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

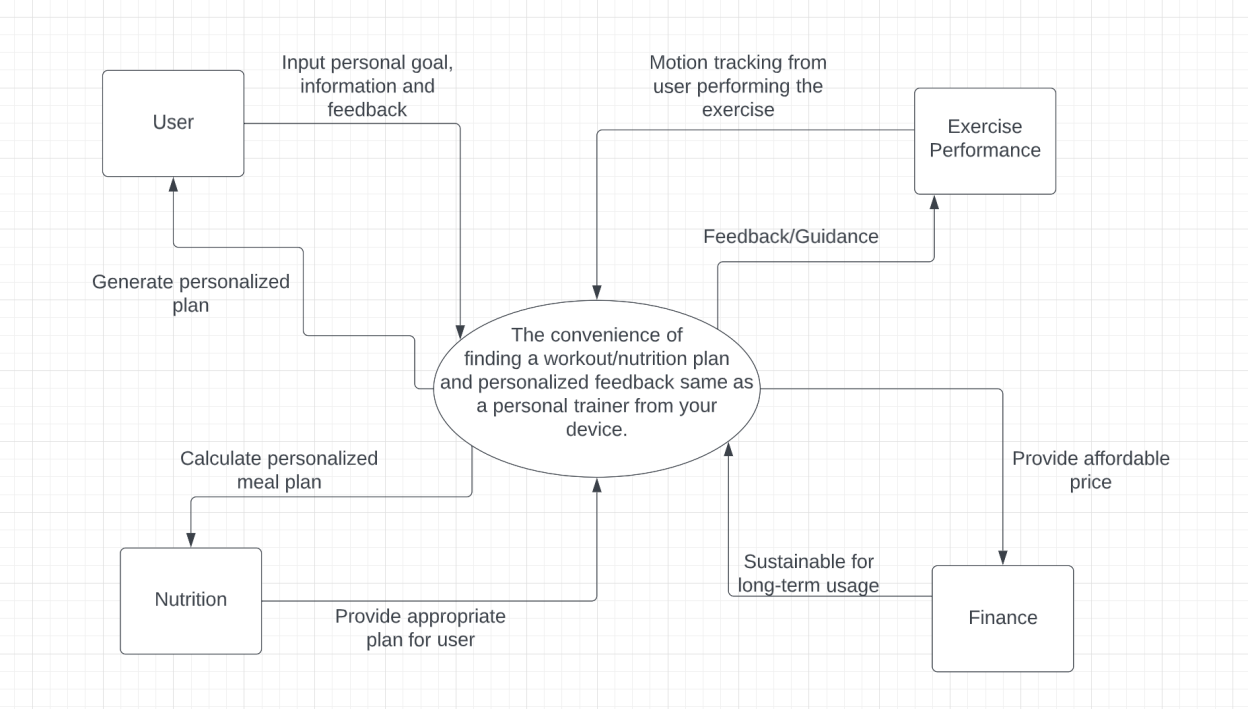

Figure 1 - Context of Work

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)

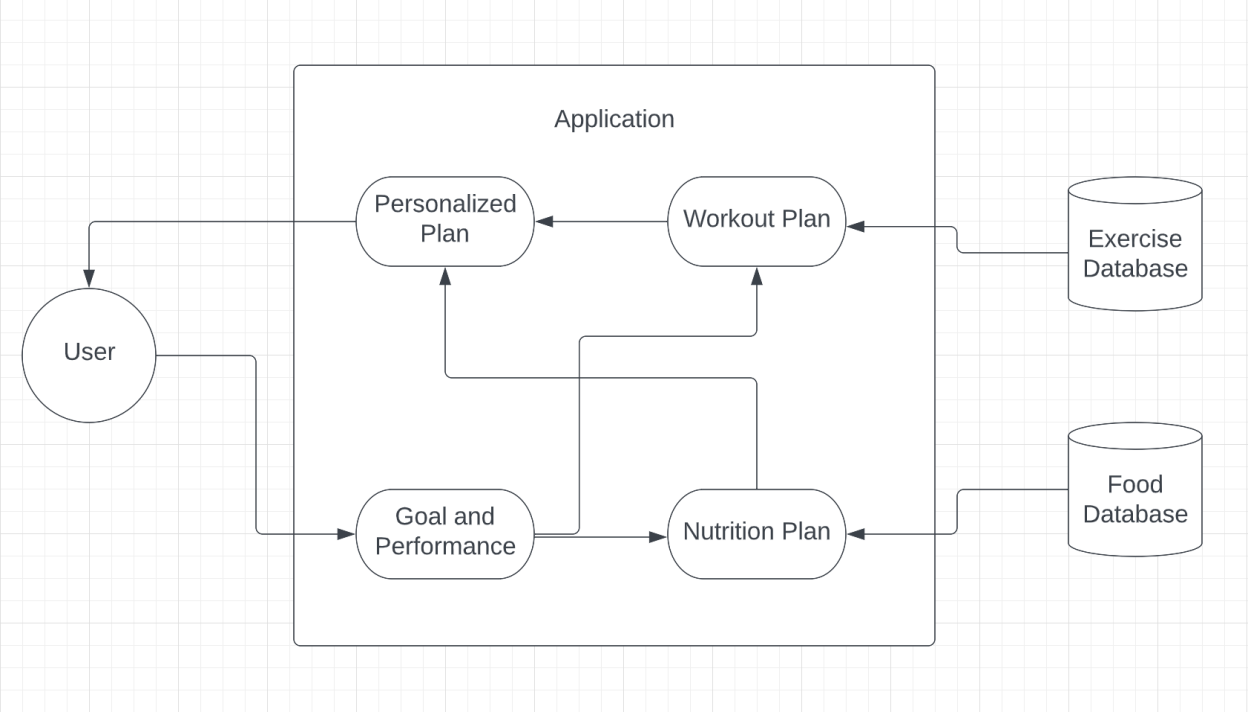

Figure 2 - Scenario Diagram

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/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:** Readying 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:** Weight / $Height^2$.
- **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

1 Product Use Cases

1a Use Case Diagrams

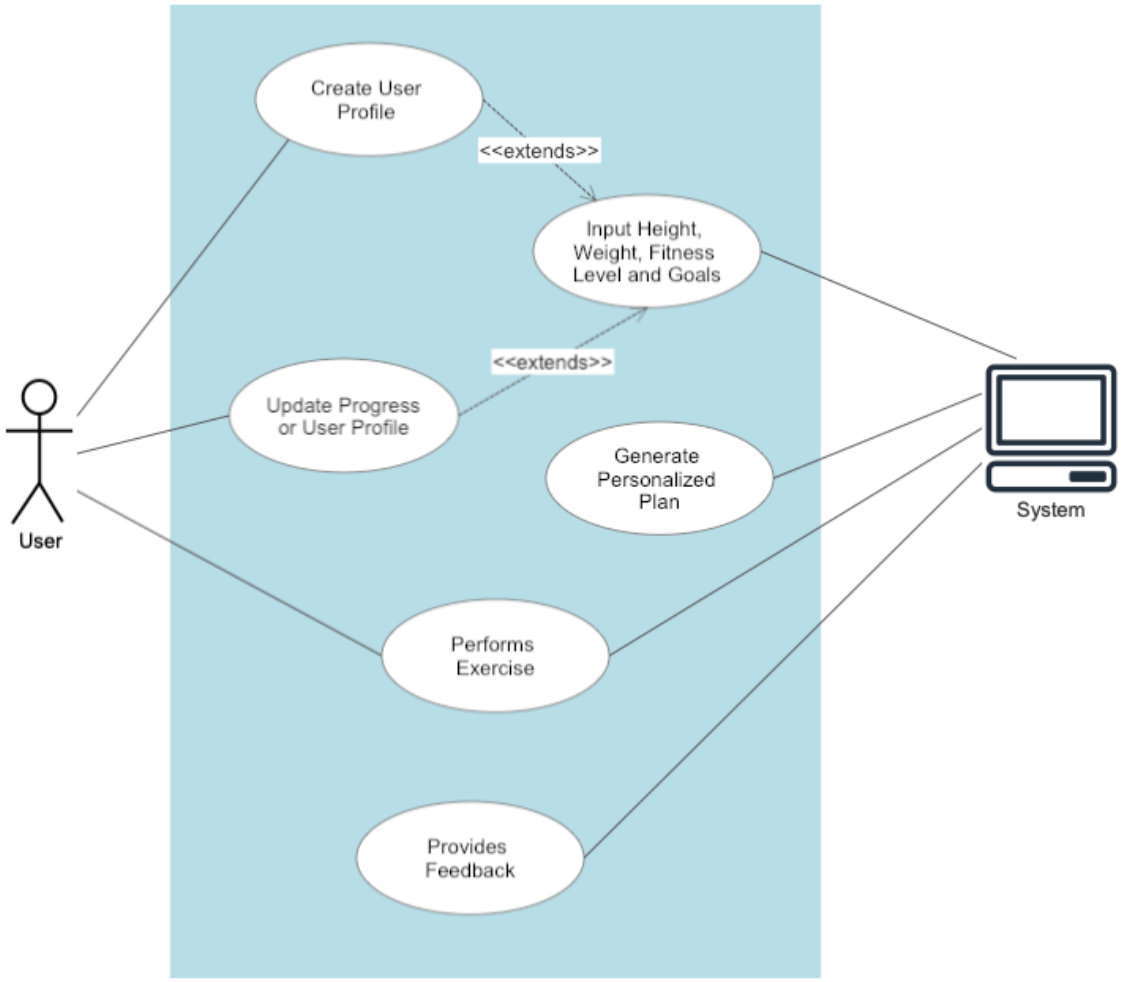

Figure 3 - Use Case Diagram

The use case diagram shows that the user can interact with the application to perform various actions, such as creating a user profile with information such as height, weight, fitness level and goals, and also be able to update it. The system then responds to these changes, and provides personal recommendations based on their body type and fitness goals. The system also tracks the user's form while performing an exercise and provides feedback for improvement.

1b Product Use Case List

Not Applicable.

1c Individual Product Use Cases

There are two main use cases: personalized workout plan generation and real-time form tracking during exercise. The personalized workout plan is generated based on the user's body type and goals after they have filled/updated their profile. Real-time form tracking provides feedback to the user on their form in real-time. The application continues to provide ongoing feedback throughout the exercise and keeps track of the data.

Use case ID: 001 Name: Personalized workout plan generation pre-conditions: User has logged in and filled/updated their profile. post-conditions: User receives a personalized workout plan based on their body type and goals. Initiated by: User Triggering Event: User selects the "Generate Workout Plan" option. Additional Actors: None
Sequence of Events: 1. User selects the "Generate Workout Plan" option. a. The application analyzes the user's profile 2. The application provides the user's profile and generates a personalized workout plan. 3. The user reviews the workout plan and can make adjustments if needed. 4. The application saves the personalized workout plan to the user's account. 5. The user completes the exercise and the application tracks the data.
Alternatives: If the user does not have a filled profile, prompt the user to complete it.

Exceptions: If a user inputs incorrect information, prompt the user to re-enter information.

Use case ID: 002 Name: Real-time form tracking during exercise pre-conditions: User has logged in and is performing an exercise. post-conditions: User receives feedback on their form in real-time. Initiated by: User Triggering Event: User selects an exercise and starts performing it. Additional Actors: None
Sequence of Events: 1. User selects an exercise and starts performing it. a. The application uses the device camera to track the user's movements. b. The application analyzes the user's form in real-time. 2. Application provides specific feedback on how to improve their form. 3. The user adjusts their form based on feedback provided. 4. The application continues to analyze the user's form and provides ongoing feedback throughout the exercise. 5. The user completes the exercise and the application tracks the data.
Alternatives: If the exercise is not listed, prompt the user to select another exercise. Exceptions: If the application encounters technical difficulties, prompt the user to adjust their camera or device placement.

2 Functional Requirements

The application requires the user to input body measurements, fitness level and goals, and progress to provide a personalized workout plan and recommendations personalized to the user's body type, fitness level, and goals. It incorporates real-time tracking through the camera to analyze form during exercise and provide immediate feedback for maximizing results and preventing injuries. The application also tracks progress metrics such as weight loss and strength gains, and adjusts the workout plan accordingly with feedback for continuous improvement.

ID#001- User Profile

Description: The user will input their bodily measurements, fitness goals, progress and their expertise which would be used by the application to suggest a personalized workout plan.

Rationale: A proper user profile with details about the physical characteristics, experience level, and goals is necessary to generate a personalized workout plan.

Fit Criterion: Is the application saving user information when they sign up and have it saved (including the progress) and allow the user to make changes at a later time.

Acceptance Tests: User Information Test

ID#002 - Personalized Recommendations

Description: The application will provide personalized workout recommendations based on the user's body type, fitness level, and goals.

Rationale: Personalized recommendations ensure that the user is doing exercises that are effective and safe for their specific needs and will help them achieve their goals faster.

Fit Criterion: Does the application provide personalized workout recommendations based on the user's body type, fitness level, and goals.

Acceptance Tests: Personalized Recommendation Test

ID#003 - Real-Time Tracking

Description: The application will utilize the camera on the user's device to track their body movements and analyze their form in real-time during an exercise.

Rationale: Proper form is detrimental to achieving maximum results from an exercise and avoiding injury,

Fit Criterion: Does the application accurately track the user's body movements and provide feedback on form in real-time during exercise.

Acceptance Tests: Form Correction Test

ID#004 - Progress Tracking

Description: The user will input their progress over time, including metrics such as weight loss and strength gains, and adjust the workout plan accordingly.

Rationale: Progress tracking will help users to see results of their work and allow them to adjust their workout plan to continue making progress.

Fit Criterion: Does the application track and analyze the user's progress over time and adjust the plan and provide feedback.

Acceptance Tests: Progress Analysis Test

3 Data Requirements

To provide personalized recommendations and accurate form tracking, the application requires data related to the user's body type, fitness level, goals, progress and exercise form. This information will be represented by an object model, including classes for the user profile, form tracking, and exercise routine. To ensure effectiveness, it is important to consider existing data and object models for similar fitness applications and capture all necessary information for a useful user experience.

ID#005 - Data Model

Description: The application should capture the essential information such as user profiles, tracking information, exercise routines, and progress data.

Rationale: Having an accurate data model is necessary to ensure the user is getting proper exercises and feedback to exercise safely and effectively.

Fit Criterion: The data model must capture all the necessary information such as user profiles, tracking information, exercise routines, and progress data to provide a useful and effective user experience.

Acceptance Tests: Data Handling Test

4 Performance Requirements

4a Speed and Latency Requirements

The application has specific speed and latency requirements for personalized recommendations and real-time form tracking. The application is to provide personalized recommendations and real-time form tracking feedback within a reasonable time to ensure a seamless and efficient user experience.

ID#006 - Personalized Recommendation Response Time

Description: The application must provide personalized recommendations for workouts and exercises based on the user's body type and fitness goals.

Rationale: Personalized recommendations can help users achieve their fitness goals faster and safer.

Fit Criterion: The application must respond to user input within 10 seconds of the user providing or editing their information.

Acceptance Tests: Effective Recommendation Test

ID#007 - Real-Time Form Tracking

Description: The application will track and analyze the user's exercise form in real-time and provide feedback for improvement.

Rationale: Tracking the user's exercise form is crucial for ensuring that the exercises are performed correctly to maximize results and reduce risk of injury.

Fit Criterion: The feedback for improvement after analyzing the form tracking data must be provided within 10 seconds of completing the exercise.

Acceptance Tests: Real-Time Tracking Efficiency Test

4b Precision or Accuracy Requirements

The application shall track and analyze the user's exercise form in real-time with a precision of at least 95%. This is crucial for ensuring the user's safety and the effectiveness of the workout program.

ID#008 - Tracking Precision

Description: The application will track and analyze the user's exercise form in real-time with a precision of at least 95%.

Rationale: A high level of accuracy is essential for the user's safety and the effectiveness of the workout program.

Fit Criterion: Does the application track the user's form during an exercise and provide feedback with a precision of at least 95%.

Acceptance Tests: Real-Time Tracking Precision Test

4c Capacity Requirements

The application needs to handle multiple users and store user data without performance issues or crashing. Thus, the application should have large data storage and retrieval mechanisms that can handle large volumes of data and user requests.

ID#009 - User Capacity

Description: The application must be able to handle at least 100 simultaneous users performing the exercises at once, without experiencing any lag or slowdown in performance.

Rationale: It is important to ensure that the application is able to handle a large volume of users at once, which is essential for fitness applications that can experience heavy volume at times.

Fit Criterion: The application should be tested with 100 users performing different operations simultaneously to ensure it can handle this volume.

Acceptance Tests: Capacity Test

5 Dependability Requirements

5a Reliability Requirements

SV: Under no circumstances should the app fail to load the user data. Video streaming can fail or have lower quality if the user connection is not strong enough. The user's ability to access their fitness plan should never fail. In the event of a failure, the user's data must be saved.

Content: If the user's connection is fine then the app shouldn't fail to load. The only reason it should fail is if the connection is not strong enough.

Motivation: If the app fails too often then user's will leave. We want to prevent this by maintaining reliability.

ID#010 - Data Dependability

Description: The application must not fail to load user data and fitness plan.

Rationale: The fitness plan with corrections to the user's form is the most important function of this application.

Fit Criterion: Determination of success/failure to load user data and fitness plan may be checked with constant updates/monitoring. Additionally, specific bug tests will be used to make sure users have constant access to these features and that these features are working at all times.

Acceptance Tests: fitness plan display test, form correction unit tests, form correction for specific exercise tests

5b Availability Requirements

The application should be available for the vast majority of the day, with any downtime for maintenance planned for when there will be the least amount of users active. Since most people workout between 5 AM to 10 PM, this will be the time when the app is most used, and maintenance should not occur during these horse. Maintenance can take place between 10 PM and 5 AM - it should not take longer than these allocated 7 hours. Outside of scheduled downtime, the application should not be down for more than a few minutes throughout the day. If this does occur, it should be fixed within the hour.

ID#011 - Active Hours

Description: The application must be running for the majority of the day.

Rationale: The app must be running and support full functionality for the users to be able to access it for all their various needs throughout the day.

Fit Criterion: The application must be up and running between 5 AM and 10 PM at minimum. This is needed for users to be able to access their fitness plan, track their goals, and check their form while exercising. This information will be acquired by periodically checking if the app is running.

Acceptance Tests: app availability tests, unit tests, functionality tests

5c Robustness or Fault-Tolerance Requirements

The application will retain some functionality in offline mode as the data required will be saved. Users will be able to check their fitness goals and look at previously saved information. They can also change their goals and profile information. Any changes made will be saved in a temporary file until connection is regained and then it will sync with the server and save to the database.

ID#012 - Offline Mode

Description: The application will still have some limited functionality whilst it is offline. At this point the user can still access the application in a limited fashion.

Rationale: An offline mode is necessary in case of network or connectivity issues. The user must be able to still use the application in some capacity, as much as is possible.

Fit Criterion: There are often times where network issues happen or when users are in an area with poor connectivity. Software is not always reliable and there will be room for improvement. For this reason, an offline mode can help mitigate the issues that come with poor connectivity.

Acceptance Tests: unit tests for functionality of offline mode, unit tests on different platforms (android, iOS, etc.), tests on information display

5d Safety-Critical Requirements

There are no specific standards, such as OSHA, that the application must adhere to. However, as the app is based partly on safety, there are certain safety considerations that the user must be aware of. The application should notify the user of safety information related to the exercises that the user chooses to perform. When new information is discovered, the app should be updated to convey this. The app must strive to provide relevant information to the user as much as possible.

ID#013 - Safety Information

Description: The application must provide users with relevant safety information for any exercise they are choosing to attempt.

Rationale: Safety information is mandatory to prevent injury and gain effectiveness from exercise.

Fit Criterion: Safety is a critical factor when exercising. This condition can be met when the user is fully informed of all relevant information. Thus the app has a responsibility to do so.

Acceptance Tests: safety info test, unit test for specified exercises

6 Maintainability and Supportability Requirements

6a Maintenance Requirements

System maintenance can be divided into two sections: application and server. Application maintenance would include bug fixes and new releases that can be performed by the dev team. This can be the original team of developers or an entirely new team. Server maintenance would include maintenance of the databases and servers being used to run the application. This would be performed by someone specifically responsible for maintaining servers, whether that be onsite or through a third party.

ID#014 - Maintenance

Description: Regular maintenance must be performed on the application and on associated servers to keep everything running smoothly. Maintenance must be performed out of regular use hours.

Rationale: The system must have regular maintenance, both for application and for server, in order to maintain quality and keep the application running smoothly. Regular maintenance will reduce errors and issues with the app.

Fit Criterion: In case of no maintenance being performed, the application would crash or have bugs regularly. This must be avoided with weekly maintenance and frequent checking of app quality.

Acceptance Tests: JUnit tests, bug tests, runtime tests

6b Supportability Requirements

Ongoing support can be in the form of implementing new information as it is discovered and adding new exercises and options to the user's fitness plan. Whenever new exercises or methods of working out become popular, the user will surely want to try it, so the app must make it available to them. Updates will primarily be in the form of updating such information and in monthly bug fixes and polishing. Larger updates would be released based on how quickly the dev team can complete and implement a feature. An example would be, in January of the year, there might be a feature that allows users to further customize the duration and intensity of their workouts. Then, the next major update may be released in August, depending on how the dev team progresses on the next new feature.

ID#015 - Support

Description: The app should provide support for the users in the form of constantly updating information, convenient user experience, and intuitive use of new features.

Rationale: Support for the users is needed so that they can maximize the benefits they get from the app. If users are able to conveniently and easily use the app and any new features, then they will keep wanting to use it.

Fit Criterion: Users should be able to constantly have access to new information as it is discovered and implemented. Users should also be able to easily understand and make use of new features.

Acceptance Tests: customer satisfaction ratings, unit tests for new features, unit tests for display of new information

6c Adaptability Requirements

The primary platforms that the application will run on are iOS and Android as these are the platforms that the majority of mobile users are using. Thus these will be the main focus of development. The application will be regularly updated to be compatible with the latest versions of both OS. Since the app will be primarily used at the gym or outdoors, it will not be developed for PC or Mac as users are unlikely to use the app from a computer. The application will be focused on mobile devices or small tablets.

ID#016 - Adaptability

Description: The application must work on latest/current versions of iOS and Android. It must be adaptable to all devices that run on either iOS or Android. After a major OS update is released, the app must be compatible with the new version within a week.

Rationale: Having the application available on both iOS and Android will maximize the users that are able to use the app as many people have phones of one type or the other.

Fit Criterion: All users must be able to use the app on a smartphone that runs a new/current version of iOS or Android. Users must be satisfied with the application available on the app store.

Acceptance Tests: platform dependent tests, platform compatibility tests, user satisfaction tests

6d Scalability or Extensibility Requirements

On launch, the system should be able to support 10,000 users saving data and creating custom plans. This number is expected to increase by another 50,000 within the following two years. The system should be able to constantly increase the number of users it is able to support, with the intention of supporting a large user base.

ID#017 - Scalability

Description: The application must be able to accommodate a large number of users, in the tens or hundreds of thousands.

Rationale: This application is expected to be a popular app with a large user base. In the case that it grows to an incredibly large number of users, it should be able to support all of them without issues.

Fit Criterion: If the app is able to support a large number of users and continue to increase its capacity. For optimal growth of the app, it should be always striving to increase its user base.

Acceptance Tests: scalability tests, database tests

6e Longevity Requirements

The application is expected to run at budget for a minimum of five years. This will be time to establish a user base and create a foothold within its niche. At the end of each year, there will be an evaluation to see if the app is performing as expected and to adjust future metrics accordingly. At the end of the five year period, the app will be evaluated deeply and its future will be decided.

ID#018 - Longevity

Description: The application will run for a minimum of five years and maintain its budget and user base.

Rationale: The application must run for long enough to establish itself and perform successfully. It must also maintain its budget and performance requirements in order to be continually functional.

Fit Criterion: The application must meet its budget, performance, and user requirements for a period of five years.

Acceptance Tests: metrics analysis, performance analysis

7 Security Requirements

7a Access Requirements

The users have access to their own information from the database as presented by the product. They have no other access to the data stored in the database. They aren't able to change anything about the product that doesn't pertain to the knowledge about the user themselves.

Customers, depending on whether they've bought the product for themselves or for their organization, have access to a single person's data versus a database for multiple people. If the customer has bought the product for themselves to use or for a single

user, their access to the product is as limited as a user's accessibility to the product. If the customer has bought the product for an organization which would include multiple users, then they have access to the user database. The user database would include a list of all the people using the product through the distribution of the customer. The customer would not have access to any tracker information or any databases not relating to the customer. They would also have no access to any of the front or back end code.

The product maintenance team would have access to the back and front end code. They wouldn't have access to any databases or information relating to the customers and users. Though an exception would be a list of names or email addresses to recognize the purchases and usage of the product.

ID#019 - Accessibility

Description: The application must protect user and product data from unauthorized personnel.

Rationale: The user data must be protected from anyone other than the user themselves. This is to protect the privacy of the user from other users and or anyone else related to the product. The product data, coding information, must be protected from anyone other than the maintenance team.

Fit Criterion: No data is accessible without clearance.

Acceptance Tests: Data Accessibility.

7b Integrity Requirements

The product shall protect against unintentional or intentional abuse of authority by hiding user data away from anyone other than the users themselves. The product would have the option for the user to back up their information anywhere on their personal devices. The product's data will not be available to anyone other than the programmers themselves and the maintenance team.

If there is a cyber attack and the product isn't able to recognize it in time, the user data would be backed up on their personal devices and removed from the product database. All of the product information, such as code, would be backed up to the main maintenance team's backup database and be removed from the product itself. After the threat has been removed, the product information would have to be reloaded onto the product by the maintenance team and then user information would automatically be reloaded onto the product as soon as the user is connected.

ID#020 - Data Integrity

Description: The product must protect the correctness of user and product data in any situation.

Rationale: The product must be able to protect against any corruption of the user and product data. If the product or user data is incorrect or leaked to unauthorized personnel, there needs to be contingencies in place to handle such situations.

Fit Criterion: The user data is correct according to the user and the product data is correct according to the maintenance team.

Acceptance Tests: Data Correction.

7c Privacy Requirements

The product follows the current laws on user privacy along with the product privacy policies.

The product shall not reveal any of the private user data to anyone other than the user themselves unless required by law.

The product is responsible for informing the user of its user data and privacy policies.

The users are able to change any of their own information at any time without needing any permissions.

The users are informed about the product storing data on their devices as a backup database in case of an emergency.

Any transactions between the user and the product are recorded and stored in a secure database that cannot be accessed by anyone but the maintenance team, and can only be accessed through legal approval.

ID#021 - Private

Description: The system shall protect user data to the best of its ability.

Rationale: No one other than the user themselves can access the private data. The risk of unauthorized access to user data is to be reduced to uphold the privacy credibility of the product.

Fit Criterion: None of the user data is accessible to anyone other than the user.

Acceptance Tests: User access only.

7d Audit Requirements

All transactions within the usage of the product shall be recorded. The transaction would require a valid name, address, and debit or credit card number. This information would be stored by the product's main database and would only be accessible through the maintenance team and only if there are legal matters to be

sorted. The maintenance team itself would not have access to the transaction information unless cleared by a legal authority.

ID#022 - Transaction Details

Description: The system must protect the transaction details for both the seller and buyer.

Rationale: The product needs to protect against scams and fake information given during a transaction. It needs to be able to uphold the rightfulness of a transaction in a legal setting.

Fit Criterion: All of the information provided is valid and safely stored in the main database.

Acceptance Tests: Information Validation, Database Check.

7e Immunity Requirements

The product would use a security proxy to protect its information from cyber attacks. The product also would have a specific code passed within itself which would be checked at any ports for viruses or any outside attacks. So, if anything invading the program is unrecognized by the product, the invasion is either more thoroughly checked or removed altogether.

ID#023- Invasion Protection

Description: The system must protect from cyber attacks of all kinds.

Rationale: Anyone other than the maintenance team should not be able to make changes to the product as a whole and have any access to either the user or product data. Cyber invasion into the product could compromise both the security and integrity of the product.

Fit Criterion: No outsider has access to any of the inside product information.

Acceptance Tests: Proxy check.

8 Usability and Humanity Requirements

8a Ease of Use Requirements

The user should immediately be able to use the product, since in the current generation everyone is very familiar with the usage of cameras and angling them correctly. The GUI of the product should be user friendly and to easily be understood by anyone who can read and understand the english language.

The user isn't expected to remember anything about the usage of the product. The product would tell the user what is expected as it is being used.

It is crucial that the user is able to correctly scan their whole body. If the scan isn't complete or has an error, the user is notified and asked to scan again. So it is important that the user doesn't make any mistakes while scanning their body at the start of a workout.

The product should have an efficient and user friendly GUI. It should be up to date with the new trends of user interaction designs and the ways in which it collects information. The user should be able to relate to the overall design of the product, so as to keep the product design relevant to the software trends.

The product should give constant feedback on the user's movement. So as long as the product is scanning the user for posture, there is constant feedback on whether the expected posture is reached.

ID#024 - Usability

Description: The user should be at ease and be able to use the product.

Rationale: The usage requirements of the product should be simple enough that anyone who works out should be able to use the product.

Fit Criterion: User satisfaction should be above 60%

Acceptance Tests: Satisfaction poll.

8b Personalization and Internationalization Requirements

The users should be able to change to their preferred language and adjust the specific words used to their liking. The users should also be able to change the name of any workout position to their preference.

The user should be able to choose between using the metric system or the measurement system as defined in the US. They should also be able to change to any currency as they wish, and be able to use that currency for any electronic transactions.

The user would not be able to change any of the product configurations.

ID#025 - Personalization

Description: The user should be able to change the language and currency of the product in accordance with their preferences.

Rationale: The user should feel comfortable using the product by changing the settings so they match their preferences. Changing the language of the product and/or the currency would help the user spend less time in figuring out what the product is doing and spend more time enjoying the benefits of the product.

Fit Criterion: The Language translation is accurate and the Currency change is accurate with the current money rate.

Acceptance Tests: Language test, Currency Exchange test.

8c Learning Requirements

The product should be an immediate easy use for people who have access and use cameras adequately. People don't need any extensive knowledge on how to use the product as it should give instructions on how to use the scanner. Anyone who has a smartphone and has used a mobile application should be able to easily navigate their way through the usage of the product.

ID#026 - Easy Learn

Description: The system should be able to be used by anyone who has the slightest knowledge of using a camera and a smartphone application.

Rationale: In the current age of technology most people have had sufficient interaction with a smartphone camera and applications. So, it can be assumed that most users of this application would immediately be able to work their way through the product.

Fit Criterion: Product usage difficulty should be lower than a 2.

Acceptance Tests: Difficulty Rate test.

8d Understandability and Politeness Requirements

The product shall use terms and symbols that are easily understood by anyone over the age of 11. It is crucial that the product not use any technical terms which would be hard for users to understand. Technical terms can only be used in reference to workout postures, where appropriate pictures should be added to accommodate the meaning of the words.

The product shall never reprimand or use inappropriate language towards the user. The words used by the product should always be encouraging and advising but never negative.

ID#027 - Polite

Description: The system should use words that are easy to understand and are not offensive.

Rationale: The product shouldn't cause the user to work harder than necessary so they spend more time using the product than learning about it.

Fit Criterion: User understandability should be more than 95%.

Acceptance Tests: User understandability test.

8e Accessibility Requirements

The product shall generally be accessible to anyone who can see or read. The major use of the product is to see if the users posture aligns with the correct posture of the workout. If the user is able to see the screen and read the instructions given by the product they are able to use the product.

It is possible to add a vocal instruction to the product for anyone who cannot see and read.

ID#028 - See

Description: The system must allow the user to use the product by simply looking at the screen.

Rationale: The user should be able to use the product if they are able to look at the screen. They should be able to read the instructions given by the system and see the different properties of the product.

Fit Criterion: The screen displays everything that the user needs to use the product. This includes both visual and written instructions.

Acceptance Tests: Visual and Written test.

8f User Documentation Requirements

A manual with all the postures available to be tracked by the product. This manual can be used by the user or any of the product management team as a list of naming conventions for the workout postures. This document can be found within the product and so it is the responsibility of the maintenance team to update it with progression.

User manual is a document with all the instructions that the product would give to the user in different situations. This document can be used by the user or more likely the maintenance team to evaluate the usability of the product. This document can be found within the product and so it is the responsibility of the maintenance team to update it with any changes necessary with any upgrades to the product.

Technical Specifications documents all the different types of devices the product is compatible with. This document specifies the exact specifications needed from a device in order of this product to be usable on that device. This document would be used by the user to identify which device to use for this product. This document would be posted on the organization's official website along with being stored within the product. The maintenance team would be required to update this document as the product compatibility changes.

ID#029 - Documents

Description: The system must provide the user with a user manual, posture documentation, and technical specifications.

Rationale: The user should be able to have a full documentation of how the product works and the different requirements they have to fulfill in order to use the product.

Fit Criterion: User manual, posture documentation, and technical specifications are made available to the user.

Acceptance Tests: Documentation check.

8g Training Requirements

The product shall create a default run through of the product by adding definition tags to each of the buttons and symbols displayed. These tags should be created by the programmers of the product and would only appear on the first usage of the product.

ID#030 - Default Training

Description: The system should define what each button and symbol is in the product by adding small tags.

Rationale: First time users might get overwhelmed by the new product and so the basic and common definitions of each of the unknown buttons and symbols are displayed to make the user feel at ease.

Fit Criterion: There are tags on each button and symbol upon the first run of the product.

Acceptance Tests: Tag test.

9 Look and Feel Requirements

9a Appearance Requirements

The product should heavily attract anyone who likes to use applications to track their workouts. It should also interest those who would like to workout but aren't motivated enough to get moving. It should be able to motivate the users to workout and enjoy using the product while exercising.

The product should also be interesting to companies in the wellness industry. It should be able to attract anyone who likes to workout.

ID#031 - Attract

Description: The product should be able to attract the intended users.

Rationale: The product is especially suitable for people who like to use applications to track their fitness goals, and so it needs to meet the appearance standards that people in the wellness industry like to see.

Fit Criterion: A group of workout enthusiasts rate the appearance of the product more than a 7

Acceptance Tests: Appearance rating.

9b Style Requirements

The product shall have a serious and authoritative style so as to mimic the essence of a professional trainer.

ID#032 - Style

Description: The system should be styled to be taken seriously.

Rationale: The user should be able to feel that the information provided by the product is reliable and authoritative enough to follow.

Fit Criterion: After first encountering the product 80% of people agree that the product is trustworthy and authoritative like a real life trainer.

Acceptance Tests: Style test.

10 Operational and Environmental Requirements

10a Expected Physical Environment

The product will be used by people on their smartphones or tablets while in the gym, at home or outside. The environment will be noisy if the user is outside, especially at the gym. Therefore, the user won't require audio to communicate with the application. The main communication will be through visuals, such as reading or watching. The brightness of the screen is adjustable by the user through their devices. The weather condition won't be a factor that affects the use of the application. The application will have a feature to read the texts or describe the videos out loud that the user can choose to activate if needed. The application minimizes the need for audio so that the user can get the full benefit with visuals.

ID#033 - User Communication

Description: The user can be at home or outside. The majority will be at the gym or at home, where users workout or evaluate their plans.

Rationale: With a stable internet connection, the application will perform the same with any environment.

Fit Criterion: The user should use the application while at the gym or home, where there are no distractions. It is not ideal to use the application on the move.

Acceptance Tests: Visual Communication Test

10b Requirements for Interfacing with Adjacent Systems

The product will connect with the camera application and the health application of the user devices. The product accesses the camera for recording workout movements. The product also accesses the health application to get the nutrition data. The product needs to be compatible with any version of these applications to avoid any error caused by version differences. The connection with the camera and health application allows our product to retrieve footage and health related data, which will contribute to the best outcome.

ID#034 - App Collaboration

Description: The application will be compatible with the majority of versions of the camera and health application on user's devices.

Rationale: The application needs to be flexible with changing versions to accommodate the user references.

Fit Criterion: With the version flexibility, it allows the application to operate smoothly without errors and independent from the other application's version.

Acceptance Tests: Camera and Health App Collaboration Test

10c Productization Requirements

The product will be distributed through application stores. The download procedure is the same as any other common applications. Therefore, no special training is required to download the product. Any other additional supportive platforms will also be distributed through application stores to keep the consistency.

ID#035 - Application Store

Description: The application stores allow users to search and download applications without any complication. The user can simply click on download to get the product.

Rationale: The application stores are built into any device as an important required program.

Fit Criterion: Application stores are the most effective way to deliver the product to users.

Acceptance Tests: Application Store Test

10d Release Requirements

There will be minor bug fixes and changes released for the product each month. For the major content update and maintenance, the release will happen at least once a year. The major releases may alter the application functionality to improve user

experience. However, the core structure should be almost the same as the previous release to avoid any confusion from the user. Each release should improve the product without causing errors to previous features.

ID#036 - Update and Maintenance

Description: For every release, the application needs to be improved without completely changing the original core structure. The previous features need to operate without error caused by these releases.

Rationale: Any major changes to the application may cause confusion or dissatisfaction from the user, which can impact the overall distribution of the product.

Fit Criterion: It is ideal to keep the majority of features and provide a few changes to improve user experience. Only one major release per year will minimize confusion and allow smooth transition to the new version for the user.

Acceptance Tests: Update and Maintenance Test

11 Cultural and Political Requirements

11a Cultural Requirements

The product is created for everyone who wants to get in shape. The product should not provide any discrimination to anyone. The product should take into account the user's ethnic and religion to provide plans with respect to the user's background and beliefs. The product must not violate or offend any religious or ethnic groups. The meal plan needs to be constructed based on the user's culture.

ID#037 - Cultural and Background

Description: The application provides non-discrimination service for everyone and takes into account the rules from each religion.

Rationale: The application is more popular with the younger user who has an active lifestyle.

Fit Criterion: It is best to get everyone from all backgrounds and ages to utilize the application for a better fitness experience.

Acceptance Tests: Non-discrimination Test

11b Political Requirements

The product is open for everyone around the world. The company maintains full control of the product. The product is accessible with the majority of operating systems and won't be limited to the common one in the United States.

ID#038 - Political Aspect

Description: Everyone around the world will be able to use the application using any operating system.

Rationale: The board of a company will maintain full-control over the product.

Fit Criterion: The application is accessible anywhere that technology is available.

Acceptance Tests: Access Test

12 Legal Requirements

12a Compliance Requirements

The product provides privacy to the user information and comply with the Data Protection Act. The product will not share any user information in any way. The product will not provide any illegal action in any way. The user must feel confident in providing their information.

ID#039 - Legal Protection

Description: The application will protect user's data and comply with the Data Protection Act in order to preserve user confidentiality.

Rationale: The user must feel completely safe when providing personal information to the application.

Fit Criterion: Provide protection to all user's data from any unauthorized access.

Acceptance Tests: Data Protection Test

12b Standards Requirements

The product shall comply with the standard of basic performance and data protection. All personal information must be protected. Basic functionality of software should be available.

ID#040 - Standard

Description: The application should implement all basic functionality based on the basic standard of software.

Rationale: The standard should be reviewed and updated constantly.

Fit Criterion: The application always meets the software basic standard.

Acceptance Tests: Standard Test

13 Requirements Acceptance Tests

13a Requirements – Test Correspondence Summary

1) Functional Requirements:
    - Test 1: User Information Test
    - Test 2: Personalized Recommendation Test
    - Test 3: Form Correction Test
    - Test 4: Progress Analysis Test
2) Data Requirements:
    - Test 5: Data Handling Test
3) Performance Requirements:
    - Test 6: Effective Recommendation Test
    - Test 7: Real-Time Tracking Efficiency Test
    - Test 8: Real-Time Tracking Precision Test
    - Test 9: Capacity Test
4) Dependability Requirements:
    - Test 10: Data Dependability Test
    - Test 11: Active Hours Test
    - Test 12: Offline Mode Test
    - Test 13: Safety Information Test
5) Maintainability and Supportability Requirements:
    - Test 14: Maintenance Test
    - Test 15: Support Test
    - Test 16: Adaptability Test
    - Test 17: Scalability Test
    - Test 18: Longevity Test
6) Security Requirements:
    - Test 19 : Accessibility Test
    - Test 20: Data Integrity Test
    - Test 21: Private Test
    - Test 22: Transaction Details Test
    - Test 23: Invasion Protection Test
7) Usability and Humanity Requirements:
    - Test 24: Usability Test
    - Test 25: Personalization Test
    - Test 26: Easy Learn Test
    - Test 27: Polite Test
    - Test 28: See Test
    - Test 29: Documents Test
    - Test 30: Default Training Test

8) Look and Feel Requirements:
    - Test 31: Attract Test
    - Test 32: Style Test
9) Operational and Environmental Requirements:
    - Test 33: Visual Communication Test

- Test 34: Camera and Health App Collaboration Test
- Test 35: Application Store Test
- Test 36: Update and Maintenance Test

10) Cultural and Political Requirements:
    - Test 37: Non-discrimination Test
    - Test 38: Access Test
11) Legal Requirements:
    - Test 39: Data Protection Test
    - Test 40: Standard Test

	Requirement 1	Requirement 2	Requirement 3	Requirement 4	Requirement 5	Requirement 6	Requirement 7	Requirement 8	Requirement 9	Requirement 10	Requirement 11	Requirement 12
Test 1	X											
Test 2		X										
Test 3			X									
Test 4			X									
Test 5			X									
Test 6				X								
Test 7				X								
Test 8				X								
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Test 32										X		
Test 33											X	
Test 34											X	
Test 35												X
Test 36												X

Table 3 - Requirements - Acceptance Tests Correspondence

13b Acceptance Test Descriptions

Test 1: User Information Test checks that the application successfully saves the user information upon sign up and allows the user to update their information at a later time.

Test 2: Personalized Recommendation Test checks whether the application provides personalized workout recommendations based on user information.

Test 3: Form Correction Test checks if the application tracks the user's body movements and provides feedback on form in real-time.

Test 4: Progress Analysis Test checks that the application tracks and analyzes the user's progress over time, adjusts the workout plan accordingly, and provides feedback.

Test 5: Data Handling Test checks that the application captures user data and provides accurate workout recommendations.

Test 6: Effective Recommendation Test checks that the response time is within 10 seconds after providing or editing their information.

Test 7: Real-Time Tracking Efficiency Test checks that the application efficiently tracks form and provides feedback within 10 seconds of completing the exercise.

Test 8: Real-Time Tracking Precision Test checks that the application tracks the user's exercise form in real-time with precision of at least 95% and provides feedback accordingly.

Test 9: Capacity Test checks that the application can handle at least 100 different users without experiencing lag or slowdown in performance.

Test 10: Data Dependability Test checks that the application successfully loads user data, fitness plan, and associated information.

Test 11: Active Hours Test checks that the application runs for the majority of the day (minimum 17 hours).

Test 12: Offline Mode Test checks that the application still maintains a certain level of functionality when it is offline and cannot connect to the servers. The user should still have the ability to access the app's basic functions.

Test 13: Safety Information Test checks that the application is constantly updating when new safety information becomes available in order to maximize the usefulness and helpfulness of the app.

Test 14: Maintenance Test checks that the application has regular maintenance and is running smoothly without crashes or major bugs.

Test 15: Support Test checks that the application provides users with the full support they need, such as up-to-date information and new and improved features, and maintains high customer satisfaction.

Test 16: Adaptability Test checks that the application can work on the latest and most current versions of iOS and Android.

Test 17: Scalability Test checks that the application can support a large number of users without issues (10,000 at launch and 50,000) more within two years.

Test 18: Longevity Test checks that the application is maintaining budget and meeting performance requirements. It also checks that the app is on track to function for five years following the launch.

Test 19: The Accessibility test checks whether the person trying to access certain data has clearance to access that data. If they don't the system should not allow the data to be accessible. If they do have clearance, then the system should allow the data to be accessible.

Test 20: The Data Integrity Test checks whether the user data matches the user database and if the product data matches the product database. If any of this data doesn't match, the maintenance team should be alerted.

Test 21: The Private test checks if the user has access to the user data. It also checks if the user data is accessible to anyone else.

Test 22: The Transaction Details test checks whether the information provided by the user during a transaction is valid. It would check if the address and card details provided are valid. It would also check if this information is safely stored in a secure database.

Test 23: The Invasion Protection test checks if any code outside of the product code is trying to gain access to the product data. All access points in the product data would have security code that needs to match the code entered by an incoming invasion. If the code matches then the invasion is considered product code, else no access is allowed.

Test 24: The Usability test would send out a satisfaction poll to a group of the product users about the ease of using the product. They would be able to reply positively for easy use and negative for hard use.

Test 25: The Personalization test would check if the conversion of either language or currency is accurate with the dictionary and current dollar rate.

Test 26: The Easy Learn would be a rating test where a group of new users would rate the difficulty to learn the use of the product.

Test 27: The Polite test would be a poll for a group of users to indicate whether the product instructions are easy to understand.

Test 28: The See test would check if the product is usable by just looking at the screen.

Test 29: The Documents test checks whether the product is providing the appropriate documents to the user.

Test 30: The Default Training test checks if the screen displayed to the user upon first use has tags explaining what each button and symbol does.

Test 31: The Attract test is a survey of potential users upon first interaction with the product. This test checks if the appearance of the product attracts the appropriate audience.

Test 32: The Style test is a survey of first time users to check if they feel that the product feels reliable and authoritative like a personal trainer.

Test 33: Visual Communication Test checks the visual communication between the user and the application.

Test 34: Camera and Health App Collaboration Test checks the compatibility between our product and other supportive applications.

Test 35: Application Store Test checks the distribution of our product to the user.

Test 36: Update and Maintenance Test checks the changes from each update/maintenance release.

Test 37: Non-discrimination Test checks for any ethnic and religious violation.

Test 38: Access Test checks the accessibility of the product with other parts of the world.

Test 39: Data Protection Test checks the confidentiality of the user's information.

Test 40: Standard Test checks if the product meets the standard of basic software.

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 import 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. }