Cover Page:

The Wandering Sheep Proposal (change this to a more descriptive title later)

Table of Contents:

1. Executive Summary
2. Opportunity Statement
3. Background and Design Goals
4. Design Considerations
5. Proposed Outcomes and Deliverables
6. Project Management Plan Summary
7. Team
8. Executive Summary
9. Opportunity Statement:
   1. Provide a brief overview of the situation/context and the stakeholders. (Tab)

Sheep are a significant part of many community members’ lives of Rosedale, Mthatha as most of them either own sheep or serve as shepherds [agorize]. As a result, Mthatha’s economy is heavily dependent on livestock farming []. Here, there is an ongoing issue of losing sheep mainly due to them wandering off, different owners’ sheep getting mixed up, or shepherds not showing up [agorize].

When the sheep wander off, they tend to move within a 1-2 km radius where due to the high concentration of sheep, easily get lost and end up falling into ditches, getting attacked by stray dogs, and more. Moreover, the sheep getting mixed up between community members are very common as the feeding area is limited and most of them do not have cars for the occasion. Hence, the role of a shepherd is important yet the relationship between the shepherds and owners is insecure as an outcome of underpayment, resulting in frequent and unanticipated absences.

Therefore, we are looking for a cost-efficient, … (cont. once requirements are finalized) … solution to either retain the sheep, preventing them from going missing, or track the lost sheep such that the owners can easily locate them. … (relate to team value)

Add how they graze their sheep, their pains

Add their local environment/challenges to this opportunity

Maybe also add their local culture

* 1. Frame the opportunity from the perspective of stakeholder needs. (Arielle)

Understanding the stakeholders

In the opportunity statement overview, the context provider requests a cost efficient, effective location tracker of the lost sheep for the farmers in the rural towns.

Primary stakeholders:

1. Sheep owners in the rural town area of Rosedale, Mathatha

Secondary stakeholders:

1. Shepherds
2. Sheep

Framing the opportunity:

The living conditions for the sheep owners in Mathatha is in poverty according to UN \_\_\_\_\_ standard [find a source], therefore, the stakeholder needs the solution to be cost effective, which is also explicitly requested and emphasized by the context provider Alex Kizito.

In the overview, the stakeholder expresses their needs of tracking the exact location of the lost sheep. However, this need can be reframed by

break down this first identify when sheep is lost, then be able to track or facilitate the sheep owners in finding the sheep. The framed technical foci in this project is on finding the sheep. Although in the context, the stakeholder explicitly required to track the exact location of the lost sheep, the latent primary stakeholder’s need is to prevent the loss sheep and/or to successfully find the sheep when they are lost. Tracking the exactness location, on a technical level may be more costly, which may conflict with the cost efficiency requirement. Therefore, balancing between the cost and functionality, we decide the reframe the opportunity to be prevent sheep loss with a cost-efficient solution. This frame provides more flexibility for our design team to experiment with different technology to maximize the level of satisfaction in meeting the stakeholder’s needs.

* 1. State the team’s value proposition, which relates to the stakeholder needs.
  2. Outline design-agnostic requirements that any solution would need to fulfill (i.e., define what it means for a solution to provide value in relation to the context and stakeholder needs). (Edwin)

Teams positionality?

Values

Team’s Values:

* UN SDGs/Strategyzer
  + Sustainability/green energy/reusability
  + Where do we source the materials from?
* Design for Durability: Functionally, the solution should last long (maintenance should be easy etc.)
* Equity:
  + Ease of learning
  + Affordability

1. Background and Design Goals
   1. This section provides the reader with relevant background for your opportunity context. As you want to demonstrate how the opportunity context will frame your design goals, your team should consider the following: (Ethan)
   2. 1. Understanding broadly the stakeholders and the context – Who is affected by the   
      opportunity context and how? Where are they situated? What is their lived experience   
      and what factors (societal, political, etc.) affect this? What are different forms of value   
      that meet stakeholders’ needs? (Arielle)
   3. 2. Defining the value proposition and scope – What are the limits to what you can do (and   
      not do)? Of the potential forms of value identified, what value proposition are you   
      focusing on and why? How does this value connect to the UN SDGs that are   
      relevant/important to your context? (Arielle Tab Emre)
   4. 3. Describing the service environment within your scope – What is the situation in which a   
      design that supports your value proposition must work? (Arielle)
   5. 4. Researching and analyzing how other people have generated, or attempted to generate,   
      the value you propose to deliver in your context. What have others done to provide   
      solutions? What reference designs are available and how well did they work? Does any   
      engineering design literature show there are opportunities to improve upon or leverage   
      previous approaches? (Ethan)
   6. 5. Defining design goals in the form of requirements – what are the high-level objectives   
      that any solution must meet? How might you go about verifying and validating any   
      design to meet your criteria? (Move our requirements to here)

The setting of this opportunity:

* relates to the African town of Mahatha, which has a size of around 140000 people

Value Proposition and scope:

* Add stuff here

Affordability:

As engineering students from diverse backgrounds that have experiences of being framed as cultural minorities, we value equity. This leads to our value of affordability as we understand the perspectives of financial minorities and therefore seek a design that is affordable to all community members, avoiding inequity due to cost.

service environment:

* Cell phone connection exists
* Mainly hills, not many obstacles, but also other farmers’ homes
* Must be usable by shepherds who likely don’t speak English (>85% of people there speak Xhosa)

Reference designs:

* Most common design for sheep farmers is electric fencing, however, the fact that they can’t implement this is likely due to the cost constraint.
* Electric fencing isn’t perfect because it needs to be maintained, and the relationship between farmers and shepherds is precarious

Requirements:

1. Cost Efficiency (Tab)
2. Functionality
   1. Primary Functionality
      1. Identify when sheep are lost
         1. Criteria1: Immediateness of notification
         2. Metric: Time elapse between the perception and the response
         3. Criteria2: Reliability of the notification
         4. Metric: The percentage error of false alert (lower is better)
      2. Locate the lost sheep
      3. Criteria/metric1: Be able to locate the sheep within 5km
      4. Criteria2: Exactness of the location
      5. Metric: Detect location of the sheep within a radius of 10m (need justify)
   2. Differentiate between different owners
   3. Criteria: Identification must be unique to each sheep
   4. Metric1/Constraint: Must be able differentiate each individual sheep, not just two group of sheep
   5. Metric2: The percent error must be no larger than \_\_ (need to justify)
   6. Justification: need an equation to calculate the probability
   7. Secondary Functionality
3. Accessibility
4. Sustainability
   1. Durability
   2. UNSDG, green materials
5. Safety
6. Design Considerations
   1. This section motivates, presents, and supports your proposed design concept that is intended to   
      support your value proposition. It examines the various ways a widget solution can address the   
      higher-level requirements identified in the Background and Design Goals section and converges   
      to the initial design concept you plan to pursue further towards your design pitch. Your team   
      should consider the following:
   2. 1. Identifying at least two general widget solution approaches that meet the basic   
      requirements.
   3. 2. Evaluating the solution approaches supported by insights from/information on existing   
      reference designs, developing new conceptual designs, developing and evaluating low fidelity prototypes, exploring the feasibility of high-fidelity prototypes given the team’s   
      project management plan and process constraints, and any other design research.   
      3. Converging to an initial proposed design concept and recommending a path forward in   
      terms of design development.   
      4. Providing rationale for engineering judgements made.

General Solutions:

* Radio device for adult sheep. Place a radio communication device that will alert farmers when they leave a certain radius. Can also be scanned to identify the owner
* Pros: way cheaper than gps. Has to potential to track (based on signal strength?) is an electromechanical widget
* Cons: have to attach it to sheep. Still expensive. Not every sheep is being tracked

1. Proposed Outcomes and Deliverables
   1. A high-fidelity prototype on its own is not a valuable final deliverable. Your team should   
      consider what other supporting material in addition to the prototype would provide the most   
      value to the stakeholders. Your team needs to expand on the recommended path forward by   
      providing a brief description of the expected outcome(s) of the project, including what your   
      team intends to deliver to the stakeholders for whom you are providing value and why these   
      deliverables would be useful to them. For example, is there extra information you need to   
      provide on how to operate your prototype? This should be supported by clear verification and   
      validation processes and metrics linked to the requirements models developed previously.

CADing (Edwin Emre thermal camera)

1. Project Management Plan Summary (Arielle)
   1. Teams need to provide a brief description of the high-level or major steps they will take to   
      complete their project. This should include the approach to date and plan moving forward   
      towards the final outcomes and deliverables. The information provided in the proposal   
      document should align with the information in PM plan artefacts.
2. Team (Tab)
   1. Teams need to provide a holistic, team statement describing why they are suited to   
      operationalize the proposed plan. This can include the team’s values2, a short description of   
      what each member will be responsible for going forwards, how each team member’s past and   
      recent experience and expertise aligns with the project management plan, and how these   
      elements of the team organization, goals, and motivation increase the likelihood of success of   
      the project.

Requirements:

1. Most important - Cost effective

Criteria: Design must fall within the budget provided, should not exceed the current costs that wandering sheep currently invoke

Metric: $ spent on parts and stuff, compared to how much money is lost from sheep wandering off

Constraint: Should contact stakeholders to get an exact budget, need to know how many sheep wander off

Criteria: Design must be cheap to maintain after implementation (Design should be cheap to repair)

Metric: Annual expected repair fees. Max replacement cost?

1. Identify which sheep belong to who – functionality (maybe we focus on this one?)

Criteria: Identification must be unique to each sheep

Metric: Must be able to identify each sheep (design has to apply to every single sheep)

Criteria: Must be able to differentiate between different farmers’ sheep

1. Identify when sheep are lost
2. Locate lost sheep within 5 kms

* I think we can’t ignore this, this is really the main/only thing the stakeholder is requiring

<https://learn.sparkfun.com/tutorials/displaying-your-coordinates-with-a-gps-module?_ga=2.222258008.1748545720.1643768613-178600164.1643768613> gps modules are like $70. So it’s perhaps not feasible to use GPS but we can try using radio communications. Long range ones are more expensive (maybe around $10). Don’t have to attach it to every single sheep

1. Durability

Criteria: Must be usable for a long period

Metric: Energy sources and how long it can work without charge

Criteria: Must be usable in different conditions

Constraint: Must past drop test and pressure test

Constraint: Past waterproof test since there will be rain outside

Constraint: Rustproofing (if there are metal) since conditions are generally wet

1. Accessibility

Must be implemented in a system that local shepherds with limited access to technology can use

Should be implemented in the local language (Xhosa)

From lecture feasibility: operational feasibility/ease of learning

1. Portability

Needs to be easy to move around, farmers gotta find their sheep and make sure its theirs or something right.

1. Safety

Criteria: Must be safe for the shepherd/farmers to use

Metric: Number of sharp corners, amount of voltage and current that is used by the widget

Criteria: It should be able to attached to a sheep easily and painlessly

Metric: Number of sharp corners, amount of voltage and current that is used by the widget, if it emits a sound it shouldn’t harm the sheep, time it takes to attach it to a sheep

1. Praxis 3 stuff

Should be an electromechanical widget, make use of circuit stuff, microcontrollers and cad