CyberFridge- Assignment 1
Requirements Engineering 3RA3
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1. Stakeholders

Hardware Architects
The Hardware Architects will be designing the physical components of the system.

Software Architects
The software architects will design the interface for the system.

Software Developers
The Software Developers will be programming the interface for the system.

HP
HP will provide the company machines on which the software developers will program the system.

Internet Providers
The Internet Providers will provide the internet connection upon which the system will search for recipes.

Manufacturers
The manufacturers will be mass producing the CyberFridge.

Marketing Team
The marketing team will help to market the product to the potential users.

Heads of Households
Head of Households such as parents and couples (people who manage multi-person households) will likely be the largest portion of users.

Students/Roommates
People who wish to use the CyberFridge and require that fridge space must be shared.

Chefs
People who will use the CyberFridge in a professional setting where cooking will be required.

2. Interview Purpose and Information Classification

Hardware Architects
It is imperative to interview the Hardware Architects and to gain a basic understanding of how the fridge will work. This information will then be passed onto the Software Architects where the user interface will be designed. The software developers will need to know about which hardware components will be and how they will interact with the software interface, for example, the sensors that will track the inventory, the barcode scanner, what physical components will allow for user input, what hardware components will store data and the cooling system.

Software Architects
Information about how the user interface will be designed needs to be gathered so that the Software Developers will be able to program it. Information about how the software will perform optimized searches through the database, how the software system will handle inputs from the hardware, how the system will handle user input and how the users will remotely access the system will need to be gathered.

Software Developers
Software Developers are imperative to the actual programming of the system. Information about security measures used to protect the users' private information, how long the programming process will take, how the program will be tested to ensure a level of reliability, how the program will access data, as well as how much data will need to be stored should be gathered during the interview process.

HP
As the company providing the tools for the software process, it is important to gather information about these tools so that the Software Developers are well prepared. Information will be gathered about the reliability of the machines, how the software versions will be stored, whether the machines will require maintenance, whether the machines can be expected to crash, property right of the information stored on these machines, as well as the security of these machines.

Internet Providers
Because the system will heavily require internet connectivity, it is central to the success of the system that optimal internet services are used. Information about what internet options are the most reliable, what internet options are the fastest, the security of the internet connections, and whether the internet connection can be expected to falter will be collected.

Manufacturers
Manufacturers will play an imperative role in the efficiency of the process of creating the CyberFridge. Information will need to be gathered about the amount of time it will take for the CyberFridge to be built, how the CyberFridge will be transported, the costs of the components of the system, and whether the system will be manufactured using human labor or automation.

Marketing Team
The Marketing Team will help to generate user interest in the product. Information about the aesthetics of the CyberFridge, when the CyberFridge should enter the market, if there are any competing products and how the CyberFridge can do better than its competitors, and what methods should be used should be used when advertising should be gathered.

Heads of Households
As the primary user, information about how these users' will most benefit from the CyberFridge will need to be gathered. Helpful information will include what interface will be easiest for the user, how often groceries are bought, how their current fridge is organized, how much groceries their current Fridge holds, how often recipes are used, as well as how much access each house member should be allowed.

Students/Roommates
Students are unique from other users in the sense that they will require a platform for multiple users on the user interface. Information will need to be gathered about how the CyberFridge should be organized, how often recipes are used, how often groceries are bought, how the space in their current space is divided, and how much food their current fridge holds.

Chefs
Chefs are different from the other users in that they will require to use the CyberFridge in a professional setting versus a personal setting. Information will need to be gathered about how their current fridge is divided, how much food their fridge currently holds, how often recipes are used and how much food is used on any given night.

3. Interview Questions

Hardware Architects
- How will the inside of the CyberFridge be organize? (compartments, drawers, shelves)
- What sensors will the fridge have?
- Where will the sensors be located?
- How will food barcodes be scanned?
- What physical components will allow for user interface?
- What components will allow for the storage of data?
- How much memory space will these components have?
- Will the shelves have scales to track remaining food in the fridge?
- How will the system receive user information/input? (buttons, touch screen?)
- Will a physical keyboard be used?
- Will a touch screen be used?
- Will a screen be mounted to the CyberFridge?
- How will the hardware pass information to the software program? (signals, currents)
- How will the system output information? (screen? Sent to computer? Text message, audio output?)
- How will the system track food that does not have barcode? (example: user input and weight?)

Software Architects
- How will the CyberFridge match a barcode to a food item? (internal database or external database?
- Will the required databases be stored on the system or elsewhere? (and accessed via internet?)
- What search algorithms will be used to search the databases?
- What search algorithms will be used to search for recipes?
- How can users expect to receive notifications about when food will expire? (on the CyberFridge? Through text? Through Email?)
- How will the system interpret input from the hardware?
- Will users be able to access the CyberFridge on their phones?
- Will this require a mobile application?
- How will the system track food that does not have barcode? (example: user input and weight?)

Software Developers
- What security measures should be taken to ensure privacy of the user?
- How will the user passwords be saved?
- What are feasible test cases for the CyberFridge?
- At what point in the testing process will the system be deemed sufficiently reliable?

HP
- How will the multiple copies of the system be stored?
- Where will the multiple copies of the system be stored?
- Will the code for the program be secure from access by outside parties?
- Will the machines require maintenance?

Internet Providers
- Which options are the fastest?
- How secure are the internet connections?
- Can outside parties access information being transmitted to the fridge? Vice versa?

Manufacturers
- How much will it cost to create one unit?
- How much time will it take to create one unit?
- Where will the units be created?
- How will the units be transported?
- How long will it take to transfer the unit from manufacturing warehouses to stores?
- Will units be manufactured using automation or human labor?
- How reliable are the physical components of the CyberFridge be? (will they require frequent repair/maintenance?)

Marketing Team
- What should the CyberFridge look like to appeal to users?
- When should the CyberFridge enter the market to ensure the highest profit?
- What should the user interface look like to appeal to users?
- In what forms of media should the CyberFridge be marketed?

Heads of Households
- How much food does your fridge hold?
- Do you often stick to one brand?
- Do you buy the same quantities of food every week?
- How many days a week are recipes used?
- How is your fridge organized?
- How often are groceries bought?
- How many people will have primary use of the fridge?
- How much access should each member in the household have?

Students/Roommates
- How much food does your fridge hold?
- How many days a week are recipes used?
- How is your fridge organized?
- How often are groceries bought?
- How many people will have primary use of the fridge?
- How is space in the fridge divided?

Chefs
- How much food does your fridge hold?
- In general are recipes used in the restaurant?
- Are the same brands used often?
- Is the same amount of food bought each time?
- How is the food organized in the fridge?
- How much food is used each day?

4. **Open Tracks**

Hardware Architects
- Do you have any input on how the system should function?

Software Architects
- Do you have any input for the hardware specifications?

Software Developers
- How long will it take to program the system?
- How much space with the program require?

HP
- Can the HP machines be expected to falter?

Internet Providers
- Can the internet connection be expected to falter?
- Do you have any input for the hardware specifications?

Manufacturers
- How do you think cost of the CyberFridge can be minimized?
- How do you think production time of the CyberFridge can be minimized?

Marketing Team
- Are there any competitors to the CyberFridge?
- How can the CyberFridge beat the competition?
- What does the competing system lack?

Heads of Households and Students/Roommates

- What interface would be the best for the CyberFridge?
- How would you like to interact with it?
- Through what methods would you like to interact with it?
- How would you like to receive output from the CyberFridge?
- How would you like the inside of the CyberFridge to be organized?
- Are there any recipes that you prefer?

Chefs
- What interface would be the best for the CyberFridge?
- How would you like to interact with it?
- Through what methods would you like to interact with it?
- How would you like to receive output from the CyberFridge?
- How would you like the inside of the CyberFridge to be organized

5. Functional Requirements

Use Case ID	Use Cases
1	User adds recipe to database
2	User modifies recipe in database
3	User deletes recipe in database
4	User searches for an entry
5	User adds food item to inventory
6	User removes food item from inventory
7	User specifies sort criterion
8	User remotely accesses CARA
9	User creates new category of recipe
10	User downloads recipe to database

1. The CyberFridge shall be connected to the internet.
2. The CyberFridge shall have compartments for holding food.
3. The CyberFridge shall be able to sufficiently cool food to a user defined temperature.
4. The CyberFridge shall give the user a list of all food items currently in its inventory.
5. The CyberFridge shall allow the user specify how they wish the data to be listed.
6. CARA shall return information about any item requested by the user.
7. CARA shall track additions to the current inventory.
8. CARA shall track removals from the current inventory.
9. CARA shall track the quantity of food used or removed.
10. CARA will keep a database of all recipes which the user wishes to use.
11. CARA shall allow the user to view recipes by categories defined by the user.
12. CARA shall allow the user to modify existing categories of recipes.
13. CARA shall allow the user to modify the list of recipes belonging to each category.
14. CARA shall allow the user to add new recipes to the database.
15. CARA shall allow the user to place new recipes into existing categories.
16. CARA shall allow the user to modify or delete recipes from the database.
17. CARA shall allow the user to download recipes remotely from outside servers connected through the Internet.
18. CARA will use the recipe database to recommend recipes to the user.
19. CARA will recommend food items for the user to purchase.
20. CARA shall be able to give to the user a list of recipes which can be prepared using the food currently in inventory.
21. CARA shall be able to give to the user a list of food items which need to be purchased in order to prepare a particular recipe or group of recipes.
22. CARA shall keep track of recipes which are frequently prepared by the user.
23. CARA shall suggest frequent recipes to the user.
24. CARA shall give to the user a list of suggested recipes according to criteria set by the user.
25. CARA will allow the user to access the CyberFridge through the use of the internet.
26. CARA shall be password protected to gain access to the recipe agent system.
27. CARA shall be able to get user input.
28. CARA shall output information to the user.
29. CARA shall notify users when food in the inventory is set to expire.
30. CARA shall keep track of the expiry date of foods in the inventory.

31. CARA shall allow the user to perform all recipe database actions through the use of the internet.

6. Non-Functional Requirements

Look and Feel Requirements
- CARA shall be visually appealing to the user

Usability Requirements
- Operating CARA shall be intuitive for any user who has a basic understanding of computers (i.e. How to input information into a computing system)

PERFORMANCE REQUIREMENTS
Speed Requirements
- The system must load from the internet within 30 seconds.
- Searches must implement optimized search algorithms such that a search is completed within 45 seconds of it being initiated.
- CARA shall be able to make changes to the inventory within 5 seconds of a change made.
- CARA shall be able to make changes to the recipe database within 5 seconds of a change made.

Safety Critical Requirements
- The CyberFridge should not overheat.
- CARA shall be able to detect when food has expired.
- The CyberFridge shall keep fool at a sufficiently cool temperature.

Precision Requirements
- CARA shall be able to approximate when food will expire within 6 hours of its actual expiry
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Reliability and Availability Requirements
- The CyberFridge should be available for use 24 hours a day, 360 days a year, where the remaining 5 days will be used for maintenance.
- The CARA system should be available for use 24 hours a day, 360 days a year, where the remaining 5 days will be used for system updates and maintenance.

Capacity Requirements

- The CyberFridge must hold enough food equivalent to the amount consumed in a week by a family of 5.
- CARA shall be able to store a minimum of 13 recipes.

OPERATIONAL REQUIREMENTS
Expected Physical Environment
- The CyberFridge shall be placed in a home dwelling or a restaurant.
- The CyberFridge will not undergo any sever weather or climate conditions

Expected Technological Environment
- The CyberFridge shall use a text input device to receive information from the user.
- The CyberFridge shall output information to the user by means of a screen.

Partner Applications
- The CyberFridge will require a device that can scan / take pictures of barcodes.
- The system must have a TCP/IP connection to access the internet.
- CARA shall be coded in Java.

Maintainability Requirements
- The fridge capabilities and CARA are expected to run independently such that while CARA is being updated, the food will still be refrigerated.

Portability Requirements
- The system must be able to run on Google Chrome, Internet Explorer, and Firefox on a PC with a Windows 7 operating system.
- The system must be able to run on an Apple computer under Safari.
- The system must be able to run on Windows 7 operating system + Parallel 9.
- CARA should be able to run on any target platform without modification.

Security Requirements
- CARA shall require a password for a user to gain access.
- CARA shall not make information about the CyberFridge available to unwanted third parties.

Cultural Requirements
- Foods shall be classified into appropriate categories such that users are not offended by the classifications

Political Requirements
- The CyberFridge shall not break any government laws.
- The CyberFridge shall meet FDA requirements.

Legal Requirements
- The CyberFridge shall meet not affect any current copyright laws

Open Issues
- It is yet to be determined how the system will approximate expiry dates for produce and meat as none is usually provided. Often times produce from different stores also have varying shelf lives. The system will ideally take into account whether the food is organic when calculating

expiry dates. Perhaps a default expiry for produce (such as 1 week for meat and produce in the fridge and 2-3 months for food in the freezer) would solve this issue.

7. Scenarios

Positive Scenario #1
- The user wishes to input a new recipe into an existing recipe category.
- The user is able to navigate CARA to open a new recipe file for text input.
- The user is able to type the new recipe into the new file.
- The user is able to save the recipe file to an existing category.
- The user can then access the recipe at a later date.

Positive Scenario #2
- The user wishes to search for a recipe.
- The user is able to navigate CARA to a search window.
- The user by accident, enters an incorrect spelling of the recipe.
- CARA will notify the user that no recipes were found by the given input and suggest recipes with similar spelling**.**
- The user is able to perform another search either by typing in the correct spelling or looking through the alternative recipes that were provided**.**
- The user finds the specific recipe it was looking for.

Negative Scenario
- The user adds freshly bought groceries to the inventory.
- While inputting the inventory, CARA encounters a product from a foreign country.
- CARA performs a search to gain information about the product and corresponding expiry dates.
- CARA finds a similar product and adds it to the inventory.
- CARA does not approximate the correct expiry date for the product.
- They user consumes the expired product while assuming the product is still safe for consumption because CARA has wrongly approximated the expiry date.
- The user falls ill due to the consumption of expired food.

Abnormal Scenario
- The user wishes to access the CARA system.
- The user enters in an incorrect password.
- The system notifies the user of the incorrect input.
- The user is allowed another chance to enter in the password.
- Again the input is incorrect, and the system notifies the user.

- The user is allowed one more chance to enter in the correct password.
- The password is again incorrect and the system gives the user one of two options, answer a security question to reset the password on the user interface, or have an email sent to the user's email address where a link will be provided to change the password.
- The user chooses an option and changes their password.
- The user returns to the CyberFridge and enters the new password.
- The user gains access to the system.

8. Conflicting Requirements

Two weakly conflicting requirements:

 i. CARA shall be able to give to the user a list of recipes which can be prepared using the food currently in inventory.

 ii. CARA shall keep track of the expiry date of foods in the inventory.

Boundary Condition:
- The day on which the food expires, is the food still safe for consumption?
- Should the product still be included in the suggested recipes section?

Possible Solutions
- Any product in the inventory should only be usable the day before expiry. On the day of the expiry, the product should be removed from the inventory and the fridge, and should be removed from any suggested recipes.
- The product can be used on the day of expiry as most expiry dates are not absolute. The food product can be included in suggested recipes on the day of expiry, however the day after the food item should be removed from the inventory and the fridge.

9. Risks

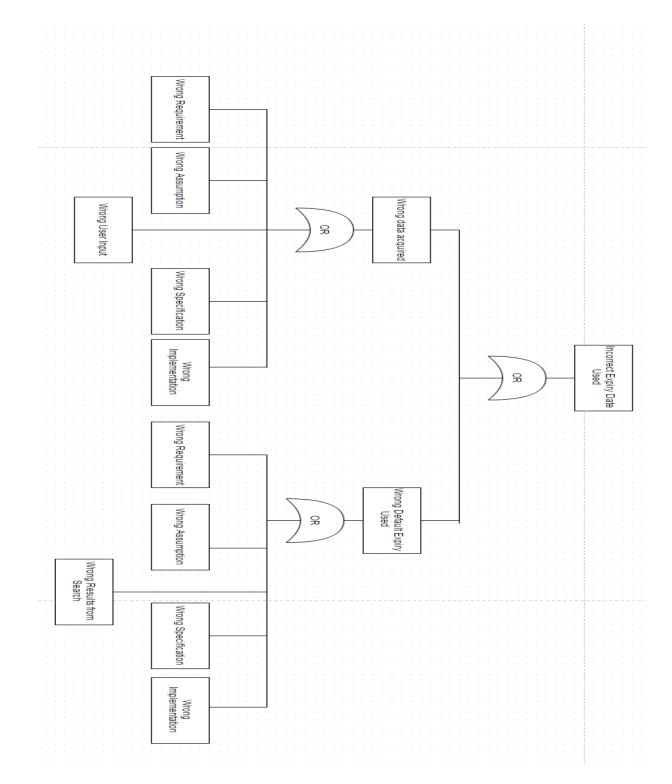**Risk: CARA does not approximate the correct expiry date of a food item correctly.**

	Risk Likelihood		
Consequences	**Likely**	**Possible**	**Unlikely**
Loss of life	Catastrophic	Catastrophic	Severe
User falls ill	High	Moderate	Low
CyberFridge Reputation Damaged	Moderate	Low	Low
CyberFridge Damaged	Moderate	Low	Low

Risk: CyberFridge does not sufficiently cool the food.

Consequences	Risk Likelihood		
	Likely	**Possible**	**Unlikely**
Loss of life	Catastrophic	Catastrophic	Severe
User falls ill	High	High	Low
CyberFridge Reputation Damaged	High	Moderate	Low
CyberFridge Damaged	Moderate	Low	Low

FAULT TREE
Risk: CARA does not approximate the correct expiry date of a food item correctly.

Fault Tree Diagram:

- Wrong Requirement
- Wrong Assumption
- Wrong User Input
- Wrong Specification
- Wrong Implementation
- OR → Wrong data acquired
- Wrong Requirement
- Wrong Assumption
- Wrong Results from Search
- Wrong Specification
- Wrong Implementation
- OR → Wrong Default Expiry Used
- OR → Incorrect Expiry Date Used

10. Risk Management System

	Risks

Objectives	Incorrect Input (likelihood = 0.60)	Incorrect Search (likelihood = 0.30)	Wrong Assumption (likelihood = 0.10)	Loss Obj.
Keep track of inventory (weight = 0.30)	0.40	0.30	0.20	0.11
Keep track of expiry date (weight = 0.60)	0.50	0.50	0.40	0.29
Cool Fridge (weight = 0.50)	0.50	0.10	0.20	0.18
Risk Criticality	0.40	0.13	0.04	

Sample Calculation for Risk Criticality:

= 0.60*((0.30*0.40)+(0.60*0.50)+(0.50*0.50)) = 0.40

Sample Calculation for Loss Obj:

= 0.30* ((0.60*0.40) + (0.30*0.30) + (0.10*0.20)) = 0.11