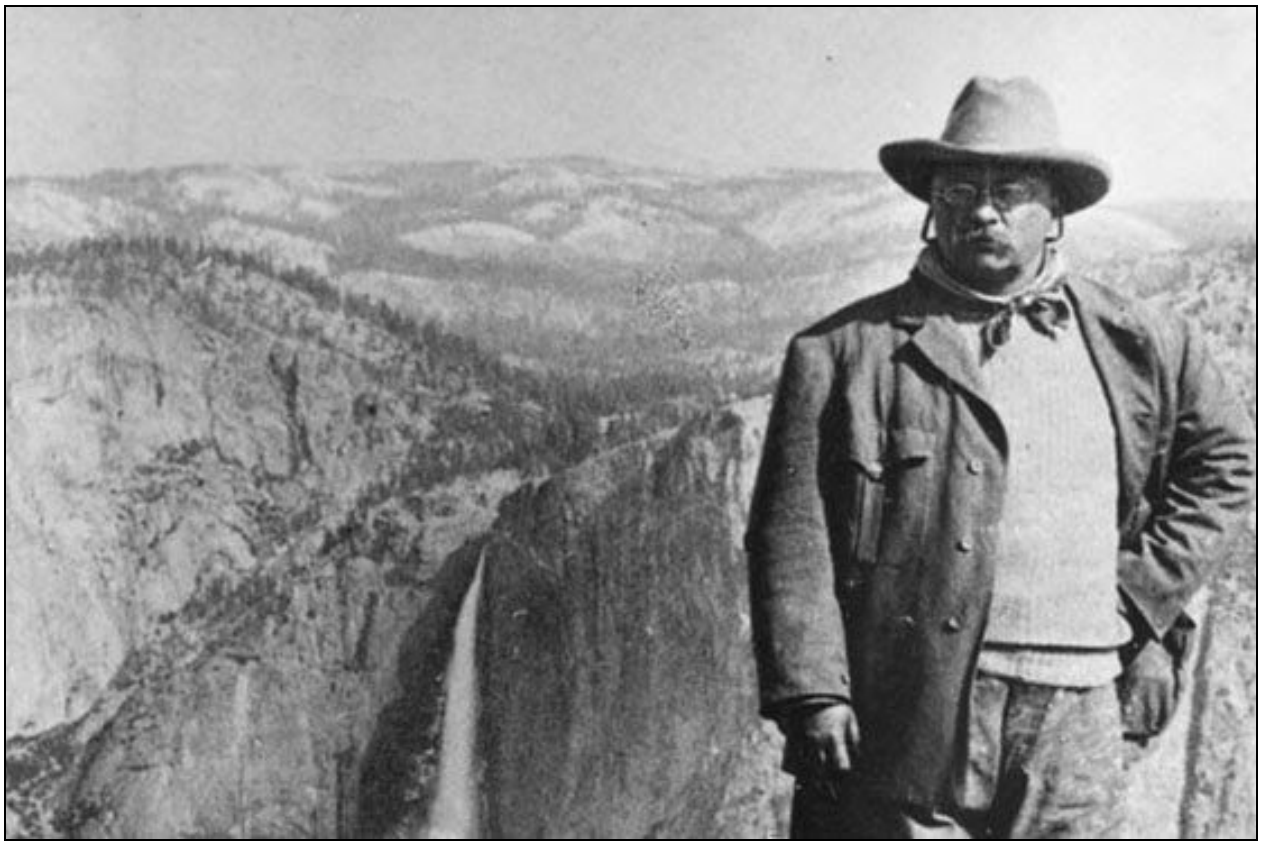
Teddy's Brochure Report



A document for creating the brochure of the future

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Table of Contents

I Project Description

1 Project Overview

Teddy's Park Pamphlet aims to provide a consistent, versatile, and reliable pamphlet for all national parks and/or forests in the United States. Simply enter the national park you wish to visit, and the app will download a package to your phone containing an interactive map, park specific rules and/or information, park specific survival tips should you get lost, a record of the weather forecast, and a list of volunteer groups working for the park.

While connected to the internet, you will be able to leave reviews for volunteer groups, post pictures for the park's gallery, and receive perpetually updating weather forecasts, and the most up to date info on parks.

2 The Purpose of the Project

2a The User Business or Background of the Project Effort

There are currently 154 national parks in the US. Each with their own management systems and websites. Some are informative and clean, while others seem like they haven't been updated since the founding of the internet. The client of this app will be whoever manages said national park, for the benefit of its visitors.

2b Goals of the Project

The goal of this service is to provide a centralized database of information for each and every national resource. For a country as vast and geographically diverse as the United States, each location has different weather conditions, topology, wildlife, and volunteer groups. This app will act as a "one stop" for park visitors, displaying all the information one could possibly need before visiting. National Parks aren't known for their cellular connection and wifi reliability, which is why at the discretion of the user, the app can download a digital copy of the park information onto their phone, so that they can have a copy of the information ready to go wherever they are in the park, regardless of mobile service.

2c Measurement

We will know the goals of the app are met when we have at least 85% of the country's national parks in our database. On the client side, the app must be able to connect to a server that contains our database. While there is an internet connection, the app should be able to load a national park, and return the following data specific to that park: Weather, logistics, links to volunteer opportunities, safety tips, and a gallery.

Should the client want access to this information offline, they can download a lightweight copy of the information onto their mobile devices. This lightweight copy of the information would

only have a “snapshot” of the weather forecast, along with park rules and logistics, maps, and safety tips for use inside the park in the event there is no service.

3 The Scope of the Work

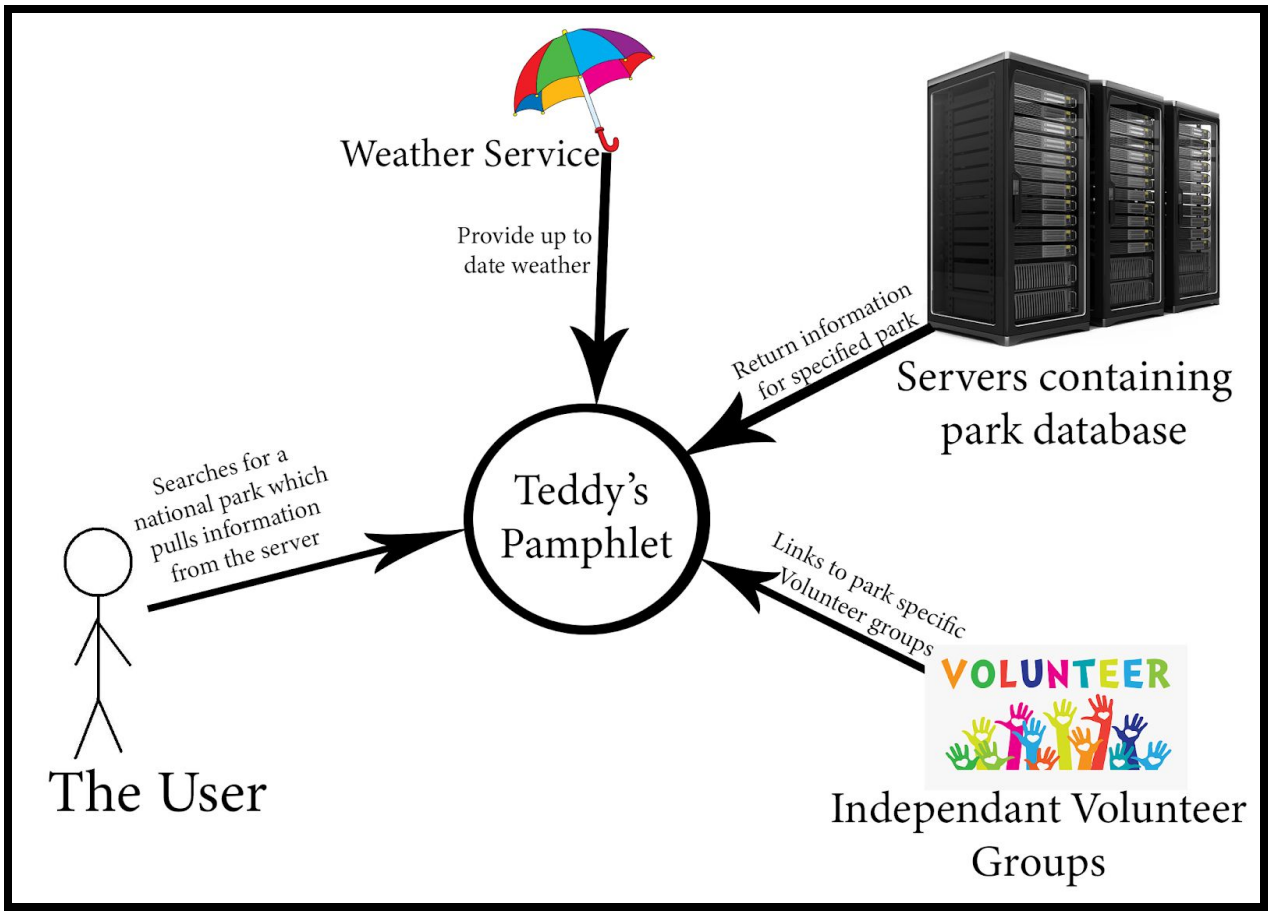
The work will be the improvement of accessibility for park information

3a The Current Situation

Currently, if the client wishes to visit a park, they can visit the park website, where information and presentation varies from park to park. If they want access to this information while they’re in the national park, they’ll have to roll the dice with shoddy phone service, or make sure they have a paper copy of the pamphlet.

If you are lost somewhere in the national park, and without a map or cellular service, then you are on your own.

3b The Context of the Work



The programmer will manually populate the database containing all the info about all the National Parks. From here, the server will contain and store all this information. When the user submits a request to see the information for any given park, the database will also pull

information for the weather in the area from a participating weather station, and a list of volunteer groups.

3c Work Partitioning

Event Name	Input and Output	Summary
Park Database	Park listings (in)	Return information for the specifies park
Weather Service	Update weather forecast for park (in)	Google API will assist in retrieving weather for chosen park
Independent Volunteer Groups	Volunteer listings (in)	Links and information will be provided for specific volunteering opportunities
User search	General information (in)	Search for specified National Park and display its information.

3d Competing Products

The National Park System already has a database of National Parks in place. Many of which have websites that are filled with bounties of valuable and pertinent information similar to what this app offers. Unlike the database offered by the NPS, Teddy's pamphlet aims to reduce the reliance on an internet connection, by providing a downloadable copy of National Park information should you find yourself in an area without service. We also provide information for what to do when you are lost or stranded. Which is information that is not easily accessible when you do not have cellular service.

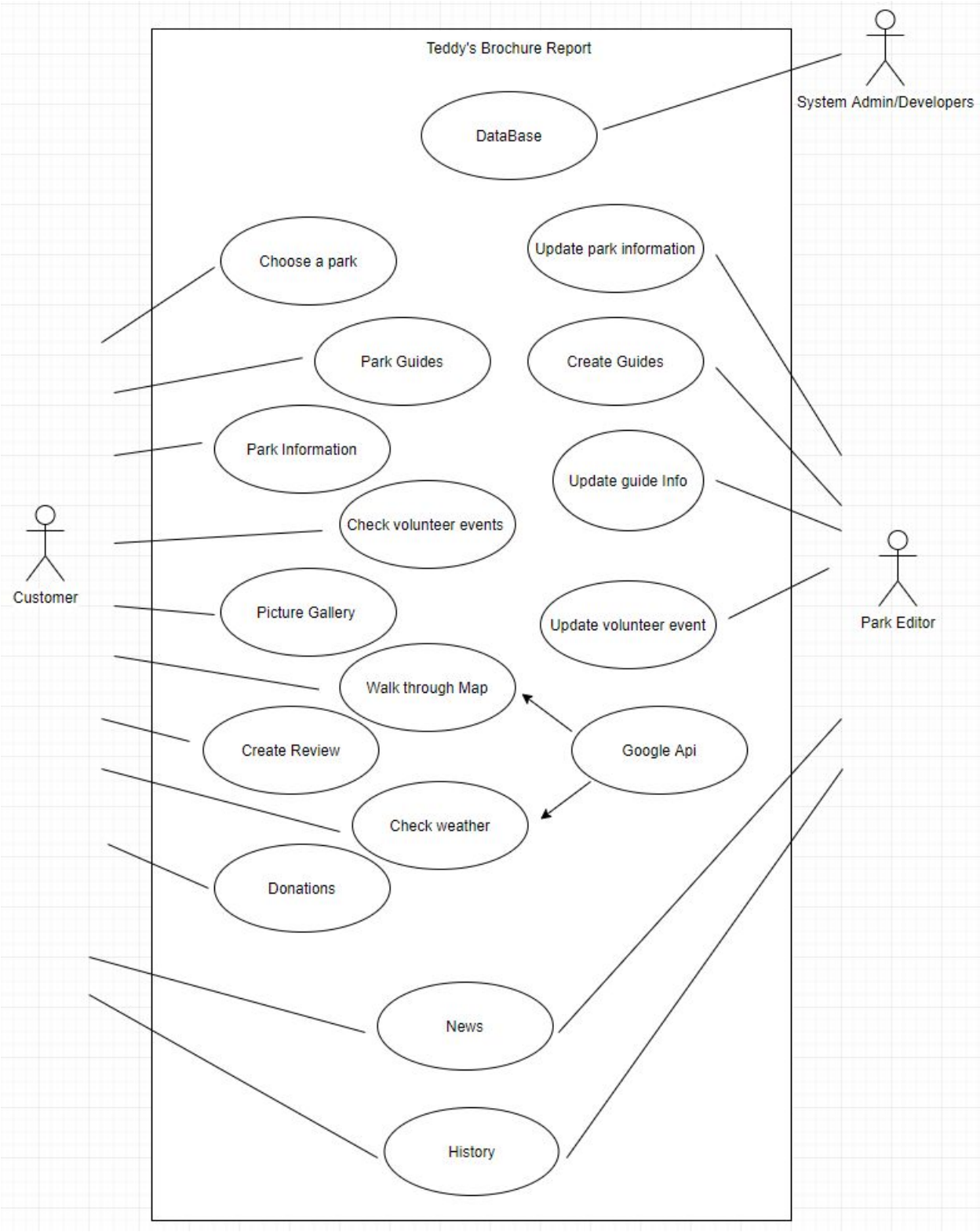
4 The Scope of the Product

Upon starting up the app, the user will be able to search for a national park, or select one from a drop down menu based off of location. the system will then pull data from a database for said national park. Information includes: Park hours, rules, maps, topological information, wildlife, volunteer groups, weather, and survival/safety tips.

The programmer will populate the server with park information. For things that are constantly updating, like the weather, the system will simply pull the most up to date information at the time the user requests for that information.

Independent Volunteer Groups will have their own websites that the app will link to. The User can leave reviews for any particular volunteer group, or visit their websites linked by our system.

4a Scenario Diagram(s)



4b Product Scenario List

1. Choose a park
2. Park Guides
3. Park Information
4. Check Volunteer Events
5. Picture Gallery
6. Walk through Map
7. Create Review
8. Check weather
9. Donations
10. News
11. History
12. Update park information
13. Create guides
14. Update guide information
15. Update volunteer event

4c Individual Product Scenarios

1. Choose a park: There are multiple national parks and the user can have the option of which park to access.
2. Park Guides: Each park is different and there are different guides to each park. What to do if lost, plan a visit, how to properly hike, what equipment to bring. All informational guides for people that have never been to a National Park.
3. Park Information: The general park location and contact information
4. Check volunteer events: The user can check each park for volunteer events. The user can check whenever they wish to volunteer. Events can be named, categorized by event, date and time, duration, and location.
5. Picture Gallery: Since each park is unique the park can showcase the highlight areas, and post photos that people have submitted from their visits.
6. Walk through Map: If a person is going to visit the national parks, there is not much cellular connection. The user can download a map for the park that uses google's street view, which can be used offline. This can make user's more confident exploring the parks.
7. Create Review: The user can create a review for the park or the volunteer events that have attended.
8. Check weather: A user can check the weather with google api. When planning a visit the user can see the park's available dates and weather forecast.
9. Donations: If a user wants to donate to the park(s), they can donate securely through the application. Maybe the application was very useful and was very thankful for the application they can donate to the parks.

10. News: The user can check news updates to each park on weather forecast, events, and history, animal endangerment, etc..
11. History: Each park is beautiful and unique in its own way. Each park can showcase its history to show its identity.
12. Update park information: Park information changes and editors can update the information accordingly.
13. Create guides: Each park can have its own specific guides to best deal with the environment.
14. Update guides: Guides can eventually be outdated, and having the best information available for people to plan their visits is key.
15. Update volunteer events: Park editors can add upcoming events for people to visit. They can also remove events that are canceled or past date.

5 Stakeholders

Teddy's Brochure could interest the National Park Service U.S. Departmental of the Interior as they focus on caring for the national parks with the help of volunteers and partners. Teddy's Brochure provides a lot of similar features they already have on their website, increasing their interest for the proposed product. Volunteers and park employees would also be interested in the development as they could potentially use the brochure as well.

5a The Client

The client is the National Park System.

5b The Customer

The customer is the National Park System, and each individual park that wishes to adopt the applications to include their park.

5c Hands-On Users of the Product

The hands-on users of the product are the general public and park employees that visit the parks. The general public would use the product to enhance their experience at the park. Their subject and technological experience could be novice. The employees would need to masters in the subject and journeyman in the technology experience in the case they are questioned by the general public. For those maintaining the brochure, they would need to masters.

5d Maintenance Users and Service Technicians

Maintaining the application will be handled by the development team. The app will be in constant update with multiple releases. After the last stages of the project, there can be a small team that deals with security updates and bug fixes.

Park managers and editors will be able to use the application to update events and information.

5e Other Stakeholders

Park employees might be replaced if their job is to assist or guide visitors around the park. Their job duties would change as there would be a system to care for and update.

Testers to test efficiency and functionality of the brochure.
System designers to see ensure functionality matches system specifications specified per sprint.
Usability Experts will attempt to download the package and report difficulties with the brochure.

5f User Participation

The client will participate through inspecting the app at different phases of development such as when the developers decide on what the app UI will look like. The client will also comment on functionalities that the app is missing. At the end, the client would test the application to make sure the user experience is up to par with the park standards.

5g Priorities Assigned to Users

As indicated in the use case diagram, the customer would be the most important user, the park editor would be the second most important user, and the system administrator would have the least amount of priority. This is mainly because the customer has the most use from the application, the park editor has less use cases than that, and the system administrator only has one use case.

6 Mandated Constraints

Mandated constraints include the app showing park information to the user. It must be compatible with at least one park. It must have a downloadable map of that one park that the user can interact with. It needs to show some volunteering activities within the specific park.

6a Solution Constraints

General constraints include the app being built within 6 months. Another constraint would be that each national park being worked on will have its own database. It should handle 1000 users at a time by the time that it is built and gradually scale up. It should be built with the client in mind as the client will greatly contribute to the development.

6b Implementation Environment of the Current System

The physical environment that the product will operate in is in each national park. Communication issues would be based on the availability of the wifi. It will be used for all operating systems including, but not limited to, Linux, Mac OS, and Windows. The hardware would include a server that is able to connect to the internet.

6c Partner or Collaborative Applications

The app must be compatible with google maps and must be able to obtain and parse information from APIs such as the one used to get weather. It must be compatible with storing jpegs and pdfs.

6d Off-the-Shelf Software

The product will come with all resources it needs. No additional software is needed for the application to function.

6e Anticipated Workplace Environment

The anticipated workplace environment for the application is the national parks where there is limited connection. Key features such as guides and maps should be accessible without internet connection. The rest of the application can be used anywhere with internet connection. There will be many first time users on the application/website, so the interface should be clean and simple to use.

6f Schedule Constraints

The pamphlet would be beneficial to be done 10 weeks after the start date. Allow 3 more weeks for testing to fix bugs and add functional enhancements. It would be beneficial to have it done by Spring into Summer when visitors begin to visit parks more due to the nice weather.

6g Budget Constraints

The application can be limited in budget by what the National Park Systems have allocated in their annual budget.

7 Naming Conventions and Definitions

Gallery: a server where people post pictures of the national park

Package: The application that is enhancing the national park service to the customers

Tips: hints on how to camp and hike at the national parks

Master: has complete knowledge of a domain

Maps: 2D maps

7a Definitions of Key Terms

Walk through map: Maps of the specific parks that people can interact with (google maps)

7b UML and Other Notation Used in This Document

This document generally follows the Version 2.5 OMG UML standard, as described by Fowler in [4]. Any exceptions are noted where used.

7c Data Dictionary for Any Included Models

Data structures that the app will use include hashamps that will store the developers, and editors information. These two users will have a name property that is a string. Editors will have an image property that accepts jpgs. The walk through maps would be of type roadmap. The listing of volunteering opportunities would be stored in an arraylist. Rules and how to prepare would be stored in a pdf.

8 Relevant Facts and Assumptions

8a Facts

Users will be able to use the brochure offline. Application is created to bring more exposure and visitors to the park.

8b Assumptions

Assumptions include that the weather information is available from google's api. Other assumptions include having volunteering organizations already established for the app to use. Any api's that we use, either for volunteering or weather, must be working and updated frequently in order to display accurate information. The user must have a device such as a phone or tablet that they can look at and that can download information when the person has service.

II Requirements

1 Product Use Cases

This section begins to describe in more specific and precise detail exactly what steps the system takes in the course of its performance. Use cases serve not only to more specifically define the system (and its boundaries), but also to identify functional requirements, to identify initial objects / classes, and to organize the work.

1a Use Case Diagrams

Use Case diagrams serve two purposes: As a form of graphical table of contents listing the individual use-cases, and also to define the boundary of what is included as part of the proposed system and what is not included.

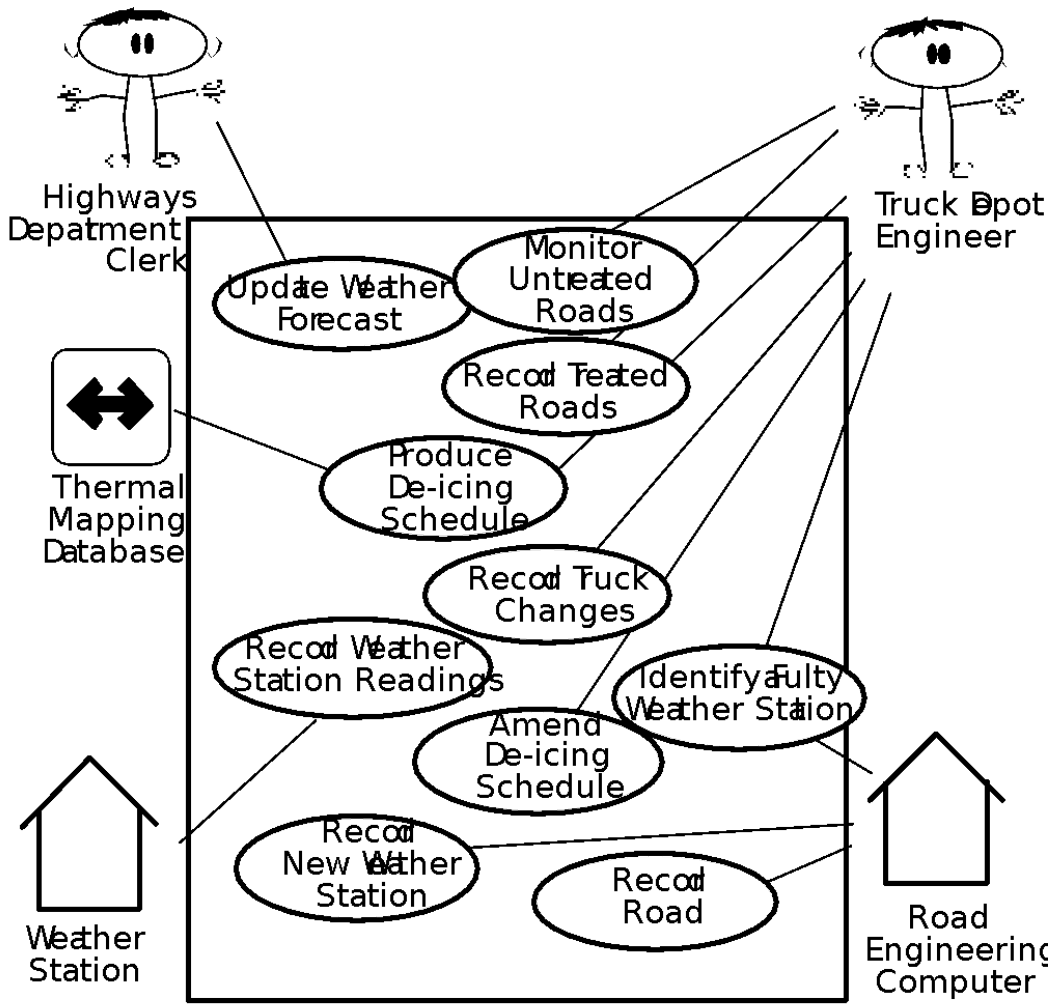
A use case diagram identifies the boundaries between the users (actors) and the product. You arrive at the product boundary by inspecting each business use case and determining,

in conjunction with the appropriate stakeholders, which part of the business use case should be automated (or satisfied by some sort of product) and what part should be done by the user. This task must take into account the abilities of the actors (section 3), the constraints (section 4), the goals of the project (section 1), and your knowledge of both the work and the technology that can make the best contribution to the work.

The use case diagram shows the actors outside the product boundary (the rectangle). The product use cases are the ellipses inside the boundary. The lines denote usage. Note that actors can be either automated or human.

Depending on the complexity of the product it may be necessary to use more than one diagram to list all of the use cases. When more than one diagram is required the use-cases can be divided up several ways: Normal operations versus exceptional cases, or daily tasks versus monthly tasks, or user tasks versus administration tasks, etc.

Example



Derive the product use cases by deciding where the product boundary should be for each business use case. These decisions are based on your knowledge of the work and the requirements constraints.

1b Product Use Case List

The use case diagram is a graphical way of summarizing the product use cases relevant to the product. If you have a large number of product use cases (we find 15–20 is a good limit), then it is better to make a list of the product use cases and model or describe each one individually.

1c Individual Product Use Cases

Use cases are similar to scenarios, in that both tell the story of how the system interacts with the user(s) in response to some business event or while conducting some business task. The difference is that use-cases are much more formal, with certain pre-determined sections for each use-case, and that use-cases indicate clearly what action the system takes in response to what actions taken by the user.

For example, here is Figure 4.7 from "Object Oriented Software Engineering" by Bruegge and DuToit. (See also the sample Use-Case form provided on the CS 440 web site.)

Use case name	`ReportEmergency`
Participating actors	Initiated by `FieldOfficer` Communicates with `Dispatcher`
Flow of events	1. The `FieldOfficer` activates the "Report Emergency" function of her terminal. 2. `FRIEND` responds by presenting a form to the `FieldOfficer`. 3. The `FieldOfficer` completes the form by selecting the emergency level, type, location, and brief description of the situation. The `FieldOfficer` also describes possible responses to the emergency situation. Once the form is completed, the `FieldOfficer` submits the form. 4. `FRIEND` receives the form and notifies the `Dispatcher`. 5. The `Dispatcher` reviews the submitted information and creates an `Incident` in the database by invoking the `OpenIncident` use case. The `Dispatcher` selects a response and acknowledges the report. 6. `FRIEND` displays the acknowledgment and the selected response to the `FieldOfficer`.
Entry condition	• The `FieldOfficer` is logged into `FRIEND`.
Exit conditions	• The `FieldOfficer` has received an acknowledgment and the selected response from the `Dispatcher`, OR • The `FieldOfficer` has received an explanation indicating why the transaction could not be processed.
Quality requirements	• The `FieldOfficer`'s report is acknowledged within 30 seconds. • The selected response arrives no later than 30 seconds after it is sent by the `Dispatcher`.

Figure 4-7 An example of a use case, `ReportEmergency`. Under `ReportEmergency`, the left column denotes actor actions, and the right column denotes system responses.

2 Functional Requirements

Content

A specification for each functional requirement. As with all types of requirements, use the requirements shell. A full explanation is included in this template's introductory material.

Motivation

To specify the detailed functional requirements for the activity of the product.

Examples

Fit Criterion

Each functional requirement should have a fit criterion or a test case. In any event, the fit criterion is the benchmark to allow the tester to determine whether the implemented product has met the requirement.

Considerations

If you have produced an event/use case list (see sections 7b and 8a), then you can use it to help you trigger the functional requirements for each event/use case. If you have not produced an event/use case list, give each functional requirement a unique number and, to help with traceability, partition these requirements into event/use case–related groups later in the development process.

3 Data Requirements

Content

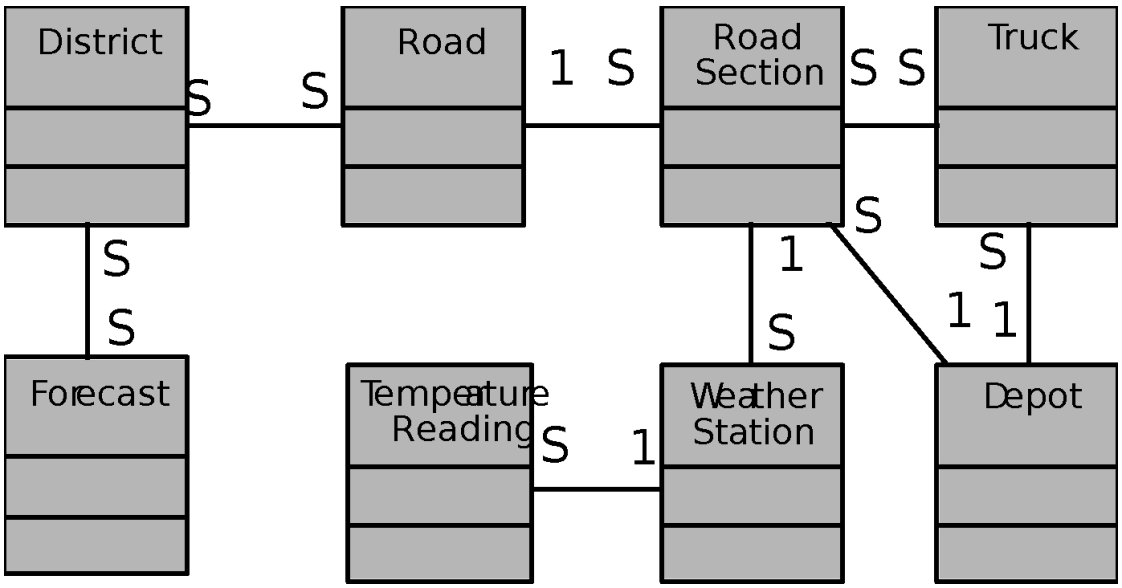
A specification of the essential subject matter, business objects, entities, and classes that are germane to the product. It might take the form of a first-cut class model, an object model, or a domain model. Alternatively, these requirements might be described by defining the terms in the dictionary described in section 5.

Motivation

To clarify the system's subject matter, thereby triggering recognition of requirements not yet considered.

Example

This is a model of the system's business subject matter using the Unified Modeling Language (UML) class model notation.



You can use any type of data or object model to capture this knowledge. The issue is to capture the meaning of the business subject matter and the connections between the individual parts, and to show that you are consistent within your project. If you have an established company standard notation, use that, as it will help you to reuse knowledge between projects.

Considerations

Are there any data or object models for similar or overlapping systems that might be a useful starting point? Is there a domain model for the subject matter dealt with by this system?

4 Performance Requirements

4a Speed and Latency Requirements

Content

Specifies the amount of time available to complete specified tasks. These requirements often refer to response times. They can also refer to the product's ability to operate at a speed suitable for the intended environment.

Motivation

Some products—usually real-time products—must be able to perform some of their functionality within a given time slot. Failure to do so may mean catastrophic failure (e.g., a ground-sensing radar in an airplane fails to detect an upcoming mountain) or the product will not cope with the required volume of use (e.g., an automated ticket-selling machine).

Examples

Any interface between a user and the automated system shall have a maximum response time of 2 seconds.

The response shall be fast enough to avoid interrupting the user's flow of thought.

The product shall poll the sensor every 10 seconds.

The product shall download the new status parameters within 5 minutes of a change.

Fit Criterion

Fit criteria are needed when the description of the requirement is not quantified. However, we find that most performance requirements are stated in quantified terms. The exception is the second requirement shown above, for which the suggested fit criterion is

The product shall respond in less than 1 second for 90 percent of the interrogations. No response shall take longer than 2.5 seconds.

Considerations

There is a wide variation in the importance of different types of speed requirements. If you are working on a missile guidance system, then speed is extremely important. By contrast, an inventory control report that is run once every six months has very little need for a lightning-fast response time.

Customize this section of the template to give examples of the speed requirements that are important within your environment.

4b Precision or Accuracy Requirements

Content

Quantification of the desired accuracy of the results produced by the product.

Motivation

To set the client's and users' expectations for the precision of the product.

Examples

All monetary amounts shall be accurate to two decimal places.

Accuracy of road temperature readings shall be within ±2°C.

Considerations

If you have done any detailed work on definitions, then some precision requirements might be adequately defined by definitions in section 5.

You might consider which units the product is intended to use. Readers will recall the spacecraft that crashed on Mars when coordinates were sent as metric data rather than imperial data.

The product might also need to keep accurate time, be synchronized with a time server, or work in UTC.

Also, be aware that some currencies have no decimal places, such as the Japanese yen.

4c Capacity Requirements

Content

This section specifies the volumes that the product must be able to deal with and the amount of data stored by the product.

Motivation

To ensure that the product is capable of processing the expected volumes.

Examples

The product shall cater for 300 simultaneous users within the period from 9:00 A.M. to 11:00 A.M. Maximum loading at other periods will be 150 simultaneous users.

During a launch period, the product shall cater for a maximum of 20 people to be in the inner chamber.

Fit Criterion

In this case, the requirement description is quantified, and thus can be tested.

5 Dependability Requirements

5a Reliability Requirements

Content

This section quantifies the necessary reliability of the product. The reliability is usually expressed as the allowable time between failures, or the total allowable failure rate.

Motivation

It is critical for some products not to fail too often. This section allows you to explore the possibility of failure and to specify realistic levels of service. It also gives you the opportunity to set the client's and users' expectations about the expected frequency and significance of potential failures.

Examples

The product shall not fail more than once per day.

*No data shall be lost or damaged in the event of a failure. (This is an example of a **fail-safe** requirement, which states that the product is allowed to fail, but it must do so safely.)*

Considerations

Consider carefully whether the real requirement for your product is that it is available for use or that it does not fail at any time.

Consider also the cost of reliability and availability, and whether it is justified for your product.

5b Availability Requirements

Content

This section quantifies the necessary availability of the product. The availability is usually expressed as the fraction of total time that the system is up and available for use.

Availability is a function of the mean time between failures, the mean time required to bring the system back up after a failure, and the mean time the system is expected to be down for routine maintenance.

Motivation

There is a subtle distinction between how often a system goes down (reliability)3and how much total time it spends being down (availability). This section allows you to specify realistic expectations about the amount of time that the product will be available for use.

Examples

The product shall be available for use 24 hours per day, 365 days per year.

The product shall be available for use between the hours of 8:00 A.M. and 5:30 P.M.

The escalator shall run from 6 A.M. until 10 P.M. or the last flight arrives.

The product shall achieve 99 percent uptime.

Considerations

Consider carefully whether the real requirement for your product is that it is available for use or that it does not fail at any time.

Consider also the cost of reliability and availability, and whether it is justified for your product.

The sections on reliability and availability can sometimes be combined.

5c Robustness or Fault-Tolerance Requirements

Content

Robustness specifies the ability of the product to continue to function under abnormal circumstances.

Motivation

To ensure that the product is able to provide some or all of its services after or during some abnormal happening in its environment.

Examples

The product shall continue to operate in local mode whenever it loses its link to the central server.

The product shall provide 10 minutes of emergency operation should it become disconnected from the electricity source.

Considerations

Abnormal happenings can almost be considered normal. Today's products are so large and complex that there is a good chance that at any given time, one component will not be functioning correctly. Robustness requirements are intended to prevent total failure of the product.

You could also consider disaster recovery in this section. This plan describes the ability of the product to reestablish acceptable performance after faults or abnormal happenings.

5d Safety-Critical Requirements

Content

Quantification of the perceived risk of damage to people, property, and environment. Different countries have different standards, so the fit criteria must specify precisely which standards the product must meet.

Motivation

To understand and highlight the damage that could potentially occur when using the product within the expected operational environment.

Examples

The product shall not emit noxious gases that damage people's health.

The heat exchanger shall be shielded from human contact.

Fit Criterion

The product shall be certified to comply with the Health Department's standard E110-98. It is to be certified by qualified testing engineers.

No member of a test panel of [specified size] shall be able to touch the heat exchanger. The heat exchanger must also comply with safety standard [specify which one].

Considerations

The example requirements given here apply to some, but not all, products. It is not possible to give examples of every variation of safety-critical requirement. To make the template work in your environment, you should customize it by adding examples that are specific to your products.

Also, be aware that different countries have different safety standards and laws relating to safety. If you plan to sell your product internationally, you must be aware of these

laws. A colleague has suggested that for electrical products, if you follow the German standards, the largest number of countries will be supported.

If you are building safety-critical systems, then the relevant safety-critical standards are already well specified. You will likely have safety experts on your staff. These experts are the best source of the relevant safety-critical requirements for your type of product. They will almost certainly have copious information that you can use.

Consult your legal department. Members of this department will be aware of the kinds of lawsuits that have resulted from product safety failure. This is probably the best starting place for generating relevant safety requirements.

6 Maintainability and Supportability Requirements

6a Maintenance Requirements

Content

A quantification of the time necessary to make specified changes to the product.

Motivation

To make everyone aware of the maintenance needs of the product.

Examples

New MIS reports must be available within one working week of the date when the requirements are agreed upon.

A new weather station must be able to be added to the system overnight.

Considerations

There may be special requirements for maintainability, such as that the product must be able to be maintained by its end users or by developers who are not the original developers. These requirements have an effect on the way that the product is developed. In addition, there may be requirements for documentation or training.

You might also consider writing testability requirements in this section.

6b Supportability Requirements

Content

This specifies the level of support that the product requires. Support is often provided via a help desk. If people will provide support for the product, that service is considered part of the product: Are there any requirements for that support? You might also build

support into the product itself, in which case this section is the place to write those requirements.

Motivation

To ensure that the support aspect of the product is adequately specified.

Considerations

Consider the anticipated level of support, and what forms it might take. For example, a constraint might state that there is to be no printed manual. Alternatively, the product might need to be entirely self-supporting.

6c Adaptability Requirements

Content

Description of other platforms or environments to which the product must be ported.

Motivation

To quantify the client's and users' expectations about the platforms on which the product will be able to run.

Examples

The product is expected to run under Windows XP and Linux.

The product might eventually be sold in the Japanese market.

The product is designed to run in offices, but we intend to have a version running in restaurant kitchens.

Fit Criterion

Specification of system software on which the product must operate.

Specification of future environments in which the product is expected to operate.

Time allowed to make the transition.

Considerations

Question your marketing department to discover unstated assumptions that have been made about the portability of the product.

6d Scalability or Extensibility Requirements

Content

This specifies the expected increases in size that the product must be able to handle. As a business grows (or is expected to grow), our software products must increase their capacities to cope with the new volumes.

Motivation

To ensure that the designers allow for future capacities.

Examples

The product shall be capable of processing the existing 100,000 customers. This number is expected to grow to 500,000 customers within three years.

The product shall be able to process 50,000 transactions per hour within two years of its launch.

6e Longevity Requirements

Content

This specifies the expected lifetime of the product.

Motivation

To ensure that the product is built based on an understanding of expected return on investment.

Examples

The product shall be expected to operate within the maximum maintenance budget for a minimum of five years.

7 Security Requirements

7a Access Requirements

Content

Specification of who has authorized access to the product (both functionality and data), under what circumstances that access is granted, and to which parts of the product access is allowed.

Motivation

To understand the expectations for confidentiality aspects of the system.

Examples

Only direct managers can see the personnel records of their staff.

Only holders of current security clearance can enter the building.

Fit Criterion

System function name or system data name.

User roles and/or names of people who have clearance.

Considerations

Is there any data that management considers to be sensitive? Is there any data that low-level users do not want management to have access to? Are there any processes that might cause damage or might be used for personal gain? Are there any people who should not have access to the system?

Avoid stating how you will design a solution to the security requirements. For instance, don't "design a password system." Your aim here is to identify the security requirement; the design will then come from this description.

Consider asking for help. Computer security is a highly specialized field, and one where improperly qualified people have no business. If your product has need of more than average security, we advise you to make use of a security consultant. Such consultants are not cheap, but the results of inadequate security can be even more expensive.

7b Integrity Requirements

Content

Specification of the required integrity of databases and other files, and of the product itself.

Motivation

To understand the expectations for the integrity of the product's data. To specify what the product will do to ensure its integrity in the case of an unwanted happening such as attack from the outside or unintentional misuse by an authorized user.

Examples

The product shall prevent incorrect data from being introduced.

The product shall protect itself from intentional abuse.

Considerations

Organizations are relying more and more on their stored data. If this data should be come corrupt or incorrect—or disappear—then it could be a fatal blow to the organization. For example, almost half of small businesses go bankrupt after a fire destroys their computer systems. Integrity requirements are aimed at preventing complete loss, as well as corruption, of data and processes.

7c Privacy Requirements

Content

Specification of what the product has to do to ensure the privacy of individuals about whom it stores information. The product must also ensure that all laws related to privacy of an individual's data are observed.

Motivation

To ensure that the product complies with the law, and to protect the individual privacy of your customers. Few people today look kindly on organizations that do not observe their privacy.

Examples

The product shall make its users aware of its information practices before collecting data from them.

The product shall notify customers of changes to its information policy.

The product shall reveal private information only in compliance with the organization's information policy.

The product shall protect private information in accordance with the relevant privacy laws and the organization's information policy.

Considerations

Privacy issues may well have legal implications, and you are advised to consult with your organization's legal department about the requirements to be written in this section.

Consider what notices you must issue to your customers before collecting their personal information. A notice might go so far as to warn customers that you intend to put a cookie in their computer. Also, do you have to do anything to keep customers aware that you hold their personal information?

Customers must always be in a position to give or withhold consent when their private data is collected or stored. Similarly, customers should be able to view any private data and, where appropriate, ask for correction of the data.

Also consider the integrity and security of private data—for example, when you are storing credit card information.

7d Audit Requirements

Content

Specification of what the product has to do (usually retain records) to permit the required audit checks.

Motivation

To build a system that complies with the appropriate audit rules.

Considerations

This section may have legal implications. You are advised to seek the approval of your organization's auditors regarding what you write here.

You should also consider whether the product should retain information on who has used it. The intention is to provide security such that a user may not later deny having used the product or participated in some form of transaction using the product.

7e Immunity Requirements

Content

The requirements for what the product has to do to protect itself from infection by unauthorized or undesirable software programs, such as viruses, worms, and Trojan horses, among others.

Motivation

To build a product that is as secure as possible from malicious interference.

Considerations

Each day brings more malevolence from the unknown, outside world. People buying software, or any other kind of product, expect that it can protect itself from outside interference.

8 Usability and Humanity Requirements

This section is concerned with requirements that make the product usable and ergonomically acceptable to its hands-on users.

8a Ease of Use Requirements

Content

This section describes your client's aspirations for how easy it is for the intended users of the product to operate it. The product's usability is derived from the abilities of the expected users of the product and the complexity of its functionality.

The usability requirements should cover properties such as these:

- *Efficiency of use: How quickly or accurately the user can use the product.*
- *Ease of remembering: How much the casual user is expected to remember about using the product.*
- *Error rates: For some products it is crucial that the user commits very few, or no, errors.*
- *Overall satisfaction in using the product: This is especially important for commercial, interactive products that face a lot of competition. Web sites are a good example.*
- *Feedback: How much feedback the user needs to feel confident that the product is actually accurately doing what the user expects. The necessary degree of feedback will be higher for some products (e.g., safety-critical products) than for others.*

Motivation

To guide the product's designers toward building a product that meets the expectations of its eventual users.

Examples

The product shall be easy for 11-year-old children to use.

The product shall help the user to avoid making mistakes.

The product shall make the users want to use it.

The product shall be used by people with no training, and possibly no understanding of English.

Fit Criterion

These examples may seem simplistic, but they do express the intention of the client. To completely specify what is meant by the requirement, you must add a measurement against which it can be tested—that is, a fit criterion. Here are the fit criteria for the preceding examples:

Eighty percent of a test panel of 11-year-old children shall be able to successfully complete [list of tasks] within [specified time].

One month's use of the product shall result in a total error rate of less than 1 percent.

An anonymous survey shall show that 75 percent of the intended users are regularly using the product after a three-week familiarization period.

Considerations

Refer to section 3, Users of the Product, to ensure that you have considered the usability requirements from the perspective of all the different types of users.

It may be necessary to have special consulting sessions with your users and your client to determine whether any special usability considerations must be built into the product.

You could also consider consulting a usability laboratory experienced in testing the usability of products that have a project situation (sections 1–7 of this template) similar to yours.

8b Personalization and Internationalization Requirements

Content

This section describes the way in which the product can be altered or configured to take into account the user's personal preferences or choice of language.

The personalization requirements should cover issues such as the following:

- *Languages, spelling preferences, and language idioms*
- *Currencies, including the symbols and decimal conventions*
- *Personal configuration options*

Motivation

To ensure that the product's users do not have to struggle with, or meekly accept, the builder's cultural conventions.

Examples

The product shall retain the buyer's buying preferences.

The product shall allow the user to select a chosen language.

Considerations

Consider the country and culture of the potential customers and users of your product. Any out-of-country users will welcome the opportunity to convert to their home spelling and expressions.

By allowing users to customize the way in which they use the product, you give them the opportunity to participate more closely with your organization as well as enjoy their own personal user experience.

You might also consider the configurability of the product. Configurability allows different users to have different functional variations of the product.

8c Learning Requirements

Content

Requirements specifying how easy it should be to learn to use the product. This learning curve ranges from zero time for products intended for placement in the public domain (e.g., a parking meter or a web site) to a considerable amount of time for complex, highly technical products. (We know of one product where it was necessary for graduate engineers to spend 18 months in a training program before being qualified to use the product.)

Motivation

To quantify the amount of time that your client feels is allowable before a user can successfully use the product. This requirement guides designers to understand how users will learn the product. For example, designers may build elaborate interactive help facilities into the product, or the product may be packaged with a tutorial. Alternatively, the product may have to be constructed so that all of its functionality is apparent upon first encountering it.

Examples

The product shall be easy for an engineer to learn.

A clerk shall be able to be productive within a short time.

The product shall be able to be used by members of the public who will receive no training before using it.

The product shall be used by engineers who will attend five weeks of training before using the product.

Fit Criterion

An engineer shall produce a [specified result] within [specified time] of beginning to use the product, without needing to use the manual.

After receiving [number of hours] training a clerk shall be able to produce [quantity of specified outputs] per [unit of time].

[Agreed percentage] of a test panel shall successfully complete [specified task] within [specified time limit].

The engineers shall achieve [agreed percentage] pass rate from the final examination of the training.

Considerations

Refer to section 3, Users of the Product, to ensure that you have considered the ease of learning requirements from the perspective of all the different types of users.

8d Understandability and Politeness Requirements

This section is concerned with discovering requirements related to concepts and metaphors that are familiar to the intended end users.

Content

This specifies the requirement for the product to be understood by its users. While "usability" refers to ease of use, efficiency, and similar characteristics, "understandability" determines whether the users instinctively know what the product will do for them and how it fits into their view of the world. You can think of understandability as the product being polite to its users and not expecting them to know or learn things that have nothing to do with their business problem.

Motivation

To avoid forcing users to learn terms and concepts that are part of the product's internal construction and are not relevant to the users' world. To make the product more comprehensible and thus more likely to be adopted by its intended users.

Examples

The product shall use symbols and words that are naturally understandable by the user community.

The product shall hide the details of its construction from the user.

Considerations

Refer to section 3, Users of the Product, and consider the world from the point of view of each of the different types of users.

8e Accessibility Requirements

Content

The requirements for how easy it should be for people with common disabilities to access the product. These disabilities might be related to physical disability or visual, hearing, cognitive, or other abilities.

Motivation

In many countries it is required that some products be made available to the disabled. In any event, it is self-defeating to exclude this sizable community of potential customers.

Examples

The product shall be usable by partially sighted users.

The product shall conform to the Americans with Disabilities Act.

Considerations

Some users have disabilities other than the commonly described ones. In addition, some partial disabilities are fairly common. A simple, and not very consequential, example is that approximately 20 percent of males are red-green colorblind.

8f User Documentation Requirements

Content

List of the user documentation to be supplied as part of the product.

Motivation

To set expectations for the documentation and to identify who will be responsible for creating it.

Examples

Technical specifications to accompany the product.

User manuals.

Service manuals (if not covered by the technical specification).

Emergency procedure manuals (e.g., the card found in airplanes).

Installation manuals.

Considerations

Which documents do you need to deliver, and to whom? Bear in mind that the answer to this questions depends on your organizational procedures and roles.

For each document, consider these issues:

- *The purpose of the document*
- *The people who will use the document*
- *Maintenance of the document*

What level of documentation is expected? Will the users be involved in the production of the documentation? Who will be responsible for keeping the documentation up-to-date? What form will the documentation take?

8g Training Requirements

Content

A description of the training needed by users of the product.

Motivation

To set expectations for the training. To identify who is responsible for creating and providing that training.

Considerations

What training will be necessary? Who will design the training? Who will provide the training?

9 Look and Feel Requirements

9a Appearance Requirements

Content

The section contains requirements relating to the spirit of the product. Your client may have made particular demands for the product, such as corporate branding, colors to be used, and so on. This section captures the requirements for the appearance. Do not attempt to design it until the appearance requirements are known.

Motivation

To ensure that the appearance of the product conforms to the organization's expectations.

Examples

The product shall be attractive to a teenage audience.

The product shall comply with corporate branding standards.

Fit Criterion

A sampling of representative teenagers shall, without prompting or enticement, start using the product within four minutes of their first encounter with it.

The office of branding shall certify the product complies with the current standards.

Considerations

Even if you are using prototypes, it is important to understand the requirements for the appearance. The prototype is used to help elicit requirements; it should not be thought of as a substitute for the requirements.

9b Style Requirements

Content

Requirements that specify the mood, style, or feeling of the product, which influences the way a potential customer will see the product. Also, the stakeholders' intentions for the amount of interaction the user is to have with the product.

In this section, you would also describe the appearance of the package if this is to be a manufactured product. The package may have some requirements as to its size, style, and consistency with other packages put out by your organization. Keep in mind the European laws on packaging, which require that the package not be significantly larger than the product it encloses.

The style requirements that you record here will guide the designers to create a product as envisioned by your client.

Motivation

Given the state of today's market and people's expectations, we cannot afford to build products that have the wrong style. Once the functional requirements are satisfied, it is often the appearance and style of products that determine whether they are successful. Your task in this section is to determine precisely how the product shall appear to its intended consumer.

Example

The product shall appear authoritative.

Fit Criterion

After their first encounter with the product, 70 percent of representative potential customers shall agree they feel they can trust the product.

Considerations

The look and feel requirements specify your client's vision of the product's appearance. The requirements may at first seem to be rather vague (e.g., "conservative and professional appearance"), but these will be quantified by their fit criteria. The fit criteria give you the opportunity to extract from your client precisely what is meant, and give the designer precise instructions on what he is to accomplish.

10 Operational and Environmental Requirements

10a Expected Physical Environment

Content

This section specifies the physical environment in which the product will operate.

Motivation

To highlight conditions that might need special requirements, preparations, or training. These requirements ensure that the product is fit to be used in its intended environment.

Examples

The product shall be used by a worker, standing up, outside in cold, rainy conditions.

The product shall be used in noisy conditions with a lot of dust.

The product shall be able to fit in a pocket or purse.

The product shall be usable in dim light.

The product shall not be louder than the existing noise level in the environment.

Considerations

The work environment: Is the product to operate in some unusual environment? Does this lead to special requirements? Also see section 11, Usability and Humanity Requirements.

10b Requirements for Interfacing with Adjacent Systems

Content

This section describes the requirements to interface with partner applications and/or devices that the product needs to successfully operate.

Motivation

Requirements for the interfaces to other applications often remain undiscovered until implementation time. Avoid a high degree of rework by discovering these requirements early.

Examples

The products shall work on the last four releases of the five most popular browsers.

The new version of the spreadsheet must be able to access data from the previous two versions.

Our product must interface with the applications that run on the remote weather stations.

Fit Criterion

For each inter-application interface, specify the following elements:

- *The data content*
- *The physical material content*
- *The medium that carries the interface*
- *The frequency*
- *The volume*

10c Productization Requirements

Content

Any requirements that are necessary to make the product into a distributable or salable item. It is also appropriate to describe here the operations needed to install a software product successfully.

Motivation

To ensure that if work must be done to get the product out the door, then that work becomes part of the requirements. Also, to quantify the client's and users' expectations about the amount of time, money, and resources they will need to allocate to install the product.

Examples

The product shall be distributed as a ZIP file.

The product shall be able to be installed by an untrained user without recourse to separately printed instructions.

The product shall be of a size such that it can fit on one CD.

Considerations

Some products have special needs to turn them into a salable or usable product. You might consider that the product has to be protected such that only paid-up customers can access it.

Ask questions of your marketing department to discover unstated assumptions that have been made about the specified environment and the customers' expectations of how long installation will take and how much it will cost.

Most commercial products have some needs in this area.

10d Release Requirements

Content

Specification of the intended release cycle for the product and the form that the release shall take.

Motivation

To make everyone aware of how often you intend to produce new releases of the product.

Examples

The maintenance releases will be offered to end users once a year.

Each release shall not cause previous features to fail.

Fit Criterion

Description of the type of maintenance plus the amount of effort budgeted for it.

Considerations

Do you have any existing contractual commitments or maintenance agreements that might be affected by the new product?

11 Cultural and Political Requirements

11a Cultural Requirements

Content

This section contains requirements that are specific to the sociological factors that affect the acceptability of the product. If you are developing a product for foreign markets, then these requirements are particularly relevant.

Motivation

To bring out in the open requirements that are difficult to discover because they are outside the cultural experience of the developers.

Examples

The product shall not be offensive to religious or ethnic groups.

The product shall be able to distinguish between French, Italian, and British road-numbering systems.

The product shall keep a record of public holidays for all countries in the European Union and for all states in the United States.

Considerations

Question whether the product is intended for a culture other than the one with which you are familiar. Ask whether people in other countries or in other types of organizations will use the product. Do these people have different habits, holidays, superstitions, or cultural norms that do not apply to your own culture? Are there colors, icons, or words that have different meanings in another cultural environment?

11b Political Requirements

Content

This section contains requirements that are specific to the political factors that affect the acceptability of the product.

Motivation

To understand requirements that sometimes appear irrational.

Examples

The product shall be installed using only American-made components.

The product shall make all functionality available to the CEO.

Considerations

Did you intend to develop the product on a Macintosh, when the office manager has laid down an edict that only Windows machines are permitted?

Is a director also on the board of a company that manufactures products similar to the one that you intend to build?

Whether you agree with these political requirements has little bearing on the outcome. The reality is that the system has to comply with political requirements even if you can find a better, more efficient, or more economical solution. A few probing questions here may save some heartache later.

The political requirements might be purely concerned with the politics inside your organization. However, in other situations you may need to consider the politics inside your customers' organizations or the national politics of the country.

12 Legal Requirements

12a Compliance Requirements

Content

A statement specifying the legal requirements for this system.

Motivation

To comply with the law so as to avoid later delays, lawsuits, and legal fees.

Examples

Personal information shall be implemented so as to comply with the Data Protection Act.

Fit Criterion

Lawyers' opinion that the product does not break any laws.

Considerations

Consider consulting lawyers to help identify the legal requirements.

Are there any copyrights or other intellectual property that must be protected? Conversely, do any competitors have copyrights on which you might be in danger of infringing?

Is it a requirement that developers have not seen competitors' code or even have worked for competitors?

The Sarbanes-Oxley (SOX) Act, the Health Insurance Portability and Accountability Act (HIPAA) and the Gramm-Leach-Bliley Act may have implications for you. Check with your company lawyer.

Might any pending legislation affect the development of this system?

Are there any aspects of criminal law you should consider?

Have you considered the tax laws that affect your product?

Are there any labor laws (e.g., working hours) relevant to your product?

12b Standards Requirements

Content

A statement specifying applicable standards and referencing detailed standards descriptions. This does not refer to the law of the land—think of it as an internal law imposed by your company.

Motivation

To comply with standards so as to avoid later delays.

Example

The product shall comply with MilSpec standards.

The product shall comply with insurance industry standards.

The product shall be developed according to SSADM standard development steps.

Fit Criterion

The appropriate standard-keeper certifies that the standard has been adhered to.

Considerations

It is not always apparent that there are applicable standards because their existence is often taken for granted. Consider the following:

- *Do any industry bodies have applicable standards?*
- *Does the industry have a code of practice, watchdog, or ombudsman?*
- *Are there any special development steps for this type of product?*

III Design

1 System Design

1a Design goals

Content

Design goals are important properties of the system to be optimized, and which may affect the overall design of the system. For example computer games place a higher priority on speed than accuracy, and so the physics engine for a computer game may make some rough approximations and assumptions that allow it to run as fast as possible while sacrificing accuracy, whereas the physics calculations performed by NASA must be much more rigorously correct, even at the expense of speed.

Note an important difference between design goals and requirements: Requirements include specific values that must be met in order for the product to be acceptable to the client, whereas design goals are properties that the designers strive to make "as good as possible", without specific criteria for acceptability. (Note also that the same property may appear in both a requirement and a design goal, so a design goal may be to make the system run as fast as possible, with a requirement that says any speed below a certain specified threshold is unacceptable.)

Your text goes here . . .

2 Current Software Architecture

SV:

Your text goes here . . .

3 Proposed Software Architecture

3a Overview

SV:

Your text goes here . . .

3b Class Diagrams

SV:

Your text goes here . . .

3c Dynamic Model

SV:

Your text goes here . . .

Content

Include sequence diagrams of each use-case here. This is a first step towards identifying preliminary objects. (If the sequence diagram would be too big to fit, then it can either be broken down into pieces or a communication diagram can be used in its place.)

Depending on the particular design, this section may also include finite state diagrams.

3d Subsystem Decomposition

SV:

Your text goes here . . .

3e Hardware / software mapping

SV:

Your text goes here . . .

3f Data Dictionary

SV:

Your text goes here . . .

3g Persistent Data management

SV:

Your text goes here . . .

3h Access control and security

SV:

Your text goes here . . .

3i Global software control

SV:

Your text goes here . . .

3j Boundary conditions

SV:

Your text goes here . . .

4 Subsystem services

SV:

Your text goes here . . .

5 User Interface

SV:

Your text goes here . . .

6 Object Design

6a Object Design trade-offs

SV:

Your text goes here . . .

6b Interface Documentation guidelines

SV:

Your text goes here . . .

6c Packages

SV:

Your text goes here . . .

6d Class Interfaces

SV:

Your text goes here . . .

IV Test Plans

1 Features to be tested / not to be tested

SV:

Your text goes here . . .

2 Pass/Fail Criteria

SV:

Your text goes here . . .

3 Approach

SV:

Your text goes here . . .

4 Suspension and resumption

SV:

Your text goes here . . .

5 Testing materials (hardware / software requirements)

SV:

Your text goes here . . .

6 Test cases

SV:

Your text goes here . . .

7 Testing schedule

SV:

Your text goes here . . .

V Project Issues

1 Open Issues

SV: Issues that have been raised and do not yet have a conclusion.

Your text goes here . . .

2 Off-the-Shelf Solutions

SV: Discussion of products or components currently available that could either be incorporated into the new solution or simply used instead of developing (parts of) the new solution. The distinction between sections 35 a, b, and c is subtle, and not very important.

Your text goes here . . .

2a Ready-Made Products

SV: Products available for purchase that could be used either as part of a solution or instead of (a part of) a solution.

Your text goes here . . .

2b Reusable Components

SV: Similar to 35a, but for components such as libraries or toolkits instead of fully blown products.

Your text goes here . . .

2c Products That Can Be Copied

SV: Products that could legally be copied would typically be past projects developed by the same development group, provided there were no restrictions that would prevent their reuse.

Your text goes here . . .

3 New Problems

SV: The proposed new system certainly has its benefits, but it could also raise new problems. It is a good idea to identify any such potential problems early on, rather than being surprised by them later.

3a Effects on the Current Environment

SV: Could the new system have any adverse effects on the working environment, e.g. the way people do their jobs?

Your text goes here . . .

3b Effects on the Installed Systems

SV: Could the new system have any adverse effects on other hardware or software systems?

Your text goes here . . .

3c Potential User Problems

SV: Could the new system have any adverse effects on the users of the software? Could users possibly have a negative response to the new system?

Your text goes here . . .

3d Limitations in the Anticipated Implementation Environment That May Inhibit the New Product

SV: Are there any (physical) limitations in the expected environment that could inhibit the proposed product? (e.g. weather, electrical interference, radiation, lack of reliable power, etc.)

Your text goes here . . .

3e Follow-Up Problems

SV: Basically any other possible problems that could occur.

Your text goes here . . .

4 Migration to the New Product

SV: This section only applies when there is an existing system that is being replaced by a new system, particularly when data must be preserved and possibly translated / reformatted. Otherwise just write "Not Applicable" under section 38 and remove sections 38a and 38b.

4a Requirements for Migration to the New Product

SV: These are a list of requirements relevant to the migration procedures. For example a requirement that the two systems be run in parallel for a time until the client is satisfied with the new system and the users know how to use it.

Your text goes here . . .

4b Data That Has to Be Modified or Translated for the New System

*SV: This section specifically addresses **data** that must be preserved and/or translated / reformatted during the migration process.*

Your text goes here . . .

5 Risks

SV: Consideration of the potential risks that could cause the project to fail / underperform.

Your text goes here . . .

6 Costs

SV: An estimate of what it will cost to complete this project. Think not only in terms of dollars, but also time, resources, lost opportunities, etc.

Your text goes here . . .

7 Waiting Room

SV: This is a place to record ideas or wishes that will not be included in the current release of the product, but which might be worth reconsidering at a later date.

Your text goes here . . .

8 Ideas for Solutions

SV: When developing requirements only, it is not the role of the business analyst to dictate the implementation of the solution. However they can pass along any ideas they have here as suggestions to the developers. For CS 440 this report includes system and object design, so this section would make suggestions for implementation and testing that would come after design, such as the use of a particular language, IDE, library, or other tools.

Your text goes here . . .

9 Project Retrospective

SV: At the conclusion of the (CS 440) project, reflect back on what worked well and what didn't, and how the process could be improved in the future.

Your text goes here . . .

VI Glossary

SV: The glossary is a more complete and inclusive dictionary of defined terms than that found in section I.7.a, the latter of which only covered the most important key terms needed to understand the report.

Your text goes here . . .

VII References / Bibliography

This section describes the documents and other sources from which information was gathered. This sample bibliography was generated using the "Insert Citation" and "Bibliography" buttons in the "Citations & Bibliography" section under the "References" tab of MS Word. Creating new citations will not update this list unless you click on it and select "Update Field". You may need to reset the style for this paragraph to "normal" after updating.

[1] Robertson and Robertson, Mastering the Requirements Process.

[2] A. Silberschatz, P. B. Galvin and G. Gagne, Operating System Concepts, Ninth ed., Wiley, 2013.

[3] J. Bell, "Underwater Archaeological Survey Report Template: A Sample Document for Generating Consistent Professional Reports," Underwater Archaeological Society of Chicago, Chicago, 2012.

[4] M. Fowler, UML Distilled, Third Edition, Boston: Pearson Education, 2004.

VIII Index

This section provides an index to the report. The sample below was generated using the "Mark Entry" and "Insert Index" items from the "Index" section on the "References" tab, and can be automatically updated by right clicking on the table below and selecting "Update Field". To remove marked entries from the document, toggle the display of hidden paragraph marks (the paragraph button on the "Home" tab), and remove the tags shown with XE in { curly braces. }