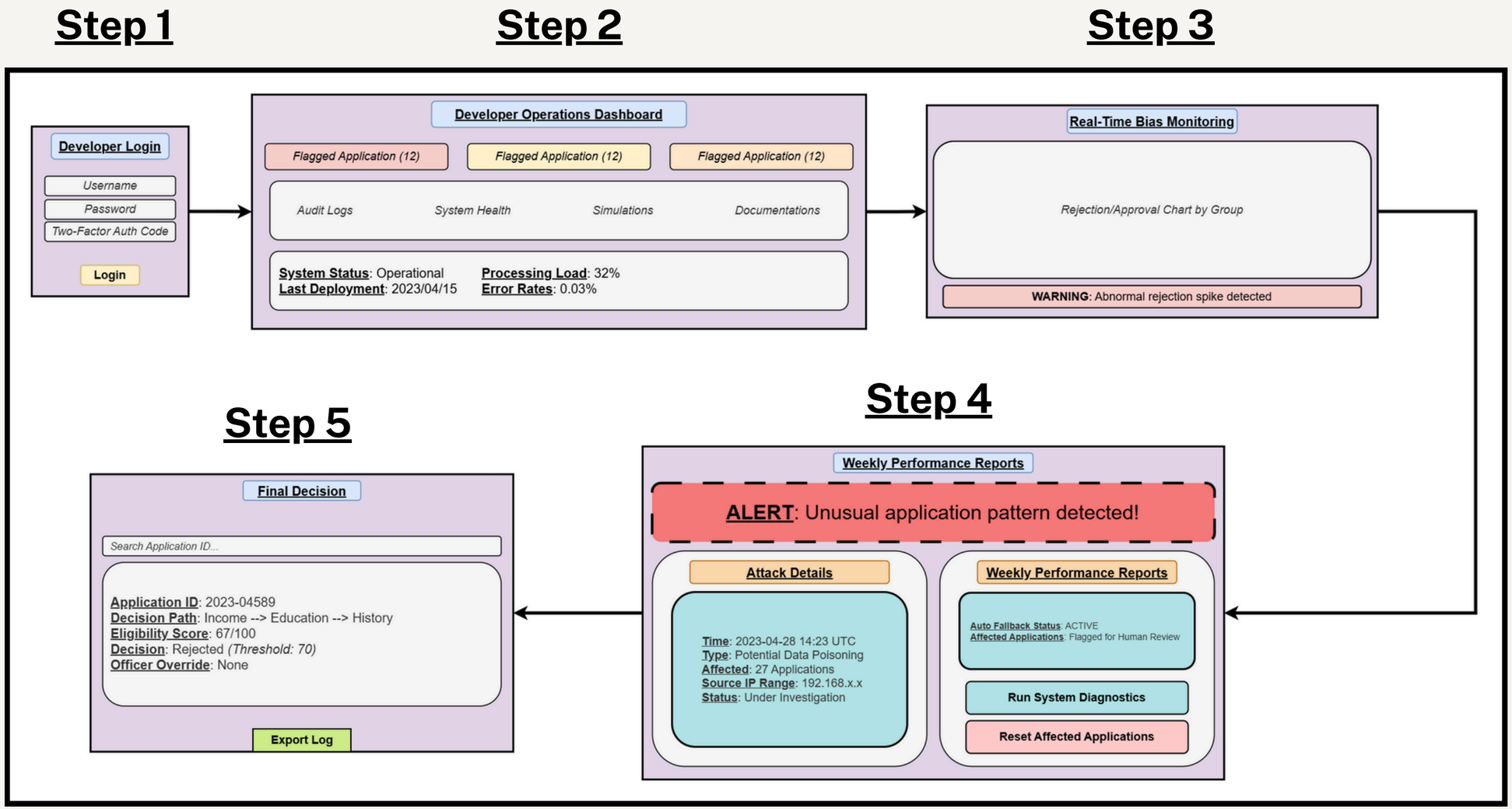


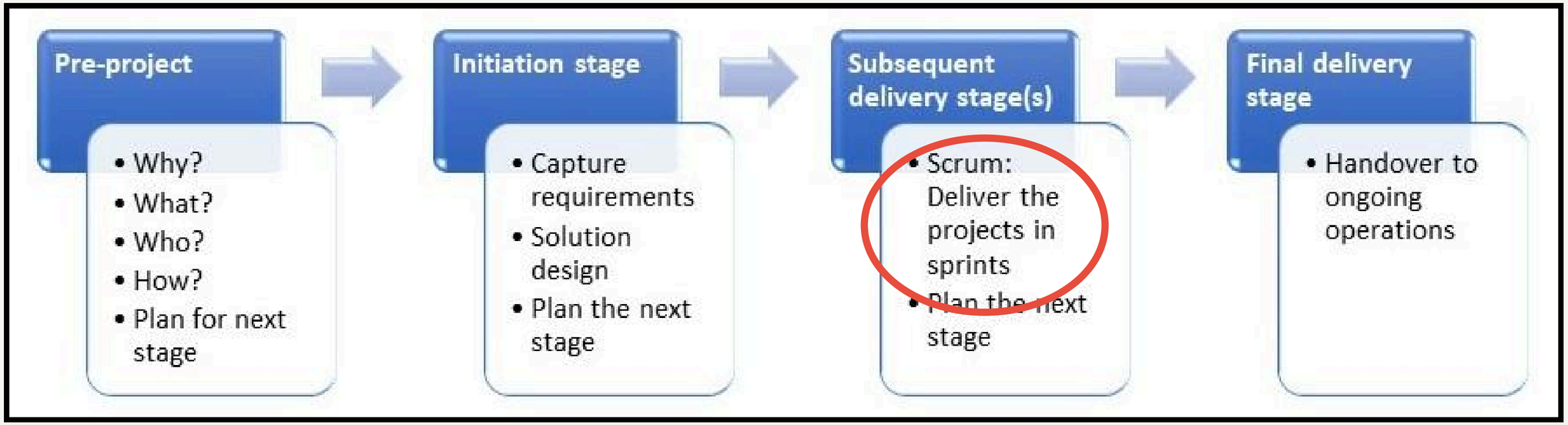
Figure 14 - AI Software Developers Monitoring and Maintenance Process (Wireframe 4)

METHOD EXECUTION: OUR INTEGRATED APPROACH

PRINCE2 promotes the “manage by stages” principle.

The figure below is highly inspired by PRINCE2, but we have added the “Deliver the projects in sprints” step in the delivery phase.

We are Combining Design Thinking (DT), Scrum, and PRINCE2 principles to create a Hybrid Methodology.



RATIONALE FOR METHOD INTEGRATION

- **DT:** Ensures ***a user-centered approach to problems for applicants***. We also address human needs and pain points defined in our ‘Empathy’ and ‘Journey’ Maps.

- **Scrum:** Provides ***an agile, iterative framework for flexible development and continuous feedback loops***. It eases the project complexity, components, and timeline.

- **PRINCE2:** Offers ***essential governance, control, and alignment with overall business objectives*** and project tolerances previously defined.

DESIGN THINKING: GUIDING USER-CENTRIC DEVELOPMENT

Nabil

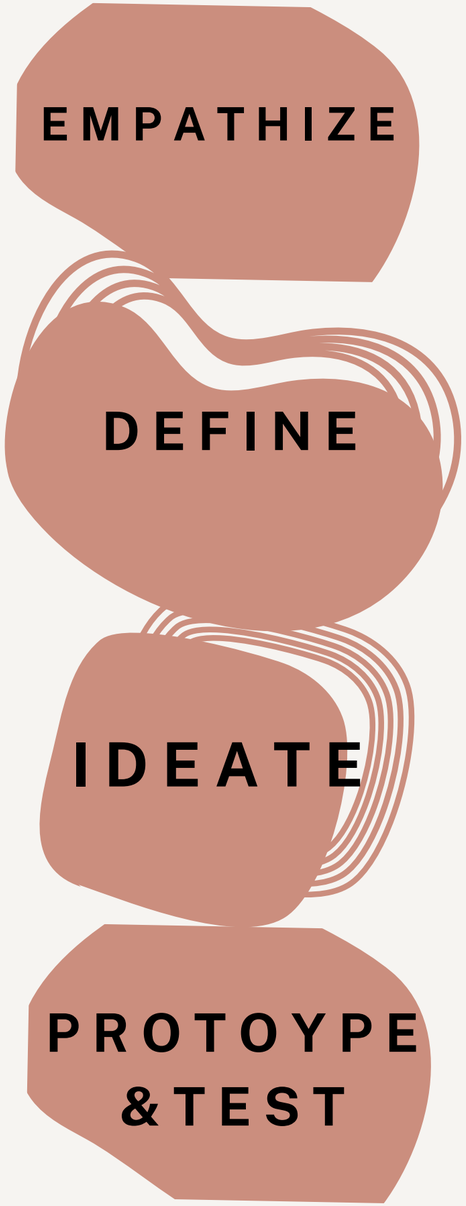
The Phases of DT drive our understanding of the project and the user requirements.

- **<u>Empathise</u>:**
  - In the ‘Empathise’ phase, the ***focus is case study analysis and the tools of “Design Thinking”***, like our maps. Here, we build an understanding of stakeholders' mindset

- **<u>Define</u>:**
  - In the ‘Define’ phase, the ***focus is on synthesising insights into POV statements*** that define user needs.

- **<u>Ideate</u>:**
  - The ‘Ideation’ phase is ***used to generate diverse solutions to our now defined problems***. Converting POV statements into "How Might We" questions.

- **<u>Prototype & Test</u>:**
  - Lastly, the ‘Prototype & Test’ phase ***allows us to develop wireframes/mock-ups, perform user testing***, ***and*** use this data to ***inform the Sprint Backlog***.



SCRUM: ITERATIVE DEVELOPMENT AND SPRINT FOCUS

The development of the project in the ‘Delivery’ phase will flow as follows:

- **Step 1 - Iteration:** The project is structured into timeboxed Sprints linked to user needs (1-4 weeks)
- **Step 2 - Sprint Planning:** The team selects user stories based on a prioritised Product Backlog
- **Step 3 - Sprint Execution:** The Development Team works on selected items (design, code, and test)
- **Step 4/5 - Sprint Review/Retrospective:** The team demonstrates a completed work increment to stakeholders and reflects to improve processes

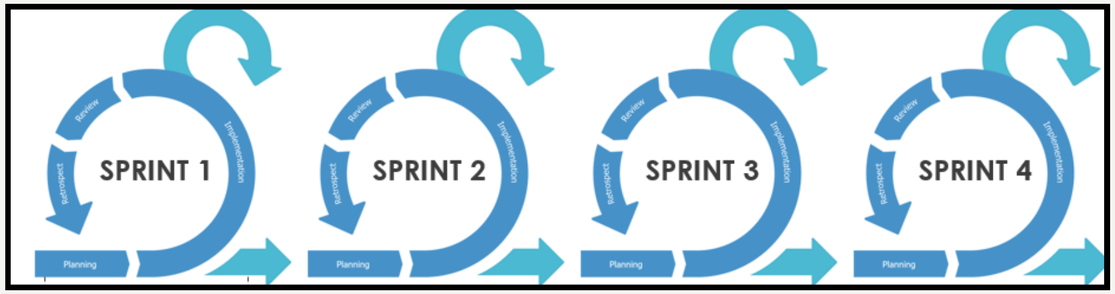
SPRINT BREAKDOWN

The details of each sprint phase can be found within the full project report.

However, an example of sprint content is as follows:

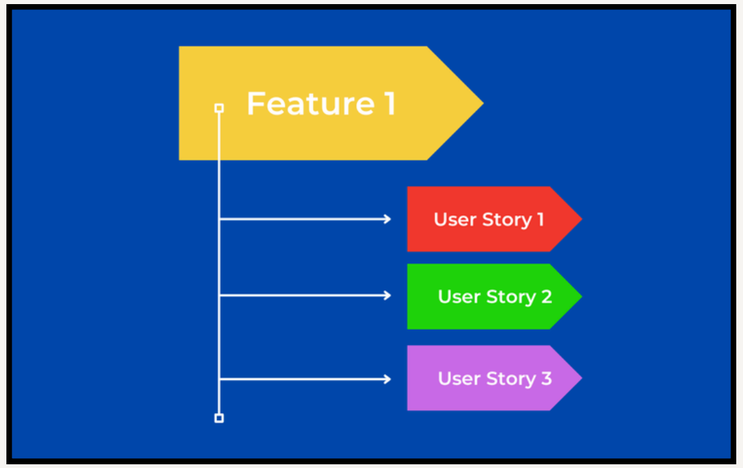
<u>Sprint 1</u> - Foundation & Applicant Registration:

1. Establish infrastructure,
2. integrate Applicant DB,
3. develop registration



This is in line with the ‘Social Housing Applicants’ Journey map.

PROJECT TRACKING & GOVERNANCE



- **<u>Tracking Mechanisms</u>:**
  - ***Team Level***: Digital "diary" for daily progress/decisions;
    - Digital board for user story status (To Do, In Progress, Done).
  - ***Project Level***: Issue and Risk Log (actively maintained & reviewed); Monitoring against schedule and product descriptions.
- **Project Board Interaction (via PRINCE2):**
  - ***Sprint Reviews***: Hold key points for stakeholder inspection and feedback on working software.
  - ***Highlight Reports***: Regular summaries of progress, issues, risks, and forecasts provided by Project Manager.

Thank you!