

Workout Movement Tracker Application



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I Project Description

1 Project Overview

Our application, the Workout Movement Tracker, will be a great application utilized by those who are interested in fitness and working out. This application will analyze the user's body type and track the user's form in real-time during exercise to make sure it is being performed correctly. This will benefit the user by allowing them to ensure they are performing exercises correctly, which helps to avoid injury and to get healthier and fitter. It will also give the user personal recommendations based on their body type and goals without the hassle and expense of hiring a personal trainer. This application would be an affordable way to gain access to a personally tailored program and achieve fitness goals.

2 The Purpose of the Project

This project is being done for the benefit and convenience of those who aspire to live a fit lifestyle. With this application being developed, it will be much easier for someone to figure out a fitness program to suit their needs and to understand how to perform the exercises properly. This would target an audience of all ages who would be interested in leading a healthier and more active lifestyle.

2a The User Business or Background of the Project Effort

The business that would benefit from this application would be large gyms that cater to beginners, such as Planet Fitness or Life Time Fitness. It could also be used by small businesses that are trying to expand their clientele or individuals who take an interest in fitness. Other businesses like sportswear companies or sporting goods stores or any type of business interested in working with such an application could benefit from the Workout Movement Tracker. The business being done would be users needing exercise-related help and seeking out an application for their needs to apply to their lives.

2b Goals of the Project

We want to provide customers with a convenient and affordable way to get 'personal training' so that they can have a workout plan developed for them and gain feedback on their workout performance.

2c Measurement

We will provide a premium subscription of our application for a monthly fee and provide a free trial of the premium subscription. We will also provide bonuses for the user referring friends/family to the app. The user will also be able to rate their satisfaction with the application, ideally this will be 4 stars or above.

3 The Scope of the Work

The work is described as providing a personal trainer/guide service that the users need to pursue their fitness goal. The work generates recommendations and feedback for exercise and nutrition guides based on the user's performance and goal.

3a The Current Situation

The current situation for client work is the application will be published on application stores for the users to download as soon as it's completed. The user inputs their information into the application. User comments and feedback are reviewed by developers. Therefore, developers can provide updates for any errors that they find.

3b The Context of the Work

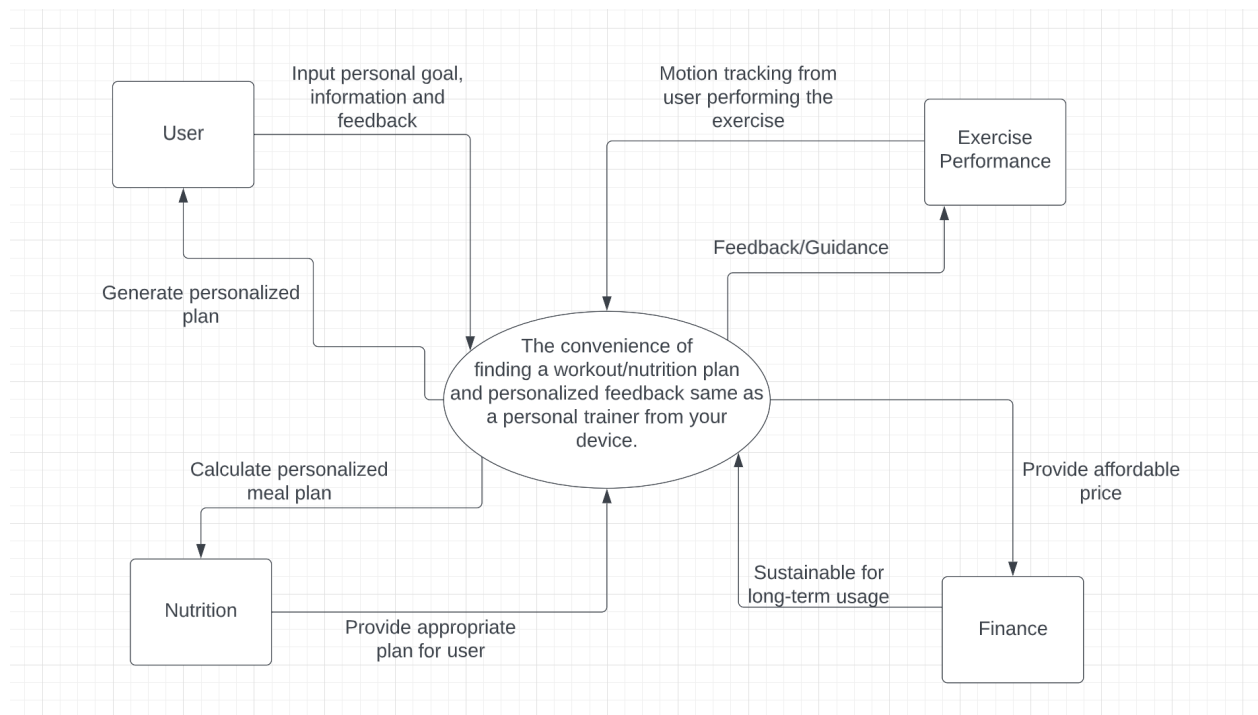


Figure 1 - Context of Work

The context of work includes the user, nutrition, exercise performance and finance. These environments interact with the application to create a beneficial result for the user. The application takes the user's information and generates a plan. The application takes movement from the exercise to produce guidances. The application gives an affordable price for long-term usage. The application calculates and provides nutritious meal plans for the user.

3c Work Partitioning

EVENT NAME	INPUT and OUTPUT	SUMMARY
User performs the exercise	- Motion tracking from the user (in) - Recommendations and encouragements (out)	Analyze the data from motion tracking and provide feedback and encouragement.
User searches for food	- Type of food requested (in) - Meal plan (out)	Record type of food requested to provide personalized plan for the user.
User updates their fitness goal	- Fitness goal (in) - Personalized workout plan (out)	Record the user's goal to provide an appropriate workout plan.
Incorrect exercise performance	- Motion tracking from the user (in) - Guidance for the correct form (out)	Detects incorrect movement from the user performance to provide guidelines for improvement.
User exercise plan request	- Fitness goal and exercise information (in) - Personalized workout plan (out)	Determined the user's desire to construct an appropriate plan
User updates their progress	- Updated progress information (in) - Updated plans and recommendations (out)	Analyze user progression from their updated information to adjust the plan and provide feedback.

Table 1 - Work Partitioning

3d Competing Products

At the moment, there is no application that can track our real-time movement to provide feedback for the exercises. However, regarding the nutrition and workout plan, the competition is MyFitnessPal. It is an application that acts as a dairy to record the user's macronutrients and calories. Their recommendation for nutrition/workout plans is inaccurate because they provide a general plan for everyone. On the other hand, our application provides a personalized plan for a specific user. MyFitnessPal application is used primarily for recording plans. Our application generates, analyzes and records plans for the user.

4 The Scope of the Product

The scope of our product is to provide a convenience and affordable “personal trainer” application that can guide the users throughout their fitness journey. The application can generate a personalized plan based on the user’s goal and information. During the exercise, the application tracks the user movements to provide guidance. The user can avoid injuries from exercising incorrectly. The application also constructs appropriate meal plans based on the user’s goal and information. The application can analyze user progression to update the user’s plan.

4a Scenario Diagram(s)

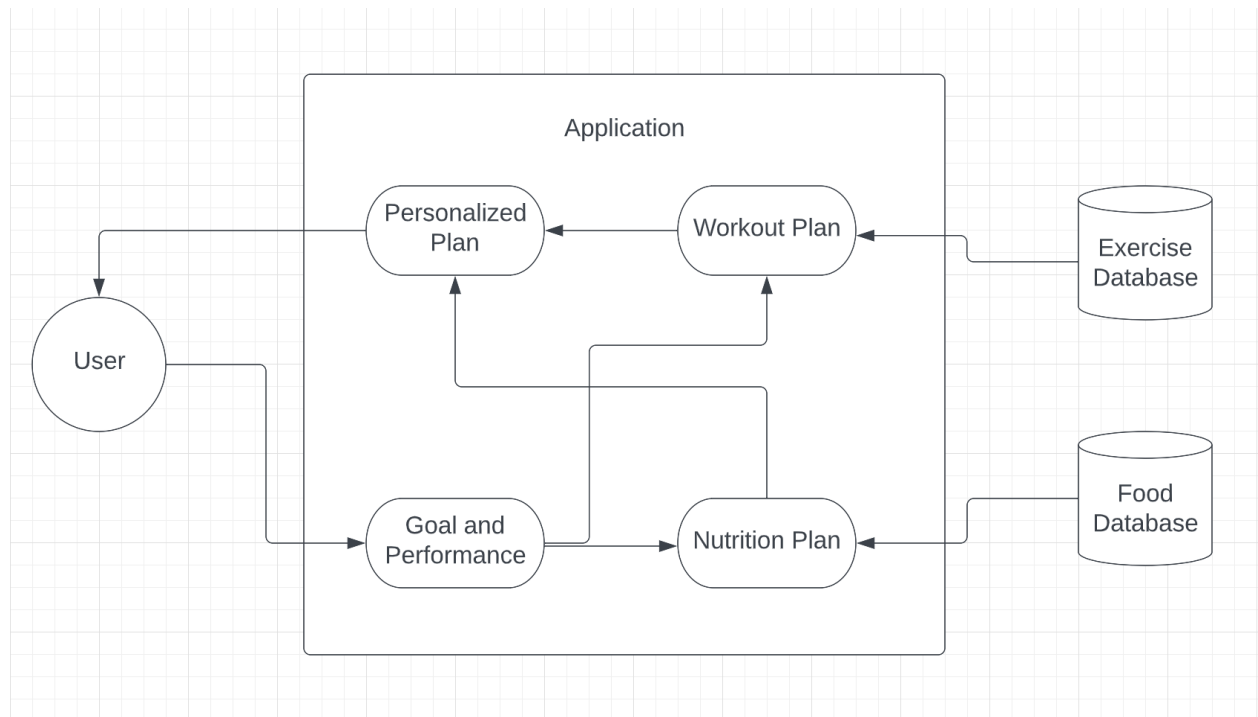


Figure 2 - Scenario Diagram

4b Product Scenario List

Scenario Name	Actors Involved
Update goals and information	The users
Tracking progression	The users
Prefer plan	The users
Exercise/Meal database	Developers, database company

Table 2 - Product Scenario List

4c Individual Product Scenarios

Updates goals and information: The user can generate the personalized plan based on the input information. The user provides their goals and body type. The users can also provide a preferred exercise plan or nutrition plan. The application will analyze the inputs and provide the best result that will accommodate the user's needs.

Tracking progression: The application analyzes the user's workout and reports. After the analysis, the application produces a report for the user that contains recommendations and their progression toward their goal.

Prefer plan: The user has a preference for the workout or nutrition plan that they want. The application updates the analysis to focus around the user preferences. Therefore, the application can produce the best result based on those preferences.

Exercise/M meal database: The application developers consistently populate and update the exercise and nutrition database. The database can be obtained from data companies. This allows the application to have a variety of updated choices when generating a plan for the user.

5 Stakeholders

5a The Client

The client is the fitness industry as they are the ones that will find the most benefit in the product and will distribute it to the different entities within the industry. Since they are focused on attracting more customers and raising more revenue, they will provide guidance and other input to ensure the success of the product.

5b The Customer

There are 3 groups of customers who will buy the product after it has been completed:

Fitness Centers: These are the institutions that would like to offer digital service to their members to help them achieve their fitness goals. The fitness centers could either include the app as part of their basic membership or have them upgrade their membership to get access to the app.

Physical Trainers/Coaches: These are the institutions that train professional athletes or normal people who are trying to get fit. They deal with their clients 1-1 and utilize the app to see how accurately they are performing the exercise and detect minor changes in movements that could lead to injuries.

Independent Exercisers: These are the people who are exercising independently for recreation or to get in shape. They would like to seek assistance in designing a

program that would help them achieve their fitness goals, or would like to check their form of exercises to perform them safely and effectively, minimizing injuries.

5c Hands-On Users of the Product

There are 3 groups of users who will use the product in-practice:

Beginner Exercisers: These users are new to exercise and have a specific fitness goal in mind. They are completely new to exercise, meaning they have no prior experience playing sports or in physical activity (novice). They would like to gain basic knowledge and foundation in physical fitness and build the habit of exercising. They possess no knowledge of using technology targeted towards physical activity (novice). They are motivated individuals determined to attain their physical goals. They can have any education, linguistic skills, be from any age group and gender.

Experienced Exercisers: These users have some experience with exercise and are aware of their fitness goals and what they need to do to achieve those goals. However, they would still like help in designing a new program or helping them fix their form on certain exercises. They are not completely new to exercise, meaning they do have prior experience playing sports or in physical activity (journeyman). They would like to gain more knowledge in physical fitness and continue their habit of exercising. They possess some knowledge of using technology targeted towards physical activity (journeyman). They are moderately motivated individuals who already possess the determination to attain their physical goals. They can have any education, linguistic skills, be from any age group and gender.

Expert Exercisers: These users have a lot of experience with exercise and are fully aware of their fitness goals and what they need to do to achieve those goals. This group would like to try out a new exercise plan and also supplement the product in their already existing exercise routine. They are now new to exercise at all, meaning they have a lot of prior experience playing sports or in physical activity (expert). They would like to hone their existing knowledge in physical fitness and continue their habit of exercising. They possess a lot of knowledge in using technology targeted towards physical activity (expert). They are highly motivated individuals who possess high determination to attain their physical goals. They can have any education, linguistic skills, be from any age group and gender.

5d Maintenance Users and Service Technicians

The original developers are the ones that will actually work in maintaining and updating the product. Since the product can be downloaded directly from the respective app stores by the customers themselves, it does not require any external assistance in installing the app.

The original developers are responsible for periodically checking the performance of the product, fixing bugs and releasing new updates based on feedback from the client and customers. These updates are also automatically applied to the product without any external assistance.

5e Other Stakeholders

There are 2 other stakeholders for this product:

Fitness Experts: These are the people that are highly knowledgeable about physical fitness and training. They are responsible for making sure that the product is suggesting the right workout plans based on the user's fitness level and goals. They are also responsible for ensuring that the workout movements are being tracked accurately and that the product is suggesting the right corrections if there is an error in the movement. Their degree of influence and involvement in the product development is high since the core offerings of the product are based on the knowledge and information gathered by these experts. If there is a conflict between stakeholders, it will be resolved by regularly consulting and communicating with them and ensuring their input is taken into account and used for the overall betterment of the users.

Technology Experts: These are the people that possess the technical expertise of hardware used, mobile app development, database management, UI design, debugging, and deployment. Their degree of involvement is high since they have the practical knowledge as to how to efficiently develop the product based on the project goals. Their degree of influence is also high since they will be the ones making design decisions, implementing solutions, and choosing the right technology to be used in the development of the product. Conflicts will be resolved by establishing clear communication between the technology experts and other stakeholders where the technology experts would present their technological decisions that were made in the development of the product.

5f User Participation

The product requires users to participate throughout the development phase to ensure the success of the product once it is released to market. Initially, the fitness experts will choose a group of beginners and assess their height, weight, and fitness goals. The same information will be loaded into the application, which will design a workout plan based on their goals and will be approved by the fitness experts.

The beginners are then required to put the workout plan into action, and follow it over the course of the development of the product, ideally 2 months, and also use the movement tracker in each of those exercises. At the end of each week, the users will report their feedback to the technology experts, who will then make changes to the application to ensure proper functionality and usability.

5g Priorities Assigned to Users

Beginner Exercisers (Primary Users): These are the users that are detrimental to the product's success. They are the ones that would use the product the most and provide feedback which is used to make improvements to the product.

Experienced Exercisers (Secondary Users): These are the users that we expect to use the product most after beginner exercisers. Although they are not as invested in the product and its success, they could still provide valuable feedback that is used to improve the product.

Expert Exercisers (Unimportant Users): These users are merely using the product as a supplement and the product is not as important in reaching their fitness goals. They would solely like to test it out and are not as interested in its long term success and would provide little to no feedback to the product's long term success.

6 Mandated Constraints

6a Solution Constraints

Description: The product shall be a mobile application that would run on the two popular operating systems: iOS and Android.

Rationale: The product should be available to the maximum number of users and be as convenient to use as possible.

Fit criterion: The product shall be available on the App Store and the Play Store, and will show the user their workout plan and be readily available to track the movements in any conditions.

Description: The product shall have workout videos demonstrating the proper form for each exercise suggested to the user.

Rationale: This will help the client perform the exercise properly and effectively while minimizing injuries.

Fit criterion: Each exercise will have a short video, ideally less than a minute, demonstrating the proper way to perform the exercise which will be performed by fitness experts. The videos will be stored in a library for the user to come back and watch it again if needed.

Description: The product shall have a motion detector that corrects the form of the exercise in real time.

Rationale: This will help the user perform the exercise properly and also be able to watch what they are doing wrong in order to improve their form.

Fit criterion: The motion detector works through the camera of the respective mobile device, and provides instant feedback and makes corrections to the form in real-time.

6b Implementation Environment of the Current System

The product will operate on most mobile devices with iOS and Android operating systems. It uses the device's camera to track the motions in real-time and provide instant feedback. The product is meant to provide convenience to the user and already possesses the necessary hardware and software to function seamlessly. Although the

product works well on most devices, it is important to consider the technological specifications and other configurations of the device that may interfere with the workings of the application.

6c Partner or Collaborative Applications

The application must be compatible with other applications such as Microsoft Excel. This is where most of the data is stored. Since the application uses the mobile device's camera extensively, it is important that the product is able to use some of the features present in the camera application, to perform its functions well and must not cause any problems to external applications.

6d Off-the-Shelf Software

The device camera and its application is the only off-the-shelf software that is required in the development of the product. The product must be compatible with the camera specifications and must be able to accurately track exercise movements. The product must also be able to utilize all the other camera features such as exposure and focus modes to only track the subject and nothing else. Most device cameras on the market have these features and many others which the product must be able to use as required.

6e Anticipated Workplace Environment

The product is used in both outdoor and indoor settings. The most common place the product is used is a public gym where there is a lot of noise. This should not necessarily impact the functionality of the product since it uses a camera and does not rely on the device's microphones. However, as gyms are crowded, it is possible that there are multiple people in the camera's view, which would cause the motion detector to capture their movements and not focus on the user who is performing the exercise. To tackle this, the camera must first map the user and avoid tracking the other subjects in the frame. The same must be done when used in an outdoor setting. Another problem that arises from using the product outdoors is that there are various factors such as sunlight or weather conditions that could affect the camera's ability to accurately track the user. The camera must be sufficiently developed to track the user in these cases and adapt to the lighting or the weather conditions.

6f Schedule Constraints

There are no schedule constraints in building the product. That does not mean the product would not be developed in a timely manner. Since people exercise year round, the project could be released during any time of the year. However, there is a surge in gym memberships around the January mark every year, so it is reasonable to release the final product during this time and release the beta version 2 months before this time i.e before the end of the calendar year. If the product is not developed by the end of the calendar year, it will surely be released in the first quarter of next year. The only financial impact of not having the product at the beginning of the new year is that it would lead to lost profits from those who would have bought the product at the

beginning of the year. As such, it is important to release the product during the new year to maximize profits.

6g Budget Constraints

It is realistic to build the product with the given budget and resources, and as such there are no budget constraints that would impact the development of the application. Since most of the technologies used in the project are readily available in the market, it is not required to research and develop new technologies to use in the product. However, the aim is to sell the application to a large group of customers in the fitness industry, and as such the product must be developed using the latest technologies. The only resources in this project are the developers who are capable of building the product.

7 Naming Conventions and Definitions

7a Definitions of Key Terms

- **Exertion:** The Effort outputted by the user as the workout routine is in progress. It is not referred to for exertion from anything or anyone else other than the user of the device.
- **Toning:** Refers to building muscles and strengthening specific parts of the body. Toning is not used to refer to anything related to color.
- **Warm-Up:** Readyng the body before a workout. It only refers to the human body.
- **Position:** The current positioning of the different body parts that are scanned by the motion scanner. It only refers to the human position scanned by the motion scanner.
- **Angle:** Refers to the angle between two limbs connected by a joint. Angle does not refer to anything other than the body angles.
- **Straight:** The specific body limbs are aligned in a straight line. It does not refer to gender specifications or anything non-workout related.
- **Weight:** Weight by itself is used in reference to the body weight of the user. It is not used in reference to the equipment. Generally, if the equipment is being referred, then it will be used in the format <Name of Equipment> + weight.
- **Performance:** Refers to the overall performance of the user during the workout. It does not refer to the device's performance or anything unrelated to the user.
- **Spot:** A human helper who is there for safety measures against heavy equipment used in weight training and other workout routines that could prove dangerous to be performed alone.
- **Reps:** The number of repetitions of a certain exercise in a routine. It does not refer to reputation.
- **Sets:** The number of repetitions performed.
- **Rest:** The gap between one workout and another.
- **HIIT:** High-Level Intensity Interval Training; A workout routine with high intensity movements to increase heart rate followed by low intensity movements.

- **Equipment:** Machinery or tools used to help enhance the performance and add intensity to the workout.

7b UML and Other Notation Used in This Document

Generally this document uses arrows and ovals, ellipses, rectangles, and squares to represent different entities. The entity which is pointed to is receiving the information sent by the entity the arrow is pointing from. the same level entities are all the same shapes, though the meaning behind each shape may change.

7c Data Dictionary for Any Included Models

- **User:** The person who uses the product.
- **Name:** The name of the account holder.
- **Weight:** Weight of the product user.
- **Height:** The product user's height in feet followed by inches.
- **BMI:** $\text{Weight} / \text{Height}^2$.
- **Workout Plan:** The workout plan chosen by the product user.
- **Nutrition:** Calories + Carbohydrates + Fat + Protein + Vitamins + Minerals.
- **Calories:** A unit of energy equivalent to the heat needed to raise the temperature of 1 kilogram of water by 1 degrees Celsius.
- **Carbohydrates:** Sugar Molecules found in food and drinks.
- **Fat:** Fatty acids found in food and drinks.
- **Protein:** Biomolecules or Macromolecules that contain one or more chains of amino acid residues.
- **Vitamins:** Micronutrients essential for normal growth.
- **Minerals:** Micronutrients that the human body needs to function properly.
- **Finance:** Cost of buying the product + (premium membership or no premium membership).
- **Cost of buying the product:** The money paid by the product user to gain access to the product.
- **Premium membership:** For an additional cost, new features that aren't available to non premium members.
- **Exercise Performance:** Feedback.
- **Feedback:** Good points of the performance + bad points in the performance.
- **Good points in the performance:** Parts of the workout routine that were perfectly performed by the user.
- **Bad points in the performance:** Parts of the workout routine that need improvement.

8 Relevant Facts and Assumptions

8a Facts

The device will need to be placed in a position to be able to scan the positioning of the user.

The device can only be used when placed in a position perpendicular to the ground.

The Federal law requires that policies on private information be made available.

The Federal law required that parents of underage children be allowed to change personal information about the children on the application.

The federal law requires applications to be available and usable for everyone.

The law requires that safety measures be taken to keep the personal information of users private.

The law requires that disclosures and disclaimers about the information given out from the application and the policies of the application be provided to the user.

8b Assumptions

The political policies and law do not change in accordance with the legality of the Workout Movement Tracker Application.

It is expected that the programmers will be provided with data from a motion tracker and the product user.

The application is expected to be compatible with multiple different types of hardware. For example, it would be compatible with Apple and Windows products. Also, the application would be able to function from any device with appropriate software compatability.

There are multiple applications out there that are very similar to our project but there don't seem to be any that track the motion of the user to correct the posture of the user and give active feedback like a trainer.

There might be new products added to this application upon buying into the premium membership.

It is expected that the application user will have access to a space to workout.

It is expected that the user has Wi-Fi.

It is assumed that the user will have access to a camera that can scan the body type of a person.

It is expected that the user has access to technology he/she can download the application on.

Generally, most parts of the application are available to all users except for the special components available only to the premium users.

The application is only used for tracking the movement of the user as they workout and not for tracking daily activities. For example, the application can be used for tracking the performance of a pilates routine but not to track the number of step walked in a day.

It is assumed that the user will specify the type of workout or routine they want to perform to input to the application.

The application could possibly expand to include dance practices and track the correct postures to be performed in the routine, given the correct reference.

II Requirements

SV: Sections 9 and 10 deal with functional requirements. Sections 11 to 20 are a very thorough list of possible non-functional requirements, not all of which apply to every project. You should think carefully about each of these, form requirements if applicable, or write “Not Applicable” otherwise. See section 10 for the format of individual requirements. Section 21 documents the acceptance tests planned to verify the requirements – See that section for further details, and be aware that every requirement needs at least one verifying acceptance test (though some tests may verify more than one requirement.)

1 Product Use Cases

SV: Product Use Cases are very similar to Product Scenarios, but in more formal detail. They serve as a first step towards developing functional requirements, and can aid in organizing requirements according to the use case(s) from which they were developed. See the CS 440 web site for a sample use-case form, with instructions.

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

SV: Use case diagrams list the use cases developed for a system, mark the boundary of what is internal or external to the system to be developed, and indicate which external entities (actors) are associated with each use case.

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.

Examples

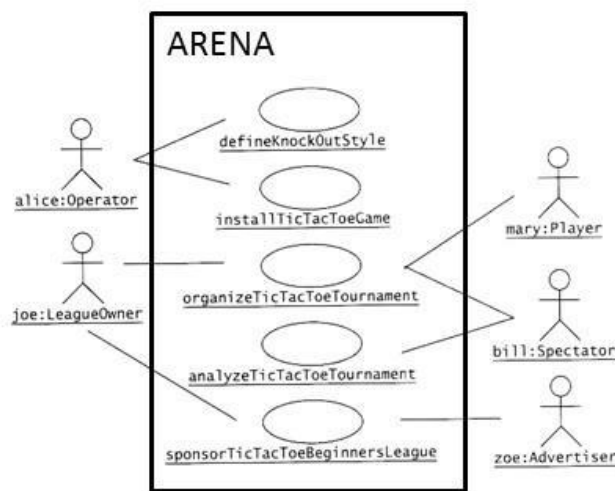


Figure 1 - Sample Use Case Diagram from Bruegge & DuToit (modified)

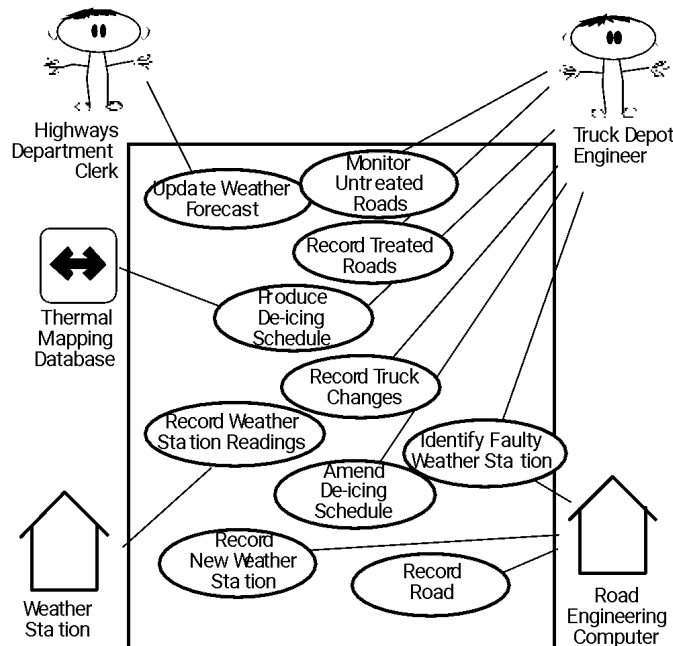


Figure 2 - Sample Use Case Diagram from Robertson and Robertson

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

SV: A list (table) of use cases is an alternative to the use case diagram, particularly when there are many use cases. There may be additional information in the table not found in the diagram, such as cross referencing to other sections or materials.

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.

SV: The following example was copied from “useCaseFormWithInstructions.docx”, available on the CS 440 web site. (There is also a blank version available.)

Use case ID:	Name:
pre-conditions:	
post-conditions:	
Initiated by:	
Triggering Event:	
Additional Actors:	
<p>Sequence of Events:</p> <ol style="list-style-type: none"> 1. Initiating event or action should be step 1, taken by initiating actor. 2. System response follows, indented right. 3. All external action steps are aligned with step 1. ("stimulus" style) 4. All system responses are indented right, aligned with step 2. ("response" style) 5. All steps should be expressed in the active voice, clearly indicating <u>who</u> performs each action 6. The sequence of events should show a back-and-forth stimulus-response relationship. 	
<p>Alternatives: These would be normal and expected variations from the base case.</p> <p>Exceptions: These would be unusual variations from the base case, often caused by problems.</p>	

- *For all of the above, list as NA if not applicable.*
- *The following may be added if relevant, or omitted otherwise:*
 - o related use cases or scenarios*
 - o associated tests, systems, classes, etc.*
 - o revision history*
 - o references to other documents*
 - o author(s) / originator(s)*

- o notes
- *Alternatives and Exceptions may be listed either as separate use cases or as notes to a base case, depending on their significance and similarity.*
- *For regularly occurring periodic events, "time" can be listed as the initiating actor.*

You may also want to view Figure 4.7 from "Object Oriented Software Engineering" by Bruegge and DuToit

2 Functional Requirements

SV: Each requirement listed needs to have a unique identifier, a short name, a one- or two-sentence description, a rationale, a fit criteria, and reference to one or more acceptance tests to be used to confirm the completion of this particular requirement. The acceptance tests themselves are documented in section 0- See that section for further details. It is recommended to number the requirements according to their type, such as F-4 for the fourth functional requirement or U-2 for the second usability requirement. Functional requirements specifically deal with the functionality the system must have, and are generally derived directly from the steps the system takes during use cases.

Content

A specification for each functional requirement. A full explanation is included in this template's introductory material.

Motivation

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

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.

ID# - Name

Description: Your description here . . .

Rationale: Your rationale here . . .

Fit Criterion: Your fit criteria here . . .

Acceptance Tests: List ID# and/or names here . . .

3 Data Requirements

SV: Data requirements deal with requirements that are somehow related to data, such as the definition of what is included in a “student record” or the acceptable form of an e-mail address or allowable range of certain data items.

Content

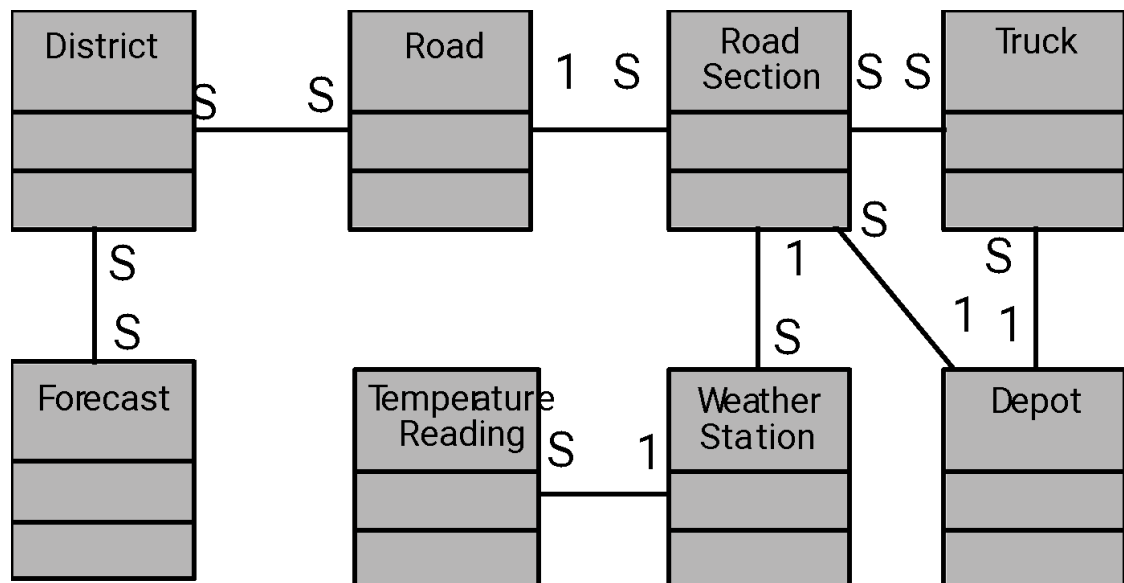
A specification of the essential subject matter, business objects, entities, and classes that are germane to the product. It might take the form of a first-cut class model, an object model, or a domain model. Alternatively, these requirements might be described by defining the terms in the dictionary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

ID# - Name

Description: Your description here . . .

Rationale: Your rationale here . . .

Fit Criterion: Your fit criteria here . . .

Acceptance Tests: List ID# and/or names here . . .

4 Performance Requirements

4a Speed and Latency Requirements

SV: Requirements specifying how fast (or slow) the product must operate or how much lag is allowable between stimulus and either initial response or task completion. Other timing-related requirements could go in this section.

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.

ID# - Name

Description: Your description here . . .

Rationale: Your rationale here . . .

Fit Criterion: Your fit criteria here . . .

Acceptance Tests: List ID# and/or names here . . .

4b Precision or Accuracy Requirements

SV: Self-explanatory. How accurate or precise must the system be.

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.

ID# - Name

Description: Your description here . . .

Rationale: Your rationale here . . .

Fit Criterion: Your fit criteria here . . .

Acceptance Tests: List ID# and/or names here . . .

4c Capacity Requirements

SV: Requirements regarding the largest “thing” the system must be able to handle, or perhaps how many things it can handle (at once.) Note: Requirements regarding how many things it can handle in a given time period would be a speed requirement, covered in section 12a above.

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.

ID# - Name

Description: Your description here . . .

Rationale: Your rationale here . . .

Fit Criterion: Your fit criteria here . . .

Acceptance Tests: List ID# and/or names here . . .

5 Dependability Requirements

5a Reliability Requirements

SV: Reliability relates to how frequently the system fails, (either by shutting down or by delivering erroneous results), and the consequences of those failures. These requirements may also address the conditions under which it is allowed to fail (or not.), See also availability and robustness in the following sections.

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.

ID# - Name

Description: Your description here . . .

Rationale: Your rationale here . . .

Fit Criterion: Your fit criteria here . . .

Acceptance Tests: List ID# and/or names here . . .

5b Availability Requirements

SV: Availability addresses the amount of time the system is running and available for use. It is affected by how often the system goes down (reliability), but also by the time required to bring the system back up again, the availability lost due to regularly scheduled maintenance down times, and the ability of the system to offer at least partial functionality in the face of failures or resource shortages. See also reliability and robustness.

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) and 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.

ID# - Name

Description: Your description here . . .

Rationale: Your rationale here . . .

Fit Criterion: Your fit criteria here . . .

Acceptance Tests: List ID# and/or names here . . .

5c Robustness or Fault-Tolerance Requirements

SV: This section deals with the system's ability to provide at least partial functionality in the face of failures or resource shortages, such as operating in offline mode when network connectivity is unavailable. See also reliability and availability.

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.

ID# - Name

Description: Your description here . . .

Rationale: Your rationale here . . .

Fit Criterion: Your fit criteria here . . .

Acceptance Tests: List ID# and/or names here . . .

5d Safety-Critical Requirements

SV: These requirements address potential harm to health, safety, or property, and may refer to relevant standards such as OSHA compliance.

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.

ID# - Name

Description: Your description here . . .

Rationale: Your rationale here . . .

Fit Criterion: Your fit criteria here . . .

Acceptance Tests: List ID# and/or names here . . .

6 Maintainability and Supportability Requirements

6a Maintenance Requirements

SV: This section deals with the ease with which the system can be maintained, and possibly who will perform system maintenance and under what conditions. The ease of evolving the system into future versions may also be addressed here, or in a separate section (not included in this template) if that is a major concern.

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.

ID# - Name

Description: Your description here . . .

Rationale: Your rationale here . . .

Fit Criterion: Your fit criteria here . . .

Acceptance Tests: List ID# and/or names here . . .

6b Supportability Requirements

SV: What ongoing support is to be provided, e.g. through a help desk. See also training requirements in section 16g below.

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.

ID# - Name

Description: Your description here . . .

Rationale: Your rationale here . . .

Fit Criterion: Your fit criteria here . . .

Acceptance Tests: List ID# and/or names here . . .

6c Adaptability Requirements

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

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.

ID# - Name

Description: Your description here . . .

Rationale: Your rationale here . . .

Fit Criterion: Your fit criteria here . . .

Acceptance Tests: List ID# and/or names here . . .

6d Scalability or Extensibility Requirements

SV: The ease of expanding the system to a larger capacity as the business grows.

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.

ID# - Name

Description: Your description here . . .

Rationale: Your rationale here . . .

Fit Criterion: Your fit criteria here . . .

Acceptance Tests: List ID# and/or names here . . .

6e Longevity Requirements

SV: This specifies the expected lifetime of the product.

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.

ID# - Name

Description: Your description here . . .

Rationale: Your rationale here . . .

Fit Criterion: Your fit criteria here . . .

Acceptance Tests: List ID# and/or names here . . .

7 Security Requirements

SV: Security requirements address who is allowed what type of access to the system, and what areas require special protection or diligence. In practice security requirements must often be written by security experts, and may refer to standards.

7a Access Requirements

SV: These requirements address who has access to what (data or functionality) and under what conditions or restrictions.

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.

ID# - Name

Description: Your description here . . .

Rationale: Your rationale here . . .

Fit Criterion: Your fit criteria here . . .

Acceptance Tests: List ID# and/or names here . . .

7b Integrity Requirements

SV: These requirements address the protection of data(bases) from intentional or accidental corruption, loss, or theft.

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.

ID# - Name

Description: Your description here . . .

Rationale: Your rationale here . . .

Fit Criterion: Your fit criteria here . . .

Acceptance Tests: List ID# and/or names here . . .

7c Privacy Requirements

SV: These requirements address data that must remain confidential, such as medical records or other personally identifiable data. Laws often apply. (See also section 20.)

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.

ID# - Name

Description: Your description here . . .

Rationale: Your rationale here . . .

Fit Criterion: Your fit criteria here . . .

Acceptance Tests: List ID# and/or names here . . .

7d Audit Requirements

SV: This section applies when a system must provide support for transaction auditing, such as some financial or medical systems.

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.

ID# - Name

Description: Your description here . . .

Rationale: Your rationale here . . .

Fit Criterion: Your fit criteria here . . .

Acceptance Tests: List ID# and/or names here . . .

7e Immunity Requirements

SV: This section addresses the system's ability to resist viruses, worms, Trojan Horses, etc.

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.

ID# - Name

Description: Your description here . . .

Rationale: Your rationale here . . .

Fit Criterion: Your fit criteria here . . .

Acceptance Tests: List ID# and/or names here . . .

8 Usability and Humanity Requirements

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

8a Ease of Use Requirements

SV: This section addresses the ease with which the intended audience can use the system properly, and conversely the difficulty with which they can use it improperly.

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.

ID# - Name

Description: Your description here . . .

Rationale: Your rationale here . . .

Fit Criterion: Your fit criteria here . . .

Acceptance Tests: List ID# and/or names here . . .

8b Personalization and Internationalization Requirements

SV: This section addresses the ease with which the system can be configured for personal preferences, and for things such as language, currency, units, symbols, etc.

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.

ID# - Name

Description: Your description here . . .

Rationale: Your rationale here . . .

Fit Criterion: Your fit criteria here . . .

Acceptance Tests: List ID# and/or names here . . .

8c Learning Requirements

SV: Requirements related to how easy it is for the intended audience to learn to use the product.

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.

ID# - Name

Description: Your description here . . .

Rationale: Your rationale here . . .

Fit Criterion: Your fit criteria here . . .

Acceptance Tests: List ID# and/or names here . . .

8d Understandability and Politeness Requirements

SV: These requirements relate to how intuitively the intended audience understands what the program does, what its messages mean, and how to use it. Definitely related to ease of use, (section 16a), but more specifically addressing comprehension of the program output, instructions, and other messages.

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.

ID# - Name

Description: Your description here . . .

Rationale: Your rationale here . . .

Fit Criterion: Your fit criteria here . . .

Acceptance Tests: List ID# and/or names here . . .

8e Accessibility Requirements

SV: Requirements related to use of the product by individuals with disabilities.

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.

ID# - Name

Description: Your description here . . .

Rationale: Your rationale here . . .

Fit Criterion: Your fit criteria here . . .

Acceptance Tests: List ID# and/or names here . . .

8f User Documentation Requirements

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

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?

ID# - Name

Description: Your description here . . .

Rationale: Your rationale here . . .

Fit Criterion: Your fit criteria here . . .

Acceptance Tests: List ID# and/or names here . . .

8g Training Requirements

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

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?

ID# - Name

Description: Your description here . . .

Rationale: Your rationale here . . .

Fit Criterion: Your fit criteria here . . .

Acceptance Tests: List ID# and/or names here . . .

9 Look and Feel Requirements

9a Appearance Requirements

SV: These requirements address things such as the colors, fonts, and logos used, often to reflect corporate branding or similarity to related products. See also style in the next section.

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.

ID# - Name

Description: Your description here . . .

Rationale: Your rationale here . . .

Fit Criterion: Your fit criteria here . . .

Acceptance Tests: List ID# and/or names here . . .

9b Style Requirements

SV: Style requirements address the impression the product makes upon users, such as professionalism for a tax accounting package, friendliness for a children's game, or how "cool" it is for a teenage audience. Product packaging may also be addressed here, and/or appearance in the previous section.

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.

ID# - Name

Description: Your description here . . .

Rationale: Your rationale here . . .

Fit Criterion: Your fit criteria here . . .

Acceptance Tests: List ID# and/or names here . . .

10 Operational and Environmental Requirements

10a Expected Physical Environment

SV: These requirements relate to the physical environment in which the product will operate.

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.

ID# - Name

Description: Your description here . . .

Rationale: Your rationale here . . .

Fit Criterion: Your fit criteria here . . .

Acceptance Tests: List ID# and/or names here . . .

10b Requirements for Interfacing with Adjacent Systems

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

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*

ID# - Name

Description: Your description here . . .

Rationale: Your rationale here . . .

Fit Criterion: Your fit criteria here . . .

Acceptance Tests: List ID# and/or names here . . .

10c Productization Requirements

SV: Requirements related to the distribution and/or installation of the product.

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.

ID# - Name

Description: Your description here . . .

Rationale: Your rationale here . . .

Fit Criterion: Your fit criteria here . . .

Acceptance Tests: List ID# and/or names here . . .

10d Release Requirements

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

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?

ID# - Name

Description: Your description here . . .

Rationale: Your rationale here . . .

Fit Criterion: Your fit criteria here . . .

Acceptance Tests: List ID# and/or names here . . .

11 Cultural and Political Requirements

11a Cultural Requirements

SV: 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. Bear in mind that “cultural groups” may also apply to population subgroups such as teenagers, the elderly, or ironworkers.

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?

ID# - Name

Description: Your description here . . .

Rationale: Your rationale here . . .

Fit Criterion: Your fit criteria here . . .

Acceptance Tests: List ID# and/or names here . . .

11b Political Requirements

SV: Requirements included strictly to make “the boss” happy, either internally to the development company, or internally to the client company, or possibly an external third party.

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.

ID# - Name

Description: Your description here . . .

Rationale: Your rationale here . . .

Fit Criterion: Your fit criteria here . . .

Acceptance Tests: List ID# and/or names here . . .

12 Legal Requirements

12a Compliance Requirements

SV: A statement specifying the legal requirements for this system, often referring to relevant laws and/or requiring approval by the legal department.

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?

ID# - Name

Description: Your description here . . .

Rationale: Your rationale here . . .

Fit Criterion: Your fit criteria here . . .

Acceptance Tests: List ID# and/or names here . . .

12b Standards Requirements

SV: These requirements specify documented standards to which the product must conform, as opposed to legal regulations.

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?*

ID# - Name

Description: Your description here . . .

Rationale: Your rationale here . . .

Fit Criterion: Your fit criteria here . . .

Acceptance Tests: List ID# and/or names here . . .

13 Requirements Acceptance Tests

SV: Every requirement must have one or more acceptance tests associated with it, to confirm that the requirement has been met. At this point these tests are not yet completely specified – A one- or two-sentence description of each test will suffice. Note that some tests may verify more than one requirement, and that some requirements may require multiple tests for their confirmation.

13a Requirements – Test Correspondence Summary

SV: The following sample table is available from the CS 440 web site as “Sample Requirement Test Correspondence Table.xlsx” It is recommended that you work with the table in Excel, and then drag it into the document when it is completed. Depending on the number of requirements and/or tests included, it may be necessary to use multiple tables, and/or use landscape mode. Every row and every column of the table should include at least one X. Below the table list the ID #, name, and short description of each individual acceptance test.

Test	Requirements																			
	Req 1	Req 2	Req 3	Req 4	Req 5	Req 6	Req 7	Req 8	Req 9	Req 10	Req 11	Req 12	Req 13	Req 14	Req 15	Req 16	Req 17	Req 18	Req 19	Req 20
Test 1	X																			
Test 2		X				X														
Test 3			X	X																
Test 4					X	X														
Test 5																				
Test 6																				
Test 7																				
Test 8																				
Test 9																				
Test 10																				
Test 11																				
Test 12																				
Test 13																				
Test 14																				
Test 15																				

Table 1 - Requirements - Acceptance Tests Correspondence

13b Acceptance Test Descriptions

SV: Provide a brief description of each acceptance test. Detailed test specifications will appear in a separate document, which may be referenced here when available.

ID # - Name

Description: Your description here . . .

III Design

1 Design Goals

SV: Identify the important design goals that are to be optimized in the proposed design.

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 System Design

*SV: **IF** the proposed new system is to replace an existing system, then the current system should be described here. Otherwise insert a brief statement that there is no pre-existing system.*

Your text goes here . . .

3 Proposed System Design

This section will make heavy use of class diagrams, and also sequence and deployment diagrams where noted. However don't overlook finite state, activity, communication, or other diagram types as needed for effective communication.

3a Initial System Analysis and Class Identification

SV: Perform grammatical and similar analyses to identify the most important and obviously needed classes, and to organize them into an initial class structure. An initial class diagram is appropriate, containing few if any internal details.

Your text goes here . . .

3b Dynamic Modelling of Use-Cases

SV: Insert sequence diagrams of (at least the most important) use-cases, as a means of identifying other needed classes.

Content

Include sequence diagrams of each important 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.)

Your text goes here . . .

3c Proposed System Architecture

SV: Identify the Software Architecture to be applied to this project, such as Client-Server, Repository, MVC, etc., along with justification for the choice.

Your text goes here . . .

3d Initial Subsystem Decomposition

SV: A slightly more detailed class diagram, showing the classes identified in sections 24a, 24b, and 0 above, partitioned into subsystems. For each subsystem provide a brief description of the subsystem, including its key responsibilities. There should still be few if any internal details.

Your text goes here . . .

4 Additional Design Considerations

SV: The sections listed here do not need to be presented in the order given, and may not all be relevant for any particular project. Those that are relevant can help identify additional classes that are needed as a result.

4a Hardware / Software Mapping

SV: This is particularly important for distributed systems, such as those employing a client-server architecture. Use a deployment diagram to indicate which subsystems are mapped onto which piece(s) of hardware, and what communication subsystems need to be added to the system as a result.

Your text goes here . . .

4b Persistent Data Management

SV: Document the classes and perhaps subsystems necessary to store persistent data when the system shuts down, and to restore that data when the system starts back up again.

Reiterate key data structures and information as necessary for the understanding of this design phase. Refer the reader back to the data dictionary in section I7c above to avoid undue repetition, while reviewing only the most relevant items here.

Your text goes here . . .

4c Access Control and Security

SV: Identify the access control and security concerns for this system, and the new classes and/or subsystems that must be added to handle those concerns.

Your text goes here . . .

4d Global Software Control

SV: Identify the global software control concerns for this system, and the new classes and/or subsystems that must be added to handle those concerns.

Your text goes here . . .

4e Boundary Conditions

SV: Identify the boundary condition concerns for this system, and the new classes and/or subsystems that must be added to handle those concerns. In particular consider startup, shutdown (normal or abnormal), and the creation and/or maintenance of any configuration files, databases, or similar supporting data files.

Your text goes here . . .

4f User Interface

SV: Include a preliminary user interface design here, possibly as a rough sketch or other mockup, in order to identify additional classes needed to implement the interface.

The final user interface design will normally be developed by appropriate experts in that area. However it is appropriate to include an initial design here, including possibly a low- or high- fidelity sketch/mockup, in order to identify key classes necessary to implement the user interface, such as forms and dialog windows. It may also go towards addressing usability and/or look-and-feel requirements, and/or identifying other overlooked components.

Your text goes here . . .

4g Application of Design Patterns

SV: Any design patterns applied as a result of previous sections should have been addressed there, and identified as such at the time. Use this section to document only the additional design patterns that were not previously covered elsewhere. (If any.)

Your text goes here . . .

5 Final System Design

SV: Include here the final version of the overall system design, incorporating all the subsystems and classes added as a result of additional design considerations. Multiple diagrams may be needed, possibly starting with an overall package diagram showing all the different subsystems and the (important) classes contained within each one. Still not a lot of internal details.

Your text goes here . . .

6 Object Design

This section documents the internal details of each class, to the extent that they can be designed at this time. Included should be the class interfaces (public method signatures and responsibilities) and constraints. It is probably best to break this section up into subsections corresponding to subsystems as documented above, and/or by (Java) packages if those are designed. It may also be appropriate to address additional design pattern considerations here, but not to the point of being redundant of previous documentation.

Certain methods, such as simple getters, setters, and constructors are not always documented, unless there is something special about them such as in the Singleton or Factory Method design patterns.

6a Packages

SV: If the design involves assigning classes to packages (.e.g Java packages), then the packages to be created should be documented here.

Your text goes here . . .

6b Subsystem I

Your text goes here . . .

6c Subsystem II

Your text goes here . . .

6d etc.

Your text goes here . . .

IV 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 . . .

V 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 . . .

VI 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.

VII 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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