

Battlerines: The War of Submarines



Prepared by
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I Project Description

1 Project Overview

Battlerines: The War of Submarines is an extension to a popular, classic game *Battleship*. The main goal of an extension is to create an environment where the game can be played by more than two people at the same time. This extension provides game rules and mechanics for two - four players, giving them new and unique board layout, ability to move their ships and a new goal: destroy opponents bases instead of ships in order to defeat another player.

2 The Purpose of the Project

2a The User Business or Background of the Project Effort

Current implementation of the *Battleship* game provides a game mechanics suited for two players only. That makes it impossible to play in a group of three or four players without a significant amount of changes in both game logic and board layout.

2b Goals of the Project

We want to make it possible to play a classic *Battleship* game with more than two players at a time.

2c Measurement

The project is considered as completed when it provides an ability for two, three and four users to play a fair game, considering that the game lasts for at least 10 minutes.

3 The Scope of the Work

The work that is covered by the project encapsulates the activities associated with the users entertainment while playing the *Battleship* game with more than two players.

3a The Current Situation

The game industry provides a lot of games that can be played with more than two players at a time, but if the user wants to play a classic or an old game (*Battleship* in our case) with more than one of the friends, they currently have no ability at all to do that.

3b The Context of the Work

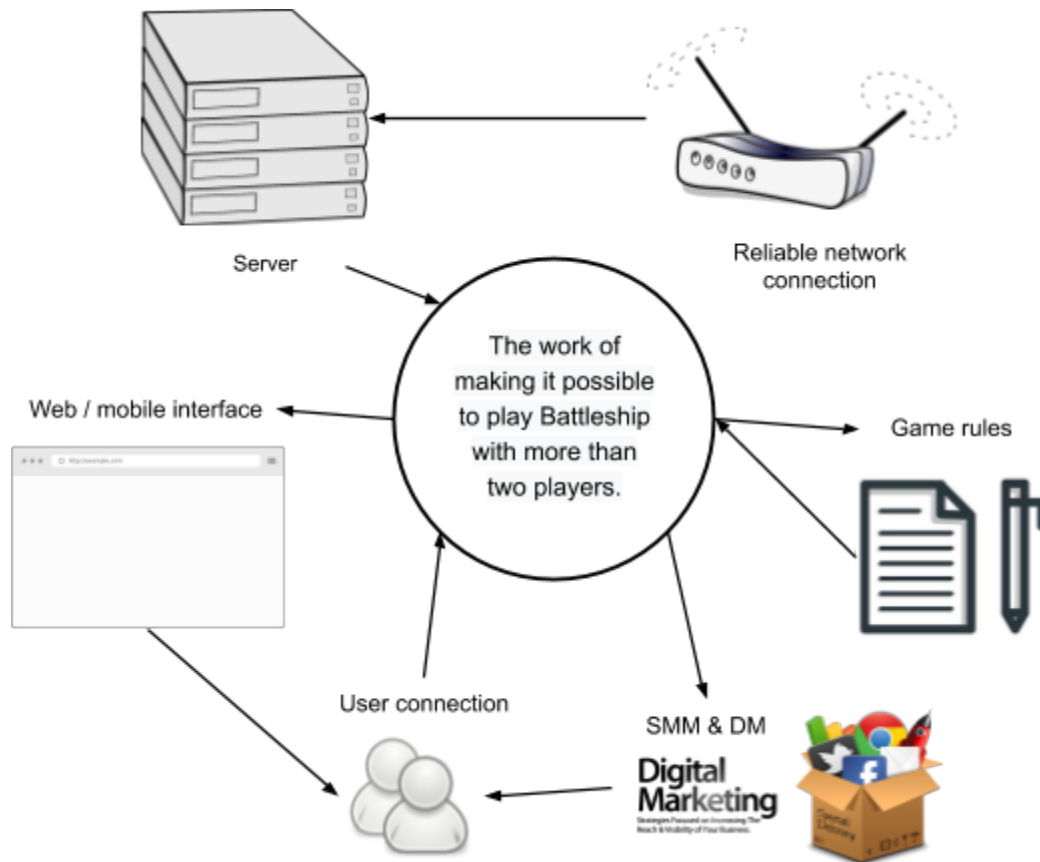


Figure 1 - The context of the work

Besides creating game rules, the scope of the work also includes providing the interface for the user to be able to connect and interact with. In order to make it possible for multiple players to interact with each other within the game, the reliable server should be created and configured to handle user connections and send the game data between all players.

3c Work Partitioning

Business Event List:

Event Name	Input & Output	Summary
Server warning or error	Server (in) Web / mobile interface (out)	Warn users about the risk of losing the game progress and start the maintenance.
User connects to the game	User connection (in) Web / mobile interface	Display the game interface to the user.

	(out)	
Lack of users	SMM & DM (out)	Target potential users with a promotion on social media or game-related web pages.
User reports a problem or suggests a feature	Game rules (out) Game rules (in)	Adjust the game rules and implement them in the game.

3d Competing Products

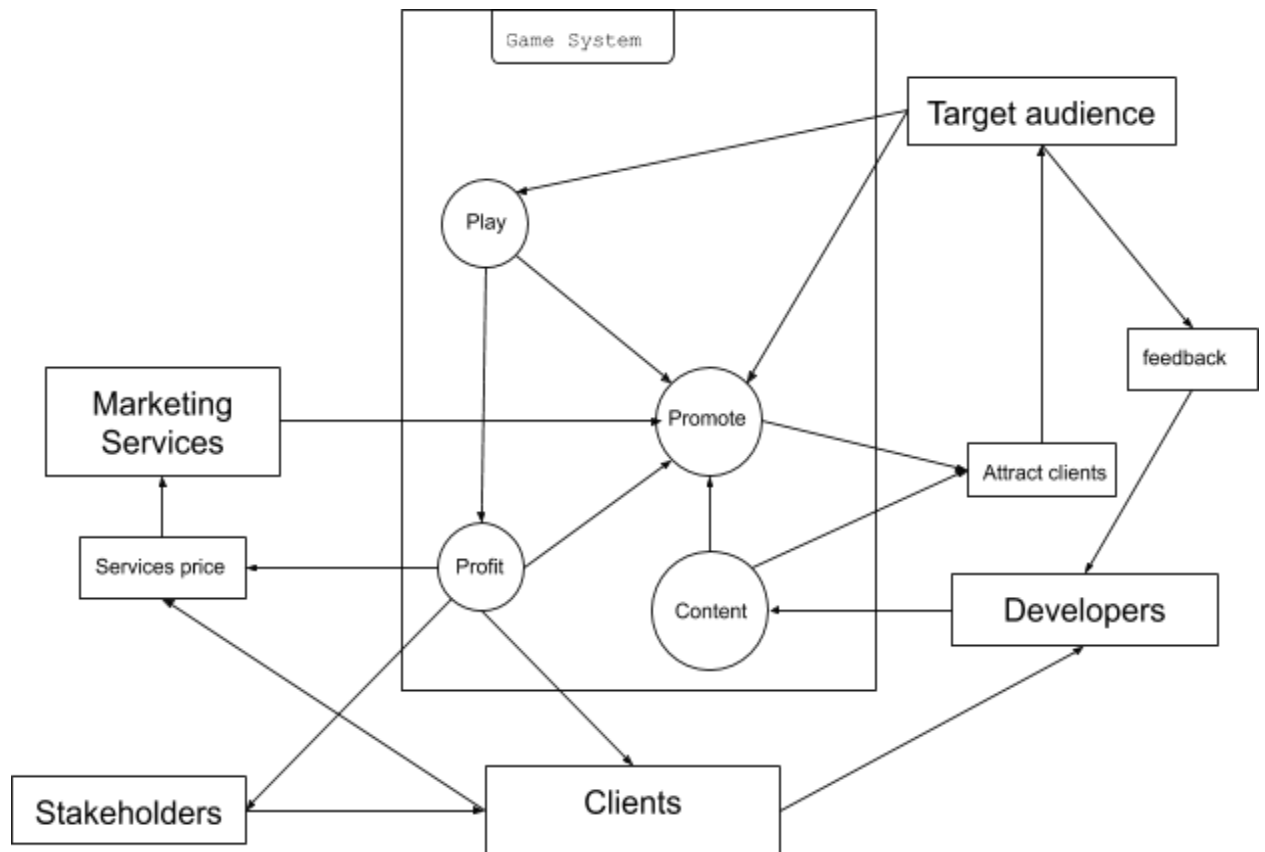
No products that give an ability to play classic or close to classic Battleship games with more than two players were found.

4 The Scope of the Product

Subset of work:

- Client Playing
- Promotion via Marketing Services
- Stakeholders Involvement
- Developers work

4a Scenario Diagram(s)



4b Product Scenario List

1. Game Playing - **Target Audience**
2. Promotion & Target Audience Attraction
Marketing Services / Stakeholders / Developers / Target Audience / Client
3. Content Updating - **Developers / Target Audience / Stakeholders**
4. Profit Getting - **Stakeholders / Clients**
5. Feedback Creation - **Target Audience**

4c Individual Product Scenarios

1. Game Playing: A **Target Audience** person who purchased the product is able to use it at any time by playing it. First thing they have to do is to log into their account and select to either play in a single or multiplayer mode. Secondly depending on what they chose, the game starts and they either begin their battle with a computer (if a single player mode was chosen) or with another enemy player (if a multiplayer mode was chosen). When the game ends, players can either play again or quit the game.
2. Promotion & Target Audience Attraction: Target Audience, Stakeholders, Developers & Marketing services are all involved.
Target Audience promote the product by using it and occasionally telling other

people about it.

Clients pay the Marketing services to do their job of promoting it. |

Marketing services promote the product by using social media ads, google ads, youtube ads, etc.

Developers promote the product by updating its content from Target Audience feedback of the product.

Stakeholders promote the product via their website and social media platform announcements of funding.

3. Content Updating: Developers get the feedback from Target Audience and update content accordingly.
4. Profit getting: Clients and Stakeholders will get their profit from Target Audience purchasing the product.
5. Feedback Creation: Target Audience will generate feedback while using the product which will directly be addressed to developers to look at.

5 Stakeholders

There is an extremely large pool of groups that are interested in game development. Below listed all the groups that are considered the most important.

5a The Client

Content

Battlerines: The War of Submarines is the original idea of VMVA Development Group Organization.

Motivation

VMVA Development Group takes full interest in development and realising the game. The game is intended for common use. Main purpose of the project is entertainment.

Considerations

5b The Customer

The game is intended to be placed on online platforms such as Kongregate.com, MmoGames.com for free and demo version. The game also will be available for purchase. Customers purchasing the game are hand-on users.

5c Hands-On Users of the Product

Hands-On Users of the product can be divided into several groups:

1) Gamers:

Gamers are the people who play the game. The concept of Battlerine: war of submarines is a new concept in the war games category. Individual gamers are responsible for the game set up and get themselves familiar with additional rules the game might have. Since the Battlerine: war of submarines is an expansion of classic battleship games it is assumed that many gamers will have some knowledge of the rules. For every gamer who is unsure about the rules we provide a description of the game rules. The game is created for people of all ages but the target audience is children 7 yo and up.

2) Game Market:

The Battlerine: war of submarines is a new game to be released in the online games market. Therefore, the Battlerine: war of submarines game is to be a market research subject.

3) Parents:

The Battlerine: war of submarines is suitable for young age players and parents are often concerned on how the game is influencing their child behavior and education.

The Battlerine: war of submarines is a strategy type game. The hands on user is the one who is interested in intellectual entertaining games. The game is suitable for any gender and educational level user who has an access to the computer with ethernet connection.

5d Maintenance Users and Service Technicians

The VMVA Development Group takes full responsibility of the game as well as technical support, game maintenance and updates development.

5e Other Stakeholders

The Battlerine: war of submarines game product is focusing on entertaining. However, the game requires users to develop strategy and therefore can carry educational purpose. Teachers and other educators may use the game as a smart entertaining experience for their students. Game elements, problem-solving skills, and discussions with fellow team members aid in facilitating active learning amongst end-users in the global market.

5f User Participation

The Battlerine: war of submarines is a complex development game. There are several stages in the development process prior final release.

Stages include: requirements, design, implementation, verification, maintenance. User participation is desirable at every stage of the process.

Several demo versions are to be developed and released for hand on users to use and give feedback on. The demo games will differ in design implementation as well as difficulty of the rules. Besides the user feedback VMVA Development Group is interested in performance evaluation of the game. Based on use;s r evaluation the version decision is to be made.

5g Priorities Assigned to Users

VMVA Development Group is a non-profit educational organization. However the development and maintenance process requires time and resources. VMVA Development Group prioritese customers purchasing the

game from online platforms and hand-on users purchasing full game for personal use.

6 Mandated Constraints

6a Solution Constraints

Description: The product should be a web-based game and function correctly in Google Chrome and Mozilla Firefox browsers.

Rationale: Users are likely to have different browsers and operating systems.

Fit criterion: The product shall be accessible from a browser.

Description: The product should properly handle the disconnection of any of the players and shouldn't crash for other players.

Rationale: Users are likely to have internet issues or the product may have unexpected code flow.

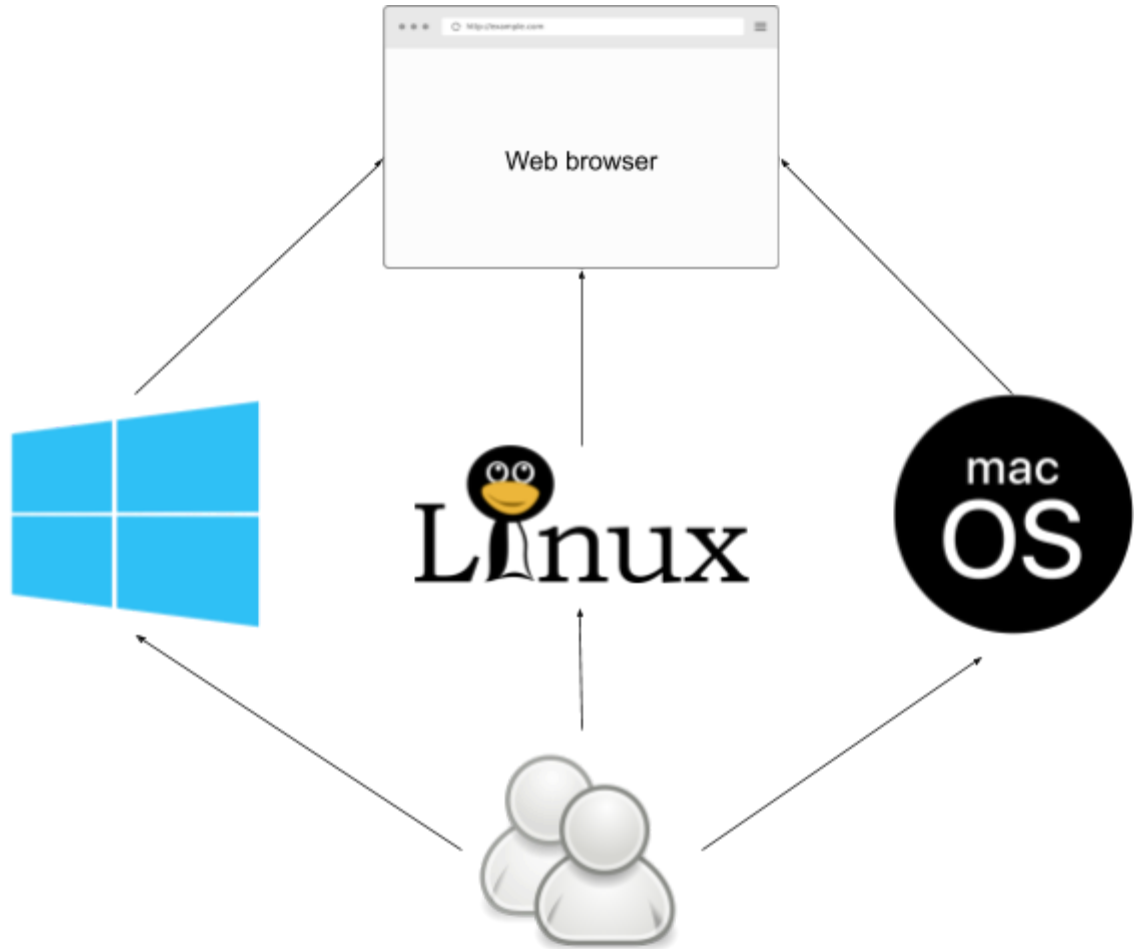
Fit criterion: The product shall continue operating correctly and count disconnected players as a defeated one.

Description: The product should operate correctly under a big number of users using it at a time.

Rationale: The product tends to be unique, therefore a big amount of users are expected.

Fit criterion: The product shall operate properly under 100,000 connected users.

6b Implementation Environment of the Current System



Users should be able to access the product no matter what operating system they use. The product should be able to function properly on Windows, MacOS and Linux operating systems. It is assumed that users have a good internet connection.

6c Partner or Collaborative Applications

The product should have an ability to create an account and/or login using both Google and Discord authentication services.

The product is not intended to have any of the data that should be used outside of itself.

6d Off-the-Shelf Software

The product has no requirements for any of the COTS software to be included. It is up to developers of the product to decide which software to use in the development and release phases.

6e Anticipated Workplace Environment

This product should be used in any environment regardless of surrounding conditions.

6f Schedule Constraints

There are no essential deadlines for this project.

6g Budget Constraints

Expected budget is 20,000\$

7 Naming Conventions and Definitions

7a Definitions of Key Terms

This section is intended to clarify and define all terms used in the Battlerine: war of submarines game.

Base: base of operations for a naval fleet. Illustrated as buildings

Submarines: a watercraft capable of independent operation underwater.

Fleet: consist of submarines and belongs to the base

International waters: term used to describe territory that does not belong to any player and used to position a fleet.

7b UML and Other Notation Used in This Document

This document uses Graphical Notation Reference to build diagrams.

The Unified Modeling Language™ (UML®) is a standard visual modeling language intended to be used for

- modeling business and similar processes,
- analysis, design, and implementation of software-based systems

UML is a common language for business analysts, software architects and developers used to describe, specify, design, and document existing or new business processes, structure and behavior of artifacts of software systems.

Specifications Explained that process:

- provides guidance as to the order of a team's activities,
- specifies what artifacts should be developed,
- directs the tasks of individual developers and the team as a whole, and
- offers criteria for monitoring and measuring a project's products and activities.

Given some UML diagram, we can't be sure to understand the depicted part or behavior of the system from the diagram alone. Some information could be intentionally omitted from the diagram, some information represented on the diagram could have different interpretations, and some concepts of UML have no graphical notation at all, so there is no way to depict those on diagrams.

For example, semantics of multiplicity of actors and multiplicity of use cases on use case diagrams is not defined precisely in the UML specification and could mean either concurrent or successive usage of use cases.

Name of an abstract classifier is shown in italics while final classifier has no specific graphical notation, so there is no way to determine whether classifier is final or not from the diagram

8 Relevant Facts and Assumptions

8a Facts

According to "Strategy Games Market Research" conducted in 2018 (NEW YORK, Dec. 11, 2018 /PRNewswire) report on global board games market offers analysis on market size & forecast, market share, industry trends, growth drivers, and vendor analysis. The exponential growth of the entertainment and gaming industry is attributing to the rising demand for analog games in the market. According to the research strategy games influence factors such as problem-solving skills and critical thinking in team-oriented games allow players to build communication and relationship skills with consumers in the market. The global board games market is anticipated to reach values of more than \$12 billion by 2023, growing at a CAGR of over 9% during 2017-2023.

8b Assumptions

The development of the Battlerine: war of submarines is based on strong assumption of the growing market of strategy games. The popularity of classic battleship games give us a strong belief that adding new features and expanding into multiplayer concepts will bring attention not only from hands-on users(gamers) but also will attract online game markets to research and invest into the development of the Battlerine: war of submarines.

Educational features of the game can not be underestimated. The game requires problem-solving skills and critical thinking as well as team-oriented skills and communication skills. Taking this fact into account it is assumed that games can be used for educational purposes.

Battlerine: war of submarines game will be created to serve entertaining purpose therefore it is to be associated with leisure and good time. The game design supports users' experience providing exceptional visual and sounds effects. Detailed design gives the user full experience.

The Battlerine: war of submarines is a war-themed board game for multiplayer therefore there is a large number of players who are going to play the game at one time. It is assumed that every user will have ethernet access and suitable technology such as smartphones, tablets or laptops.

The game can be a platform for commercial advertising.

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

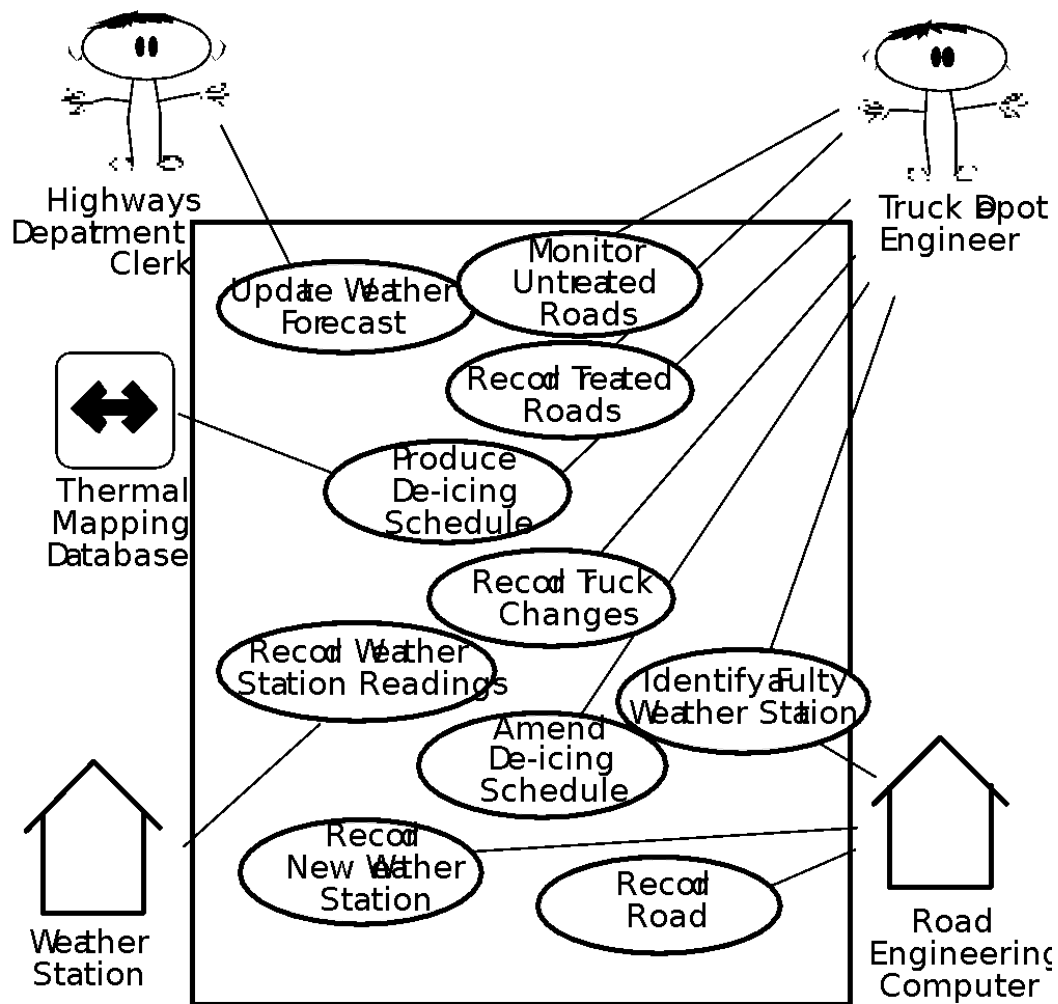
Use Case diagrams serve two purposes: As a form of graphical table of contents listing the individual use-cases, and also to define the boundary of what is included as part of the proposed system and what is not included.

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.)

<i>Use case name</i>	ReportEmergency
<i>Participating actors</i>	Initiated by FieldOfficer Communicates with Dispatcher
<i>Flow of events</i>	<ol style="list-style-type: none">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.
<i>Entry condition</i>	<ul style="list-style-type: none">• The FieldOfficer is logged into FRIEND.
<i>Exit conditions</i>	<ul style="list-style-type: none">• 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.
<i>Quality requirements</i>	<ul style="list-style-type: none">• 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

Requirement #5	Requirement type9	Event/use case7,#9.
DescriptionThe product shall record all the roads that have been treated		
RationaleTo be able to schedule untreated roads and highlight potential danger		
OriginatorArndt Sow - Chief Engineer		
Fit CriterionThe recorded treated and untreated roads shall agree with the divers' road treatment logs.		
Customer Satisfaction:	Customer Dissatisfaction:	
Priority:	Conflicts:	
Supporting Materials:		
HistoryCreated February 29 2006		

Volere
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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

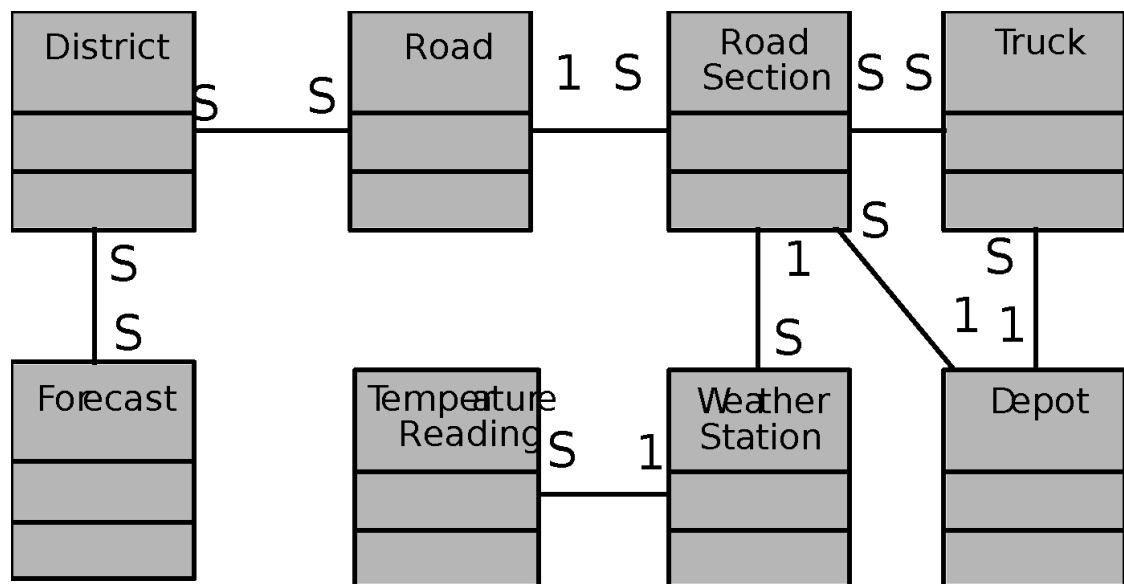
object model, or a domain model. Alternatively, these requirements might be described by defining the terms in the dictionary described in section 5.

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 $\pm 2^{\circ}\text{C}$.

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.

Content

A statement of factors that are uncertain and might make significant difference to the product.

Motivation

To bring uncertainty out in the open and provide objective input to risk analysis.

Examples

Our investigation into whether the new version of the processor will be suitable for our application is not yet complete.

The government is planning to change the rules about who is responsible for gritting the motorways, but we do not know what those changes might be.

Considerations

Are there any issues that have come up from the requirements gathering that have not yet been resolved? Have you heard of any changes that might occur in the other organizations or systems on your context diagram? Are there any legislative changes

that might affect your system? Are there any rumors about your hardware or software suppliers that might have an impact?

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.

Content

List of existing products that should be investigated as potential solutions. Reference any surveys that have been done on these products.

Motivation

To give consideration to whether a solution can be bought.

Considerations

Could you buy something that already exists or is about to become available? It may not be possible at this stage to make this determination with a lot of confidence, but any likely products should be listed here.

Also consider whether some products must not be used.

Your text goes here . . .

2b Reusable Components

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

Content

Description of the candidate components, either bought from outside or built by your company, that could be used by this project. List libraries that could be a source of components.

Motivation

Reuse rather than reinvention.

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.

Content

List of other similar products or parts of products that you can legally copy or easily modify.

Motivation

Reuse rather than reinvention.

Examples

Another electricity company has built a customer service system. Its hardware is different from ours, but we could buy its specification and cut our analysis effort by approximately 60 percent.

Considerations

While a ready-made solution may not exist, perhaps something, in its essence, is similar enough that you could copy, and possibly modify, it to better effect than starting from scratch. This approach is potentially dangerous because it relies on the base system being of good quality.

This question should always be answered. The act of answering it will force you to look at other existing solutions to similar problems.

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?

Content

A description of how the new product will affect the current implementation environment. This section should also cover things that the new product should not do.

Motivation

The intention is to discover early any potential conflicts that might otherwise not be realized until implementation time.

Examples

Any change to the scheduling system will affect the work of the engineers in the divisions and the truck drivers.

Considerations

Is it possible that the new system might damage some existing system? Can people be displaced or otherwise affected by the new system?

These issues require a study of the current environment. A model highlighting the effects of the change is a good way to make this information widely understandable.

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?

Content

Specification of the interfaces between new and existing systems.

Motivation

Very rarely is a new development intended to stand completely alone. Usually the new system must coexist with some older system. This question forces you to look carefully at the existing system, examining it for potential conflicts with the new development.

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?

Content

Details of any adverse reaction that might be suffered by existing users.

Motivation

Sometimes existing users are using a product in such a way that they will suffer ill effects from the new system or feature. Identify any likely adverse user reactions, and determine whether we care about those reactions and what precautions we will take.

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.)

Content

Statement of any potential problems with the new automated technology or new ways of structuring the organization.

Motivation

The intention is to make early discovery of any potential conflicts that might otherwise not be realized until implementation time.

Examples

The planned new server is not powerful enough to cope with our projected growth pattern.

The size and weight of the new product do not fit into the physical environment.

The power capabilities will not satisfy the new product's projected consumption.

Considerations

This requires a study of the intended implementation environment.

Your text goes here . . .

3e Follow-Up Problems

SV: Basically any other possible problems that could occur.

Content

Identification of situations that we might not be able to cope with.

Motivation

To guard against situations where the product might fail.

Considerations

Will we create a demand for our product that we are not able to service? Will the new system cause us to run afoul of laws that do not currently apply? Will the existing hardware cope?

There are potentially hundreds of unwanted effects. It pays to answer this question very carefully.

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.

Content

A list of the conversion activities. Timetable for implementation.

Motivation

To identify conversion tasks as input to the project planning process.

Considerations

Will you use a phased implementation to install the new system? If so, describe which requirements will be implemented by each of the major phases.

What kind of data conversion is necessary? Must special programs be written to transport data from an existing system to the new one? If so, describe the requirements for these programs here.

What kind of manual backup is needed while the new system is installed?

When are each of the major components to be put in place? When are the phases of the implementation to be released?

Is there a need to run the new product in parallel with the existing product?

Will we need additional or different staff?

Is any special effort needed to decommission the old product?

This section is the timetable for implementation of the new system.

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.*

Content

List of data translation tasks.

Motivation

To discover missing tasks that will affect the size and boundaries of the project.

Fit Criterion

Description of the current technology that holds the data.

Description of the new technology that will hold the data.

Description of the data translation tasks.

Foreseeable problems.

Considerations

Every time you make an addition to your dictionary (see section 5), ask this question: Where is this data currently held, and will the new system affect that implementation?

Your text goes here . . .

5 Risks

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

All projects involve risk—namely, the risk that something will go wrong. Risk is not necessarily a bad thing, as no progress is made without taking some risk. However, there is a difference between unmanaged risk—say, shooting dice at a craps table—and managed risk, where the probabilities are well understood and contingency plans are made. Risk is only a bad thing if the risks are ignored and they become problems. Risk management entails assessing which risks are most likely to

apply to the project, deciding a course of action if they become problems, and monitoring projects to give early warnings of risks becoming problems.

*This section of your specification should contain a list of the most likely risks and the most serious risks for your project. For each risk, include the probability of that risk becoming a problem. Capers Jones's *Assessment and Control of Software Risks* (Prentice-Hall, Englewood Cliffs, N.J., 1994) gives comprehensive lists of risks and their probabilities; you can use these lists as a starting point. For example, Jones cites the following risks as being the most serious:*

- *Inaccurate metrics*
- *Inadequate measurement*
- *Excessive schedule pressure*
- *Management malpractice*
- *Inaccurate cost estimating*
- *Silver bullet syndrome*
- *Creeping user requirements*
- *Low quality*
- *Low productivity*
- *Cancelled projects*

Use your knowledge of the requirements as input to discover which risks are most relevant to your project.

It is also useful input to project management if you include the impact on the schedule, or the cost, if the risk does become a problem.

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.

*For details on how to estimate requirements effort and costs, refer to Appendix C *Function Point Counting: A Simplified Introduction**

The other cost of requirements is the amount of money or effort that you have to spend building them into a product. Once the requirements specification is complete,

you can use one of the estimating methods to assess the cost, expressing the result as a monetary amount or time to build.

There is no best method to use when estimating. Keep in mind, however, that your estimates should be based on some tangible, countable artifact. If you are using this template, then, as a result of doing the work of requirements specification, you are producing many measurable deliverables. For example:

- *Number of input and output flows on the work context*
- *Number of business events*
- *Number of product use cases*
- *Number of functional requirements*
- *Number of nonfunctional requirements*
- *Number of requirements constraints*
- *Number of function points*

The more detailed the work you do on your requirements, the more accurate your deliverables will be. Your cost estimate is the amount of resources you estimate each type of deliverable will take to produce within your environment. You can create some very early cost estimates based on the work context. At that stage, your knowledge of the work will be general, and you should reflect this vagueness by making the cost estimate a range rather than a single figure.

As you increase your knowledge of the requirements, we suggest you try using function point counting—not because it is an inherently superior method, but because it is so widely accepted. So much is known about function point counting that it is possible to make easy comparisons with other products and other installations' productivity.

It is important that your client be told at this stage what the product is likely to cost. You usually express this amount as the total cost to complete the product, but you may also find it advantageous to point out the cost of the requirements effort, or the costs of individual requirements.

Whatever you do, do not leave the costs in the lap of hysterical optimism. Make sure that this section includes meaningful numbers based on tangible deliverables.

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.

Requirements that will not be part of the next release. These requirements might be included in future releases of the product.

Content

Any type of requirement.

Motivation

To allow requirements to be gathered, even though they cannot be part of the current development. To ensure that good ideas are not lost.

Considerations

The requirements-gathering process often throws up requirements that are beyond the sophistication of, or time allowed for, the current release of the product. This section holds these requirements in waiting. The intention is to avoid stifling the creativity of your users and clients, by using a repository to retain future requirements. You are also managing expectations by making it clear that you take these requirements seriously, although they will not be part of the agreed-upon product.

Many people use the waiting room as a way of planning future versions of the product. Each requirement in the waiting room is tagged with its intended version number. As a requirement progresses closer to implementation, then you can spend more time on it and add details such as the cost and benefit attached to that requirement.

You might also prioritize the contents of your waiting room. “Low-hanging fruit”—requirements that provide a high benefit at a low cost of implementation—are the highest-ranking candidates for the next release. You would also give a high waiting room rank to requirements for which there is a pent-up demand.

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.

When you gather requirements, you focus on finding out what the real requirements are and try to avoid coming up with solutions. However, when creative people start to think about a problem, they always generate ideas about potential solutions. This section of the template is a place to put those ideas so that you do not forget them and so that you can separate them from the real business requirements.

Content

Any idea for a solution that you think is worth keeping for future consideration. This can take the form of rough notes, sketches, pointers to other documents, pointers to people, pointers to existing products, and so on. The aim is to capture, with the least amount of effort, an idea that you can return to later.

Motivation

To make sure that good ideas are not lost. To help you separate requirements from solutions.

Considerations

While you are gathering requirements, you will inevitably have solution ideas; this section offers a way to capture them. Bear in mind that this section will not necessarily be included in every document that you publish.

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.

Content

At the end of every project you should reflect upon what methods were used that worked out well and should be repeated in the future, and also what methods did not work out well and should be avoided. Any recommendations, suggestions, or ideas for how to do things better in the future should also be documented

Motivation

To learn from experience, and to continually strive for process improvement.

Considerations

When things don't go well, it is important to distinguish whether the methods themselves were poor, or simply poorly implemented in this particular case, or whether they just weren't right for this particular project / group of engineers.

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.

The glossary defines terms that may not be familiar to all readers. This is especially important if the document is expected to reach a wide and varied audience, such as school children. The glossary may be placed at either the beginning or the end of the document.

Flotsam: *Any part of a ship or its cargo found floating on the water, whether it was deliberately or accidentally lost by its original owners.*

Jetsam: *Any part of a ship or its cargo that is deliberately cast off (jettisoned) by its original owners, generally in order to lighten the ship, whether it floats or sinks.*

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. }

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