UNIVERSITY of GREENWICH

INTERACTION DESIGN

Coursework

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1. Introduction.

Human-computer interaction is a growing area of research and a growing industry. It plays an important role in helping users interact with computer devices. Therefore, it is also one of the important coursework for final-year IT students of the University of Greenwich.

In this course work, Student need to create a concept and a prototype that shows the interactions for a new piece of smart gym equipment and I call it is Smart Gym. It allows users to control and broadcast content to a large wall-mounted display and it provides an environment that allows people to participate in fitness classes including pre-recorded or live classes. Besides, student relies on its research on system interaction with users to provide more personalized user interactions for a better user experience (HCI course work 2020). To give readers in-depth knowledge of how users interact with Smart Gym application. My report includes 6 main parts. The first part introduces the course work and structure of report. The second part introduces a discussion of the relevant issues and assists in the concept and prototype design process. Parts 3 and 4 are about the prototype document design and its design. Part 5 is attitude study and user interaction with Smart Gym application has been designed. And Final part to conclusion this report. And throughout this report my role is seen as the designer for the Smart Gym app.

2. Background.

Technology makes people's lives simpler and faster. That's why a lot of smart devices came into being and one of them is Smart Gym equipment. A smart gym equipment is a smart device that helps users practice easier, more efficiently and deliver a better workout experience. Many smart gym equipment and tools are an upgrade over the standard version. Smart Gym equipment are often combined with connected devices to make their products smarter and more efficient. Through the internet connected devices can easily connect and share the collected data with other devices and systems via an internet connection. These devices, often embedded with technology such as processor chips, software, and sensors. People can now do anything with little effort. They can work, eat, and shop right at their desks. They are less physically active. Being sedentary makes health problems increasingly.

Therefore, more and more people are turning to the gyms to exercise for the purpose of improving their health and having a healthy body. However, for beginners, it will be difficult to get used to the exercises. They often have to hire their own trainer at a cost many times higher than the cost of renting the gym. A personal trainer will help them exercise the right way. However, not everyone has the conditions and time to go to the gym to practice. Get ideas from the creation of smart gym equipment that helps users exercise easily and follow a methodical route. My idea creates a concept and a prototype demonstrating interactions for a new smart exercise device called SMART GYM with the content of this design is to provide 3 main types of exercises: Aerobics, HIIT, and Zumba for users targeting young people who do not have free time or do not have enough money to participate in official classes. They can take classes and do it in their own home or anywhere they want.

2.1 Processes and Frameworks for Interaction Design.

According to (Kolko, 2011) “Interaction Design is the creation of a dialogue between a person and a product, system, or service. This dialogue is both physical and emotional in nature and is manifested in the interplay between form, function, and technology as experienced over time”. When researching a field and discussing interactive design frameworks. The first thing to do is to define the definition of interaction design and understand the meaning of interaction design. It provides an overview of the interactive design and then discuss the frameworks more clearly and explicitly, when having knowledge of frameworks for interaction design. It makes the selection of frames for the Smart Gym easy and accurate.

Frameworks is a support structure that includes three interacting components are the designer, the user, and the system. It is very useful for designers to get a fundamental about design issues, design steps, principles, and tactics for implementing the design or finding answers to the design. In this coursework’s, there are 3 interaction design frameworks are User-centered design, Goal-oriented design, Participatory Design are discussed. And then, designer select one of them to use for designing Smart Gym.

- User-Centered Design (UCD).

Definition of User-Centered Design: According to (Norman, 1990) “User-centered design means working with your users all throughout the project”. Actually, it is an iterative framework with arm of converting what the user wants into how they do it in the systems by design interaction for the system (Sharp, 2015).

Process of UCD: According to (Brian Still, 2017, p. 62)User-centered design in the whole product development cycle is an iterative process and the implementation process will repeat the following steps:

- Research users: It meant define user requirements and context of use.
- Assess the situation: Visualize design ideas, assess the environment, the project goals and requirements, and the competition.
- Balance of need: Carry out user evaluations of design ideas balance user needs and affordances with your team's design aesthetic and overall organization demands.
- Create concepts and prototypes: Build out an operative Image for users to interact with that matches where you are in the project.
- Evaluate concepts and prototypes: Test with users to gather feedback.

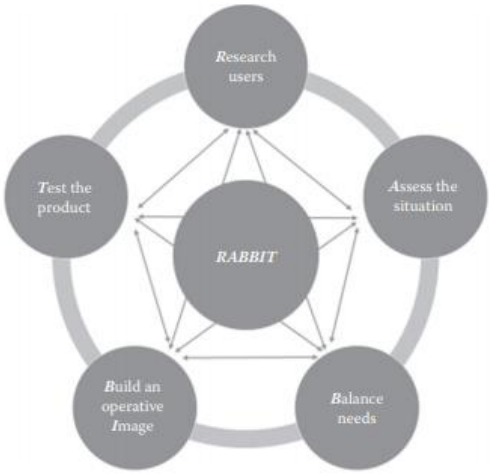

Figure 1 RABBIT process for UCD (Brian Still, 2017, p. 63).

According to (Sharp, 2015, p. 462) three UCD core principles are early focus on users and tasks, empirical measurement and Iterative design.

The UCD design process soon focused on users and tasks through the process of direct user research including behavioral research, perception, thinking, etc. Using the User Center Design for Smart Gym application means that users have been directly involved in the Smart Gym application design process from the very beginning. For empirical measurement, Smart Gym application designers will measure users' performance against the designs of several application scenarios and prototypes and record them to track and analyze their performance against the Smart Gym application. And then, when the problems are found during user testing. The designer for Smart Gym application will research more and create prototypes to fix those problems. This is called design iteration.

For example, Using a user-centric design to design Smart Gym system interactions. That means the user is seen as the sole instructor for designer, and designer role is to turn the user's needs and goals into one design solution for the entire Smart Gym system.

Advantages of User-Centered Design: According (Norman, 1990), user participation during project construction is a favorable condition for the designer to exploit natural features and their needs for the Smart Gym application. And UCD simplifies the structure of tasks by repeating tasks. Hence, the UCD is one of the best in terms of implementation and evaluation. In addition, concepts and ideas confirmed to users throughout the project help Smart Gym Product Designers avoid the risk of project failure.

Disadvantages of User-Centered Design: The first downside of UCD is time and cost because the project involves user participation so the working time will be longer and the cost is also higher. Besides, the needs of users are sometimes different. This results in a sample-dependent UCD, which if the sample is not guaranteed, can lead to project bias.

- Goal-Directed Design (GDD).

Definition of Goal-Directed Design: it is one of the most effective design methods. Its focus is on achieving product goals. It encompasses the design of a product's behavior, visual form, and physical form Therefore, it makes the product quality higher and ensures thoroughness. (Goodwin, 2009, p. 6).

According to (Goodwin, 2009, p. 8) GDD comprises four components including, principles, pattern, process, and practices.

  - Principles are guidelines for creating good practices for each particular scenario.
  - Patterns are solutions are made available, Designers can use patterns to solve certain problems. For example a generic form to log into a website with username and password. If I using UDD, I can apply it to Login Page of Smart Gym.
  - Process are the steps involved in research planning, conducting, analyzing and modeling. Designers use a process to develop and repeat steps to form a specific design solution
  - Practices involve communicating and working together to solve problem and create solutions.

Goal-Directed Design process: The goal-Directed Design process is merely one component of UDD. According to (Goodwin, 2009, p. 10) Goal Directed Design describes a seven-step process that focuses primarily on the design process. With the purpose of the 7 steps is to plan and conduct design research to build a scenario or implementing the given plan.

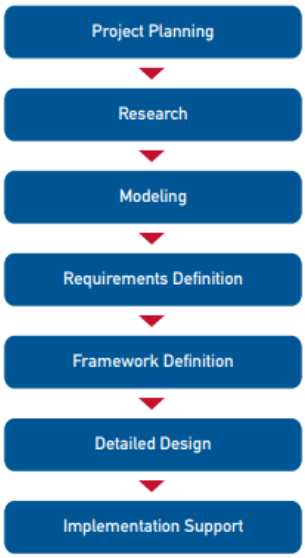

Figure 2 Goal-Directed process (Goodwin, 2009, p. 10).

- Project Planning: Identifying stakeholders, their goals for the project. And identify samples, they help designers make decisions of design and. The design for the sample will be generalized to the entire population.
- Research: Research helps designers understand the problem of projects such as business goals, specifications, risks, and hypotheses original so that the designer makes design decisions for the product. Stakeholder interviews are the first step of the research. It provides a clear view of the issues and assumptions that design should check.
- Modeling: For the Goal-Directed Design model, any product decisions can be about personality. Through the interview results, the designer gathers personalities, which are user patterns that help the designer make design decisions and communicate a theoretical basis, including personality and workflow.
- Requirements definition: This step discusses personas and requirements and determines their individual needs for product design and functionality. They represent prospective users throughout the design process.
- Framework definition: the framework of the form and behavior of the product to be designed, when and only if there is agreement between the user and the purpose of the design. It outlines the layout of the product before the blueprints are created.

- Detailed design: Base on frameworks and the scope of the product is clearly defined. The designer will create the detailed design of the form and specifies the behavior for the product.
- Implementation support: Coding begins and implement appropriate functionality as the product is built based on specifications and building a support to fix unexpected problems or questions will appear.

When using UDD for Smart Gym Product, Designers must make up “Personas”. According to (Cooper 1999: 124) "Personas are not real people, but they represent them throughout the design process. They are hypothetical prototypes of real users". And the design of Smart gym application will always focus on personal instead of conversation with user during design implementation. Therefore, the designer needs to imagine and visualize about “Personal” in his project. This is very difficult for beginners to design. Yes can realize that Goal-Directed Design is the design more suitable for skilled designers. UDD components help designers perform jobs faster while ensuring thoroughness and high quality.

- Participatory Design (PD).

According to (Mörtberg, 2014, p. 6) the participatory design is a design method with a large number of participants including developers, business representatives, and users. They work together to design a solution for the product. This method ensures the output product is designed to meet everyone's needs and requirements.

Principles of PD: The PD principle revolve around the two main values are participation and democracy. The system design and approach is based on different factors. Such as, designing based on balancing power relationships is the design in which everyone has the right to elaborate and contribute their opinion in all activities and decisions of the design process. Or design that has a commitment to democratic practices forces everyone involved in system design to be involved throughout the design process. They kept it up until the blueprint was completed. It gives confidence to all those involved in the design and ensures that design results are timely and of high quality.

Use participatory design for Smart Gym project. The designer will have a variety of system design and approaches. Depending on the design requirements of Smart Gym application, there will be a reasonable approach and design. However, with the participation of many people, Smart Gym application are also considered a barrier. It makes the decision to take the project very well approved. Therefore, Participatory design is suitable for projects other than Smart Gym. Because the influences from participants' opinions on Smart Gym application can be a subjective opinion and affect decisions during project implementation.

- Frameworks choice for Smart Gym.

Smart Gym application is an application designed to serve users to take online classes and allow user to practice. Therefore, applications need to be designed to meet the essential needs of users. From discussing 3 frameworks used to design Smart Gym. Well to see that the User-Centered Design option is the most affordable choice for Smart Gym apps than Participatory Design and Goal Direction Design have a lot of reasons. But the two main reasons are that UCD is suitable for beginners because user engagement makes it easier for them to figure out how to design an app to suit and meet the actual needs of the user. And the iteration makes it easy for me to improve the quality of the Smart Gym design. Besides, when there is user participation in the design process. Smart Gym app designers can design apps to be more efficient and secure. Any request to change during the design process is handled more quickly than Participatory Design and Goal Direction Design.

2.2 Cognitive Psychology.

According to (Benyon, 2013, p. 5)most approaches and techniques applied in social sciences must be used to understand people and technology. Sternberg (1999) defined cognitive psychology as one of the methods applied in social sciences to understand people think and the processes involved in cognition. Cognition is the processes involved in gaining knowledge and understanding, includes: Attention, perception, learning, memory, problem-solving and reading, listening, writing. There are many practical applications for this cognitive research: It helps designers understand the processes involved in the user's cognitive processes and cognitive limits, the problems they encounter, thereby providing tools and guidelines for better product design.

Using Cognitive Psychology to Smart Gym application, it helps the designer increase accuracy in decision making and product design. For example, the product will assist in dealing with memory disorders during use by its design using simple and meaningful buttons has been used by many people. Using it will help users to easily remember and manipulate the product.

- Attention

Users can receive and store information depending on its importance thanks to the rules of attracting attention and evaluating data. The rule is that important information will be bigger, brighter and more prominent, whereas less important information will be smaller and more blurred.

So Attention is the process of choosing what to focus on, from the range of possibilities available and at a given time. It allows designers to focus on information related to a selected thing at a given time. It is often involved in hearing and vision. An example of auditory

attention: People who exercise will change their movements when counting numbers. An example of visual attention is a gym workout that will focus on watching new motion training videos. Attention ensures that the interface is designed to attract the user's attention. Users will focus on content designed to stand out from the rest. Therefore, when designing Smart Gym, designers have advantage of this point to convey important information that users want to know when using the application. For example: Figure 3 provides an image that represents the data in the form of a table. Representing data in the form of a table allows users to easily observe and pay attention to the goals that are important to them.

South Carolina

City	Motel/Hotel	Area code	Phone	Rates Single	Rates Double
Charleston	Best Western	803	747-0961	$126	$130
Charleston	Days Inn	803	881-1000	$118	$124
Charleston	Holiday Inn N	803	744-1621	$136	$146
Charleston	Holiday Inn SW	803	556-7100	$133	$147
Charleston	Howard Johnsons	803	524-4148	$131	$136
Charleston	Ramada Inn	803	774-8281	$133	$140
Charleston	Sheraton Inn	803	744-2401	$134	$142
Columbia	Best Western	803	796-9400	$129	$134
Columbia	Carolina Inn	803	799-8200	$142	$148
Columbia	Days Inn	803	736-0000	$123	$127
Columbia	Holiday Inn NW	803	794-9440	$132	$139
Columbia	Howard Johnsons	803	772-7200	$125	$127
Columbia	Quality Inn	803	772-0270	$134	$141
Columbia	Ramada Inn	803	796-2700	$136	$144
Columbia	Vagabond Inn	803	796-6240	$127	$130

Figure 3 Display information by table (Sharp, 2015)

- Perception and recognition

Perception is a complex process because it involves other cognitive processes. Cognition allows the user to perceive it through the different senses. Users can identify meanings based on the images they see through their visual senses. Therefore, when designing Smart Gym application, the images and symbols must be easily distinguishable. Contour and spacing design for Smart Gym makes it easy for users to recognize and identify items. For example: When the user sees the cog icon in the Smart gym application as shown below, the user will realize it is an icon of the setting.

Figure 4 Cog Icon

- Memory

Memory is one of the main characteristics of cognition. It helps users remember what they've used about the system or information stored and retrieved in encrypted memory. However, we cannot remember everything we see, hear, taste, smell or touch that we don't want either, because our brain will be completely overwhelmed. Thus, filtering is used to decide which information is to be further processed and memorized as memory involves recalling many different types of knowledge. For example, people may find it difficult to remember everyday things like Gmail account and phone numbers, or scientific knowledge like math. On the other hand, we can easily memorize verses or melodies in our heads. The ability to instantly memorize human is limited, so when designing Smart Gym apps. The Miller theory (1956) of a short-term retention period of 7 ± 2 has been applied to aid the design process. The Smart Gym application does not contain too many unnecessary details because the user can only remember a few words, numbers or pictures they have heard or seen. The interface design of Smart Gym should be consistent with menus, icons, and objects.

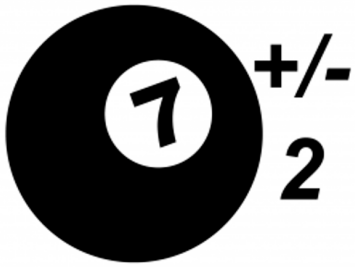

Figure 5 Miller's law (Ferster, 2017)

- Learning

Learning means newly learned information they can combine with information they already have. Most people prefer to learn through work. The design of direct manipulation interface makes it easy for users to learn, through the process of interaction, users can learn how the system works or learn new knowledge. For example, the multimedia model helps people understand difficult and abstract knowledge, it simulates formulas, special symbols, laws to help people easily recognize. , absorbing knowledge and easier to grasp. It is important that they can undo their actions when they make a mistake. For design Smart Gym

application. Designers can choose an interface that encourages users to explore, which will make users interested and curious. It makes users using Smart Gym application feel excited and nail wants to learn through the application.

Figure 6 Learning (Associates, 2019)

- Reading, speaking and listening

There are tools that allow us to express what we are thinking through communication and also what they are feeling or understanding in different ways. Besides, there are also common points that even though described and conveyed by means of reading, speaking or listening, the content and meaning do not change. Each transmission method has its own advantages and disadvantages. For example, children learn very quickly through listening rather than reading and writing because listening can be incorporated into songs, stories. They listen to every day and tend to be entertaining, no under pressure and mentally not affected much. From reading, speaking, and listening methods, applications are born to help people. For example, the google voice search application to help people who cannot spell correctly, but children cannot write or visually impaired people, they can use voice to search. Therefore, when designing Smart Gym apps, designers need to provide additional content presentation features on the large screen or create large text or layout of applications, without affecting the formatting. This will help people with reading problems to see and more easily read and use the application.

- Problem-solving, planning, reasoning and decision making

Before making a decision, the designer will consider and execute (Problem-solving, planning, reasoning and decision making). They are the tasks responsible for coordinating all system. Therefore, cognitive processes, all the information they receive will be integrated and the relationships between objects and events in the mind have been create established. For example, when planning a Smart Gym application, it is necessary to first raise problems and

solve them with phased plans such as market surveys (with books, pens, maps, paper...). Practice information survey to find out the needs of the user in the plan... Next is reasoning through situations such as Application need to design easy-to-use interface or Discovery Interface, and decide to choose and give the best solution for this plan. (Sharp et al, 2015).

GOMS is a long-standing cognitive model and it has also been known and used by many designers in their product design process. It is used to process specialized human information. GOMS focuses on the cognitive processes needed to achieve a goal and makes quantitative and qualitative predictions about how people will use a proposed system. That is also the reason, it is used by many experts to observe human-computer interactions (Benyon, 2013, p. 247). Applying GOMS to Smart gym product make sure that the design brings a good experience for the user and their product design is rated as one of the high quality application.

- Goal: Users use the Smart Gym system to do what they want to achieve, e.g. watch pre-recorder video.
- Operators: The user doing some operations that allows by the system e.g. show the pre-recorder video to large screen.
- Methods: In this step, the user will perform specific tasks or manipulation in the operation process, e.g. click to button to “Show Video” on the screen of the iPhone to show video to large screen.
- Selection rules: Rules are to approach the user's decision-making power about how users will use the Smart Gym system, e.g. touch to turn on button, click on the button or move a finger to turn on button to show the video from the phone to large screen.

2.3 Interaction Design Theory.

According to (Sharp, 2015, p. 53) there are four main types of interaction: instructing, conversing, manipulating, and exploring. Depending on the situation and the purpose of the product design. The designer will choose type of interaction to perform in order to help the designer form a conceptual model before implementing a specific interface. For Examples: voice-based, gesture-based, touch-based, etc. For Smart Gym application, voice and touch are selected for users to interact with the system. Because most mobile apps now support users to use touch gestures to use apps and search information on apps by voice. Therefore, choosing the voice and touch modes applied to Smart Gym application makes the application more user-friendly than people can easily use the app like the apps they used to.

The interaction type review will help the product deliver a better user experience. It will highlight the ways in which humans will interact with the system. Below is a detailed description of each type of interaction and how it applies to Smart Gym. When applying each type to the smart gym product design. Each type will have its own advantages and disadvantages to highlight its role for the product.

- Instructing: This is where the user performs their task by giving instructions for the system to do it. When using it for Smart Gym, users of Smart Gym products can dictate to it by performing actions such as speaking commands, entering commands or customizing commands in menus to remind the user of taking an Aerobic class. In addition, the commands to request the execution of a product's task will be executed in a certain order and the benefits of using it is help users interact with the system quickly and efficiently. For example, the implementation of adding, deleting and updating the videos of Smart Gym application will happen quickly and accurately. From there, it can be observed that instructing is particularly relevant when there is a need to frequently repeat actions performed on multiple objects such as spell-checking or video management system in Smart Gym.

- Conversing: It is where users interact with the system through a dialog. Conversing is designed to follow a two-way process. The system acts as a dialogue partner and responds in a way that another might have while chatting. Using Conversing for Smart Gym application forces users to constantly interact with it to perform actions such as Ask the Smart Gym System, “do I have a schedule to join the workout class today?” . The system will check if you have a class schedule, practice today or not and notify you of the class schedule. Conversing is used and more suitable for search or consulting application instead of application that help users participate in fitness classes like Smart Gym. Using conversing bring benefit that it allows people to interact with a system in a way that is familiar to them. Examples are sales consulting systems, product search systems or phone service.

- Manipulating: It provides physical or virtual space that allows users to interact with objects in the way they normally would in the real world. For example, users using Smart Gym application can show videos from Smart Gym application to large screen TV by dragging the icon representing that video to the “show” button displayed on the screen. Using manipulating has benefits such as helping the user

to quickly perform basic functions and easily remember how operations are performed over time. Manipulating is suitable for applications with several direct manipulation formats, including word processing, drawing, video games and image editing. And it also suitable for Smart Gym. Users perform normal and familiar system operations in the same way that they normally perform other systems.

- Exploring: Exploring is method creates virtual environments or physical spaces and allows users to move through them. This method usually uses embedded sensors and is used to detect the movement of objects or phenomena. If there is an object moving or moving it will trigger a certain event or it creates a virtual 3D environment that brings the most realistic experience to the user. Using exploring as the foundation for Smart Gym, it can help to enhance the user experience by providing virtual classroom models. It is where everyone in the virtual classroom moves and practices like the real world.

3. Design Process.

3.1 Interaction design research.

Interactive design research provides additional details for the design process and the important information for improvement in the design process. Overall, the Interactive Design research gives designer an overview of the research activities they've carried out to develop the conceptual designs. It also making design better.

In coursework, The UCD was selected for the development of Smart Gym application. Therefore, investigation methods are used from the first step of the UCD process to determine a user's request for the product. Research method used are interview and observations.

Designer went to the gym to observe people working out there. He noticed that most of the people there are young people between the ages of 20 and 27. They don't go to the gym very often. They have difficulty practicing new movements. Designer have observed that some people spend a lot of time using their cell phones looking for instructions to practice that movement. Coaching they can't guide everyone there. Through my observations, designer think that he need design an application that allows people to participate in well-trained practice classes. Interviews were conducted to capture the user's requirements for Smart Gym products with the question bellow.

Question	Answer

1. What do you think if your phone has an app that allows you to join practice classes?	I felling satisfied and interested in the app as it allows them to participate in fitness classes.
2. What features would you expect Smart Gym to have? And Why?	I want to study the exercise anytime and anywhere, because I'm a student so I often don't have much time and money to move to the gym and practice.
3. What user data do you think should be stored on Smart Gym apps? For example (Heart rate, training time…)	It would be nice to have a heart rate monitor during my workout.
4. How would you like to use the application? For example (Step by step, short-cuts, clear instructions, etc.)	I think step by step is a good way to using application.

Table 1 Interview user.

The results of data collection and analysis show that the target audience of Smart Gym application is young people, they are from 20 to 27 years old and users often do not have much time to go to the gym to exercise, if They will have difficulty practicing new movements because they do not have a guide. Users want an app that allows them to exercise wherever they like. In addition, users will be participating in gym classes including live and pre-recorded classes. Practitioners look at the instructions on their phone but they only see how quickly they don't want to stop while practicing. They don't want to stop and watch them carefully. So the application can connect to TV and play on TV is a good solution. They don't want to see a lot of other information they find annoying with that. However, they want the help they need when they need it like doctors. They want to be monitored during exercise like heart rate. And based on the content designer have researched and presented in the section 2.1, 2.2 and 2.3. The ideas of Smart Gym application come from these points.

3.2 Conceptual Design.

According to (Johnson and Henderson, 2002) “A conceptual model is a high-level description of how a system is organized and operates.” It means to allow people who use the product to get to know what they can do with the product and how they interact with it. And the value for designer that they can conceptualize the view of a system. Norman (1986)

called this the design model. Conceptual models evolve based on user needs and other requirements that have been defined and must ensure that the products developed can be tested repeatedly.

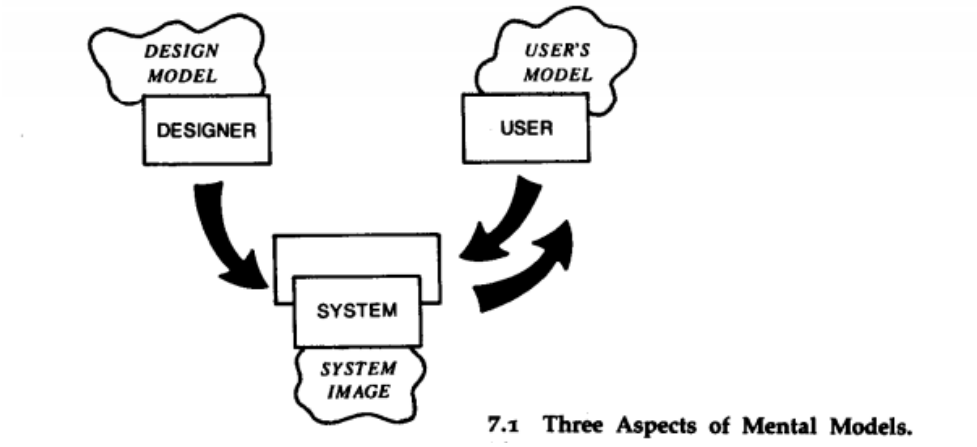

Figure 7 Three aspects of mental models. (Norman, 1990).

Conceptual design approaches provide different ways of thinking about products. A conceptual design approach is not determined to be true or false for any given situation. It assists in the creation of alternatives. According to (Benyon, 2013) there are three way to thinking about a conceptual model: Conceptual models focus on supporting user operations, conceptual models help users understand products through interface metaphors. The conceptual model specifies the product to be following by the flow of those. Deciding what a user will do when performing their task is one of the most important steps in the design process. For Design Smart Gym Application, the first is to look up the information about Smart Gym Equipment. Then create research papers on what the app will do, communicate with other users to understand Smart Gym apps. For an already knowledgeable user, Smart Gym application designer chooses the interface metaphor to design a conceptual model because it provides the basic structure for the conceptual model that the user is familiar with, this will help users to understand the application more easily. An example of a metaphorical interface for a Smart Gym is the camera button icon which is live fitness Class. Besides Conceptual model also a starting point for interaction design. It helps the user understand and solve the problems you are having with system. Besides, it helps designer establishes a common set of terms that users and designers and stakeholders both understand and agree upon about the product. It also reduces the risk of mistakes that arise later.

The conceptual model of Smart Gym application bellow:

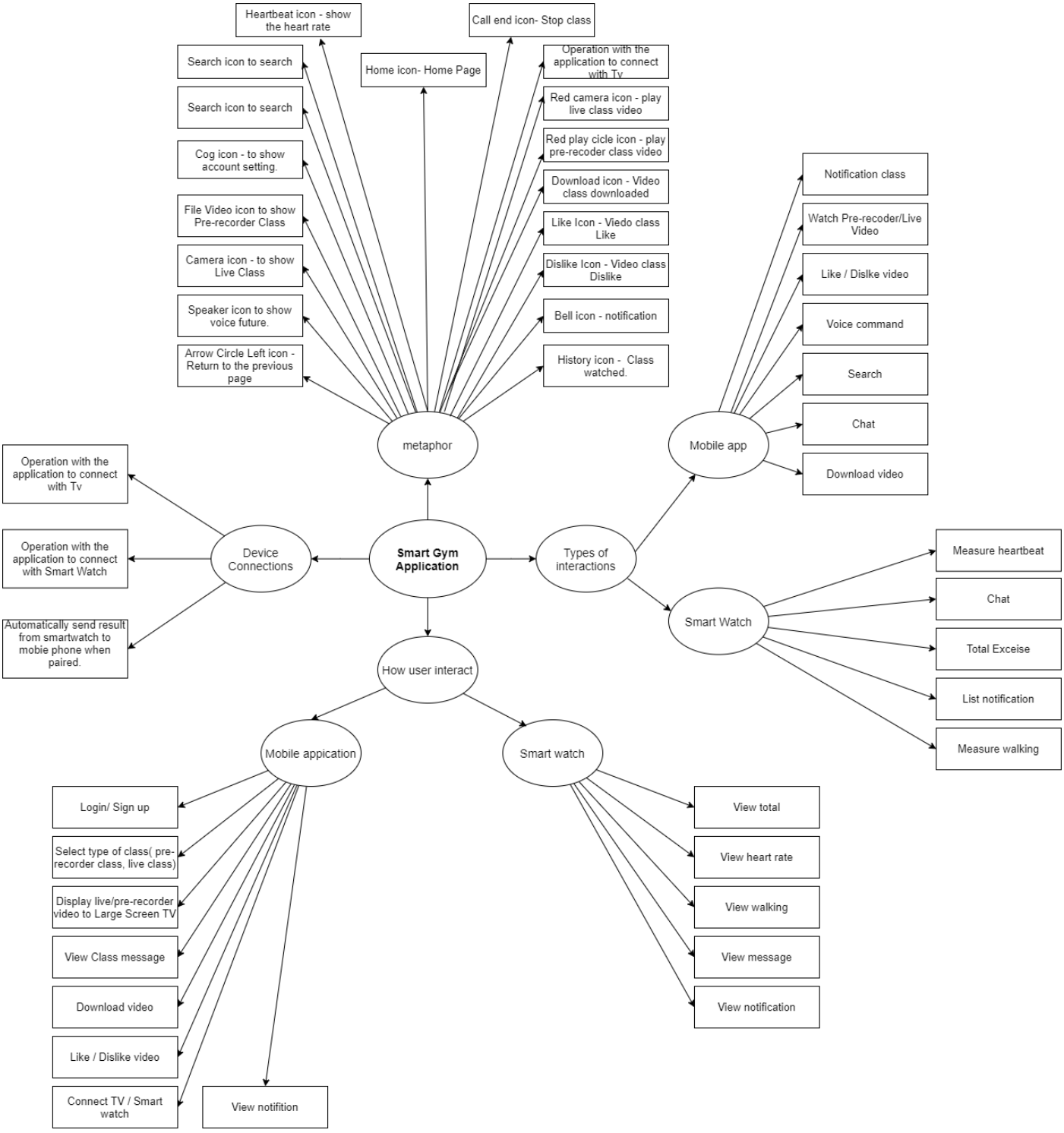

Figure 8 Conceptual model.

The conceptual model is designed with the aim of providing users and stakeholders with an idea of how the Smart Gym application will be designed. There are 4 main items in the conceptual model design of Smart gym are metaphor, type of interaction, device connections and how user interact.

- How user interact

Mobile application: The user performs a login to participate in fitness learning classes in the app. Users can display the video on the big screen TV for easier viewing. Besides, they can view the heart rate and class message during learning on the application. They can make an announcement or download their favorite classroom videos. Or dislike them.

Smart Watch: Users view their health metrics like heart rate viewing, walking, and they can view classroom messages and class notifications on their phones.

- Metaphor: Smart gym application uses many metaphor icons to make users easy to manipulate and have many choices when using the application.

No.	Metaphor icon	Name	Meaning
1		Thumbs Down	Dislike class or video.
2		Thumbs Up	Like class or video.
3		Arrow circle left	Back to previous page
4		History	History video class.
5		Commenting	Class chats.
6		Phone end.	Stop live class.
7		Microphone	Voice command.
8		Battery	Status pin of device.
9		Wifi	Wifi of device is connected.
10		Heartbeat	Heart rate of user.
11		Camera	Camera of user
12		Bell	Class notification.

13		TV	Show content form Smart Gym to TV
14		Download	Download video class.
15		Clock	Video class watch later.

Table 2 metaphor icon of smart gym application.

- Device connections: There are two devices connected to the product, the watch used to monitor and notify the health of the user and the TV used to display classroom videos on a larger screen.

Figure 9 Device connections.

- Type of interaction: Users can turn on voice search to find conversing, they can join virtual classroom models (Exploring) and Smart gym that allows users to interact with objects. In the way they normally do in the real world. User can project video from phone to TV with big screen for study (Manipulating)

4. Prototype.

According to (Sharp, 2015) “A prototype is one manifestation of a design that allows stakeholders to interact with it and to explore its suitability’’. Prototype will emphasize characterize the product. A prototype can be a paper sketch or a test model of any organization. The designer builds prototypes with different levels to capture the requirements and test on the user with high efficiency. Prototype design gives designers a practical understanding of their product design. From prototype reviews, designers can refine their app or product to be better and more efficient for the user. For example, to test if an idea is workable or to check if a prototype is good for product development the designer can build a prototype model on paper and evaluate them. Fidelity refers to the level of detail and

functionality you put into your prototype. Depending on the intended use, the fidelity of the prototype is different. There are three commonly used types of prototypes: low fidelity prototype, mid-fidelity prototype and high fidelity prototype.

- Low-fidelity prototype.

Low fidelity prototype does not provide usable functions as the end product. They are only drawings or sketches representing the original functions and appearance of the product. Low-fidelity prototypes are useful because designers can finish them off quickly, simply, and cheaply. Low-fidelity prototypes are easy to modify, so they aid very well in alternative idea discovery and generation. However. It lacks authenticity, and it's difficult for users to judge, and they'll have difficulty determining how they use the product. Almost of low-fidelity are just for exploration. The storyboard is an example of low-fidelity prototyping commonly used in conjunction with scenarios. The figure is a storyboard of Pedestrian guidance application.

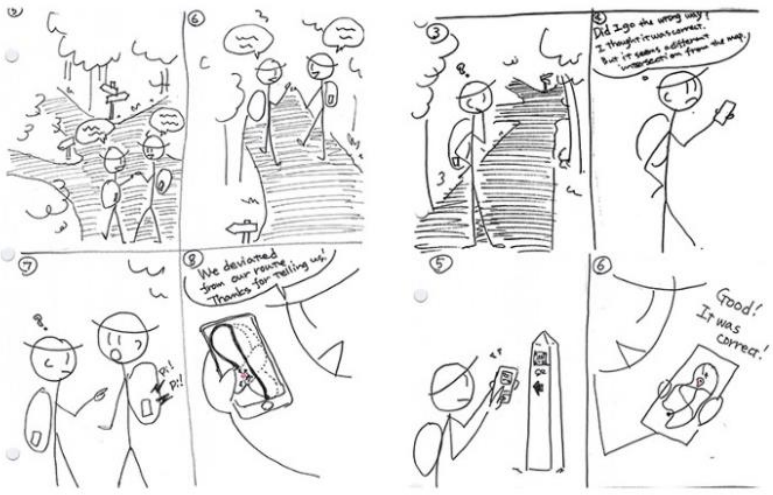

Figure 10 Story board. (Medlock, 2016).

- Medium-fidelity prototype

Middle fidelity prototypes are prototypes with functionality. However, the functionality is limited by interaction. They provide only minimal functionality and workflows. Medium fidelity prototype suitable for validating concept of interaction. Average fidelity prototypes are typically built based on user scenario.

- High-fidelity prototype.

High-fidelity prototype developed by designers that looks like the final product. It provides high fidelity functions. Users can easily manipulate and evaluate the functions

and design of the product. For example, a prototype designed with adobe will take longer than on paper, but it offers high fidelity to check technical problems. High-fidelity files can be developed on engineering software. It is where designers can integrate both the hardware and software of the product. The High fidelity prototype offers more accurate results and is highly applicable. The designer can use them to evaluate whether the design is suitable for the needs of the user. However, it takes a long time to create a high fidelity prototype and is expensive. And if the designer has the idea of changing it will take a lot of time (Sharp et al, 2015). The picture bellow shows the difference between the low-fidelity prototype (left side) and the high-fidelity prototype (right side)

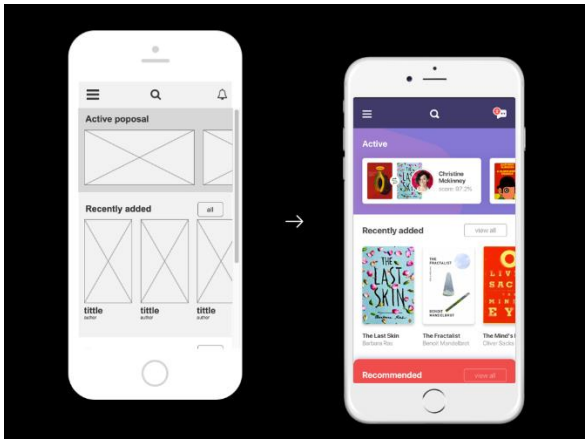

Figure 11 Low and High fidelity (Pierzchała, 2018).

- Design a low-fidelity prototype.

After researching and understanding what is low-fidelity prototype. Designers use pens and paper to design the low-fidelity prototype of Smart-Gym apps. Below are the drawings of the low-fidelity prototype.

- First Interface Smart Gym application.

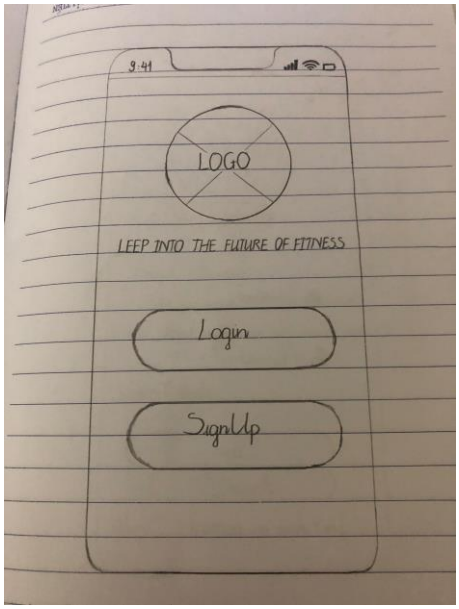

Figure 12 First page of Smart Gym application.

In the first page of the smart gym application 2 buttons are created for the user to choose from. For users who already have an account, choose to log in, but no account yet to choose sign up. The basic icon such as WIFI, Battery to show the current status of device

- Login page of Smart Gym application.

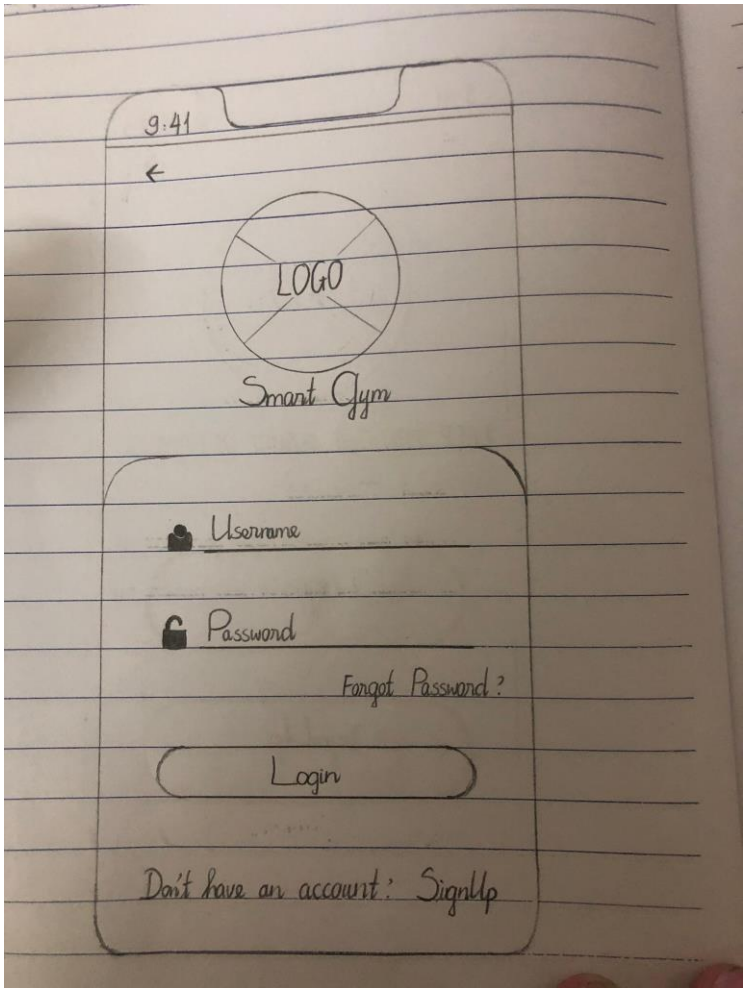

Figure 13 Login page of Smart Gym application.

In the login page the designer has chosen the user icon and lock to represent the account and password. 2 fields allow the user to enter the username and password to log into the main screen of the Smart Gym application. Besides, 2 label links are used to find the password and register the account and back button to return previous page.

- Provide Information page.

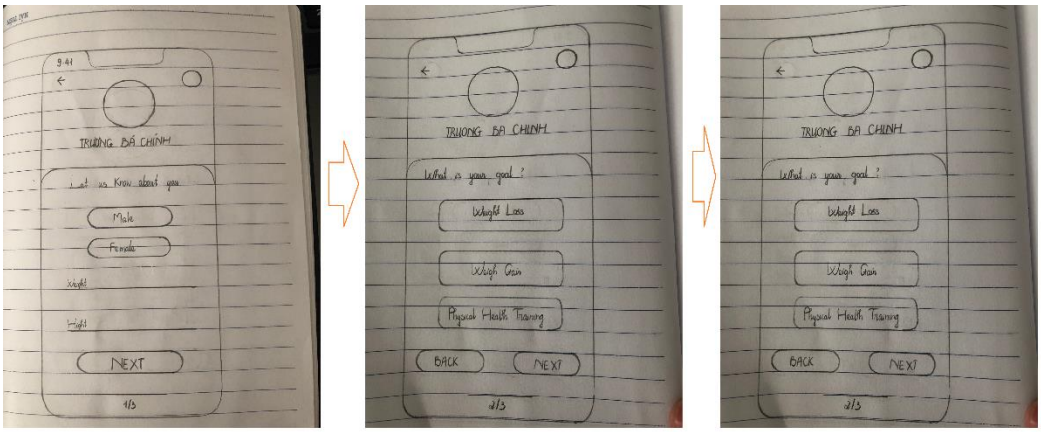

Figure 14 provide information page.

Data collection interface allows users to provide their information after the user has successfully logged in. The 2 buttons created are "Next" to go to another page and the "Back" button to undo.

- Main interface of Smart Gym application.

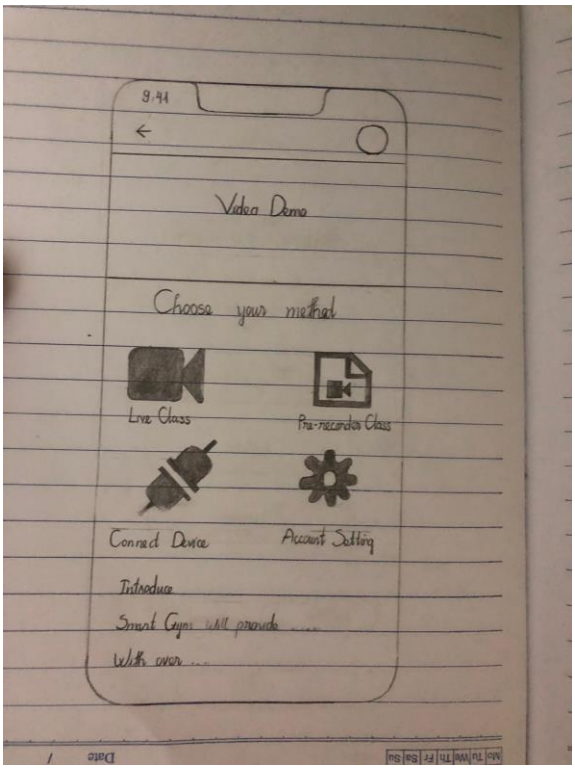

Figure 15 interface of Smart Gym application.

The designer has designed 4 icons representing 4 main options of smart Gym application, namely Connect Device, Accounting Setting, Live Class and Pre-recorder class. Users can use 4 options to serve their purposes.

- Interface of connect Smart Gym app to smart watch

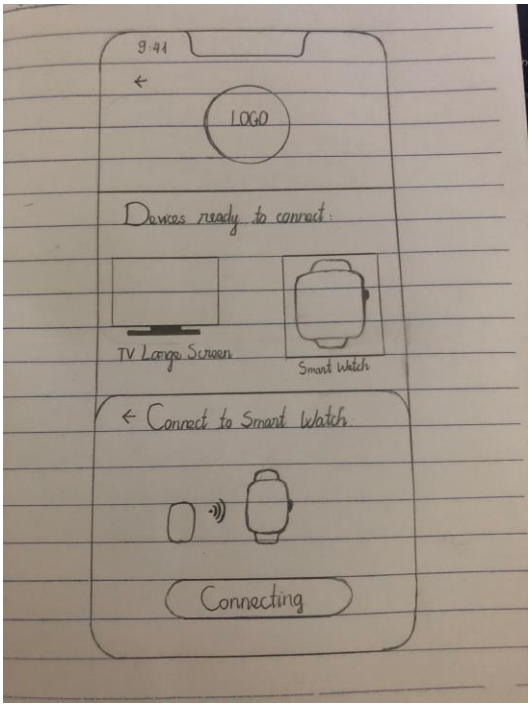

Figure 16 connect Smart Gym app to smart watch.

This is an interface that allows users to connect smart gym apps with Smart watch. Connecting the app to a Smart watch users can measure their heart rate during workouts.

- Interface of connect Smart Gym app to TV

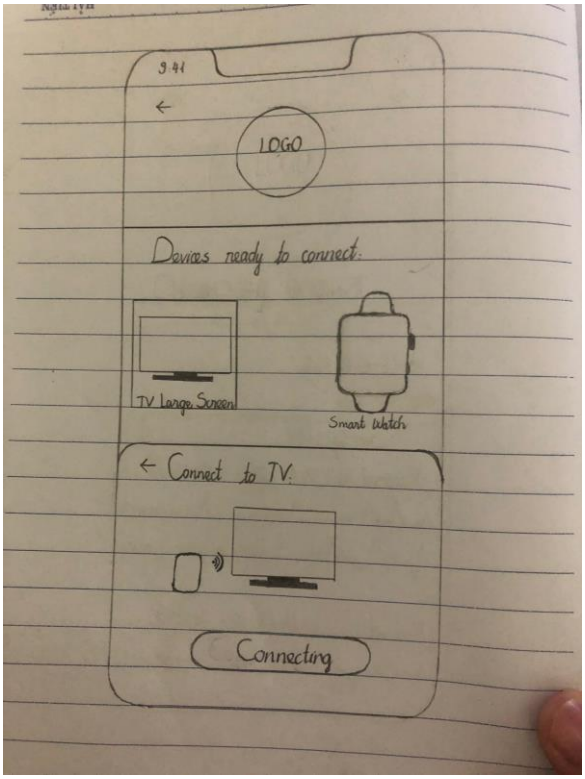

Figure 17 connect Smart Gym app to smart watch.

This is an interface that allows users to connect smart gym apps with TV. The Connect Smart gym app with TV allows users to stream content from the app to the TV.

- Live class of Smart Gym application.

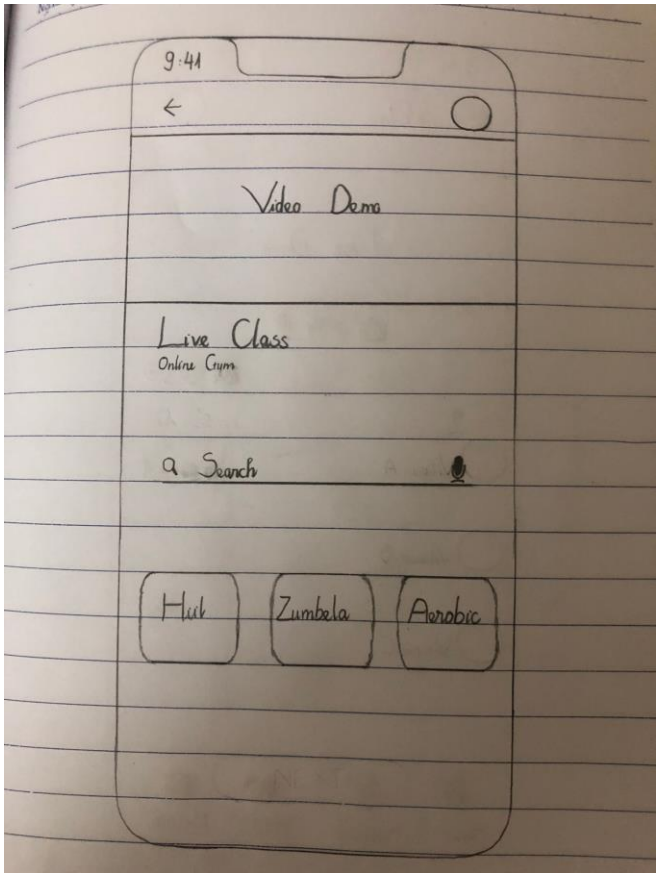

Figure 18 Low-fidelity class interface of Smart Gym application.

The Live class page is designed with 3 buttons representing 3 types of exercise: Aerobic, Zumba and Hitt. The demo video is also designed for the header of page. Designer added a speaker icon to use voice command for searching. On this page, pre-recorder class interface is similar to the live class interface.

- Hiit live class interface.

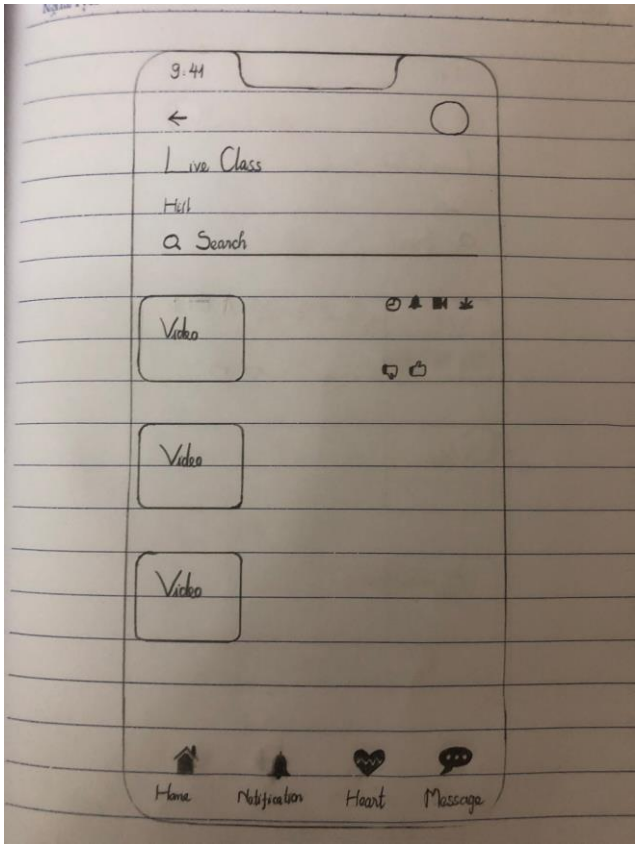

Figure 19 Hiit live class interface.

Hiit is one of the three sports that the app allows users to use and learn. The interface of this page allows users to choose which Hiit online classes they want to take. Besides, users can perform other features such as turn on notifications, download, like or dislike classes.

- Hiit pre-recorder class interface.

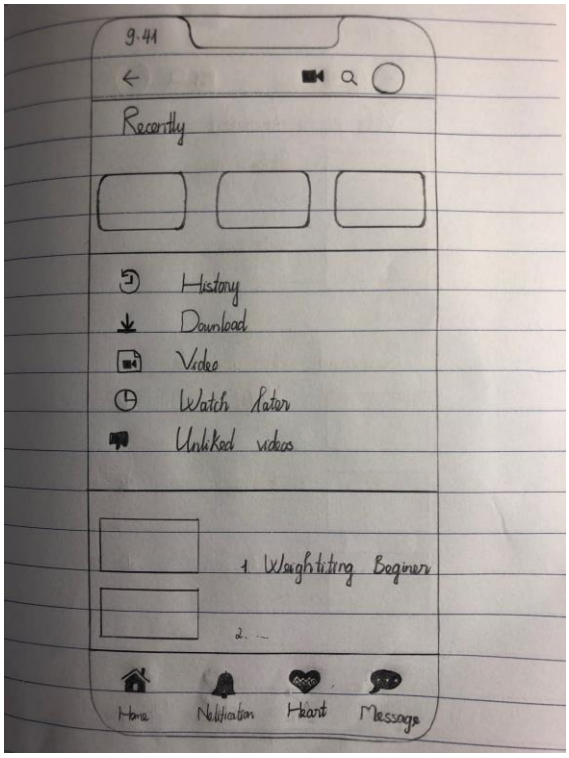

Figure 20 Low-fidelity prototype of Hiit live class.

This is the interface of Hit pre-recorder class. Besides, users can choose from options such as history video, download video, watched video, etc. to see which classes are suitable for them.

- Interface of play live class and pre-recorder class.

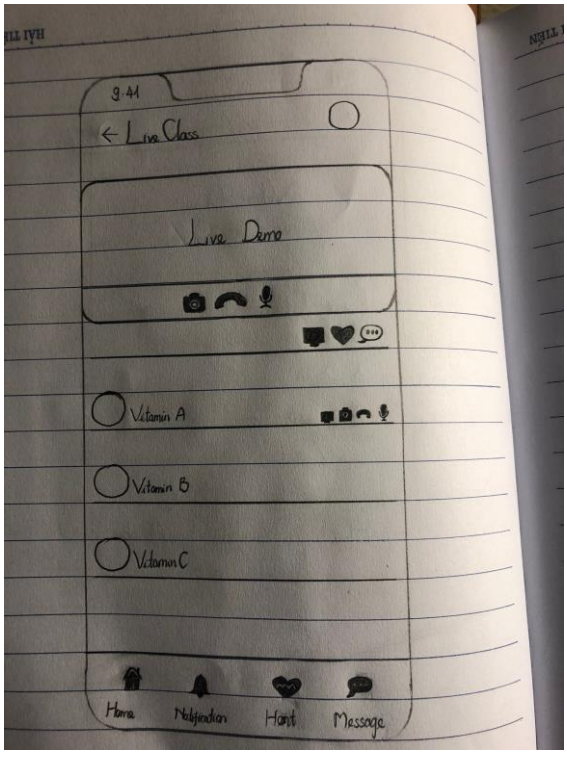

Figure 21 Play live class.

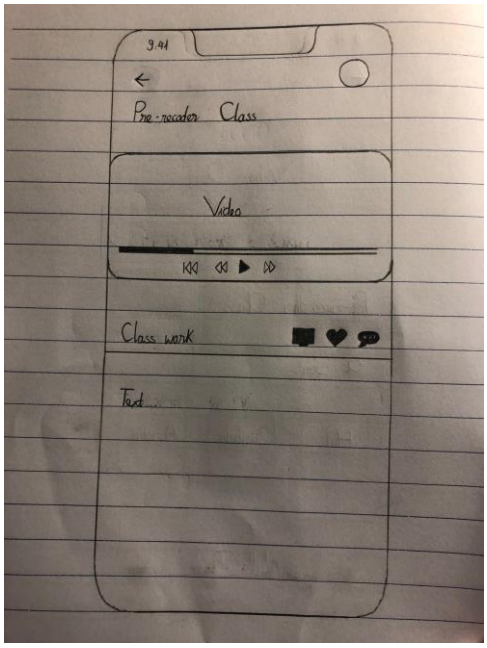

Figure 22 Play pre-recorder video class.

The interface of live class and pre-recorder class allows users to participate in the classroom and learn online. Users can perform operations via buttons.

- Interface of play video from Smart Gym app to TV.

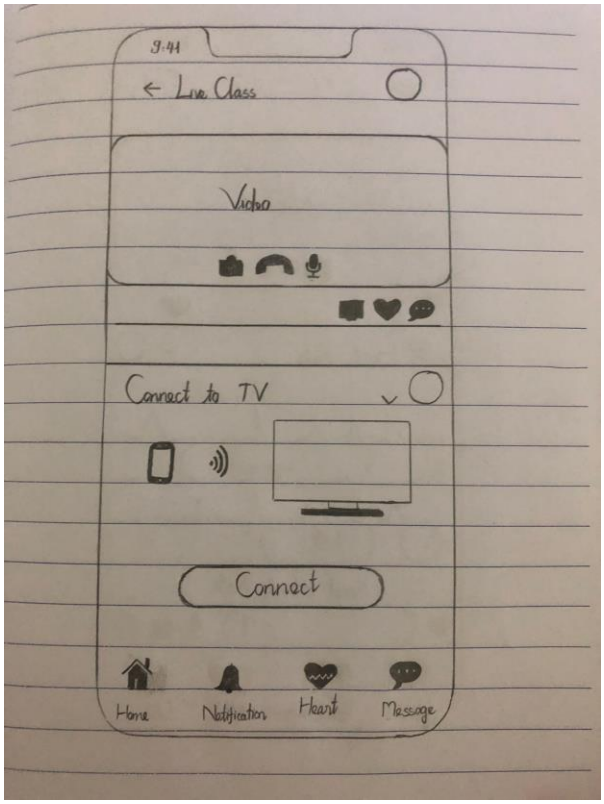

Figure 23 Show video to TV.

After the user clicks the TV button. A new interface will appear allowing users to stream content from Smart Gym app to TV.

- Interface of view heart rate when playing video.

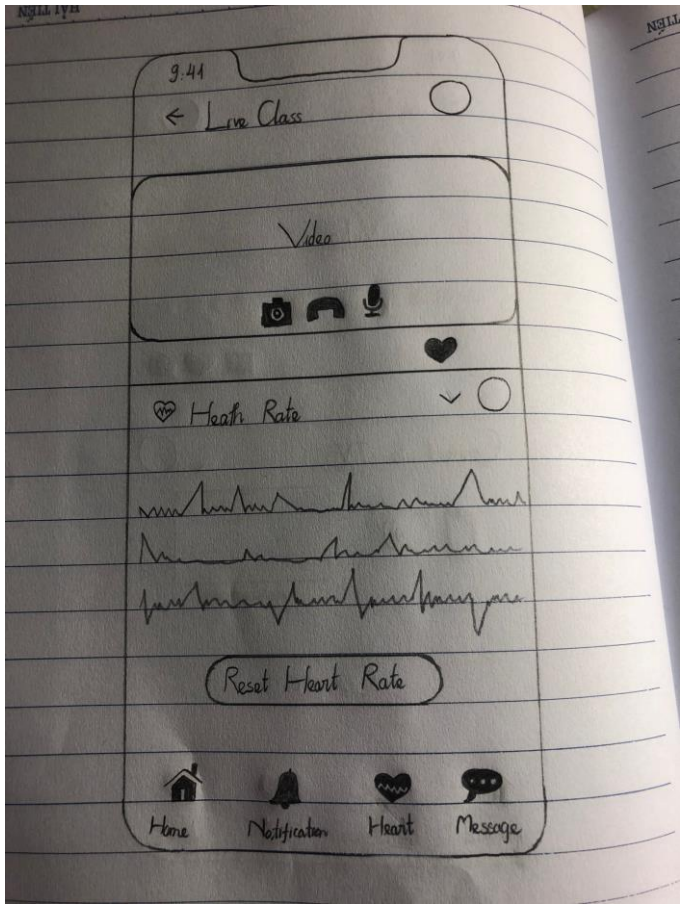

Figure 24 Interface of view heart rate when playing video.

When the user clicks on the heart rate button. Information about their heart rate status will be displayed as shown above.

- Interface of view chat class when playing video.

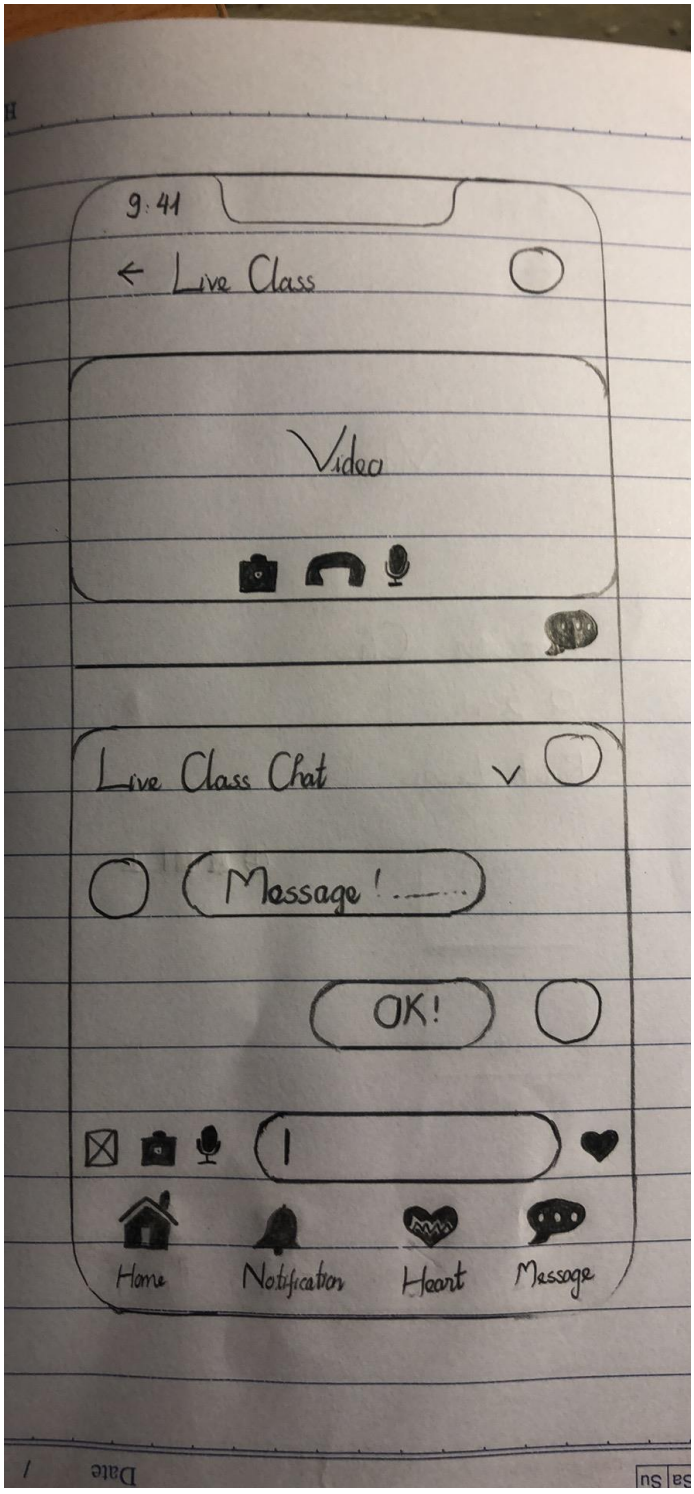

Figure 25 Interface of message when playing video.

When the user presses the communication button next to the TV button. The class chats are displayed.

- Interface feature of measuring

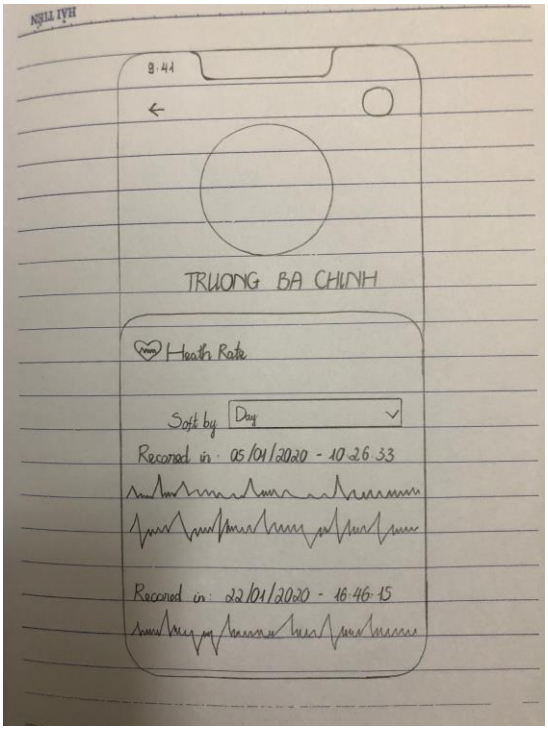

Figure 26 Interface feature of measuring

This is an interface showing the user's heart rate measurement feature. The system displays the heart rate on the screen. Heart rate duration and frequency were noted.

- Design a medium-fidelity prototype

The low fidelity prototype design is paper-based and does not allow user interaction. Therefore, to help test users interact with some of the features of Smart Gym applications. The Smart Gym app designer designed the medium-fidelity prototype as follows.

- Login-page.

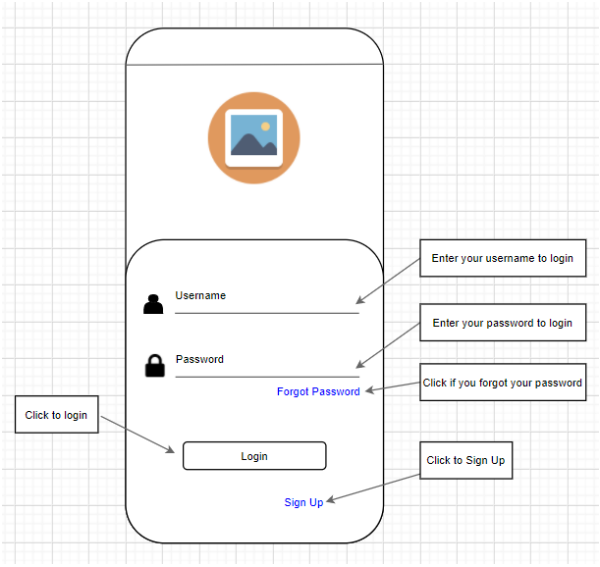

Figure 27 Medium-fidelity prototype of login page.

- Medium-fidelity prototype of home page.

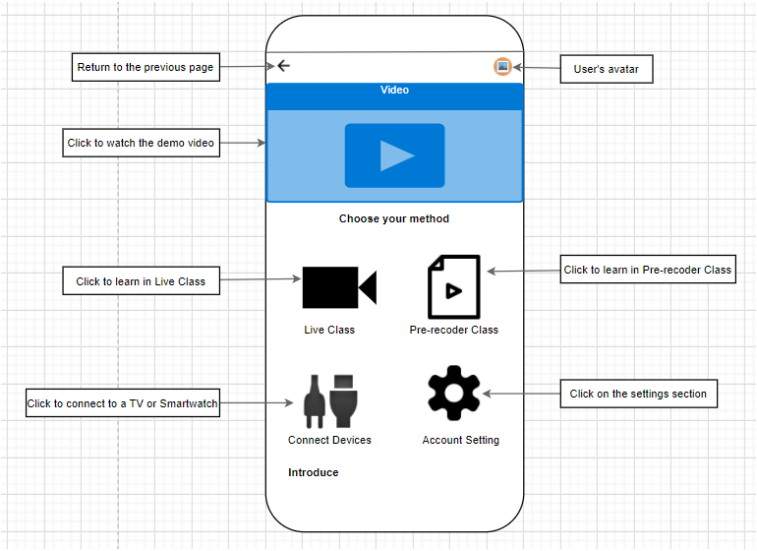

Figure 28 Medium-fidelity prototype of home page.

- Medium-fidelity prototype of Connect Device page.

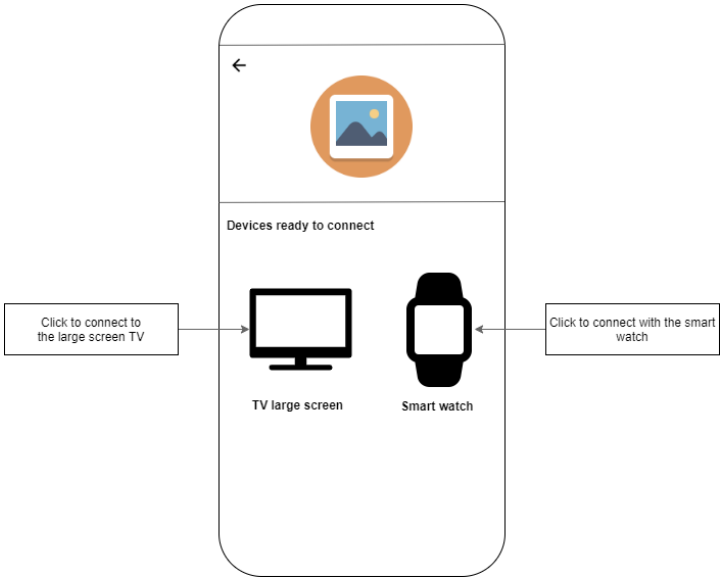

Figure 29 Connect Device page.

- Medium-prototype of Connect Smart Watch and Connect TV page.

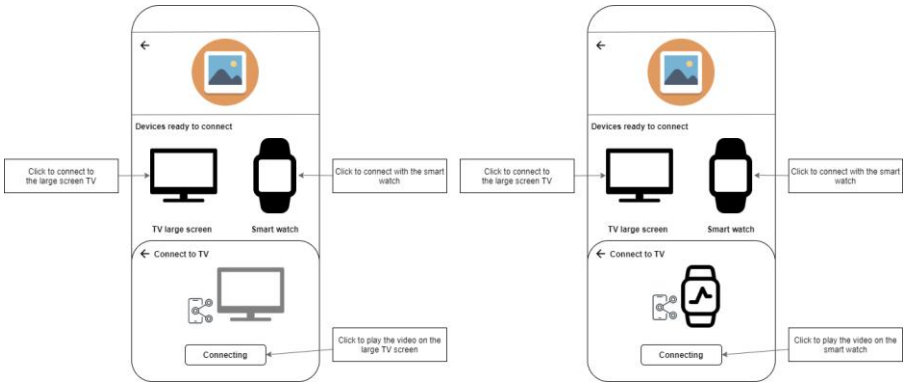

Figure 30 Medium-prototype of Connect Smart Watch and Connect TV page.

- Medium-fidelity prototype of Class page.

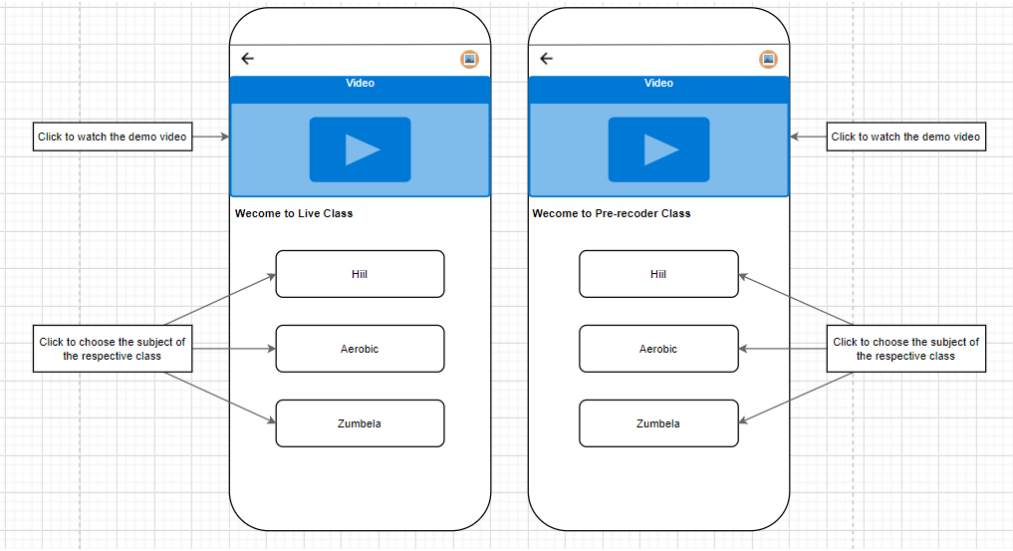

Figure 31 Medium-fidelity prototype of Class page.

- Medium-prototype of type class(Aerobic, Hitt and Zumba class).

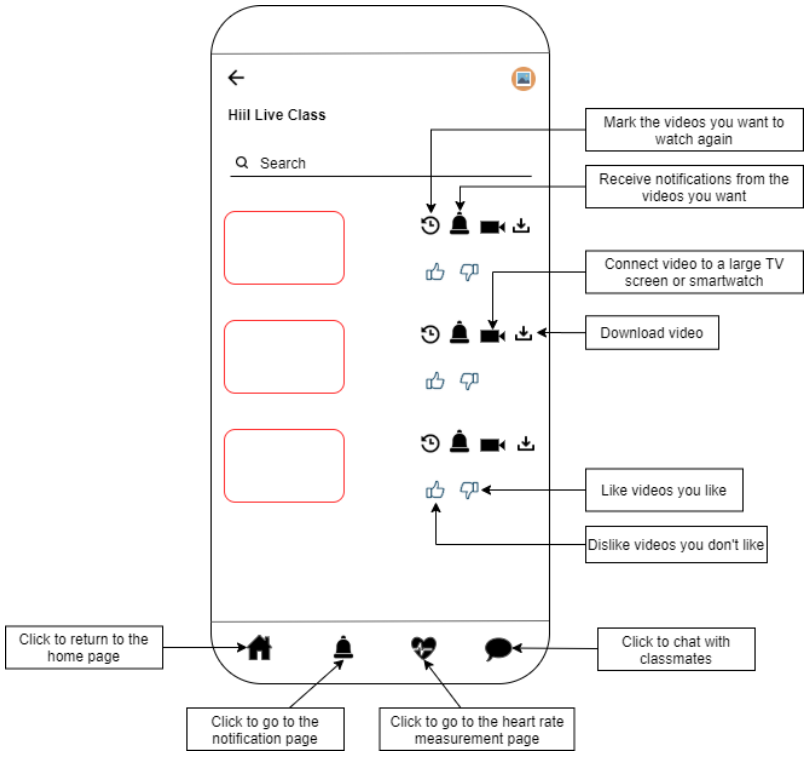

Figure 32 Medium-prototype of type class.

- Medium-prototype of play live video class.

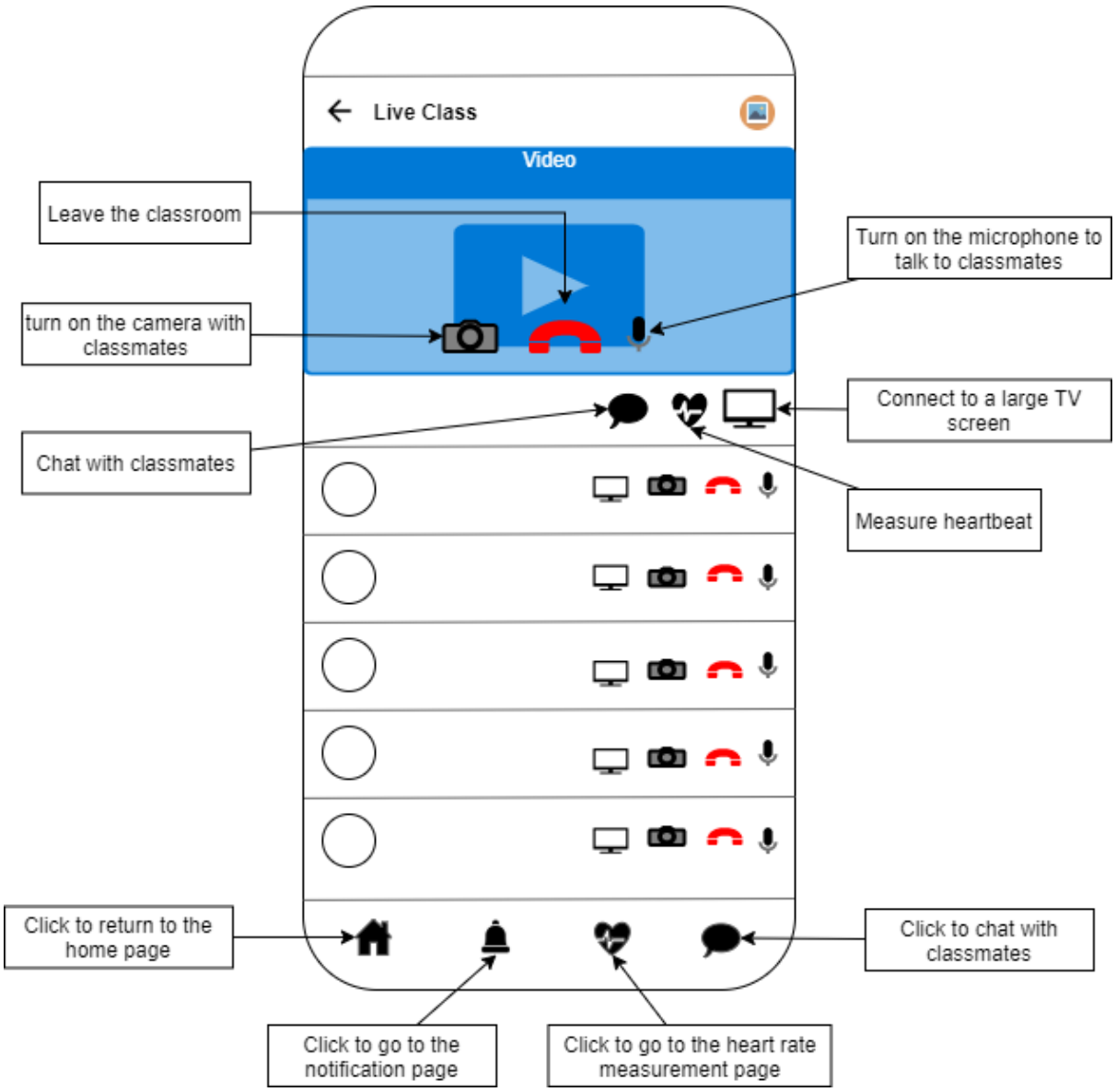

Figure 33 Medium-prototype of play live video class.

- Medium-prototype of play pre-recorder video class.

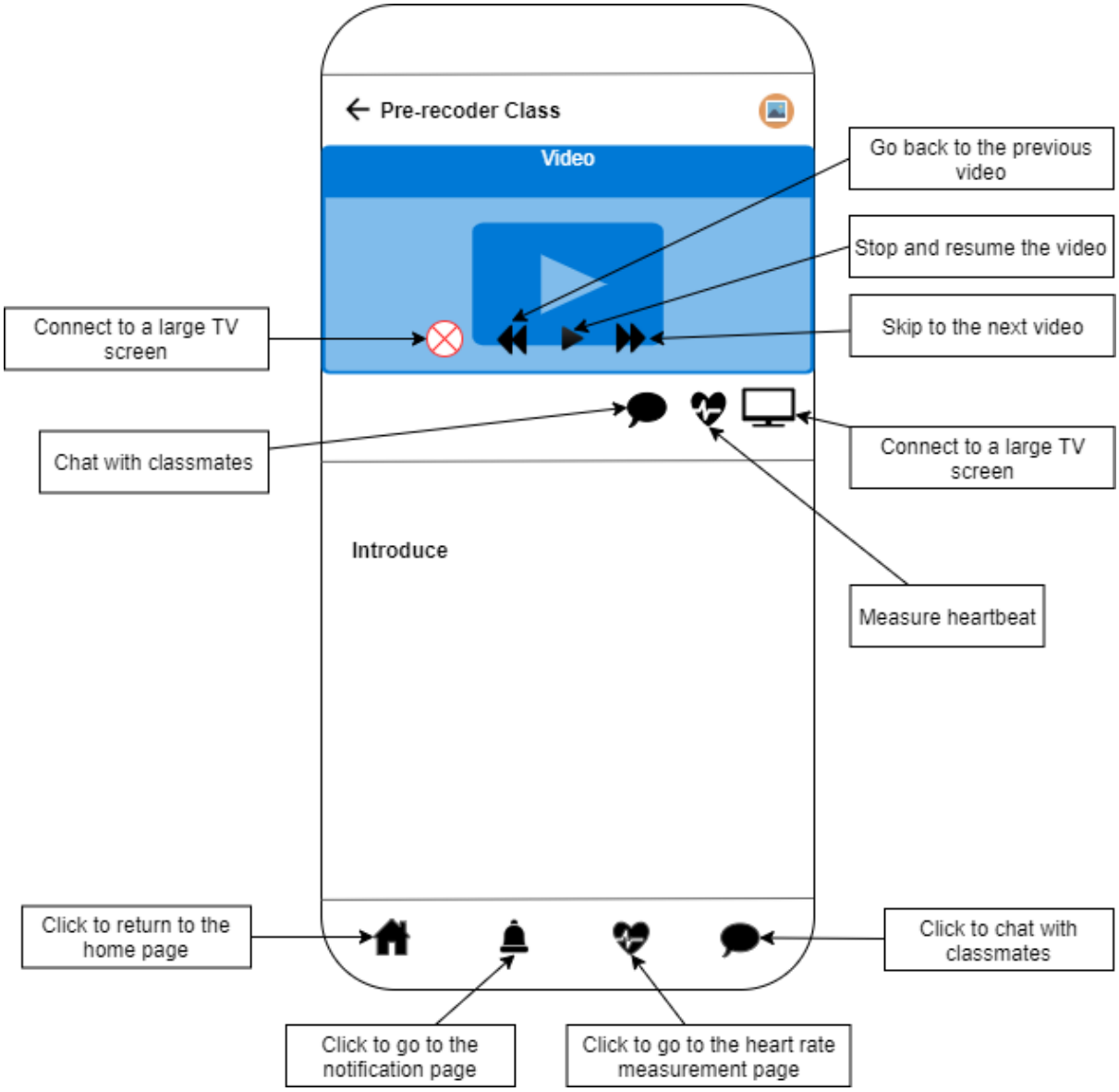

Figure 34 Medium-prototype of play pre-recorder video class.

- Medium-prototype of Smart Watch.

After the Low-fidelity prototype was designed on paper, test users wanted to experience Smart Gym application on Smart Watch devices. Below is the medium-fidelity prototype of the Smart Gym app's features on Smart Watch.

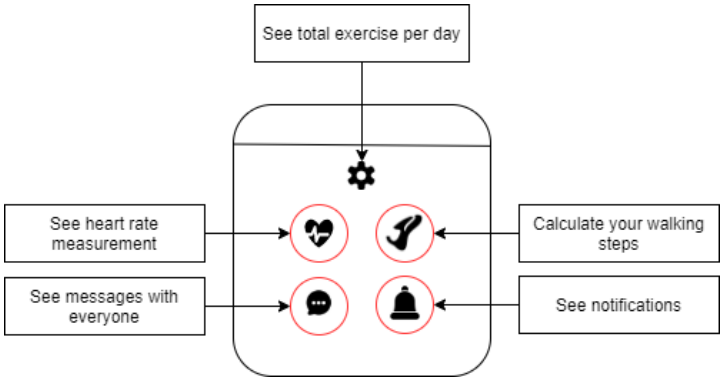

Figure 35 Home page of Smart Watch.

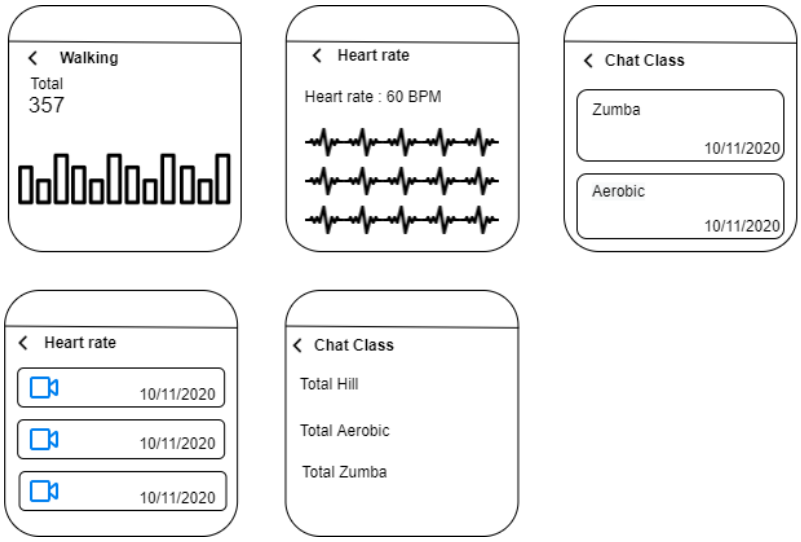

Figure 36 Feature of Smart Watch.

- Design a high-fidelity prototype.

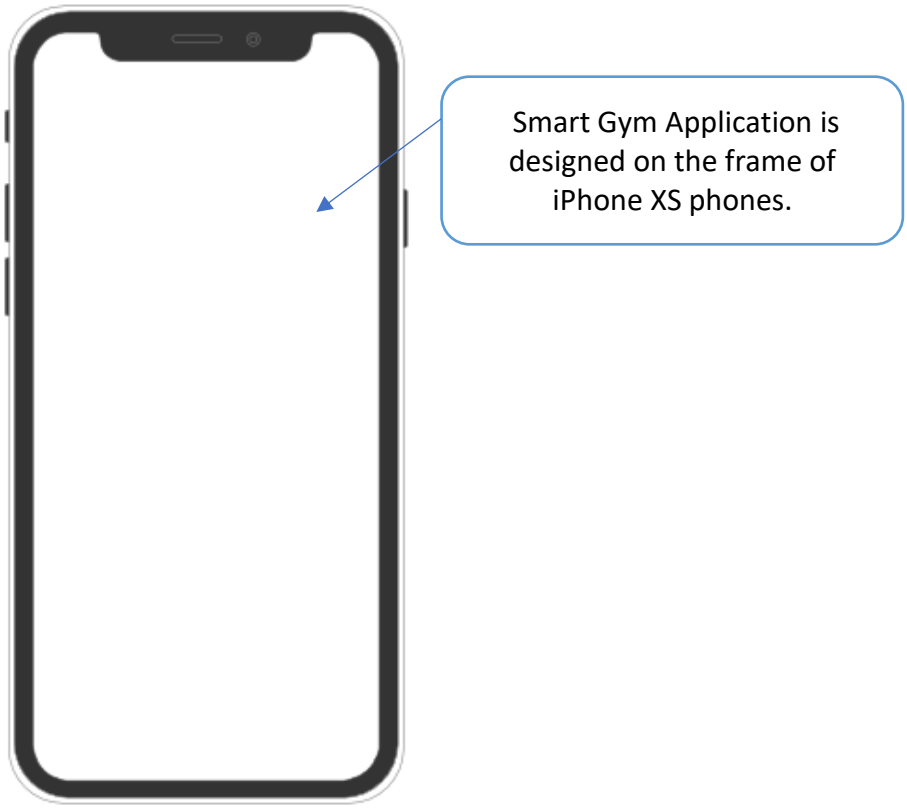

Figure 37 Physical Design.

Smart gym application is designed on the frame of iPhone XS. Designer has selected today's prevailing frame to design in order to bring good user experience. For high-fidelity prototype, the designer will use the following main colors to design the entire process of performing operations on the application. These are high fidelity colors that do not cause discomfort for the viewer. The colors below are very suitable for making apps related to learning and practice. The typeface used is Arial.

Figure 38 Color of high-fidelity prototype.

Below is a picture of the first page users use the app. The Smart Gym app's logo and slogan have been shown more clearly than the Low-fidelity version. Logo shows the power that gym brings. It is considered as a symbolic symbol of the application with the slogan "Leep into the future of fitness". The slogan means that. That is the desire of Smart Gym application

to change everyone's training style, help everyone to exercise easily and bring high efficiency. Application is trusted and used by many people around the world. Below are 2 button buttons that allow users to choose to perform when the user clicks on one of the buttons, the user will go to another page. (Login for those who already have an account and signup for those who do not have an account. Item).

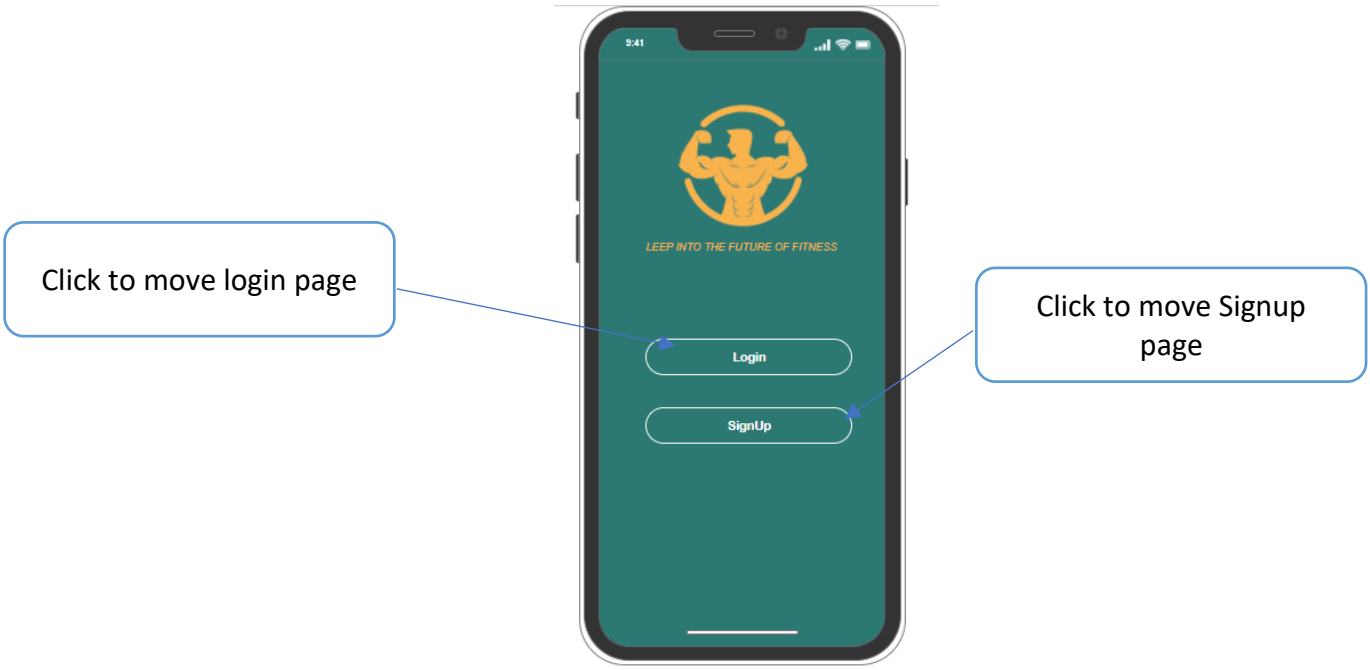

Figure 39 the first page interface of Smart Gym application.

- Login page interface.

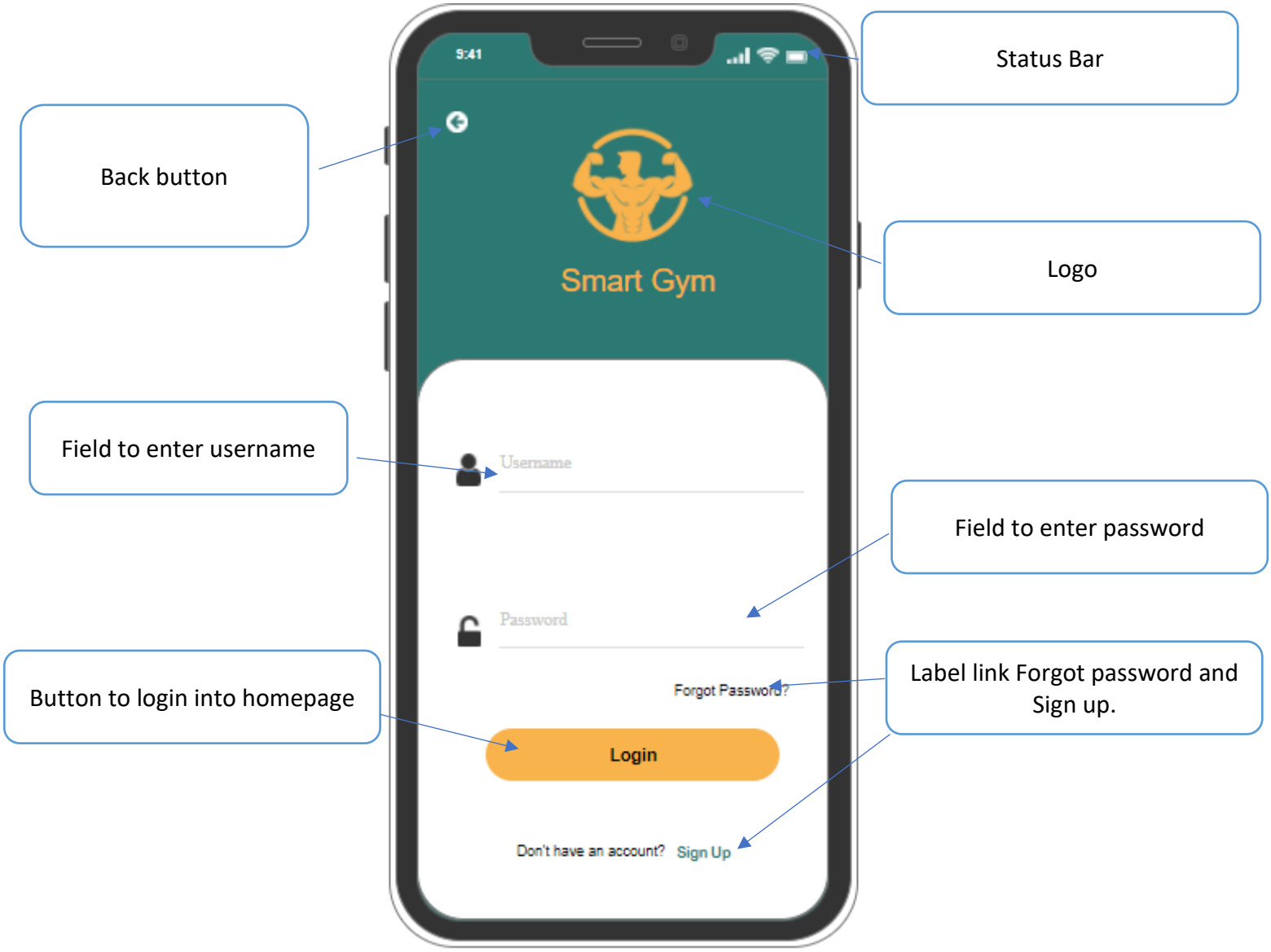

Figure 40 High-fidelity of login page interface.

This is the interface of the user login page. To pass this page, Users need to enter account information and password to log into the main page of Smart Gym application. If the user enters wrong password and account. Message will display "Invalid username or password". If the account and password are correct, the message will show "login successful" and the user has accessed the home page after 1 second. The designer has provided the account and password for users to access the Smart Gym application. This makes the user experience more realistic. So users need to login by using username "**admin**" and password "**admin**".

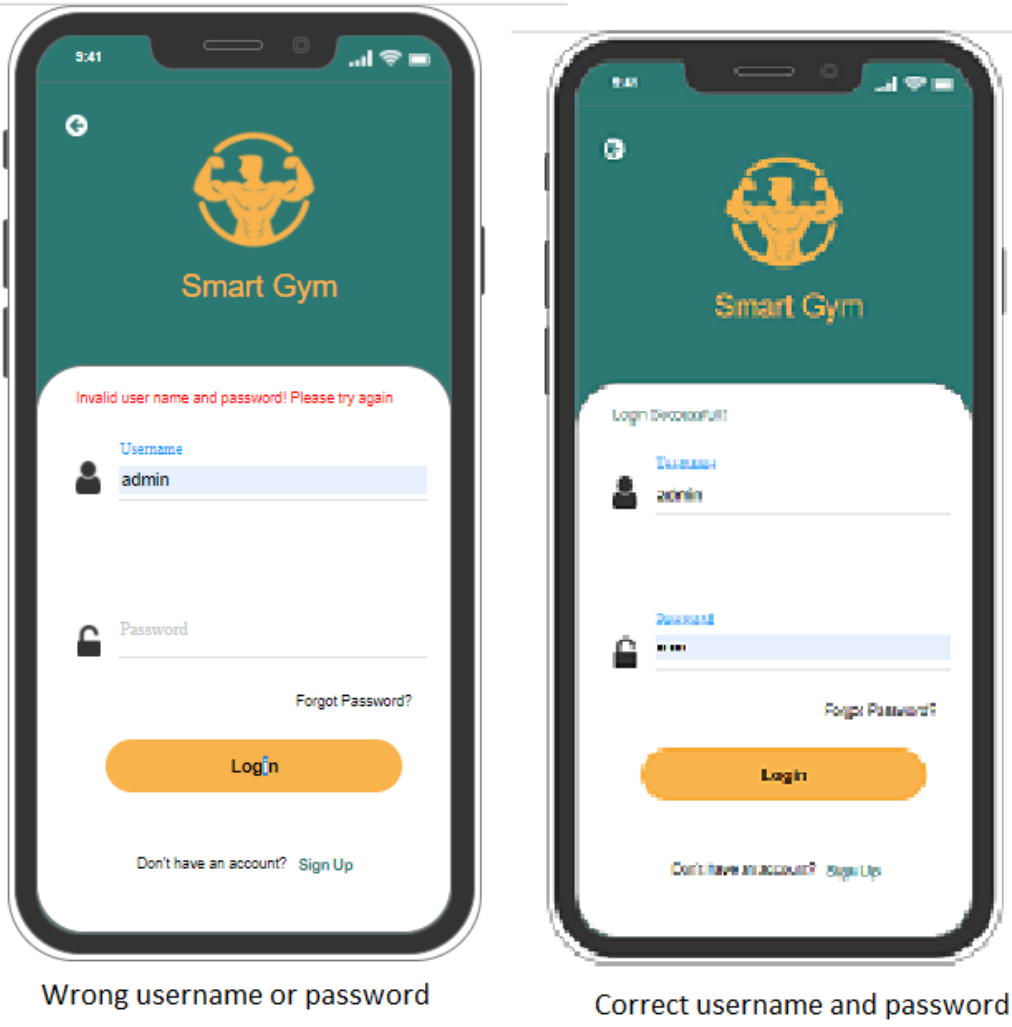

Figure 41 Enter username and password to login.

- Signup page

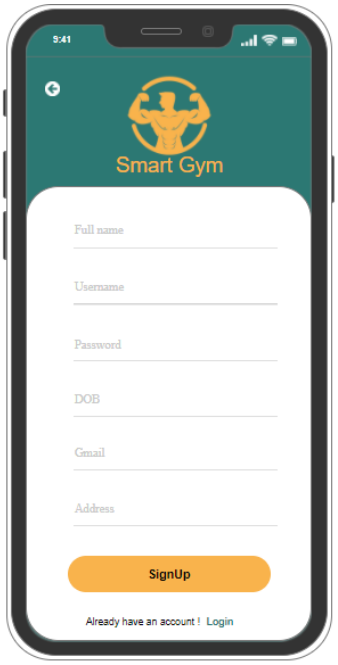

Figure 42 Signup page.

If user doesn't have account. They register an account here to log into the Smart Gym application in here.

- Reset password page.

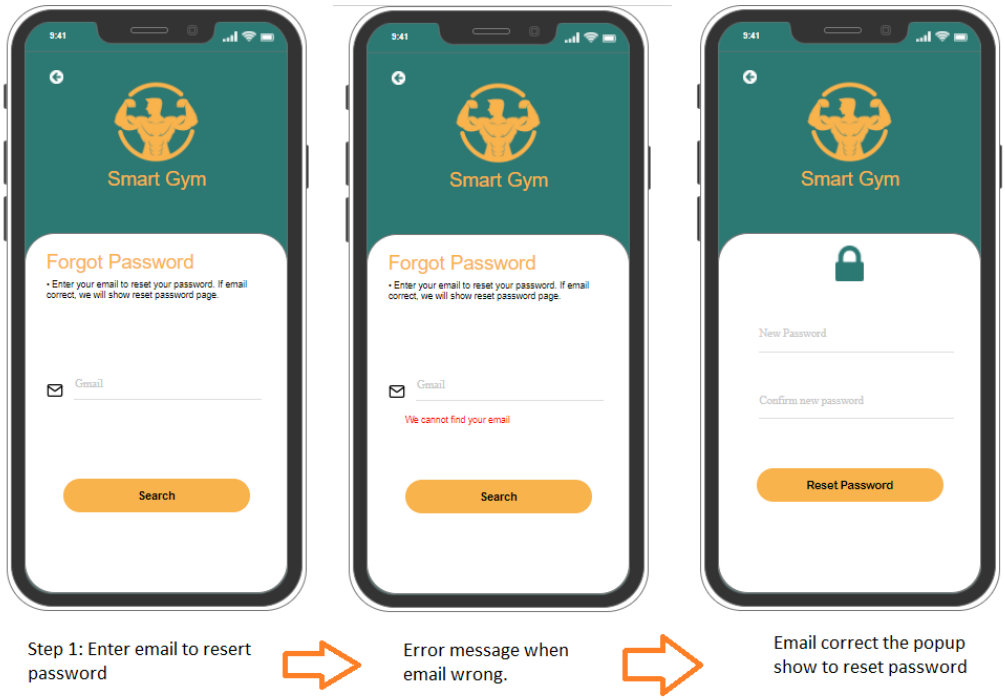

Figure 43 Reset password page.

Users get back their account when forgetting or losing password here by providing their Gmail account.

Please Using Gmail: Truongbachinh@gmail.com to reset password.

- Provider Information page.

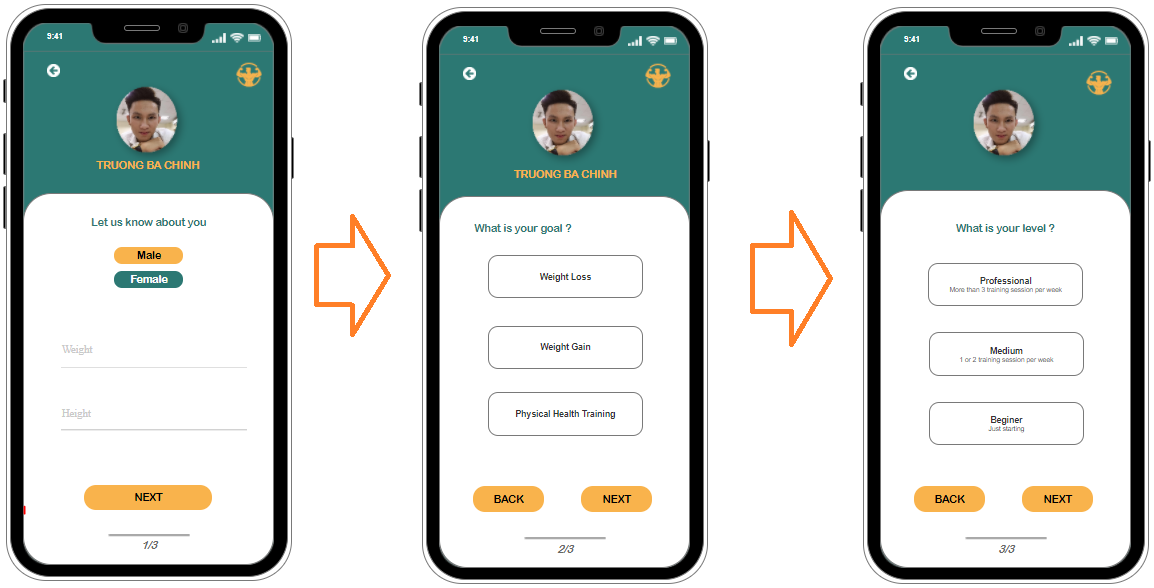

Figure 44 Provide information page.

After the user has successfully logged in, an information collection interface will appear allowing users to receive their information. This makes the application so professional. Based on the user provided data the application will provide reasonable classes for them. The user needs to fill in information or choice and then select the “Next” button to switch to another page and the “Back” button to undo.

- Home page

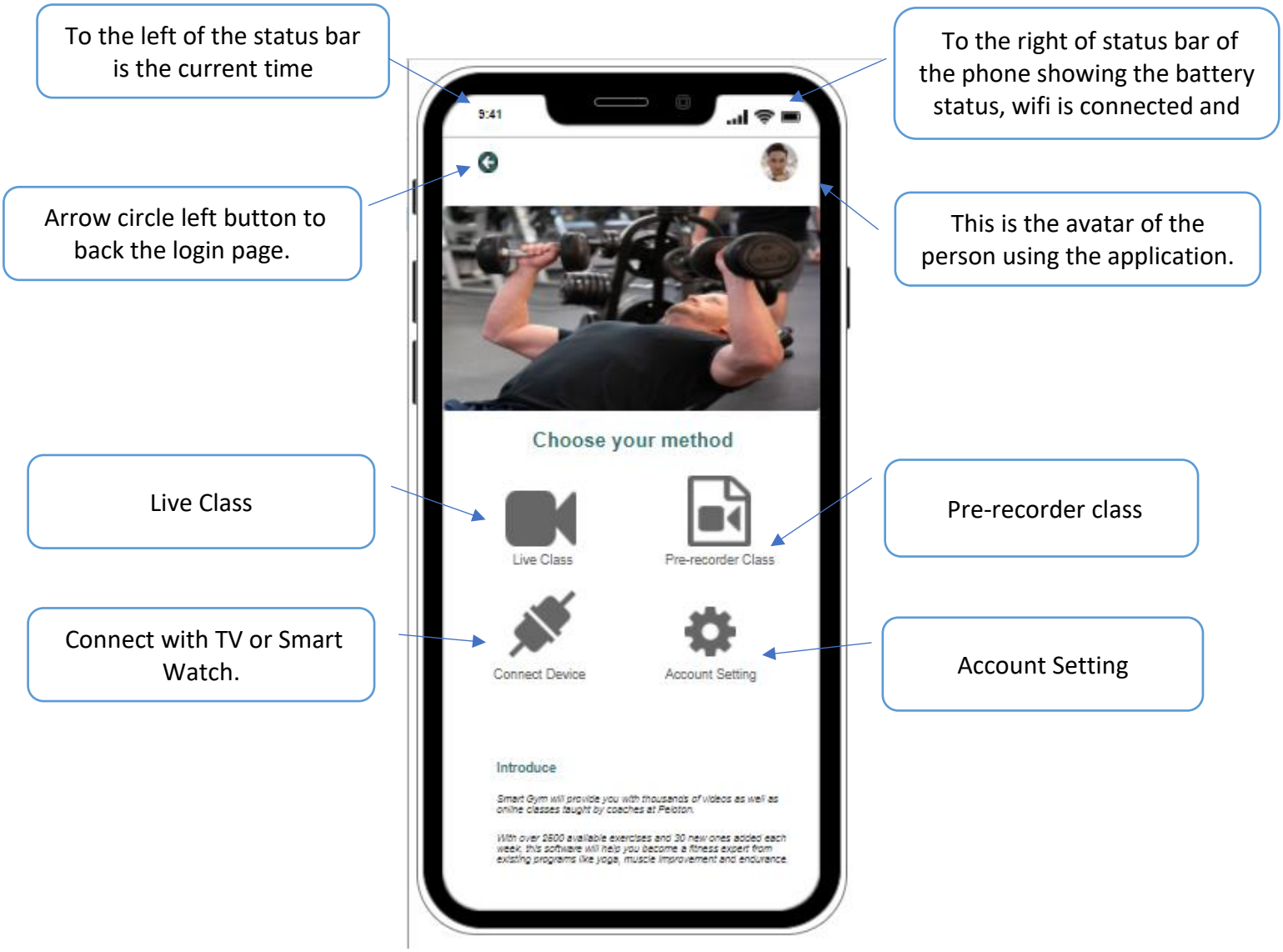

Figure 45 High-fidelity of home page

After a successful login, the Smart Gym home page will appear allowing everyone to perform the operations. There are 4 main features: Join online class, join class pre-recorder, set up account and connect with devices (TV and Smart Watch). Users choose 1 of 4 features to perform their tasks such as, click on the connect device icon to connect the Smart Gym app to your phone or TV or Join a live class by clicking on the Live Class icon. If they do not have time to watch the live streamed classes they can click on the pre-recorder class button to see the previously played class video. In addition, they can view and edit their personal information through the button Cog.

- Connections page.

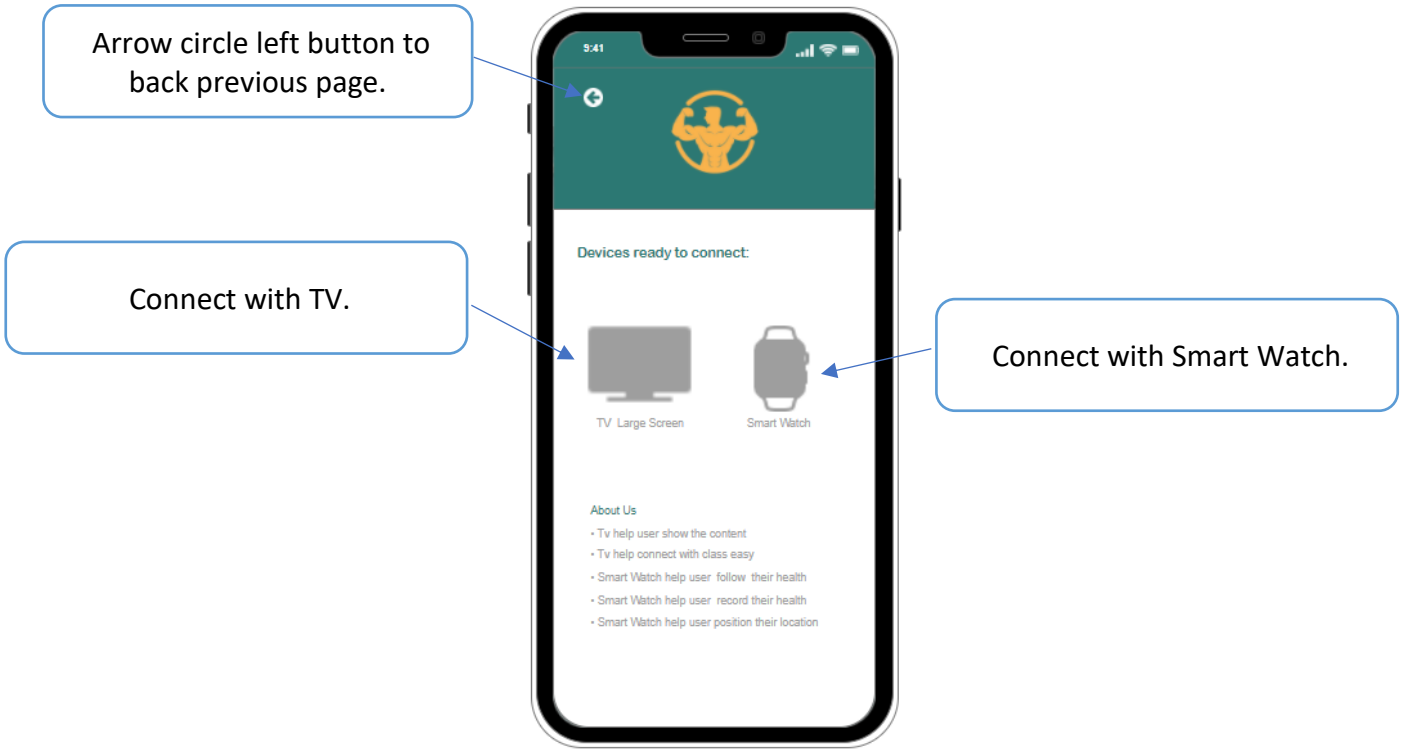

Figure 46 High-fidelity of connections page.

The connections page allow user to connect with TV or Smart watch. After connecting the app with TV device, users can play video from phone to TV. Connect the app to Smart Watch to automatically track heart rate while they work out.

Please using password "**admin123"** to connect Smart Gym app with TV and Smart Watch.

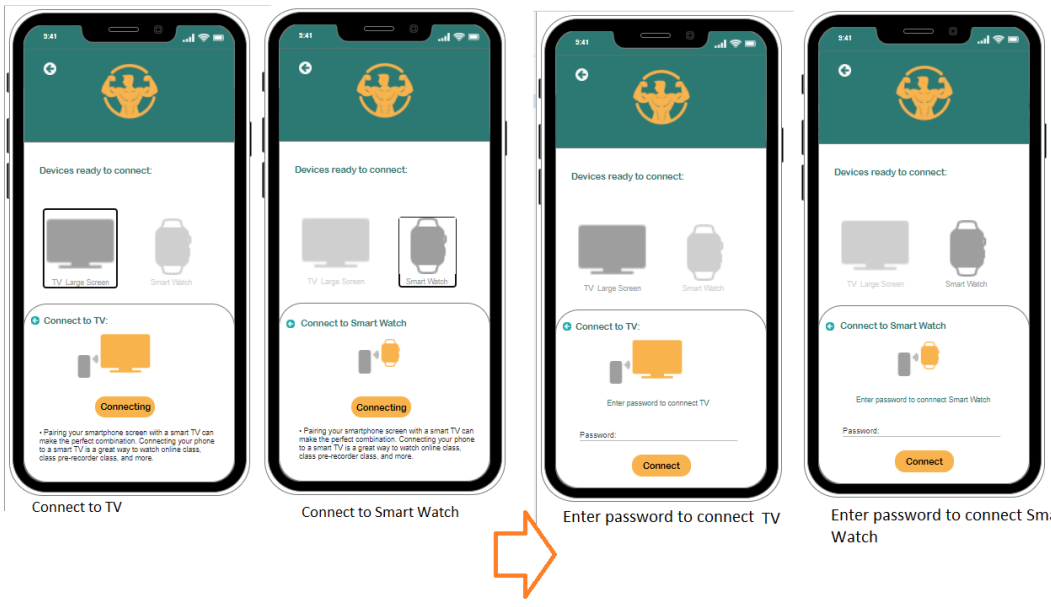

Figure 47 Connect to Smart watch and TV page.

- High-fidelity account setting page.

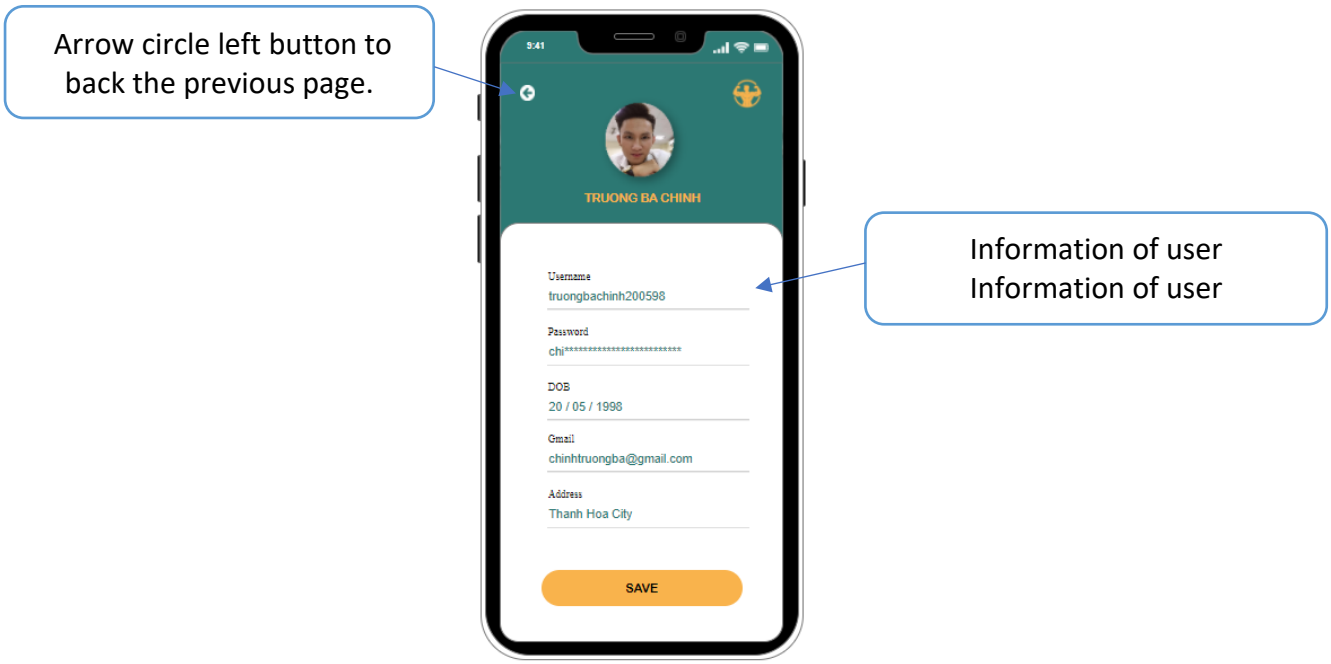

Figure 48 High-fidelity of account setting page.

Users from the main screen click on the Cog icon to go to the account settings page or click on the avatar that appears on each page. This page allows users to keep track of their information stored in the Smart Gym application. User can modify and update his information.

- High-fidelity heart rate page.

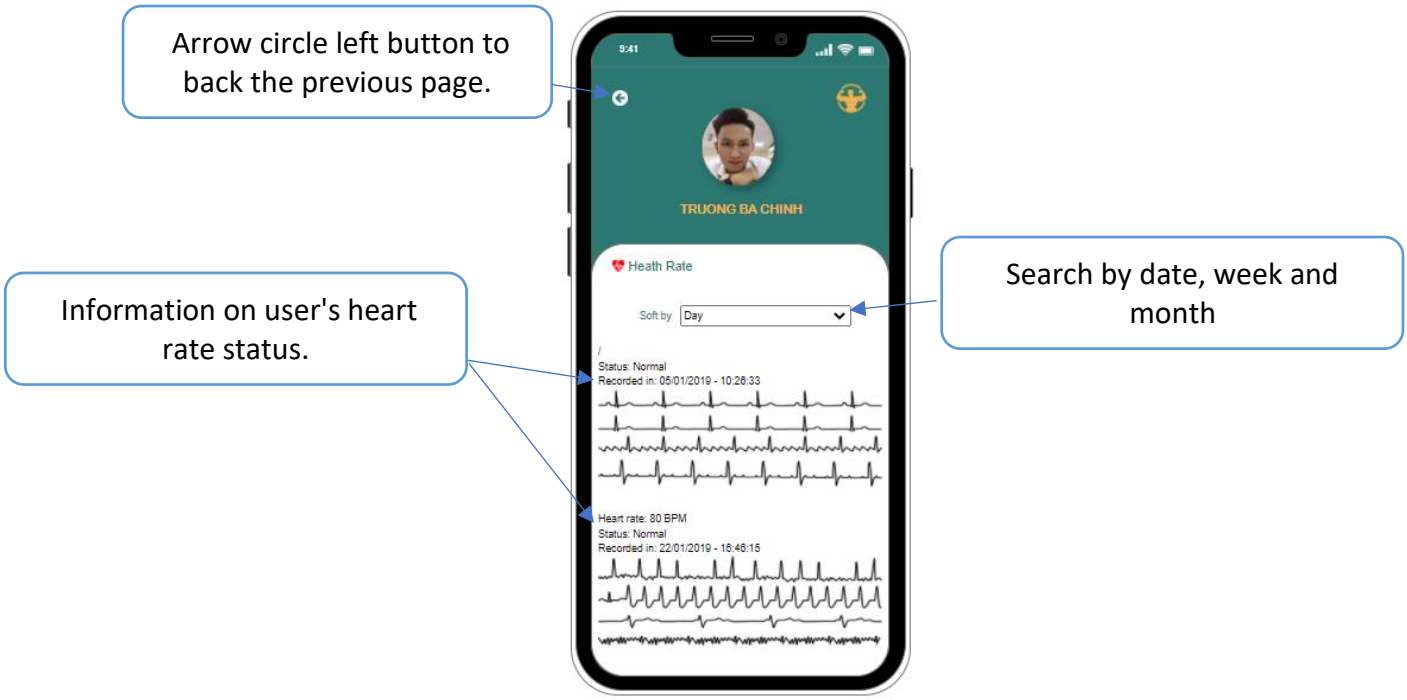

Figure 49 High-fidelity of heart rate page.

A strong heart condition during exercise is very important to the user. If it detects that the heart rate is too high or too low, the user should pause the exercise, so Smart Gym application has provided the ability to measure the user's heart rate during exercise. Users can check their heart rate frequency by day, week and month. Results of heart rate monitoring are displayed as the user's heart rate, status, date taken and heart rate image.

- High-fidelity class page

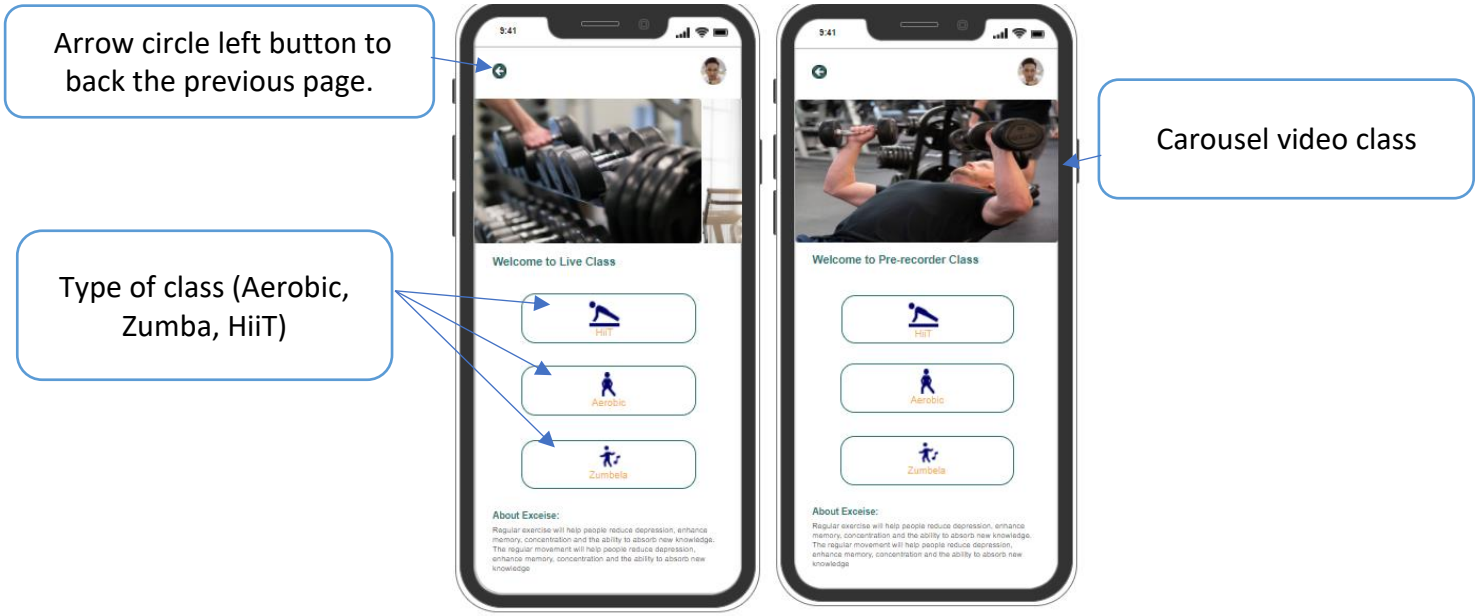

Figure 50 High-fidelity of class page.

This is the first interface when taking fitness classes. There are 3 main types of subjects: Aerobic, Zumba, and HiiT. Users need to choose their favorite subject and practice with that subject through 2 class types, Live Class and Pre-recorder Class.

- Excised in Live class page.

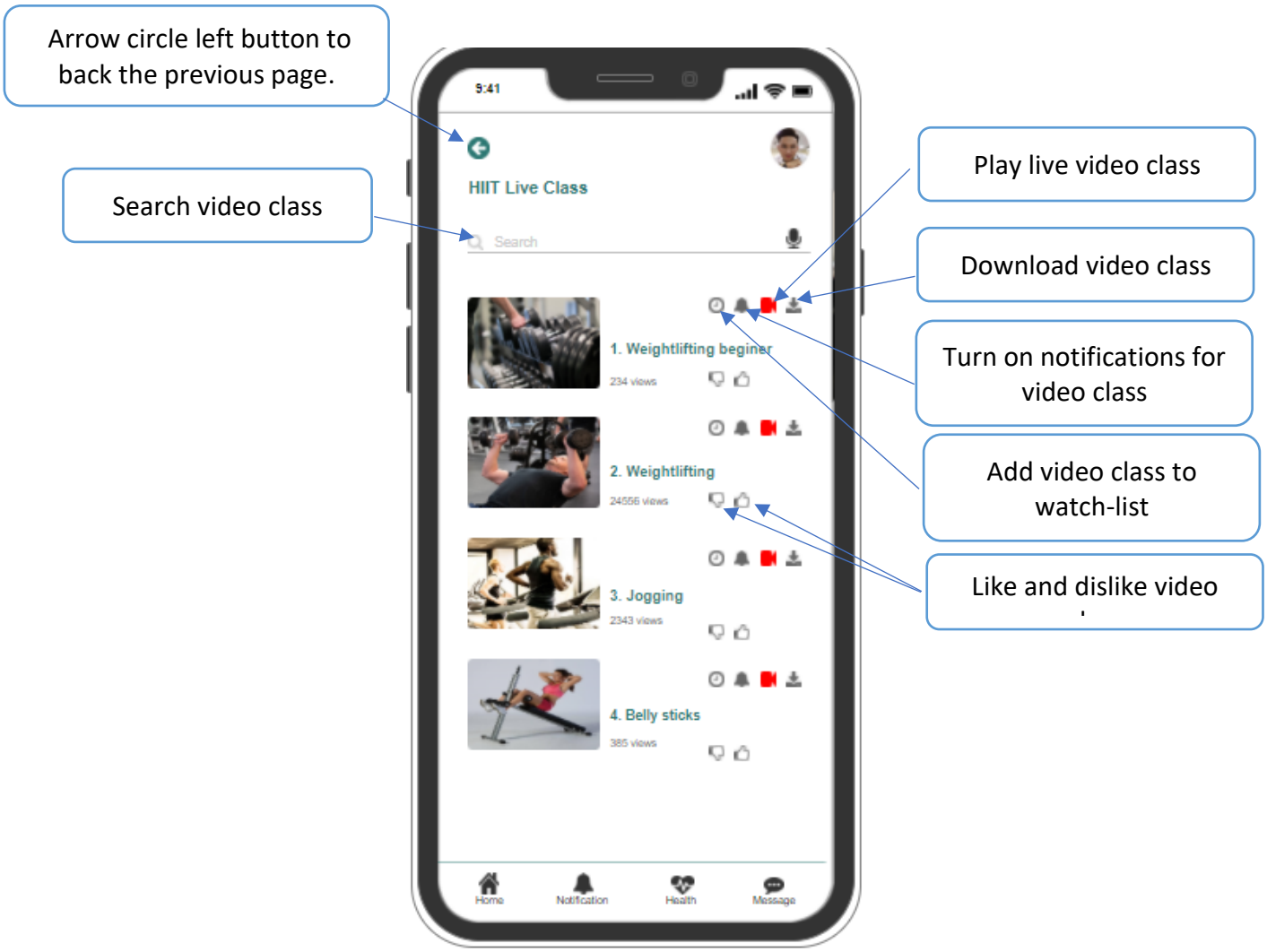

Figure 51 High-fidelity of hitt-class page.

After users choose the type of sport they will participate in the exercise. The application displays a list of fitness classes related to the genre they have selected. This is a snapshot of HIIT classes that allows users to participate by clicking on the red camera icon. Besides, there are options for people to choose such as like class videos or dislike or download them, etc...

- The user interface has joined live classes.

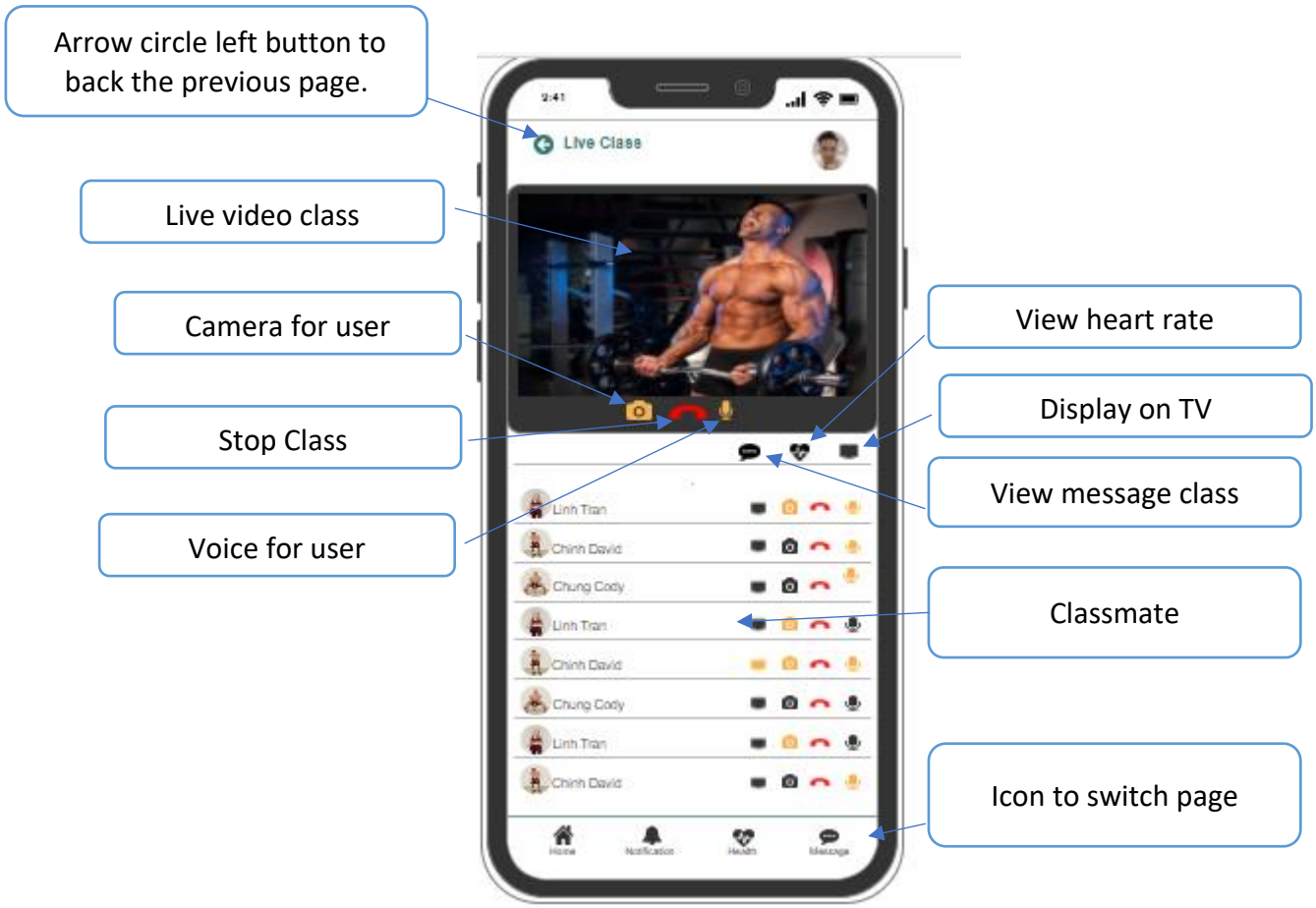

Figure 52 High-fidelity of user interface has joined live classes.

The user will see this interface when they have participated in the live classes. The bottom buttons are, ''Home'' allows them to return to the homepage, ''Notification'' allows them to turn to the notification page, ''Heath'' allows users to switch to the Heart rate and "Message" allows users to turn to the message page. Above is the screen showing the classroom content and in the middle are the members of the class. Users can check their heart rate status when they click on the heartbeat icon, when clicking on the communication icon, the classroom message will appear, and the user can broadcast the content to TV through the TV icon. The picture below shows the process of connecting from a phone to a TV to play class content.

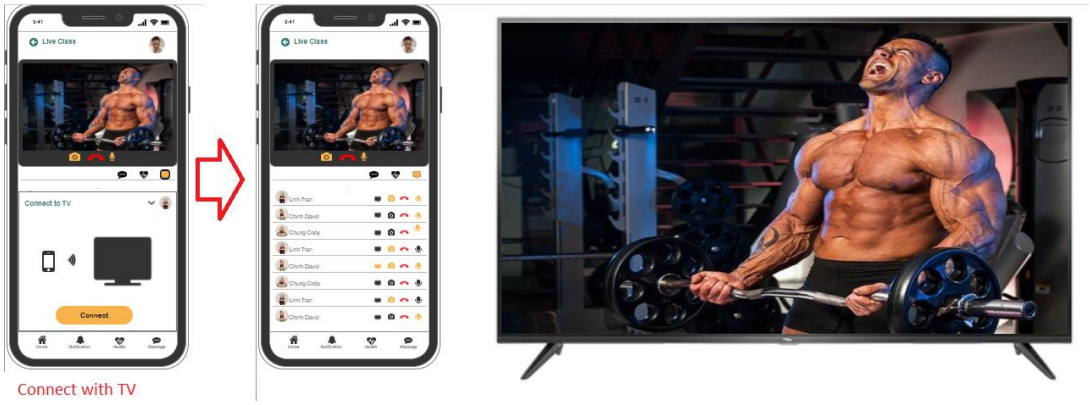

Figure 53 Connect with TV to show content to TV.

- Excises in pre-recorder class.

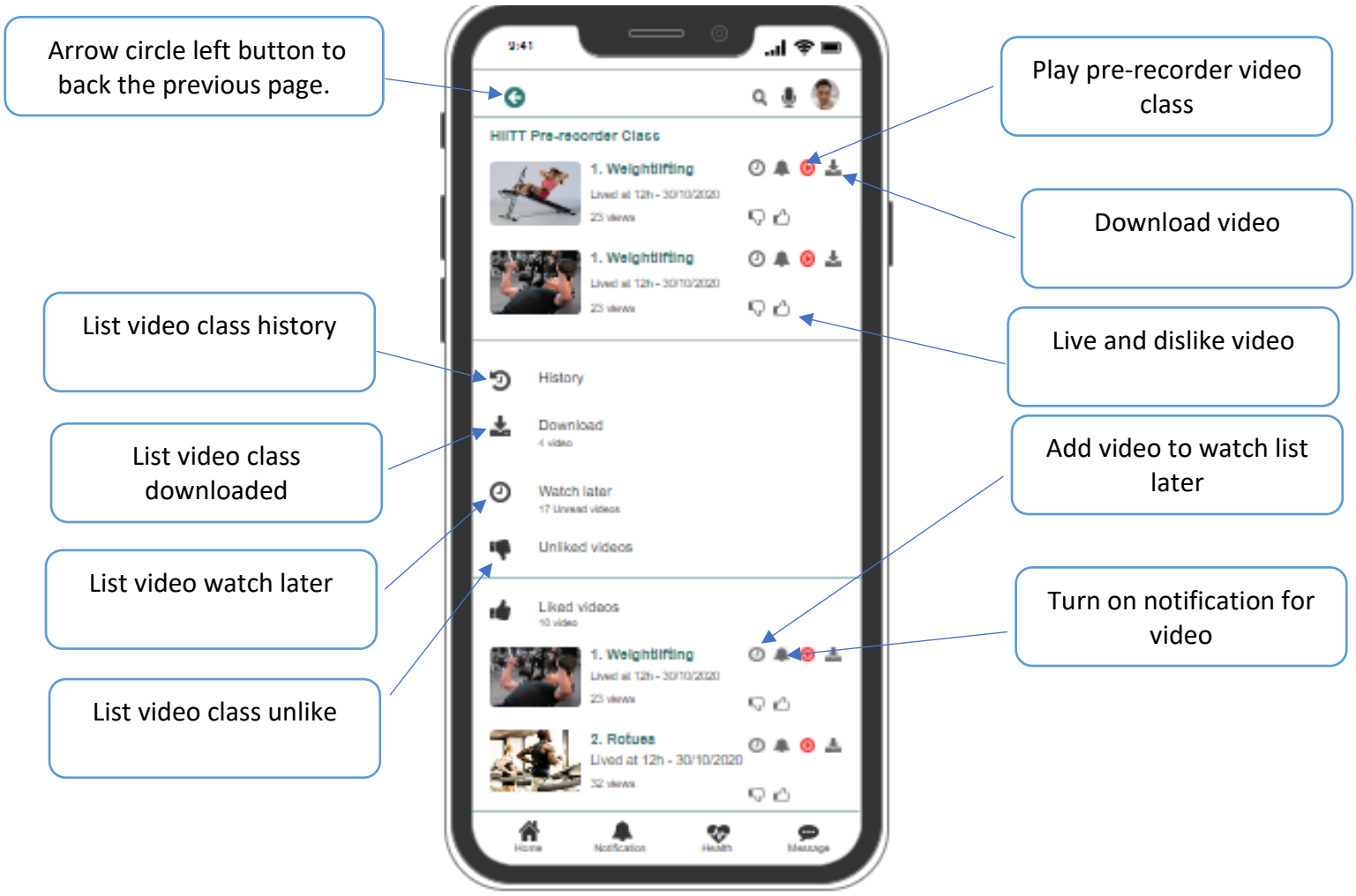

Figure 54 Type excises in pre-recorder class.

As for the pre-recorder class, users can watch previously played class videos that they didn't have time to watch them online. Pre-recorder class also has 3 types of fitness: Aerobics, Zumba and HiTT. User plays the video class by clicking the red play button. They can also add

their favorite video class to the watch list, downloaded videos list or like videos. They also have additional options such as the downloaded video class, the video class watch later, the video class they have viewed before like the image below.

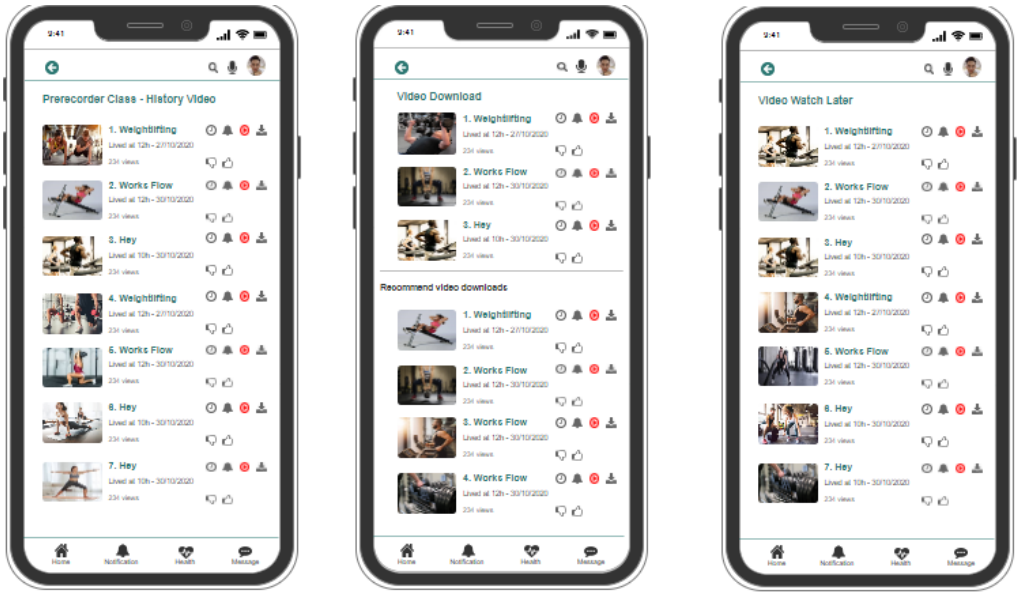

Figure 55 Pre-recorder class option.

- The user interface has joined pre-recorder class.

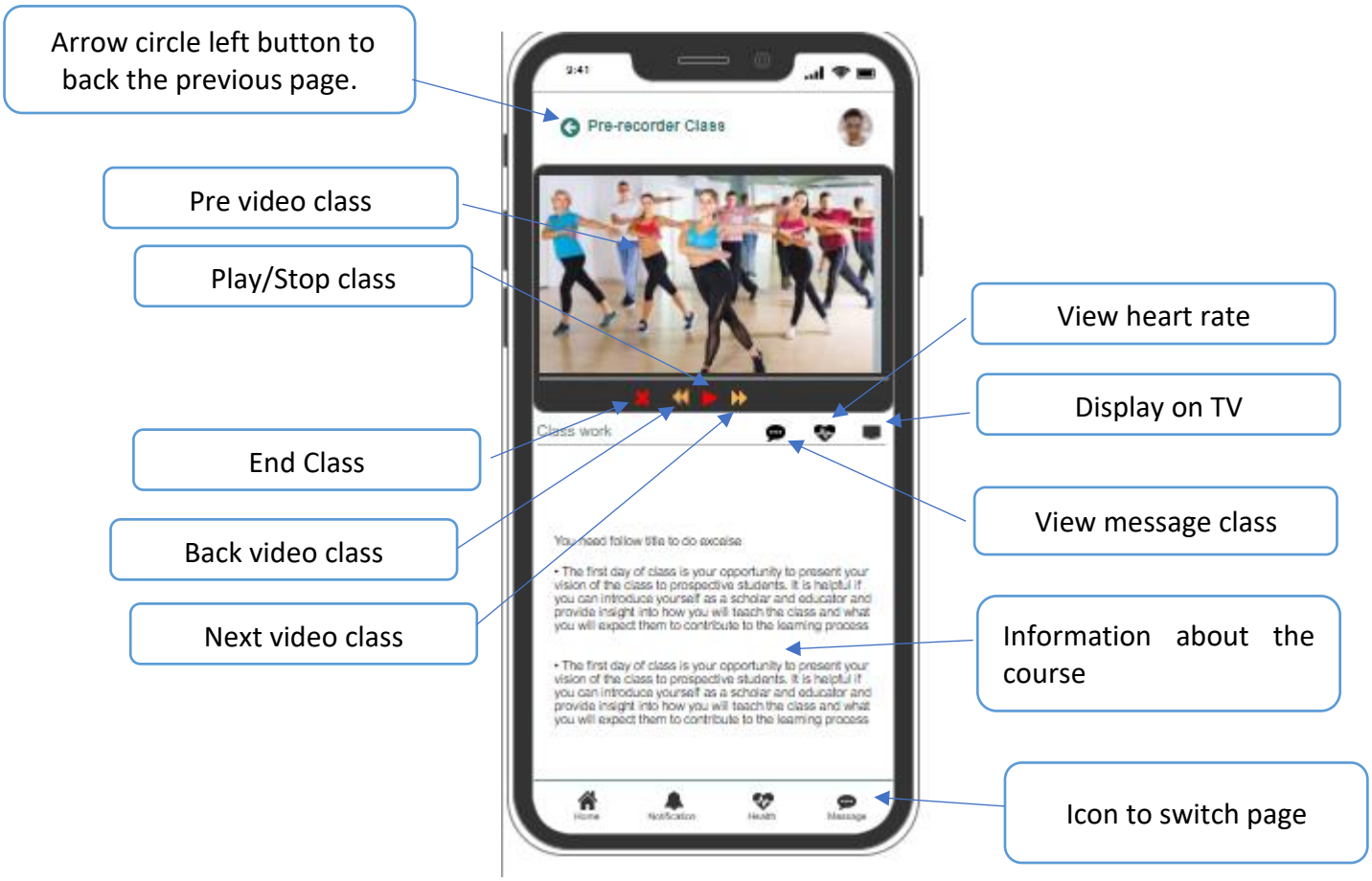

Figure 56 Play video pre-recorder class.

This is the pre-recorder class interface. Just like the live class page the buttons below are the '' Home '' which allow them to return to the homepage, '' Notifications '' allows them to switch to the notification page, '' Heath '' allows the user Switch to Heart Rate and "Message" allow the user to switch to the message page. Users also can check the status of the heart rate when clicking on the heart rate icon like live class, when clicking on the communication icon will appear class notifications, and users can stream content to the TV through the TV icon. The picture below shows the process of connecting a phone to a TV to play pre-recorder class content.

Figure 57 Connect with TV to show content to TV.

- Heart rate Interface in class.

Figure 58 Heart rate interface in class.

When the user clicks on the heartbeat icon. Their heart rate parameters will appear as shown above.

- Pre-recorder class message.

Figure 59 Message in class.

Users check their messages by clicking the communication icon. An animated message box appears about what people are talking to.

- Class message page.

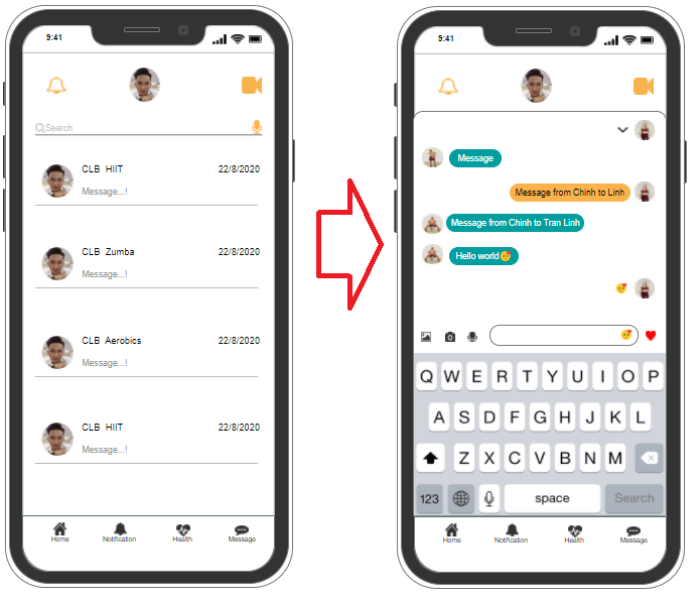

Figure 60 Class message page.

The message class page is where people exchange information about subjects. It makes it easier for everyone to get acquainted with each other and update the classroom situation easier. When a user clicks on a club, a message pops up telling them what information is being discussed or discussed.

- Notification page.

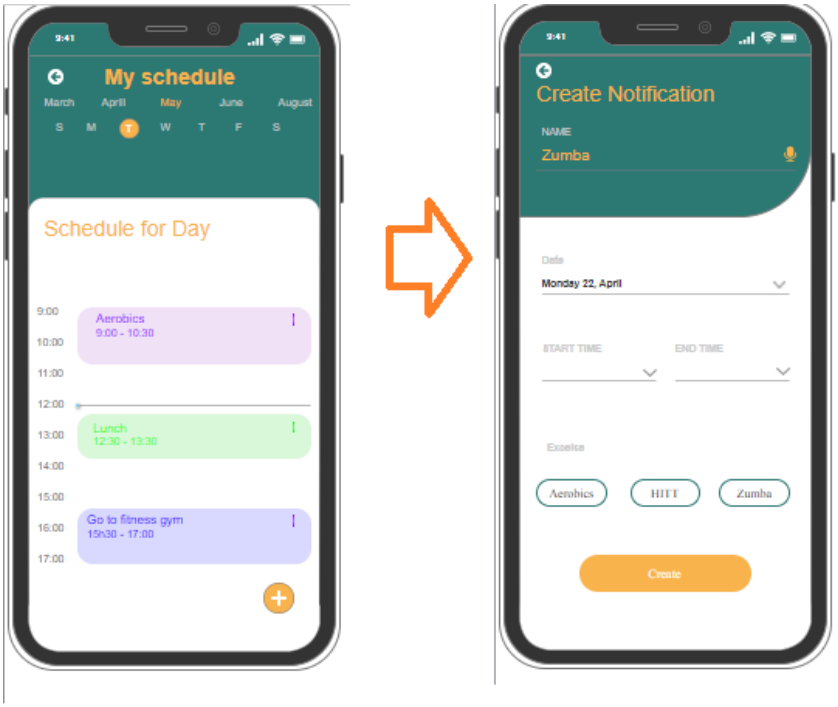

Figure 61 Notification page.

To make it easier for people to remember schedules for fitness classes. The app has added notification enabled for classes. Users can add new notifications by clicking on the button on the right hand side of the application. A new page appears allowing people to enter information in the dialog box. After that they click button “Create” to complete the process of enabling class notifications.

- Smart Watch interface.

In addition, the Smart gym application also allows users to perform a number of tasks on the phone such as receiving class messages, notifying fitness classes, measuring heart rate, walking and total activities performed.

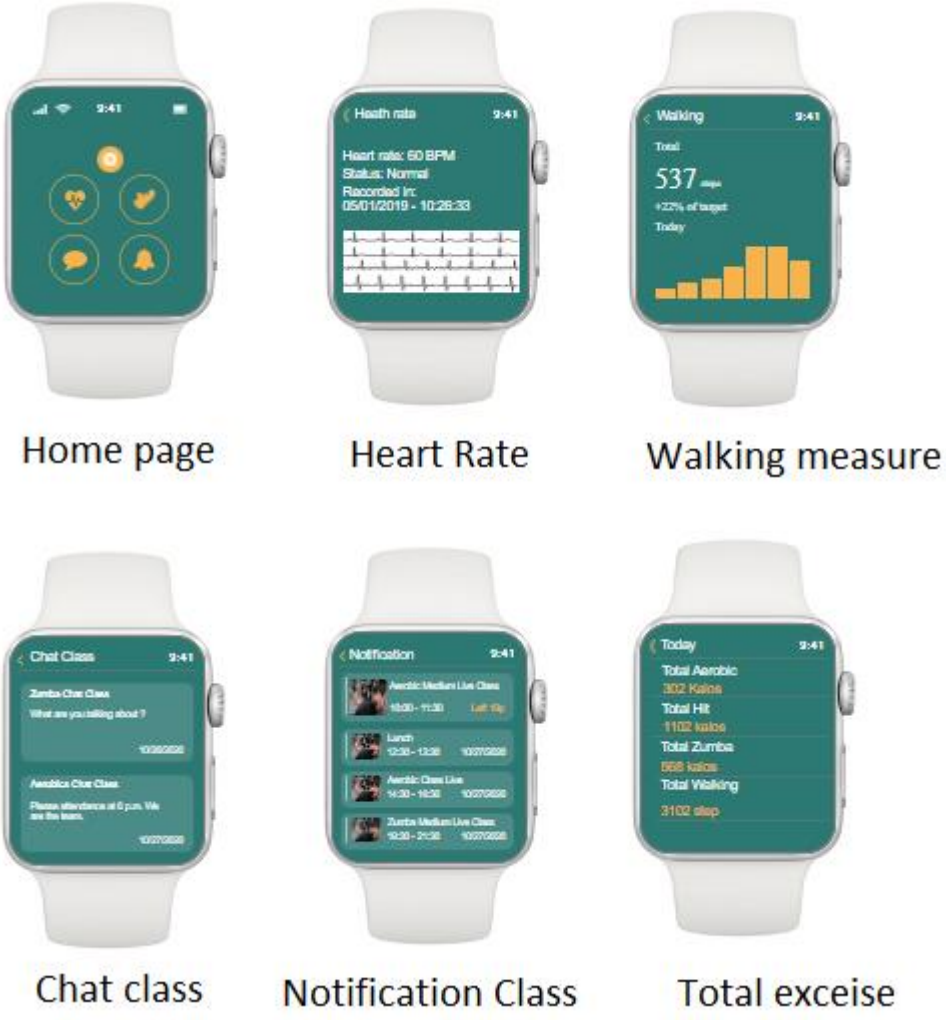

Figure 62 Smart Watch

From the images together with the above explanation, it shows that the prototype that the Smart gym app designer has put forward has effectively applied the principles of interactive design. The prototype has also been reviewed and evaluated by tutor to suit the user's experience and wishes. The design is kept consistent throughout the application. The functions of the Smart gym application have met all the requirements of the user. The app also makes user interactions easy to learn and easy to remember operations.

5. Research Study.

The importance of understanding the problem of conducting research plays an important role. After understanding the nature of the problems in the research process. It helps designers specifically define what and why they're doing, and identifies ways that users will aid in interacting with the product. (Interaction Design. Beyond Human-Computer

Interaction, 2002, p. 62). Designers need to define usability and user experience goals for the Interactive Design of Smart Gym.

The goal of UX is to make its users feel productive, entertaining, and creative. The goal of usability is Smart Gym application to help users make good use of their time, avoid wasting energy to perform tasks. Once you've learned how to use the Smart Gym app, users can easily remember how to use the app. The app will provide users with a platform to join hands-on practice classes through the phone. Besides, the design of the buttons or icons of the application is easy to remember and is easy to define and using (Sharp, 2015, p. 75).

From the UX and usability goals of Smart Gym application, designer needs to start by developing a research hypothesis from the relationship between 2 variables. The hypothesis should be presented clearly by the researcher about what Smart Gym application is about. A good hypothesis usually has the following features, hypothesis must be correct, hypothesis must be meaningful, and the relationship described must be tested through independent variable and dependent variable.

- Questions and assumptions in research.

To confirm the hypothesis of Smart Gym application. The research questions have been used are

  - Design applications that make users feel satisfied, easy to use or not?

From the questions above, it is possible to determine that the arguments are design the interface of Smart gym application and user feel about the application. To turn a research question into an experimental hypothesis, Smart Gym app designers need to identify key variables and make predictions about their relationship to each other.

Arguments	Independent variable	Dependent variable
Design the interface of Smart gym application and user feel about the application	Complexity of Smart Gym application	Application response time, accuracy of buttons, time to complete the task.

Table 3 Independent variable and dependent variable.

After understanding the smart gym application under study, the hypothesis is given.

  - ”Smart gym app bring good user experience to young people and easily learn”.
  - “The design of the Smart Gym application is good for users to easily remember and use them as a highly effective application.”

Smart Gym app designers need to test assumptions by gathering data from study participants to find answers and support the hypothesis. General, in this session the designer needs to do an experimental research to test the assumptions the designer made when designing the prototype for the Smart Gym application. According to (Kellogg, 2014, p. 191)

“experimental research aims to show how the manipulation of one variable of interest has a direct causal influence on another variable of interest (Cook & Campbell, 1979)”.

- Research participants

Research participants play an important role in the Smart Gym application. Research would not be performed without any participants in the study. Research results and procedures are routinely applicable to a large population. Therefore, the Smart gym application designer must choose a sample chosen from a population and to represent that population. Smart Gym is an application designed to bring a good experience to young users by allowing them to participate in online fitness classes. Therefore, the target audience of the application is young people. The method used in Smart Gym application research for sample selection is convenience. Choosing a convenient method to determine the participants of the Smart gym application helps the app designer avoid deviation because the method is selected based on randomness and convenience, which helps to reduce errors and overall results are more accurate. The identification of population and sample helps to make the research purpose clearer. From the results collected and analyzed, designer will have suggestions or contributions to improve the app and make it good and meaningful for younger people.

- Performing research

Survey data collection methods chosen to clarify the proposed hypothesis. The survey is conducted using Google forms and then it is sent to the sample to collect data from them. The purpose of the survey is to answer questions about whether users are satisfied with the design of Smart Gym apps through the questions below.

1. What's your (first) impression of the Smart Gym app?
    - Poor.
    - Pair.
    - Good.
    - Very good.
2. How do you feel about your experience when you finish using Smart Gym app?
    - Poor.
    - Pair.
    - Good.
    - Very good.
3. How do you rate the connection with other devices on the Smart Gym application?
    - Poor.
    - Pair.
    - Good.
    - Very-good.

4. Does the design of the important content of Smart Gym app catch your attention?
    - Yes.
    - No.
5. Do you feel the buttons of Smart Gym application have common meaning, easy to recognize?
    - Yes.
    - No.
6. When doing manipulations to join a live fitness class. Do you find these steps easy to remember?
    - Yes.
    - No.
7. When you perform operations on the app. How do you feel the response time of the operations is?
    - Poor.
    - Pair.
    - Good.
    - Very-good
8. Do you find features like heart rate measurement during workouts, Voice Search it useful?
    - Very helpful and supportive.
    - Quite good.
    - Unhelpful.
    - N/A Not applicable.
9. How would you rate this application to be reliable and used?
    - Poor.
    - Pair.
    - Good.
    - Very Good.

- Appendix – Survey result.

Here are the results I got from the answers of 15 test users. Usability researchers can rely on this collected data to analyze the results against the hypothesis.

- Question 1. What's your (first) impression of the Smart Gym app?

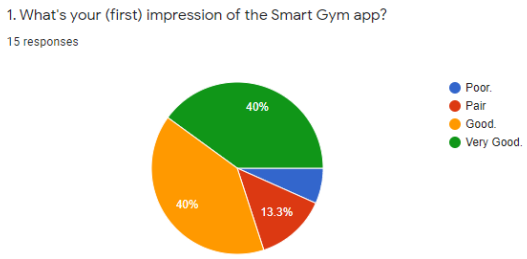

Figure 63 result of question 1.

- Question 2. How do you feel about your experience when you finish using Smart Gym app?

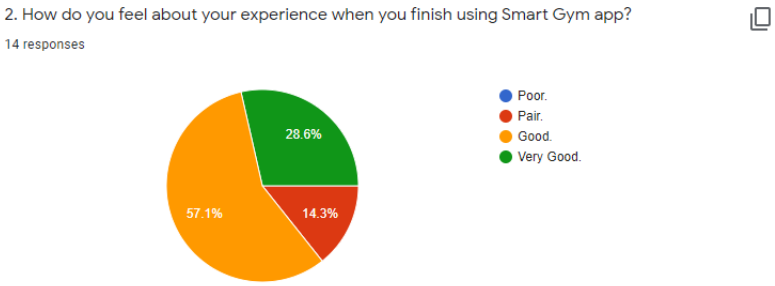

Figure 64 result of question 2.

- Question 3. How do you rate the connection with other devices on the Smart Gym application?

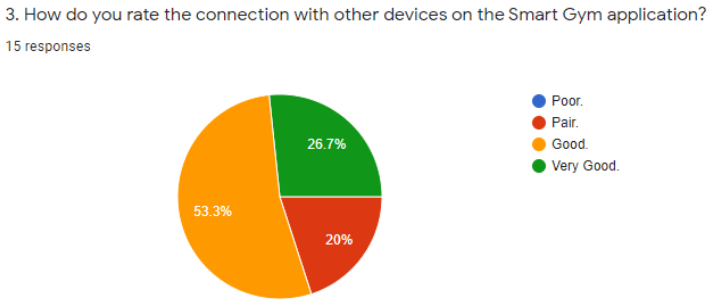

Figure 65 result of question 3.

- Question 4. Does the design of the important content of Smart Gym app catch your attention?

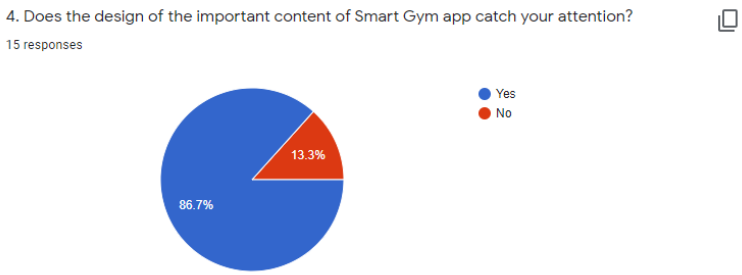

Figure 66 result of question 4.

- Question 5. Do you feel the buttons of Smart Gym application have common meaning, easy to recognize?

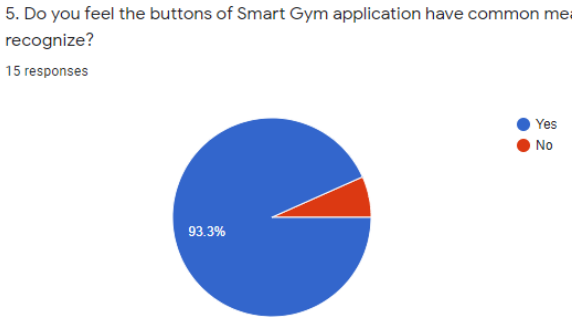

Figure 67 result of question 5.

- Question 6. When doing manipulations to join a live fitness class. Do you find these steps easy to remember?

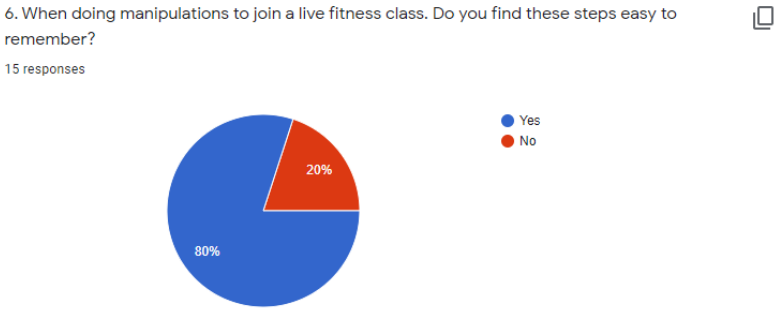

Figure 68 result of question 6.

- Question 7. When you perform operations on the app. How do you feel the response time of the operations is?

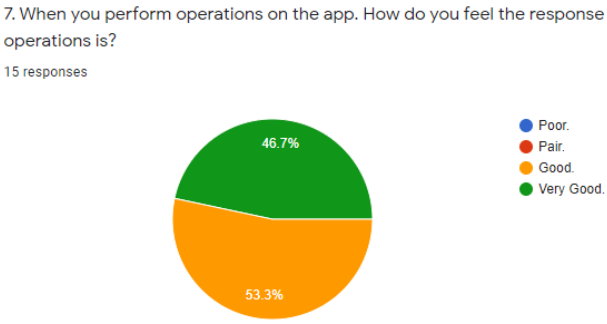

Figure 69 result of question 7.

- Question 8. Do you find features like heart rate measurement during workouts, Voice Search it useful?

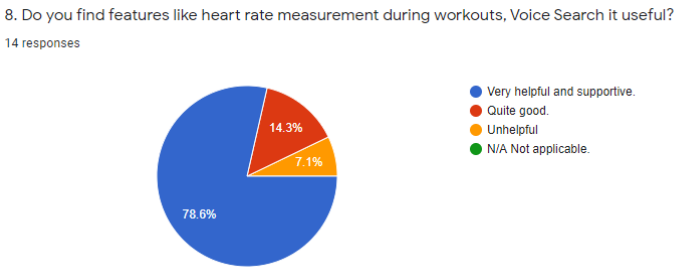

Figure 70 result of question 8.

- Question 9. How would you rate this application to be reliable and used?

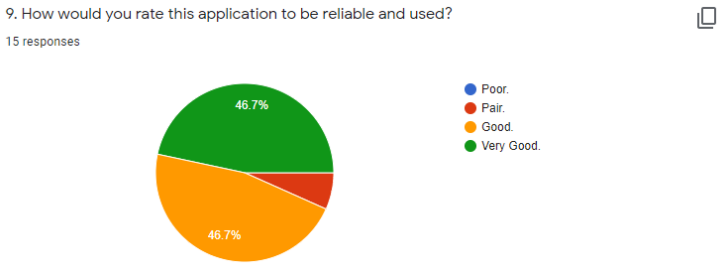

Figure 71 result of question 9.

- Analysis the result of collection data

After data collection from users is completed. Smart Gym app designer need to analyze test results using quantitative research. The data collected from the survey will be statistical analysis to determine whether the study results support the original hypothesis and whether the results are statistically significant. Data after being collected from users. Designers need to process raw data before analysis by converting the collected data into numbers or presenting them in the form of graphs or statistics. Statistical analysis is a very good way to analyze data, it will describe the data the designer collects and its variability. Designer use scatter charts or frequency tables to visualize the data collected and verify that the trends of the collected data are in line with the original assumptions. After performing data analysis, an extremely important step to take is to perform heuristic evaluation. It is a method that helps Smart Gym app designers test the usability of the application and identify problems in UI design.

- Heuristic evaluation

According to (Foundation, 2002) Heuristic evaluation is a process professional's use to measure usability of the user interface. For Smart Gym app, evaluation are important to test user requirements for Smart Gym apps. Evaluation helps designer's perfect prototypes of Smart Gym applications. From the prototypes that have been completed, the designer can collect information to develop the application into an actual application that benefits the

user. Nielsen's heuristics has given general criteria for the usability of interfaces. Based on those criteria, below is an evaluation of the usability of the Smart Gym App's interface.

interface usability criteria of Smart Gym application	
1	**Visibility of system status** • Smart Gym application responds promptly and appropriately to provide information to users. • Smart Gym application only responds to actions from the user. Application without spontaneous actions.
2	**Match between the system and the real world** • The words, symbols and concepts used in Smart Gym app are common languages known and used by many people. For example, Smart Gym application language is English. • The Metaphor in Smart Gym application is designed to be easy to understand and has a symbolic meaning. • The information and content of Smart Gym application are arranged logically and scientifically
3	**User control and freedom** • User can control Smart Gym application easily • Users can easily exit and stop the application at any time, Even if they make a mistake while using Smart Gym application. • There are buttons that allow the user to undo their actions and redo them
4	**Consistency and adherence to standards** • Words, concepts and icons of Smart Gym application are uniformly designed. There is no deviation, for example, a symbol in Smart Gym app has no two meanings.
5	**Error prevention, in particular, prevention of peripheral usability-related errors.** • Smart Gym application is scientifically designed. Users cannot easily encounter serious errors during use that affect the entire application. If they get an error they can use the arrow left button to back it up
6	**Recognition rather than recall** • Smart gym application is designed with a simple interface, all operations on the application are presented as options. Therefore, users can easily perform their tasks without having to remember them.

7	**Flexibility and efficiency of use** • Smart Gym application allows users to exercise in different levels from beginners, medium and professional.
8	**Aesthetics and minimalism in design** • The Smart Gym application is simply designed without too many notifications during their use, this makes users concentrate during learning through the application.
9	**Recognition, diagnosis, and recovery from errors** • Error messages in Smart Gym application are shown in single solver language with red font. Success notifications are shown with blue font. Notifications in Smart Gym application are given quickly, specifically, from which users can fix early. For example. User entered incorrect account and password to access the application. message "individual username or password '' appears in red text
10	**Help and documentation** • The designer has provided documents describing the process of using Smart Gym application easily and in detail.

Table 4 Heuristic evaluation (Ssemugabi, 2010).

In general, the above results show that the smart gym application has met the criteria for the ability to use the interface. From then it can be realized that, the hypotheses have been given completely consistent with the Smart Gym application.

6. Conclusion.

In this session. A reflections are provided to reflect the work performed during project implementation.

- Reflections of process and frameworks

Actually in order to do a research or an effective design, the designer needs to follow the existing processes and framework. That gives them an overview of what they are going to do. For Smart Gym application design process. Designers first selected the process and the frame words to apply to the design process. However, choosing a framework to apply for Smart Gym is difficult for those who do not know about process and frame words for designing. Therefore, the designer discussed three widely used frame words: User-Centered Design, Goal-oriented Design and Participatory Design. The discussion provided the designer with an overview and understanding of the processes for Smart Gym application development. And UCD is the framework of choice for designing Smart Gym apps. The UCD makes the design more obvious. It serves as a supporting framework for designers to design

smart gym apps faster and more efficiently. Designers do not spend time analyzing application architecture to "create" things others have done very well. It save time for designer. And the UCD process gives me an overview of the steps taken in the design process of Smart Gym applications. Designers have followed the steps in a sequential manner to ensure that Smart Gym app design is on the right track and avoided unexpected mistakes.

- Reflections cognitive psychology

Cognitive psychology and cognition plays an important role in the process of implementing Smart Gym application design. In the process of designing Smart Gym application. The role and importance of Cognitive psychology and cognition have been discussed. Cognitive Psychology and cognition help designers understand the user's cognitive process. This helps them to design Smart Gym application more accurately. Designers can use cognitive issues like learning, attention, and memory to design their apps. This makes the Smart Gym application easier to draw attention to the more important content, Users can easily remember the actions when using the application. In addition, the understanding and application of cognition and in the design process. Designers can accurately convert the user's requirements into their designs. It brings greater efficiency to the design process of Smart Gym apps.

- Reflections of interaction design theory

In this section a discussion of the types of interactions the user typically performs in order to interact with the system has been performed. There are 4 main types of interactivity discussed: instructing, conversing, manipulating, and exploring. The choice of interaction type also plays an important role in the design of Smart Gym apps. If the designer chooses the wrong type of interaction it can affect the whole process of designing Smart Gym application. Therefore, it is difficult for app designers to make their decisions about what kind of interaction to choose for Smart Gym apps. Making selection easier this discussion provides designers with information and understanding of modes of interaction and how a system interacts with users. From there, a Smart Gym app designer can easily choose the main type of interaction that Smart Gym app will perform is manipulating.

- Reflections of Design Process

The design process is divided into two parts, the first part is the implementation of research activities to develop the conceptual design of Smart Gym applications and the second part is develop conceptual design. Concept design development is difficult if research steps are not taken. Initially the designer did not determine what is required for the concept

design of Smart Gym application. Therefore, research on the conceptual design development of Smart Gym applications makes designers closer to product users. Designers proceed to collect comments from users about their wishes for Smart Gym application. The results of the study give the Smart Gym app designer new ideas to implement the conceptual model of Smart Gym application. The conceptual model of Smart Gym app got better.

- Reflection of Prototype

Prototypes are draft versions of products that allow designers to explore and express their ideas. Three prototypes have been provided: the low fidelity prototype, the mid-fidelity prototype and the high fidelity prototype. Each type of prototype will have its own advantages and disadvantages. For the low-fidelity prototype design process, designer had difficulty designing them on paper. Designing on paper took a lot of time compared to using tools like draw.io. However, the low-fidelity design allows designers to easily create their ideas so that the Smart Gym app has become more attractive and has a more eye-catching user interface. User ratings of Smart Gym application very high. For the mid-fidelity prototype, designers have presented details about navigation, functionality, content and layout, but in the form ("wireframe"), mid-fidelity prototype design is cost and time lower than high-fidelity. However it also provides a full range of simulated interactions for use and it is used as a reference for the functional specification of the Smart Gym application. The high-fidelity prototype design takes the designer a lot of time, especially when there is a change request from the user or a mistake in the design process, the designer takes a lot of time to edit them. However, the high-fidelity prototype accurately simulates the end-product's performance and interface with a highly refined design with advanced functions allowing the user to experiment with precision.

- Reflection of Research Study.

In this section the researcher has provided how to do the research that any usability researcher could run the study, Questions and assumptions about the application have been raised. Along with ways to clarify the hypothesis is also under construction. The designer also provides questions to collect data from the users. From the collected data the designer provided a way to analyze data and support the hypothesis using quantitative methods. The process of understanding and suggesting how to conduct the research should not pose any difficulty, as the designer already has knowledge of user research prior to prototyping. Besides, the user's research questions are also based on cognitive psychology and cognition to help questions become more intelligent and collect the correct data.

In general, after completing the project, the designer noticed some difficulties in the writing process such as communicating psychology and awareness to the reader, while designing the medium-fidelity prototype was difficult, because the documentation for the medium-fidelity prototype design is not really rich. However, with the research interest and time and dedication to try to complete the coursework well. The coursework has been completed and provided with complete information to readers. And they can see this as a reference to their research. Here are some solutions to help you do your research better. The research question should be provided to the tutor to evaluate the question. They will have suggestions for better and more effective questions. Besides, survey questions will provide more answers for users to choose (good, pretty good, bad) instead of yes or no.

After the research process is completed, the Smart Gym Application Designer will rely on the research results to change and edit the necessary details and carefully examine the features and design of the application. Smart Gym. Besides, the designer should check whether the Smart Gym application has met all the requirements or not. Next, the designer will hand over the design to develop the design into an application for the user.

7. References

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