2. Requirements, Constraints, And Standards

2.1 REQUIREMENTS & CONSTRAINTS

Functional requirements

- The product should measure the maximum strength of a lift and store that information to a user's profile
- The product should be able to display data about the lifts
- The user should be able to use the application on their personal device (iOS and Android apps) (**constraint**)
- The user should be able to see data about past lifts in a graphic display
- The product should be able to create new users
- The product shall be able to add multiple groups (teams) of users
- The product should be able add users to different teams
- The user should be able to create new exercises
- The hardware should disconnect with the software when the application is closed.
- The app shall be able to connect via bluetooth to the hardware on the weight rack.

Resource Requirements

- The hardware should be available to all devices to connect properly via bluetooth.
- The application needs to reference the api and database to log and chart data.
- The application should use an external API to graph force the user exerts on the rack.

Physical Requirements

- The rack should be able to fit in a weight room or any space where a coach might want to conduct their training
- The application should be scalable on different screen sizes (tablets, phones) (**constraint**)
- The software should run on any smart application that uses Google Play Store or Apple app store. (**constraint**)

Aesthetic Requirements

- The app should be in compliance with design standards and should be easily used by all types of users
- The app should follow a clear and consistent color scheme
- The app should use colors that users with color blindness can see (not use red/green or blue/yellow combinations) (**constraint**)

User Experiential Requirements

- The application should rotate depending on the device's orientation.
- The application should have different options for different types of users (coach can add users to a team)

- The app should use colors that users with color blindness can see (not use red/green or blue/yellow combinations) (**constraint**)

Economic/market Requirements

- The product should be affordable for schools, gyms, and other training centers.

Environmental Requirements

- The environment should be in a weight room as this is to help their training (**constraint**)
- The product should be able to work in a room with multiple devices with their bluetooth on
- The hardware should stay connected to one device if others have their bluetooth on
- The software shall be used with the physical weight rack near it.

UI Requirements

- The app should have a user-friendly interface that enables quick navigation for users of all experience levels.
- The UI should have clear, easy-to-read fonts and buttons
- The layout should be adaptive to different screen size (**constraint**)
- The app should provide a clear display of the lift data and user stats

2.2 ENGINEERING STANDARDS

2.2.1 IMPORTANCE OF ENGINEERING STANDARDS

Without maybe realizing it, engineering standards are everywhere around us. Not just at school or work, but at home, when using transportation, and doing day-to-day activities. Therefore, we need a defined way of doing things, which is why standards exist. They exist as an agreed upon way to do things. The IEEE engineering standards are set in place so that they can be universally understood and applied and as a way promote technology that functions safely, securely, and sustainably. Standards help when developing new products to define the requirements and best practices to follow to make sure the end result is dependable and reliable. In our senior design project, we will utilize standards at each step of development to make sure our product is reliable and adheres to the best practices defined by the existing standards.

2.2.1 THREE RELEVANT ENGINEERING STANDARDS

ISO 9241 - Ergonomics of Human-system interaction

This standard covers usability and user experience design, involving components such as the presentation of information and menu dialogues. It is meant to ensure that the software is user-friendly, learnable, and accessible to all users.

ISO 27001 - Information security management

This standard is intended to provide guidance for managing a security system. Conformity with this standard means that all the best security practices have been put in place. It is intended to accomplish better security practices and systems for companies of all sizes.

IEEE P3411 - Standard for smart identification in Internet of Things

This standard is intended to provide details on how the IoT devices should be handled within the project. It provides a framework between IoT devices using transparent data transfers and existing protocol standards to ensure the proper use of IoT devices.

2.2.3 JUSTIFICATION OF STANDARDS

ISO 9241 is important to the project because we are designing accessible and user-friendly software. The functionality and features of the software should be presented through the interface in a learnable manner to allow users to complete functions with little to no confusion or errors. The design of the user interface is meant to be simplistic yet easy to understand when carrying out tasks. This requires the software to conform with the users' expectations, provide system feedback to user interactions, and be self-descriptive when displaying tasks.

ISO 27001 is relevant because there currently is not an information security management system in place for the application. The standard requires examining the organization's security risks, designing a system to manage and control those risks, and adopting an ongoing process to ensure that the security needs remain met over time. These same three steps are necessary when creating a security management system for the TrueForce Technologies application. Conformity with security standards will be necessary for the app as it is planned to be available on app stores and used by institutions that do not want their information leaked.

IEEE P3411 is highly relevant since the project involves hardware-software communication via Bluetooth, as it standardizes identifiers and addresses for smooth, secure data transport. Without this standard, our transfer of data could be at risk of leaking information. Since our application owner is trying to sell the app to multiple schools around the country, it is extremely important to have secure IoT devices.

2.2.4 OTHER ENGINEERING STANDARDS

ISO 14000 family - Environmental Management

This standard specifies how organizations can minimize their environmental impact and comply with related laws and regulations through environmental management. It is important to recognize the impact that the physical rack will have during its creation to ensure that those involved in the process are safe. It is also important to recognize the environmental considerations for the physical rack in a fitness location such as safety measures, toxicity standards, and more. However, this standard applies to the physical aspect of this project, so it is not a major focus for us.

ISO 639 Language Code

This standard specifies the formatting and expectations of systems to allow different languages. We saw this as important because this technology is intended to be used around the world, however, we are not strictly focusing on this standard as it does not fit within our timeframe to have the application switch between languages that our team is not fluent in.

2.2.5 MODIFYING PROJECT TO ADHERE TO ENGINEERING STANDARDS

To incorporate ISO 9241, we are redesigning the app to allow users to find information easily, this includes visible tabs on the home page as well as the orientation of the application following the orientation of the tablet or device in use. We also are going to change the contrast colors that show the differing strength coming from the left and the right(of the body) so they are visible by those who are color blind. To add onto this, we will be structuring the data received by each lift in a manner that the most important data is easy to see after the lift is done, whether that is to enlarge the key data or structure the information in a way that the key data is the first to catch the eye of the user.

To ensure information security management, the main focus will be to secure the database, since it currently resides on an easy-to-use website to be accessed by anyone. Current ideas are to use Okta to provide a secure login which also prevents injection and brute force attacks. This standard will also include us looking into the structure of the database to ensure that coaches who have access to more aspects of the application to oversee athletes cannot look at athletes from different schools. This will include a knowledge of permissions in different languages.

For the IEEE P3411, our main design to incorporate this aspect is to make sure that the device/application does not continuously search for a bluetooth device after connection, as this drains battery life and can be used in a security threat.