

CSSWENG T3 AY20-21

Requirements Engineering

“No other part of the work
cripples the resulting system if
done wrong. No other part is
more difficult to rectify later.”

- *Fred Brooks, 1995*

Requirements

- Defines what the software **must do**.
- Considers what the software **must be**.
- Sets the limitations developers choose to make and **need to consider**.

Some types of requirements

Business requirements

- Why the software must be developed?
- Identifies the business problem or opportunity to be addressed.

User requirements

- What the software has to do in for the users to accomplish their tasks.
- Must adhere to business policies, standards, practices, etc.

More types of requirements

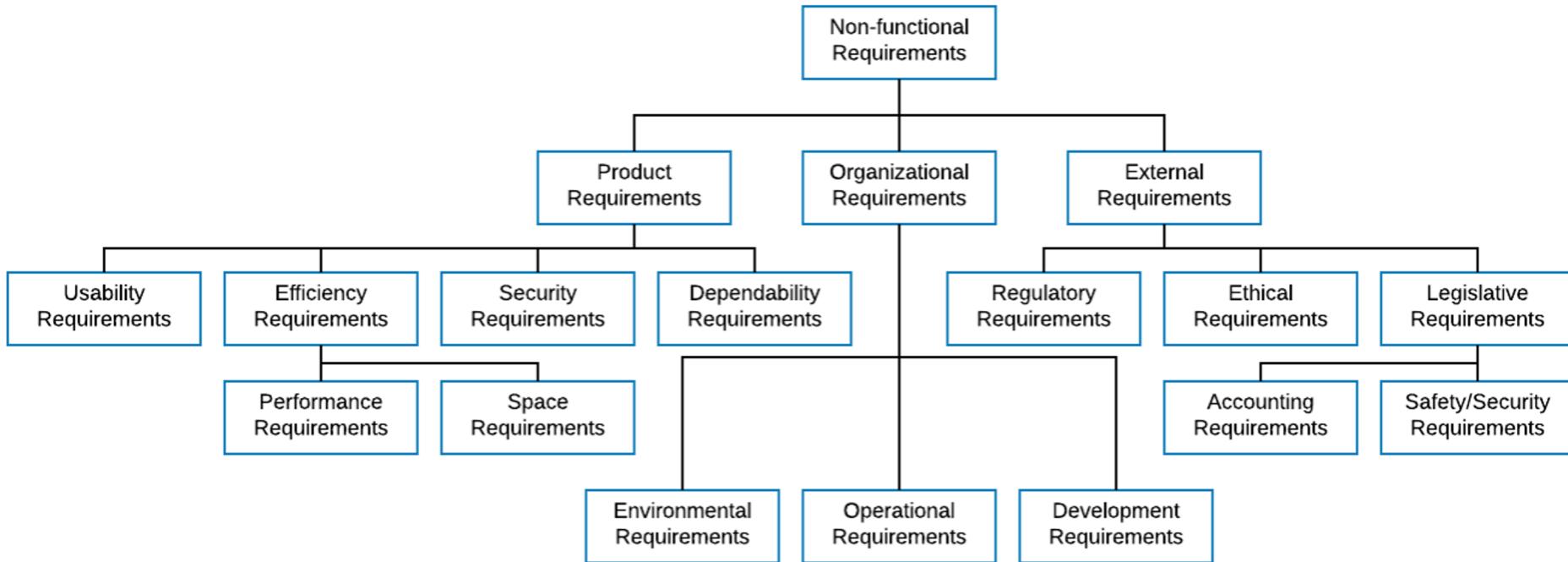
Non-functional qualities

- Characteristics that define the software's qualities

Constraints

- Specific “requirements” imposed on the design of the software
- Can be personal, standard-based, etc

Types of Non-functional Requirements



Product Requirements

specify or constrain the runtime behavior of the system

The system shall be available to all clinics during normal working hours (Mon-Fri, 09:00-17:00).

Downtime within normal working hours shall not exceed 5 seconds in any one day.

Organizational Requirements

derived from policies and procedures in the customer's and developer's organizations

Users of the system shall identify themselves using their health authority identity card.

Aim for Testability



Vague and untestable Usability Requirement

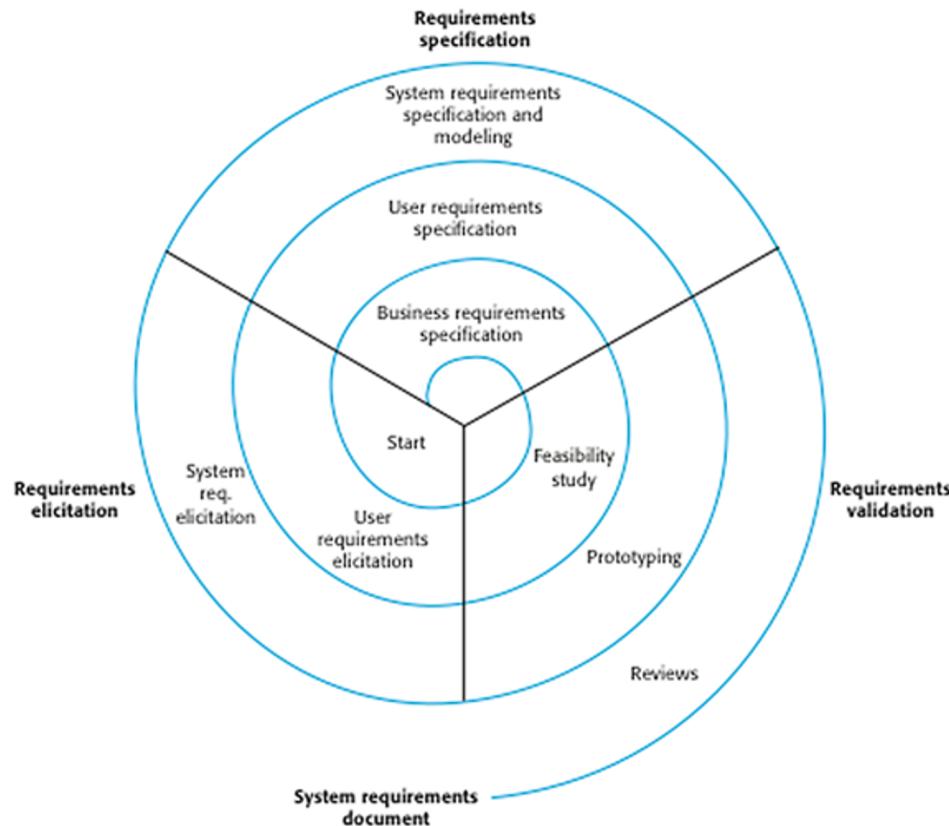
The system should be easy to use by medical staff and should be organized in such a way that user errors are minimized.



Measurable

Medical staff should be able to use all the system functions **after two hours of training**. After this training, the average number of errors made by experienced users **shall not exceed two per hour of system use**.

Requirements Engineering Process



Requirements Elicitation

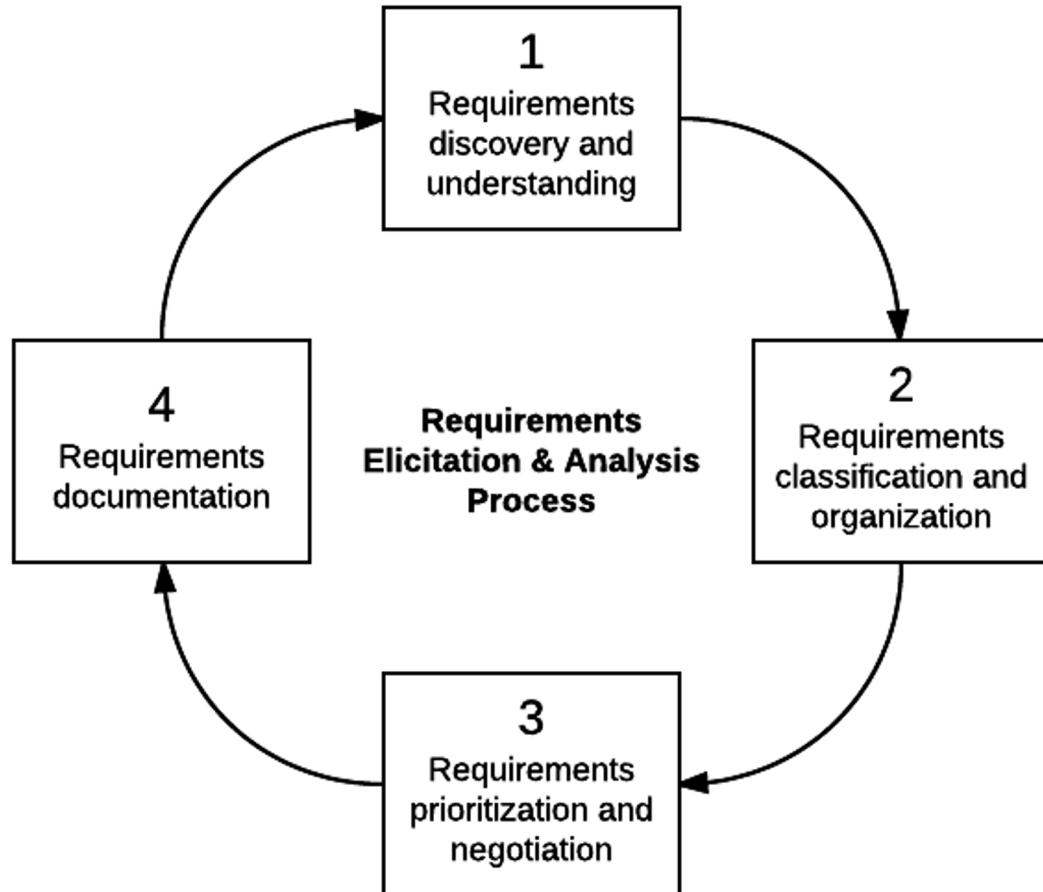
Requirements Elicitation

To understand the work that stakeholders do and how they might use a new system to help support that work

Find out about the ff:

- application domain
- work activities
- services and system features that stakeholders want
- required performance
- hardware constraints

Requirements Elicitation Process



So how do you **define**
requirements properly?

Requirements Specification

Requirements Specification

- The process of writing down user and system requirements in a requirements document
- Should be clear, unambiguous, easy to understand, complete and consistent

Notations

Natural Language sentences

- Written using numbered sentences in natural language. Each sentence should express one requirement

Structured Natural language

- Written in natural language on a standard form or template. Each field provides information about an aspect of the requirement

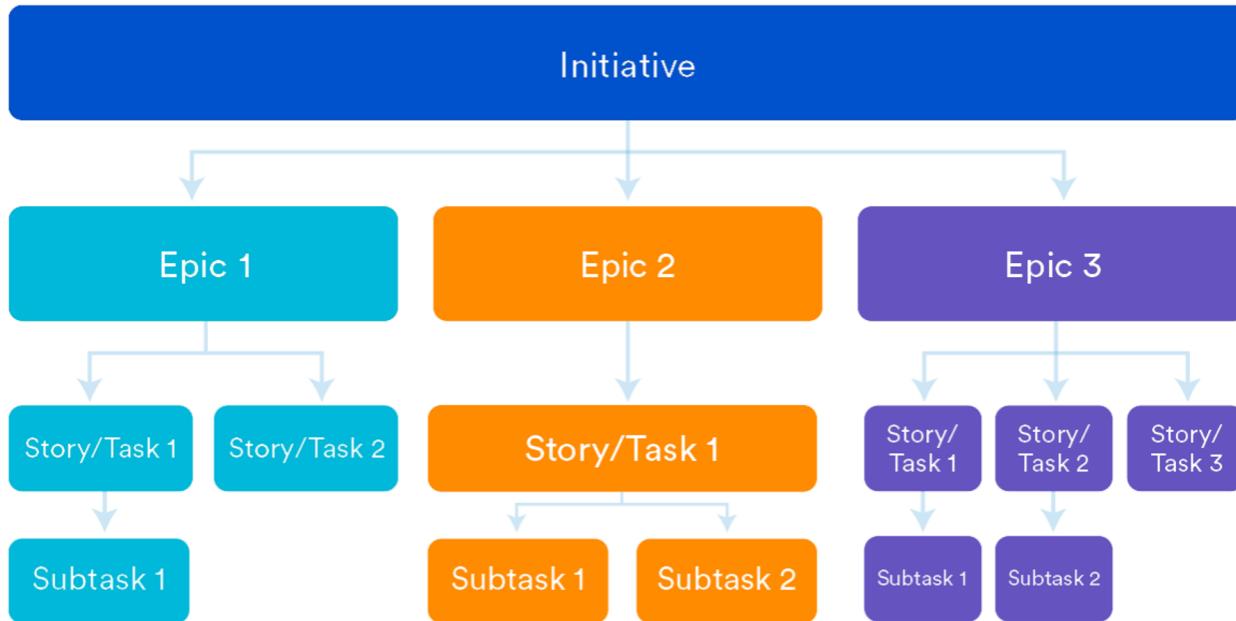
Graphical

- Graphical models, supplemented by text annotations. UML use case and sequence diagrams are commonly used

Mathematical specifications

- Based on mathematical concepts like finite-state machines or sets

Requirements in Agile



Requirements in Agile

Initiative

Assist students in enrollment by integrating program flowchart and curriculum audit information

Epic

As a program coordinator, I want to provide the latest program flowchart so that students can always refer to it.

As a student, I want to use a program flowchart during my enrollment so that I can check whether I'm still on track.

Requirements Specification

User Stories

User Stories

Template

As a <role/persona>,
I want to <action>
so that <expected outcome>

Acceptance criteria

1. Condition of satisfaction #1
2. Condition of satisfaction #2
3. ...

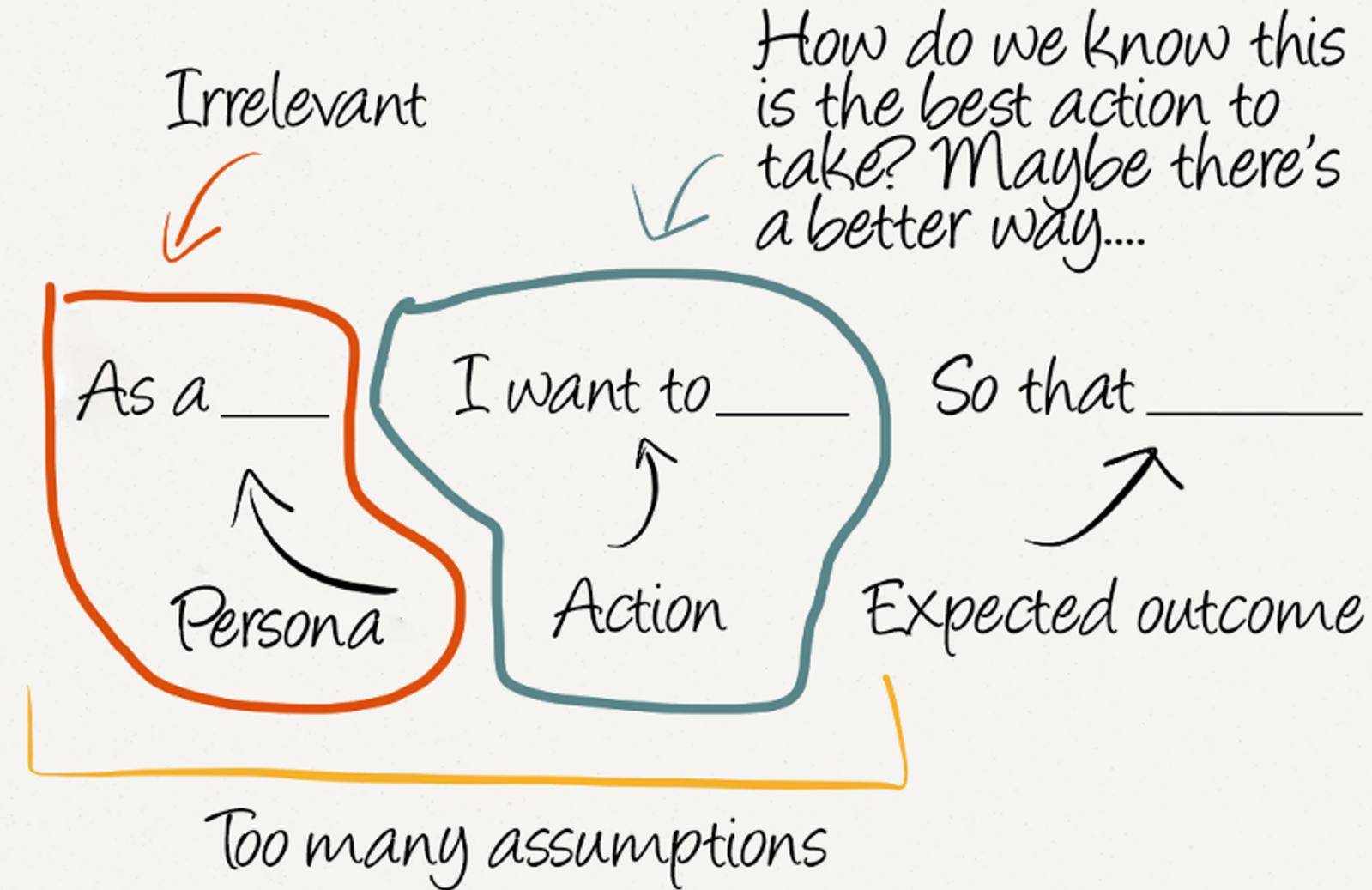
User Story #1

As an upperclassman student,
I want to see the courses that I have yet
to take from my flowchart
so that I can immediately identify which I
can enroll in next term.

User Story #2

As a first year student,
I want to see the courses that I was
automatically enrolled in
so that I can remove those that I have
failed.

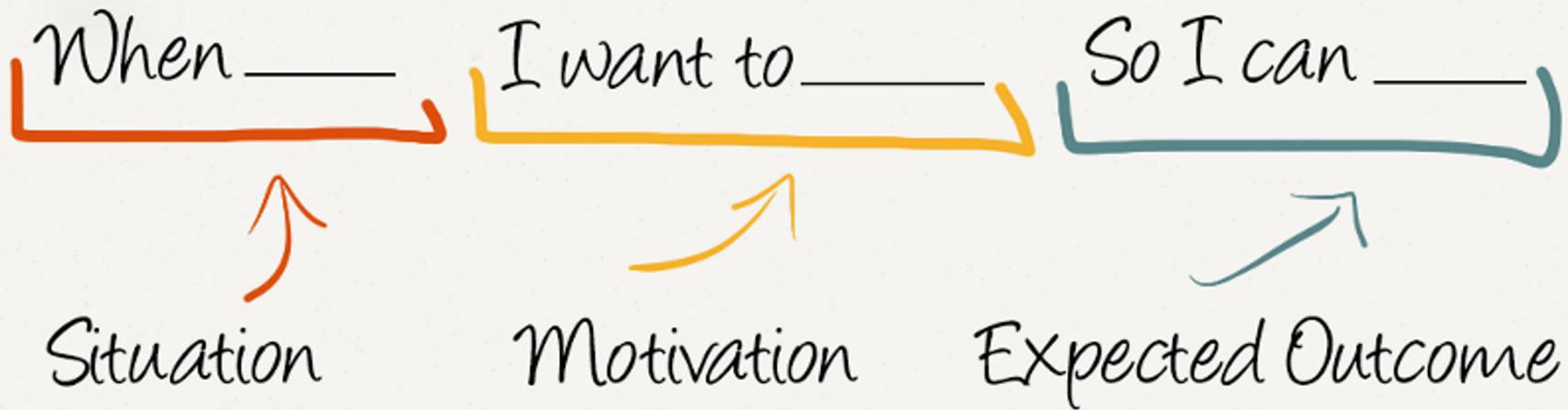
User Stories



anti-thesis

Job Stories

Writing Job Stories



Reference: [Replacing The User Story With The Job Story | by Alan Klement | Jobs to be Done](#)

User vs Job Stories

User Story

As a Buyer, I want to get notifications of counter bids so that I can update my own bid.

Job Story

When a Buyer has already made a bid on an item, they are anxious about missing a counter bid and want to immediately receive counter bid notifications, so they can have enough time to evaluate and update their own bid.

User vs Job Stories

User Story

As a moderator, I want to select an item to be estimated or re-estimated, so that the team sees the item and can estimate it.

Job Story

When an item does not have an estimate or has an estimate I'm not happy with, I want to be able to restart the estimation process and notify everyone, so that the team knows a particular item needs to be estimated upon.

Job stories define motivation
and context; they don't
define implementation.

Acceptance Criteria

Acceptance Criteria

- A user story's “**Definition of Done**”
- Conditions that **must be satisfied** to be accepted by a user or another system
- Set of statements that **define** functional and nonfunctional requirements
- Has **clear** pass/fail result

As an Administrator, I want to be able to create user accounts so that I can grant other users access to the system.

1. I can create as many user accounts as needed.
2. I can create a user account by entering the following information about the user: name, email address, phone number, license number, account status (active/inactive), and another user they report to (from a list of “active” users).
3. I cannot assign a new user to report to an “inactive” user or itself.

As an Administrator, I want to be able to create user accounts so that I can grant other users access to the system.

4. I cannot assign a new user to report to another user if it creates a cyclical relationship (e.g., user 1 reports to user 2 who reports to user 1)
5. The system notifies me that it sent an email to the new user's email address, containing a system-generated initial password and instructions for the person to set their own password.
6. I am able to verify with the intended recipient of the email that it was received.

As an Administrator, I want to be able to create user accounts so that I can grant other users access to the system. (Bad Example)

“A manager can click on the create User Account button to create a user account”

The acceptance criteria must be independent of the implementation; a rule of thumb is the wording of the acceptance criteria must be the same regardless of the platform (i.e. mobile, web, desktop etc)

Structured Natural Language

Structural Natural Language

In a structured format, the following information must be included:

1. A description of the function or entity being specified
2. A description of its inputs and the origin of these inputs
3. A description of its outputs and the destination of these outputs
4. Information about the information needed for the computation or other entities in the system that are required
5. A description of the action to be taken
6. A precondition setting out what must be true before the function is called, and a postcondition specifying what is true after the function is called
7. A description of the side effects (if any) of the operation

Example

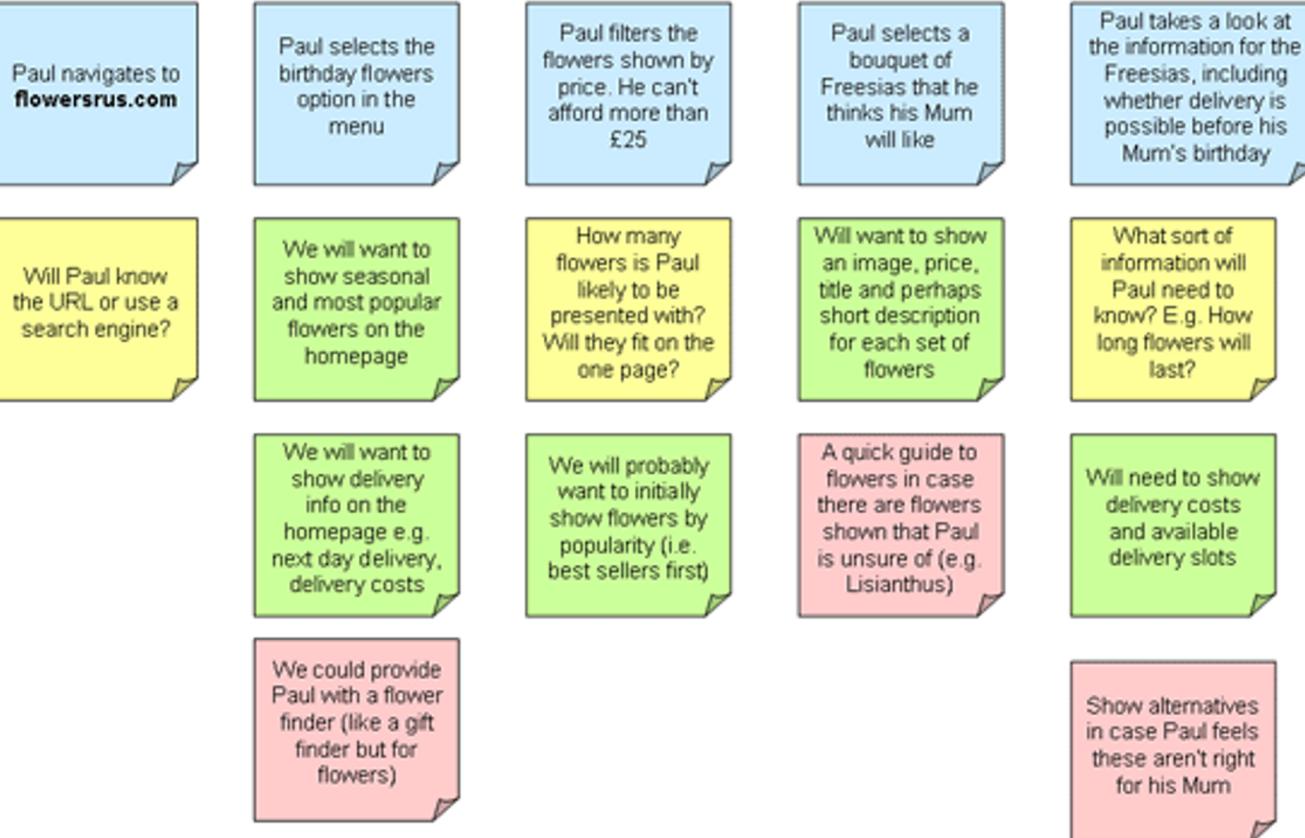
Function	Compute insulin dose: Safe sugar level
Description	Compute the dose of insulin to be delivered when the current measured sugar level is in the safe zone between 3 and 7 units
Inputs	Current sugar reading (r2), the previous two readings (r0 and r1)
Source	Current sugar reading from sensor. Other readings from memory
Outputs	CompDose - the dose in insulin to be delivered
Destination	Main control loop
Action	CompDose is zero if the sugar level is stable or falling or if the level is increasing but the rate of increase is decreasing. If the level is increasing and the rate of increase is increasing, then CompDose is computed by dividing the difference between the current sugar level and the previous level by 4 and rounding the result. If the result, is rounded to zero then CompDose is set to the minimum dose that can be delivered
Requires	Two previous readings so that the rate of change of sugar level can be computed.
Precondition	The insulin reservoir contains at least the maximum allowed single dose of insulin.
Postcondition	r0 is replaced by r1 then r1 is replaced by r2.
Side effects	None.

Then there are what we call
Scenario Maps



Paul - the online student

Ordering flowers for his Mum's birthday



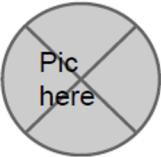
Key

Step

Question

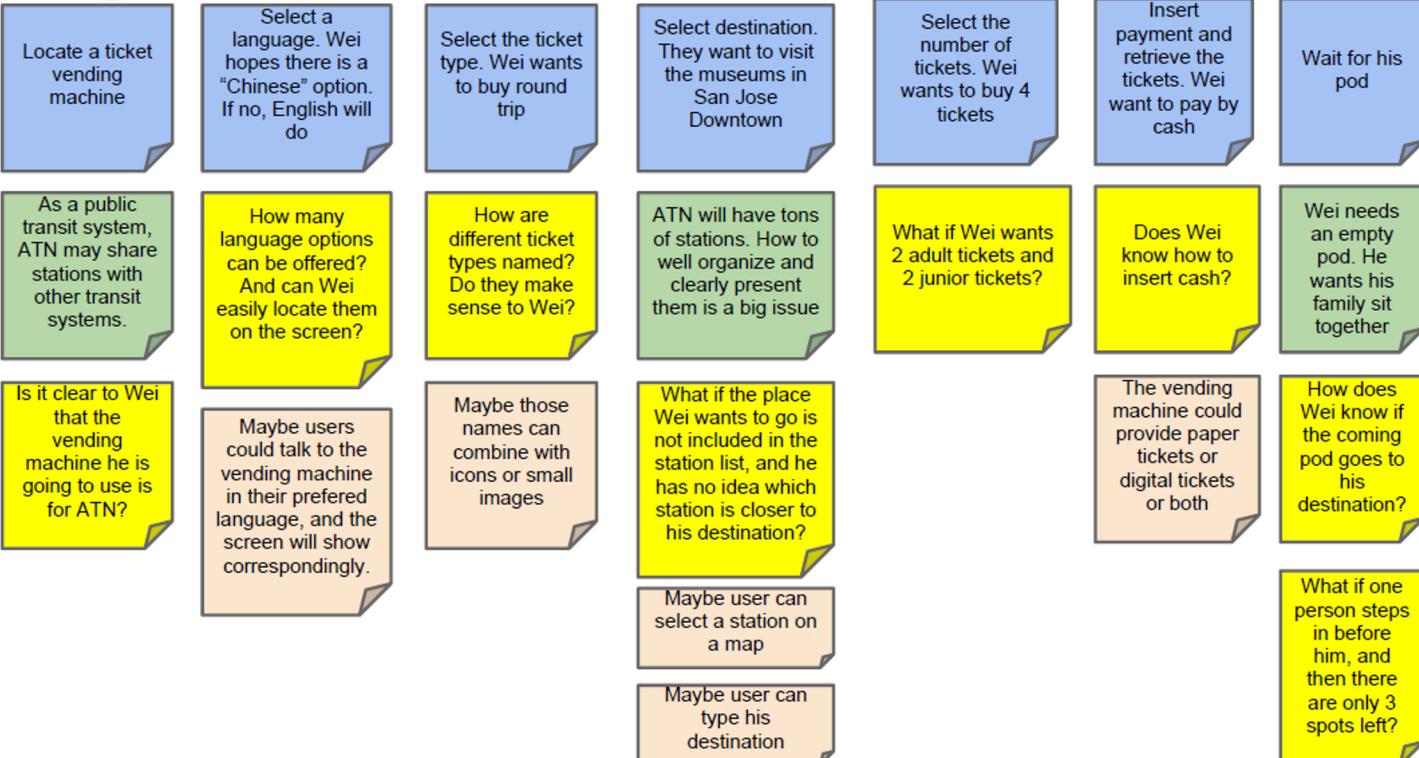
Comment

Idea



Wei - A visitor from China

Using ATM ticket vending machine to buy four tickets for his family



Key

Step

Question

Comment

Idea



Questions?