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Coursework

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Table of Contents

1. Introduction.....	6
2. Background Literature	7
2.1. HCI Research.....	7
2.2. HCI Theory	7
2.2.1. Interaction design principles and interaction design patterns	7
2.2.2. Investigation in cognitive psychology	7
2.2.3. Interaction design theory	8
2.2.4. Types of interaction and modes of interaction	8
3. Design Process	9
3.1. Conceptual Design.....	9
3.1.1. User requirement	9
3.1.2. Problem statement and design solutions.....	9
3.1.3. Hierarchical model.....	10
3.1.4. Conceptual model	11
3.2. Design Principles	12
4. Prototype.....	13
4.1. Low-fidelity Prototype.....	13
4.2. Mid-fidelity Prototype	17
4.3. Physical Prototype	30
5. Research Study	31
6. Conclusion	32
References.....	33
Appendix A – The list of metaphor plan to use for UnderSea	35
Appendix B – The questionnaires in the survey	36
Appendix C – The analysis of the responses of all survey takers	40
Appendix D – The list of Heuristic of mid-fidelity used for UnderSea	45

Table of Figures

Figure 1: The hierarchical model of the coursework	10
Figure 2: The conceptual model of the coursework	11
Figure 3: Sign-in page of low-fidelity prototype	13
Figure 4: Sign-up page of low-fidelity prototype	13
Figure 5: Community page (Homepage) of low-fidelity prototype	14
Figure 6: Dive log page (Managing track page) of low-fidelity prototype	14
Figure 7: Library page (Managing photos/videos page) of low-fidelity prototype	15
Figure 8: Account page of low-fidelity prototype	15
Figure 9: Setting page of low-fidelity prototype	16
Figure 10: Sign-in page with usual, successful sign-in, unsuccessful sign-in	17
Figure 11: Sign-up page with usual, successful sign-up, unsuccessful sign-up	18
Figure 12: Recover password page with usual, successful fill out, unsuccessful packing out	19
Figure 13: Community page	20
Figure 14: Interact with liking posts	20
Figure 15: Create a post interface	20
Figure 16: Successfully created post	20
Figure 17: The post visible	20
Figure 18: Dive log page	21
Figure 19: Track details	21
Figure 20: Usual share track interface	21
Figure 21: Successfully shared track interface	21
Figure 22: Successfully deleted track interface	21
Figure 23: The track is invisible	21
Figure 24: Edit track function with usual editing and success	22
Figure 25: The track changed	22
Figure 26: Search by name function	22
Figure 27: Search by location function	22
Figure 28: Search by time function	22
Figure 29: Add new track function	22
Figure 30: Tracking dive interface on the phone and watch while tracking	23
Figure 31: Taken a photo while tracking	23
Figure 32: Recording videos while tracking	23
Figure 33: Successfully tracked dive	23
Figure 34: The track is visible	23
Figure 35: Track details of recent track	23
Figure 36: Full size of the media in track details	23
Figure 37: Library page	24
Figure 38: Taken photo	24
Figure 39: Recording video	24
Figure 40: Recorded video	25
Figure 41: View full-size image function	25
Figure 42: Usual share photo/video interface	25
Figure 43: Successfully shared photo/video interface	25
Figure 44: Successfully deleted interface	25
Figure 45: The photo/video is invisible	25
Figure 46: Account page	26
Figure 47: Turn on/off notification function	26
Figure 48: Interact with liking posts	26
Figure 49: Delete account alert	26
Figure 50: Edit post function with usual editing and success	26

Figure 51: The post changed.....	27
Figure 52: Edit profile function with usual and editing.....	27
Figure 53: Edit profile function with fail and success.....	27
Figure 54: The profile changed.....	28
Figure 55: Reset password function with usual and editing	28
Figure 56: Reset password function with fail and success	28
Figure 57: Setting page with a usual (light) and dark theme.....	29
Figure 58: Open compass function	29
Figure 59: Convert length unit.....	29
Figure 60: Convert temperature unit.....	29
Figure 61: Help & Support function.....	30
Figure 62: About software function.....	30
Figure 63: Physical design of the project	30
Figure 64: The questionnaires in the survey (1)	36
Figure 65: The questionnaires in the survey (2)	36
Figure 66: The questionnaires in the survey (3)	37
Figure 67: The questionnaires in the survey (4)	37
Figure 68: The questionnaires in the survey (5)	38
Figure 69: The questionnaires in the survey (6)	38
Figure 70: The questionnaires in the survey (7)	39
Figure 71: The questionnaires in the survey (8)	39
Figure 72: Question 1 in the survey.....	40
Figure 73: Question 2 in the survey.....	40
Figure 74: Question 3 in the survey.....	40
Figure 75: Question 4 in the survey.....	41
Figure 76: Question 5 in the survey.....	41
Figure 77: Question 6 in the survey.....	41
Figure 78: Question 7 in the survey.....	42
Figure 79: Question 8 in the survey.....	42
Figure 80: Question 9 in the survey.....	42
Figure 81: Question 10 in the survey.....	43
Figure 82: Question 11 in the survey.....	43
Figure 83: Question 12 in the survey.....	43
Figure 84: Question 13 in the survey.....	44
Figure 85: The figures demonstrate the "Visibility of system status" of UnderSea	45
Figure 86: The figures demonstrate the " Match between the system and the real world " of UnderSea	45
Figure 87: The figures demonstrate the "User control and freedom" of UnderSea.....	45
Figure 88: The figures demonstrate the "Consistency and standards" of UnderSea	46
Figure 89: The figure demonstrates the "Error prevention" of UnderSea	46
Figure 90: The figure demonstrates the "Recognition rather than recall" of UnderSea	46
Figure 91: The figure demonstrates the "Flexibility and efficiency of use" of UnderSea	46
Figure 92: The figures demonstrate the "Aesthetic and minimalist design" of UnderSea	47
Figure 93: The figures demonstrate the "Help users recognise, diagnose and recover from errors" of UnderSea	47
Figure 94: The figures demonstrate the "Help and documentation" of UnderSea	47

Table of Tables

Table 1: The questionnaire that explains two project hypotheses	31
Table 2: Metaphor icons with the explanation of the coursework.....	35

1. Introduction

The development of information technology has made human interaction easier, particularly in sports like diving. Dive+ and Deepblu are popular applications for safety and user ability but need more functions. The author plans to design prototypes for UnderSea, an application that helps users monitor parameters and take photos/videos during diving to improve the overall diving experience.

I will offer the theoretical foundation for resolving this issue in this study. I will discuss my design goals for my application (Benyon, 2013). The following portion of our application will illustrate low-fidelity, mid-fidelity, and physical design (McElroy, 2017). A survey will be conducted later to test my hypotheses in the next section. Finally, evaluate the problem and suggest future development directions for the application.

2. Background Literature

2.1. HCI Research

(Garg, 2023) emphasises current diving apps' twin aims to improve user information and services, increase engagement among divers, track activities, and store experiences.

Divers and underwater photographers increasingly embrace diving applications such as DiveMate and Dive+, which provide complete features such as GPS tracking, camera capabilities, and underwater photography for increased documentation based on (Divernet, 2020) and (Divernet, 2020).

The (Cibis, et al., 2017) study emphasises the significance of ongoing health monitoring for divers' safety and well-being. Divers value the capacity to take underwater photographs and movies for documentation, species search, and recovery (Papadimitriou, 2015). Divers may use a social networking site to share underwater experiences and interact with individuals worldwide, boosting cross-cultural exchanges (Katariina, 2021).

The next coursework project aims to create an underwater application called UnderSea, which will track snorkelers' and scuba divers' actions, providing real-time tracking of critical elements like depth, ascent time, air in the tank and dive duration. The app will also serve as a social networking platform for divers, ensuring accurate data collection and analysis, knowledge gain, and community building.

2.2. HCI Theory

2.2.1. Interaction design principles and interaction design patterns

Interaction design is the process of developing user experiences that improve communication and interaction in everyday life and at work, and it includes problems such as user interface design, software design, and interactive system design (Sharp, et al., 2019).

According to (Norman, 2002), the concept of technology, computers, and interfaces should be intuitive and straightforward, based on six principles: constraints, visibility, mapping, feedback, affordance, and consistency.

An interaction design pattern is a generic and repeatable solution to typical usability issues in interface or interaction design. An ID pattern consists of elements: Problem, Use when, Principle, Solution, Why and Examples (Folmer, 2015).

It is planned to apply Don Norman's six Interaction Design principles to the project, focusing on user-centricity and efficiency.

2.2.2. Investigation in cognitive psychology

The mind functions as an information-processing machine, integrating perception, cognition, and action, and intelligence is often demonstrated through symbol manipulation techniques, applicable across various platforms, according to (Hurtienne, 2009).

Cognitive psychology studies human mental processes such as perception, attention, memory, and recognition (Lu & Dosher, 2007):

- **Perception** is that researchers investigate how individuals grasp environmental data using sensory faculties and computer models.
- **Attention** influences visual cortical activity, improving information processing and performance.
- **Memory** processes are classified as functional, with experiments, computer models, brain imaging, and lesion investigations pointing to diverse processing systems.
- **Recognition** of events based on complexity, structural similarity, function, and conceptual theories.

The coursework aims to improve user experience and understanding of human thinking through cognitive psychology, focusing on recognition.

2.2.3. Interaction design theory

Field (Sharp, et al., 2019), a conceptual model is a high-level description of a system's organisation and functioning, incorporating metaphors, analogies, task-domain objects, and relationships, aiding in understanding the product's purpose, function, and user interactions.

Philosophers and scientists debate the origins of language metaphors, some suggesting that all discourse is metaphoric (Hamilton, 2000). Metaphors in engineering require cognitive labour to transfer traits across objects, despite universities improving communication skills. Instructors need more understanding of rhetorical talents (Berezin, 2018).

Prototypes are critical in product development because they evolve with new business models. However, their definitions and strategic responsibilities differ among sectors, needing comprehension (Jensen, et al., 2016). There are three types of prototypes (Dam & Siang, 2020):

- **Low-fidelity Prototypes:** Sketches, paper models, or digital interfaces are cost-effective, time-efficient tools used in early project phases for concept creation and iteration.
- **Medium-fidelity Prototypes:** These prototypes are utilised for advanced prototyping, refinement, and fine-tuning due to their longer creation time and potentially higher costs.
- **High-fidelity Prototypes:** These solutions are precise and functional, aiming to provide accurate depictions without the time and cost of final manufacturing.

The coursework will design a diving application's interfaces and functional components using a low-fidelity approach, utilising Azure 10's capabilities using Azure 10 to explore user interactions, aesthetics, and functionality.

2.2.4. Types of interaction and modes of interaction

The study of genetic connections is critical for understanding complex illnesses or features, but issues occur in justifying and interpreting these models, particularly in human investigations (Wang, et al., 2010). The interaction types (Branco, et al., 2021):

- **Instructing:** It is described as the user providing input to a system, from entering instructions into a command line to shouting orders aloud.
- **Conversing:** It implies a conversation between the user and the machine.
- **Manipulation:** It requires users to apply their knowledge of the world around them to the interface in issue, whether virtual or actual.
- **Exploring:** It is defined as the system initiating a discussion with the user and allowing the user to choose whether or not to react.

The instructing interaction mode in the diving software enhances user experience by allowing real-time inputs and teaching, making underwater adventures safer and more informed.

Natural User Interaction (NUI) is a technology that mimics human behaviour and allows for simple customisation and interaction via voice recognition and touch-controlled systems (Hajraa, 2020):

- **Voice recognition:** Speech recognition technology simplifies tasks through voice instructions, influenced by factors like connectivity, processing speed, surroundings, and reading mistakes, both indoors and outdoors.
- **Touch-controller:** Advancements in technology significantly influence browsing experiences, altering screen dynamics based on phone holding and design changes focusing on the screen centre.

Most application users use a touch controller to work underwater and on land. To provide the most significant experience for consumers, it is planned to develop the most intuitive and straightforward to use in both contexts.

3. Design Process

3.1. Conceptual Design

3.1.1. User requirement

Following consideration of the criteria, UnderSea is thought to comprise two primary user needs:

- **Underwater Photography and Videography:** With a simple UI, configurable settings, and proper environmental conditions, the programme should allow users to shoot high-quality underwater photographs and movies, even in challenging situations.
- **Diving Activity Tracking in Real-Time:** The system should monitor diving activity data in real-time for crucial changes on the user's device.

UnderSea may also get the following extra user requirements to help make the programme more complete:

- **Dive Review and Dive Log:** Users should have access to a complete dive log that is organised chronologically and allows for simple viewing and updating.
- **User-Friendly App for Mobile:** For both freshman and expert divers, the smartphone application should be compatible with common platforms, user-friendly, and offer offline dive recording.
- **Social and Community aspects:** The system should monitor diving activity data for crucial changes on the user's device in real-time.

3.1.2. Problem statement and design solutions

The problem statement of the project: The project aims to create an interactive underwater app for snorkelers and scuba divers, enhancing underwater experiences and tracking diving activity, balancing usability and attractiveness for a smooth user experience.

The "UnderSea" product offers an interactive underwater and on-land experience for snorkelers and scuba divers, featuring a mobile app, waterproof attachments, and underwater tracking features:

- **Underwater Interactions:**
 - + **Photo and Video Capture:** Users can effortlessly record underwater images and movies by clicking a button on the waterproof attachment on their watch, allowing them to capture the beauty of their aquatic environment.
 - + **Depth and Dive Data Display:** The mobile app provides real-time diving data on a user's smartphone via a watch, making it easy to refer to during a dive.
- **On-land Interactions:**
 - + **Dive Log Management:** The smartphone app allows users to manage and edit dive records, images, and videos, providing detailed information about the dive.
 - + **Image and Video Gallery:** The software features a user-friendly photo and video gallery for managing and viewing underwater content.
 - + **Social Integration:** UnderSea's social feature enables users to share dive records and media, sharing and community among divers.
 - + **User Profile and Preferences:** Users may personalise their profiles, establish notification preferences, and customise the dive data display to their liking.

UnderSea will prioritise user experience (UX) concepts, emphasising intuitive design, simplicity of use, and seamless underwater functioning. It will be subjected to extensive usability testing and feedback gathering.

3.1.3. Hierarchical model

With this UnderSea application, *Figure 1* below displays the hierarchical model of the coursework:

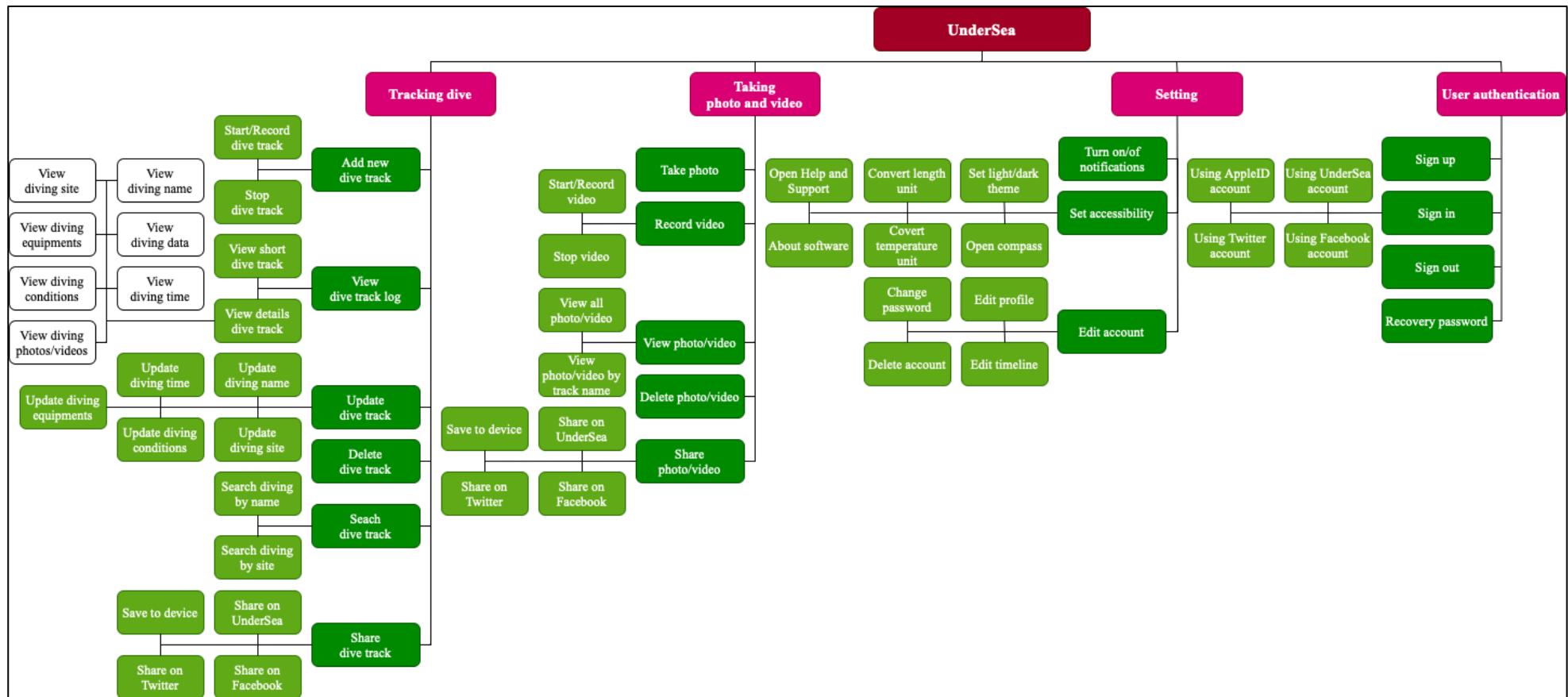


Figure 1: The hierarchical model of the coursework

UnderSea is a diving software that assists underwater and on-land users with dive tracking and photo and video capture functions. Users can create, review, update, delete, search, and share tracks, take and share photographs, configure notifications, access extra services, and manage accounts. Users can register, log in, reset passwords, and log out.

3.1.4. Conceptual model

With this UnderSea application, *Figure 2* below displays the conceptual model of the coursework:

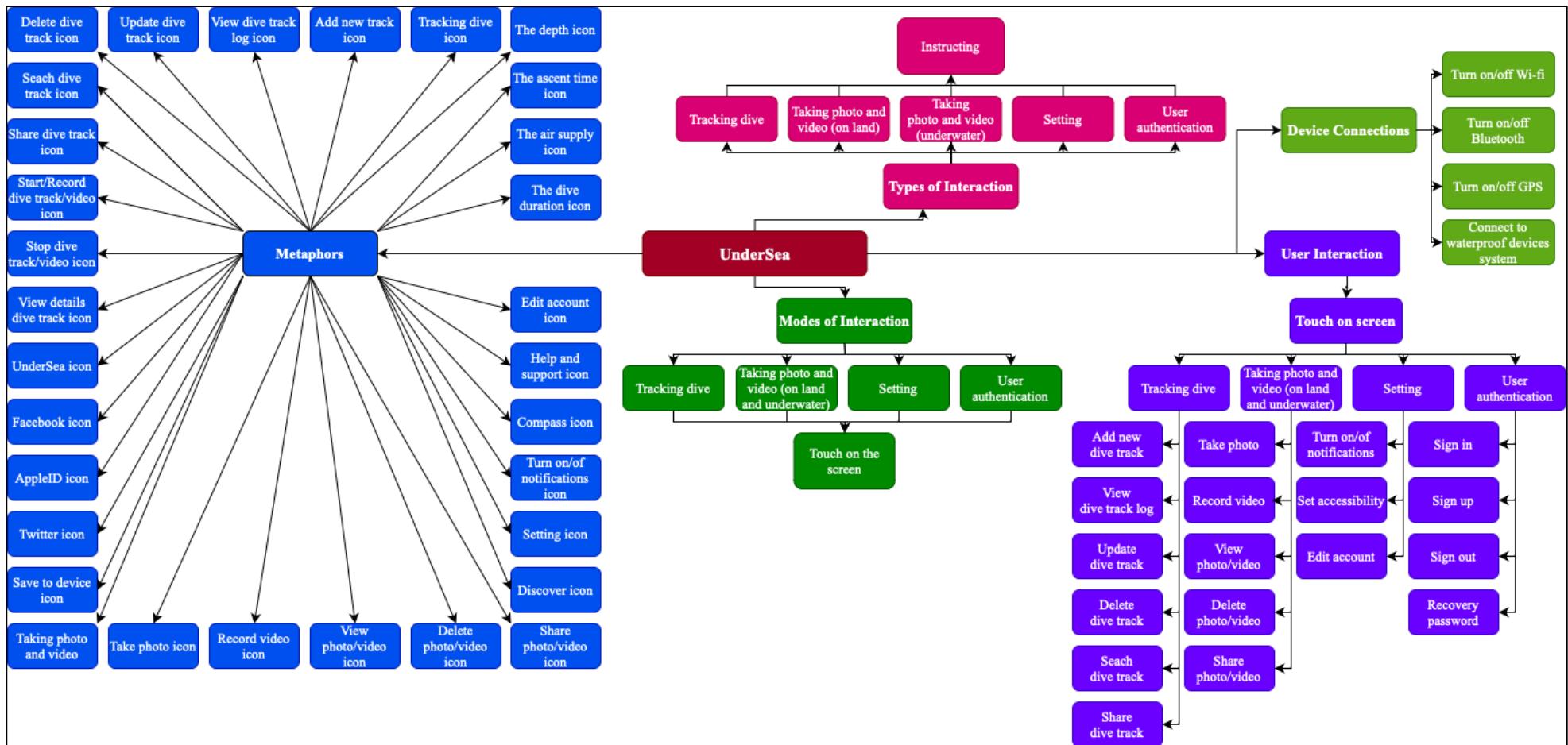


Figure 2: The conceptual model of the coursework

UnderSea is a user-friendly application requiring a WiFi connection for tasks, Bluetooth for devices like watches and cameras, GPS for location tracking, and a waterproof system to support underwater activities. It uses a touch screen for user interaction and uses common symbols and different icons to guide users through the application's functions. *Table 2* lists some metaphor icons shown in *Appendix A*.

3.2. Design Principles

According to (Norman, 2002), the concept of technology, computers, and interfaces should be designed to be intuitive and straightforward based on six principles:

- **Constraints:** These are required to limit user interaction with an interface and prevent users from becoming overwhelmed by the options available.
- **Visibility:** It increases user comprehension, but hiding them complicates their location and usage.
- **Mapping:** It refers to the connection or correlation of two things in technical terms; in this context, it relates to how the controls and their motions correspond to real-world outcomes.
- **Feedback:** It is a concept in control and information theory that educates consumers about the execution and effects of an action.
- **Affordance:** It is the link between the visual appearance of an object and how people perceive and interact with it in terms of utility or utilisation.
- **Consistency:** It creates interfaces that accomplish comparable tasks with identical elements and activities while adhering to established standards like consistent object selection procedures.

The following Norman principles will be integrated into the design of this project:

- **Constraints:** Upon completing a crucial task within the program, the user will see the confirmation screen. Aids in protecting them from mistakes and data loss while carrying out tasks.
- **Visibility:** Important application buttons or icons will be positioned in clearly recognised areas with suitable colours or icons to draw the user's attention.
- **Mapping:** The function's pop-up is presented directly at the user's location, ensuring they effortlessly observe the subsequent steps required to perform that function.
- **Feedback:** Upon user engagement in activities, notifications, whether indicating errors or confirming success, are promptly dispatched to provide users with real-time feedback and acknowledgement of their actions.
- **Affordance:** Icons are crafted to closely mirror real-life objects and events, facilitating user anticipation of their functions and enhancing intuitive interaction.
- **Consistency:** To demonstrate the application's uniformity, the application will employ the same typeface and colour scheme. Furthermore, the icons will be all the same colour so that people may quickly identify them.

4. Prototype

4.1. Low-fidelity Prototype

The features (*from Figure 3 to Figure 9*) below show the low-fidelity concepts for my UnderSea application:

- Sign-in page:

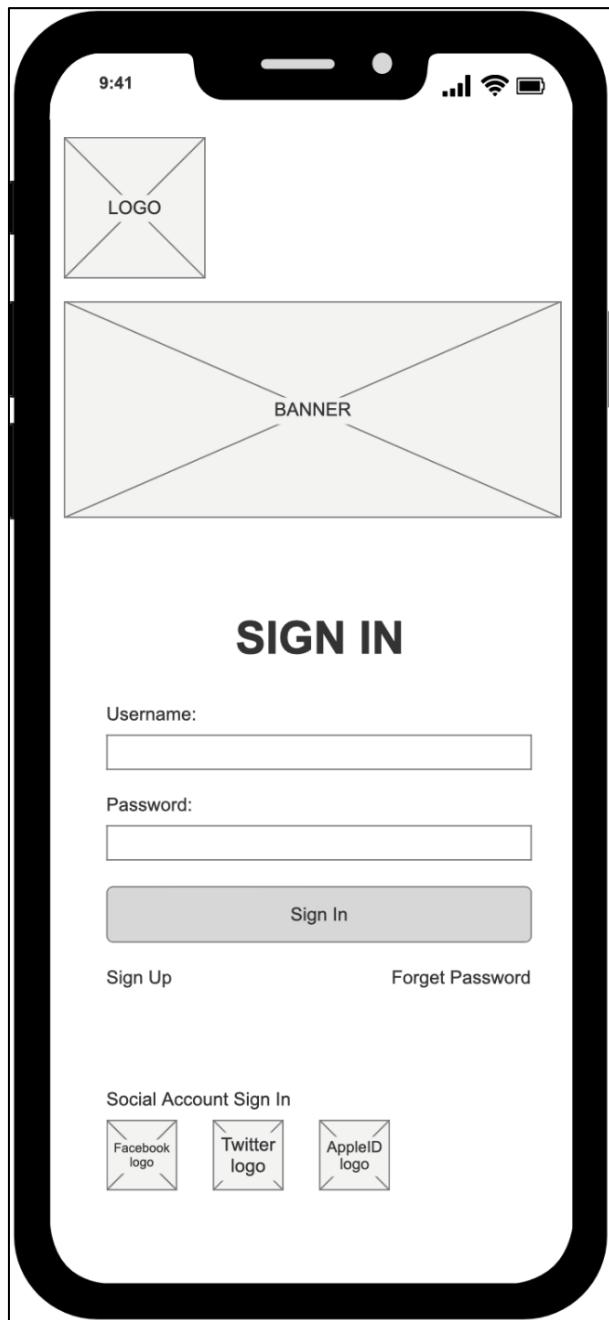


Figure 3: Sign-in page of low-fidelity prototype

- Sign-up page:



Figure 4: Sign-up page of low-fidelity prototype

- Community page (Homepage):

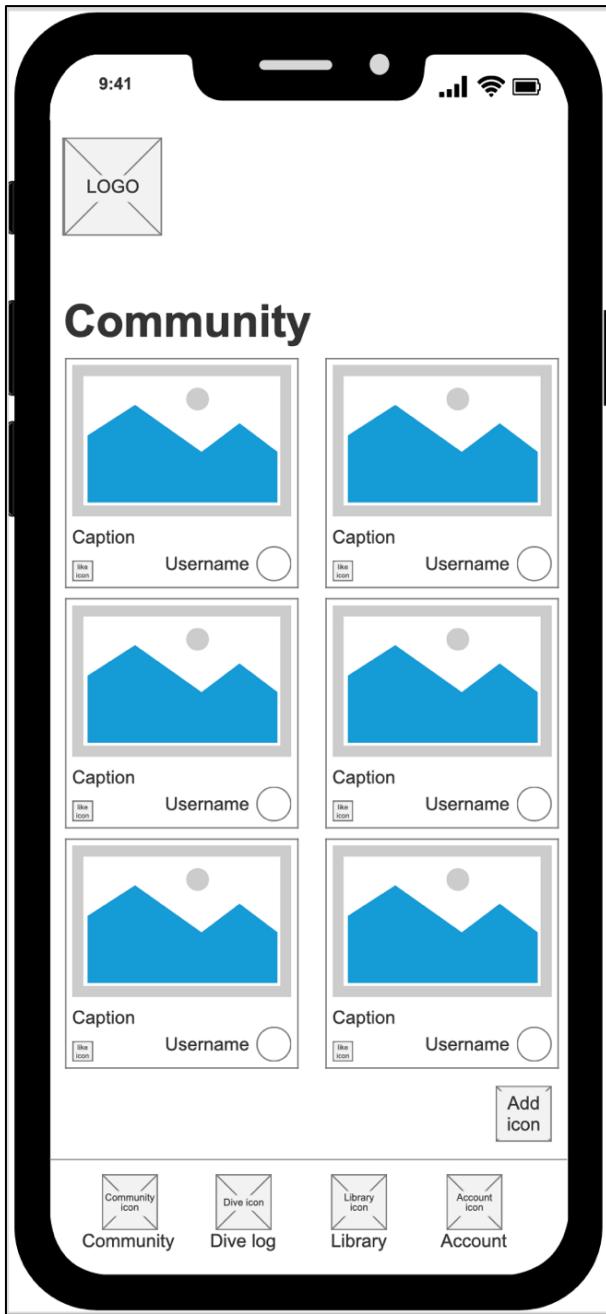


Figure 5: Community page (Homepage) of low-fidelity prototype

- Dive log page (Managing track page):

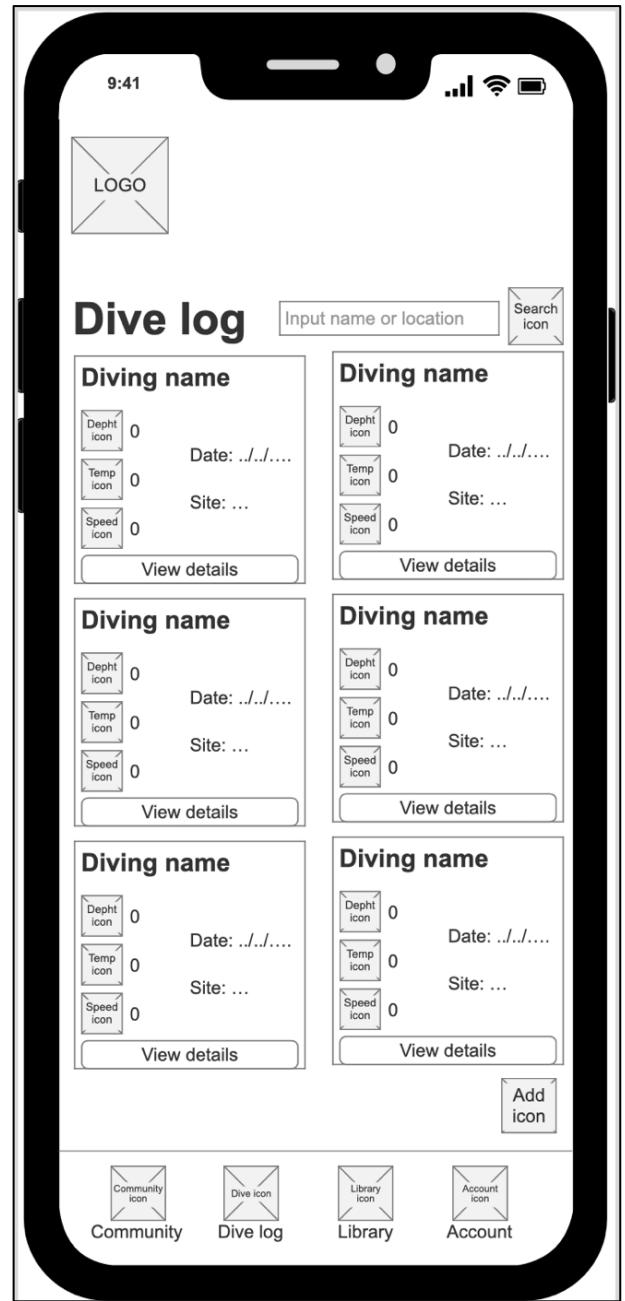


Figure 6: Dive log page (Managing track page) of low-fidelity prototype

- Library page (Managing photos/videos page):

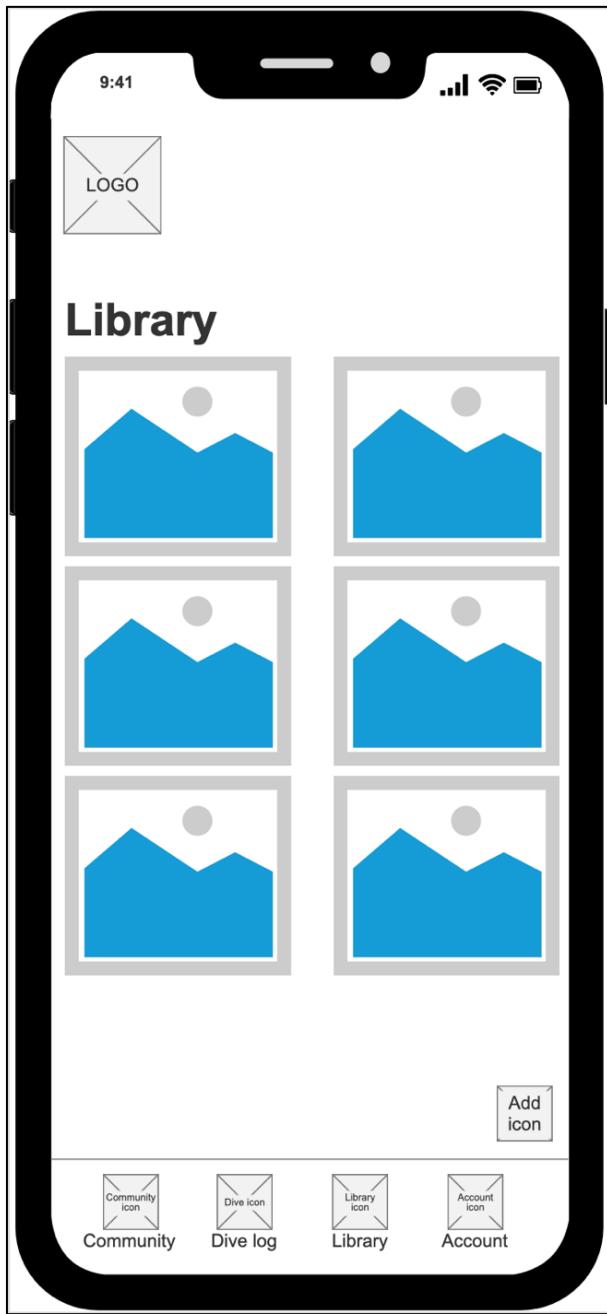


Figure 7: Library page (Managing photos/videos page) of low-fidelity prototype

- Account page:

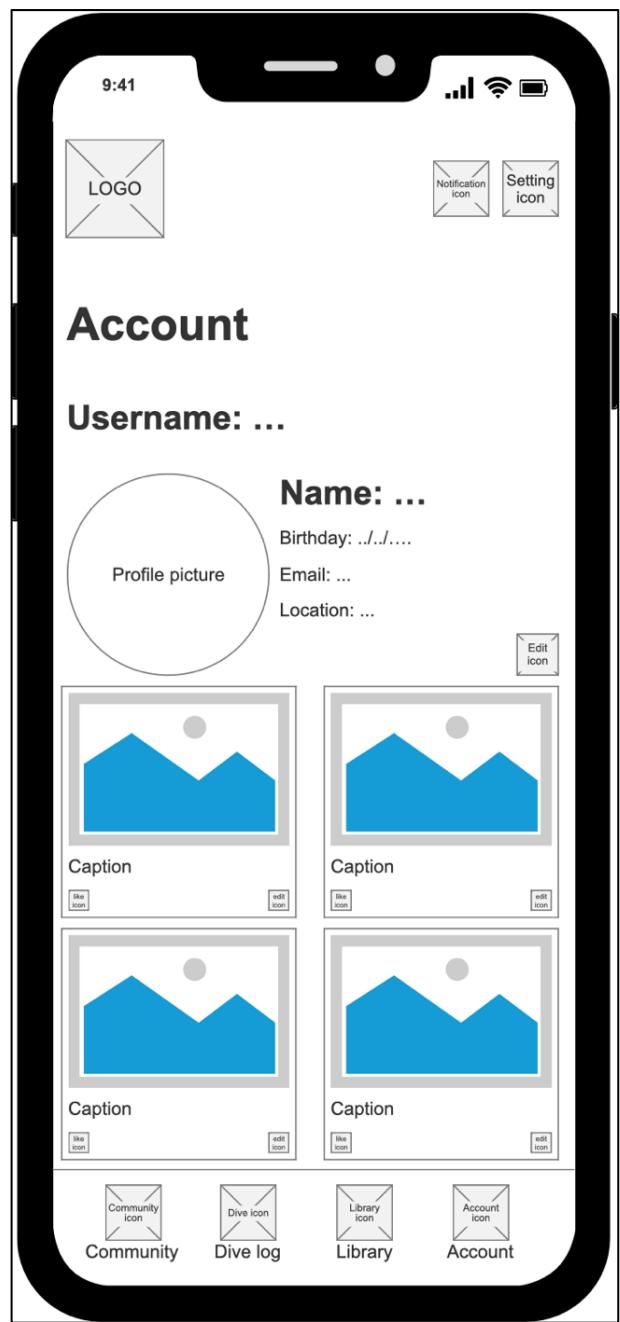


Figure 8: Account page of low-fidelity prototype

- Setting page:



Figure 9: Setting page of low-fidelity prototype

4.2. Mid-fidelity Prototype

The mid-fidelity prototype creates device pages in depth and explains application functionalities through features, assuring user ease and clarity in usage (*from Figure 10 to Figure 62*):

- **Sign-in page:** Users can access UnderSea or other accounts (per the **Touch** mode interaction of (Hajraa, 2020)), and a notice panel appears to report success or errors, update credentials, sign up, or recover passwords (*Figure 10*) per the **Feedback** principle of (Norman, 2002).

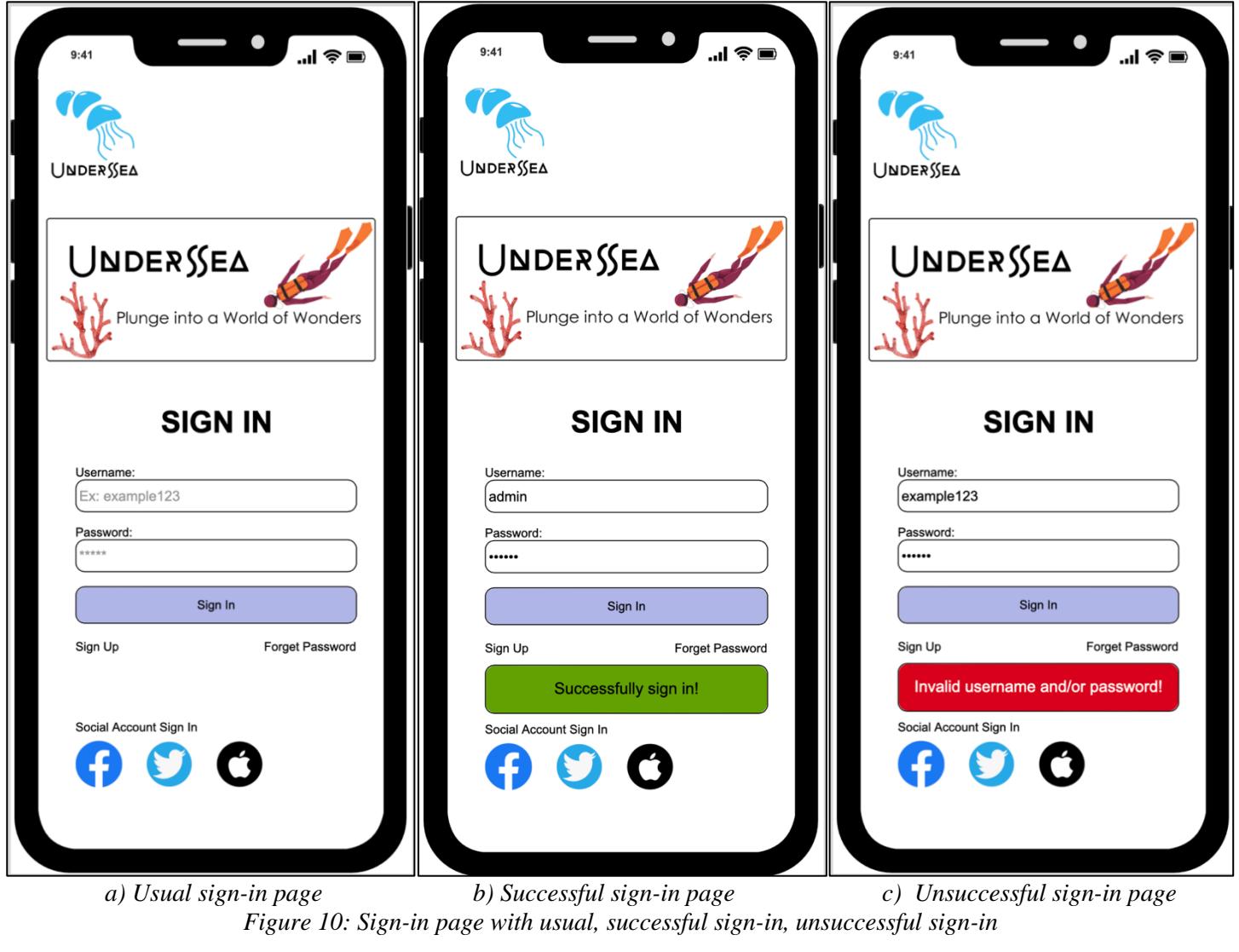
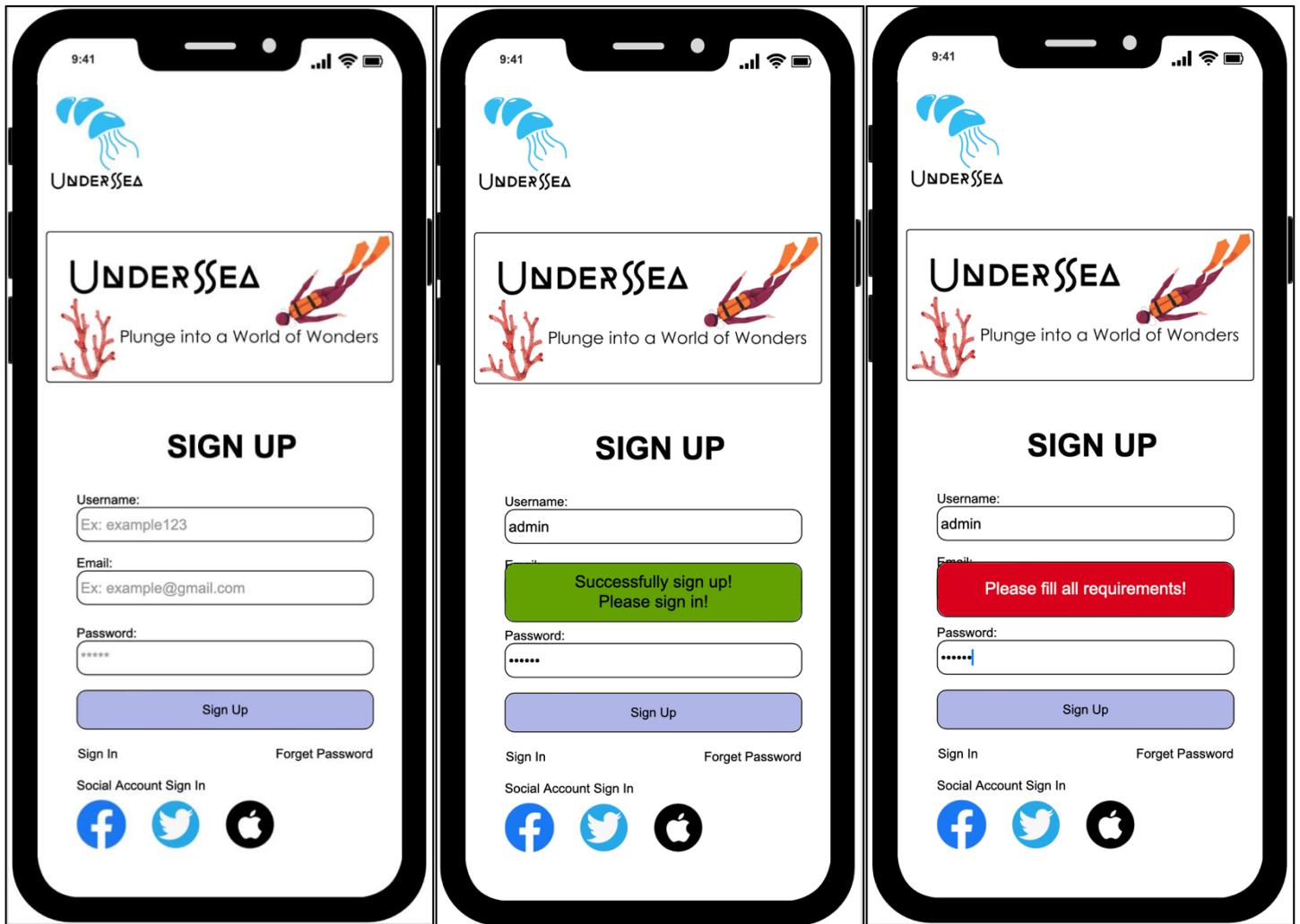


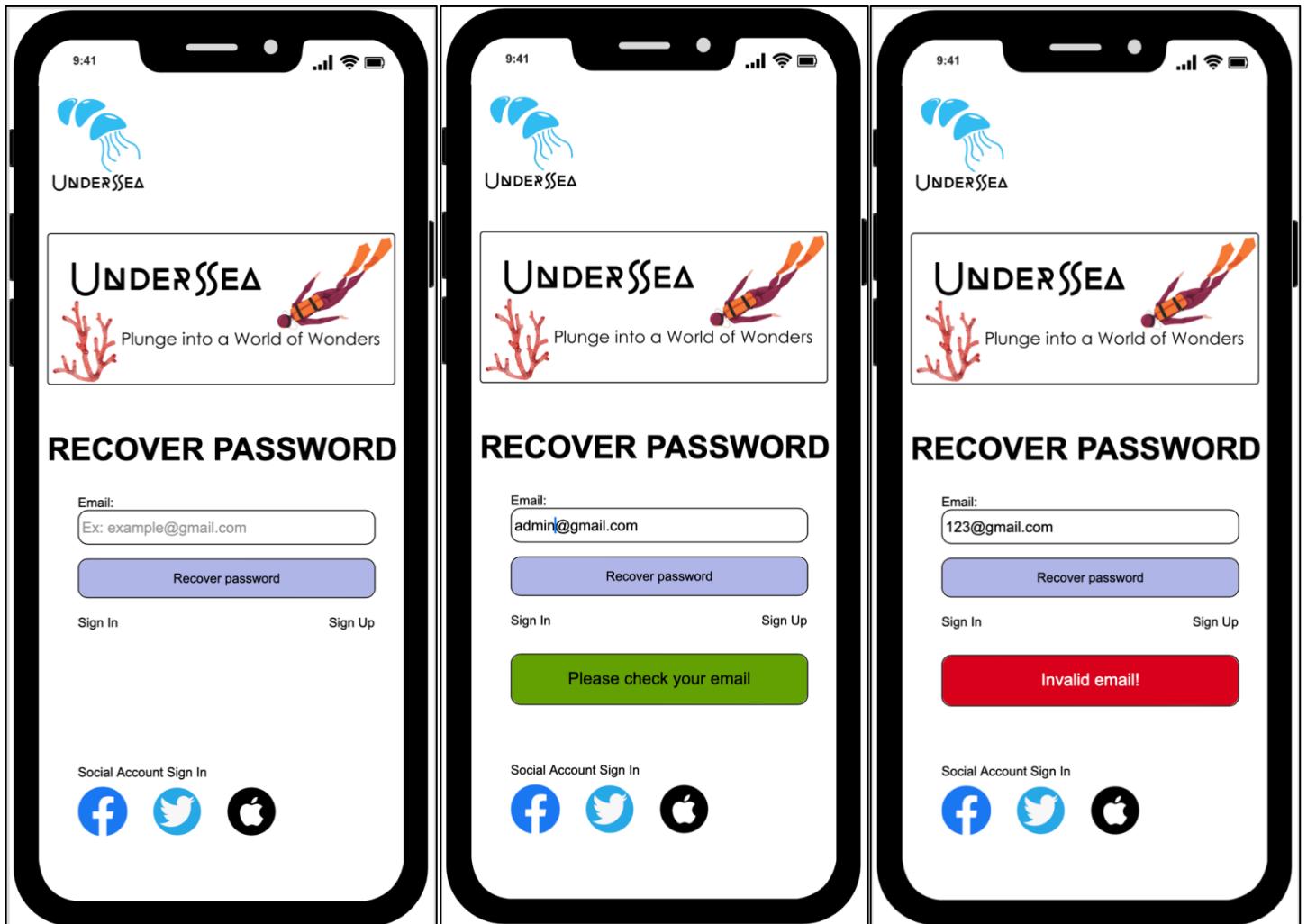
Figure 10: Sign-in page with usual, successful sign-in, unsuccessful sign-in

- **Sign-up page:** Users can register an account with a username, email, and password and receive notifications for success or errors (*Figure 11*).



a) Usual sign-up page b) Successful sign-up page c) Unsuccessful sign-up page
Figure 11: Sign-up page with usual, successful sign-up, unsuccessful sign-up

- **Recover password page:** Users can reset their password via email, which displays a notification panel to continue in the email (*Figure 12*).



a) Usual recover password page

b) Successful recover password page

c) Unsuccessful recover password page

Figure 12: Recover password with usual, successful fill out, unsuccessful packing out

- **Community page:** After logging in, users can access the main page by clicking on navigation bar icons to browse and engage with other divers' posts (*from Figure 13 to Figure 17*). The application will employ the same typeface and colour scheme. Furthermore, the icons are all the same colour, so people may quickly identify them per the **Consistency** principle of (Norman, 2002).



Figure 13: Community page

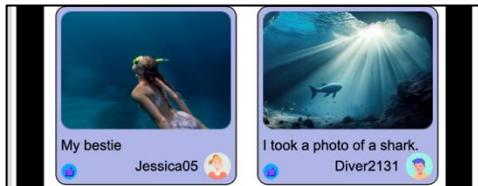


Figure 14: Interact with liking posts

Users can express their emotions and/or photos by clicking the "add" symbol in the bottom-right corner (*from Figure 15 to Figure 17*).



Figure 15: Create a post interface



Figure 16: Successfully created post



Figure 17: The post visible

- **Dive log page:** The page records a user's diving history, including track names, parameters, location, and time, and allows users to view, add, and search for tracks by name, place, or time (*from Figure 18 to Figure 36*).

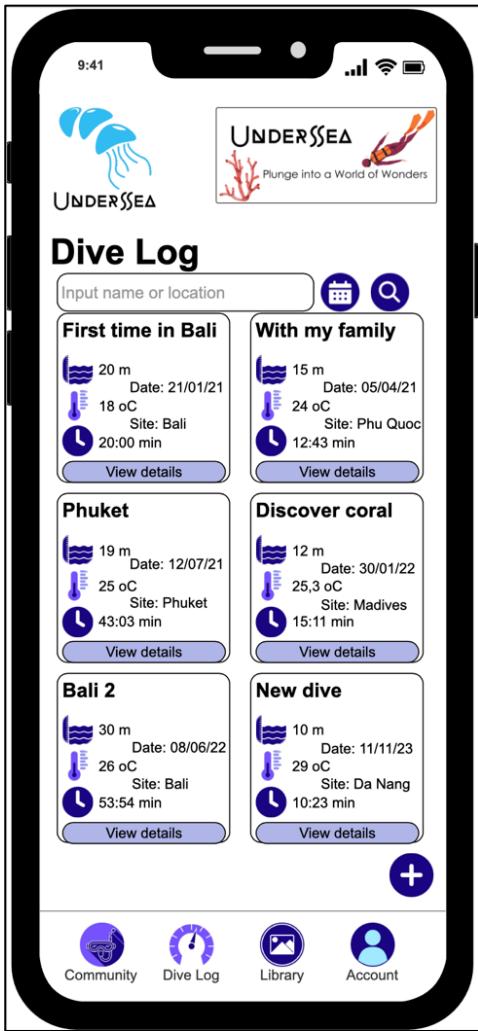


Figure 18: Dive log page

Users can access track details and delete, modify, and share tracks by tapping the "View details" button (Figure 19).

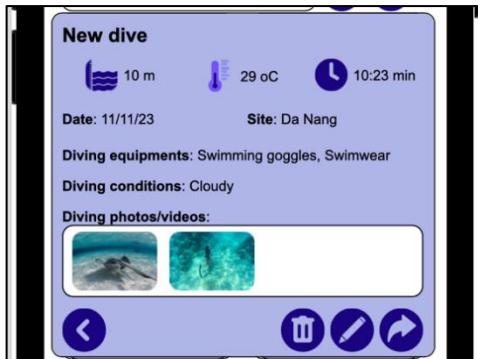


Figure 19: Track details

They may save the track on their phone or share it on Facebook by clicking the "share" button (Figure 20 and Figure 21).

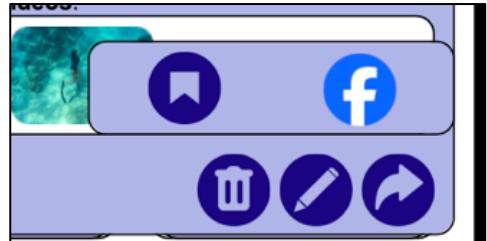


Figure 20: Usual share track interface



Figure 21: Successfully shared track interface

Or they can delete the track. The "Delete" button will display a trash can icon they are about to delete and anything (Figure 22 and Figure 23) per the **Affordance** principle of (Norman, 2002).

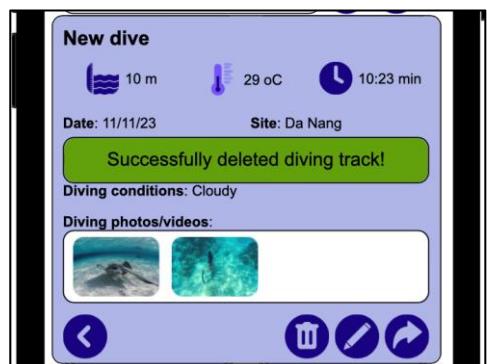


Figure 22: Successfully deleted track interface



Figure 23: The track is invisible

Users can modify track names, equipment, and diving conditions in the edit function, but diving factors remain fixed during the dive (*Figure 24 and Figure 25*). Important application buttons or icons are positioned in clearly recognised areas with suitable colours or icons to draw the user's attention per the **Visibility** principle of (Norman, 2002) and **Metaphors** of (Hamilton, 2000).



a) Usual edit track function interface b) Editing track function interface c) Successful edit track function interface
Figure 24: Edit track function with usual editing and success



Figure 25: The track changed

Users may utilise the search option to find their tracks by name, location, and time (*from Figure 26 to Figure 28*).



Figure 26: Search by name function



Figure 27: Search by location function



Figure 28: Search by time function

To start a new track, users click the add icon, enter the appropriate information, and then press play (*Figure 29*).

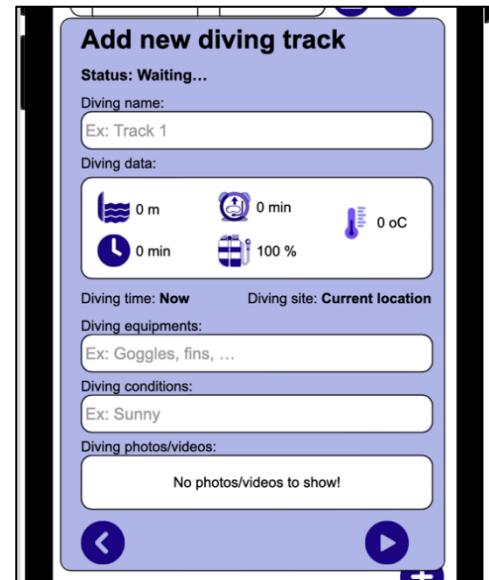
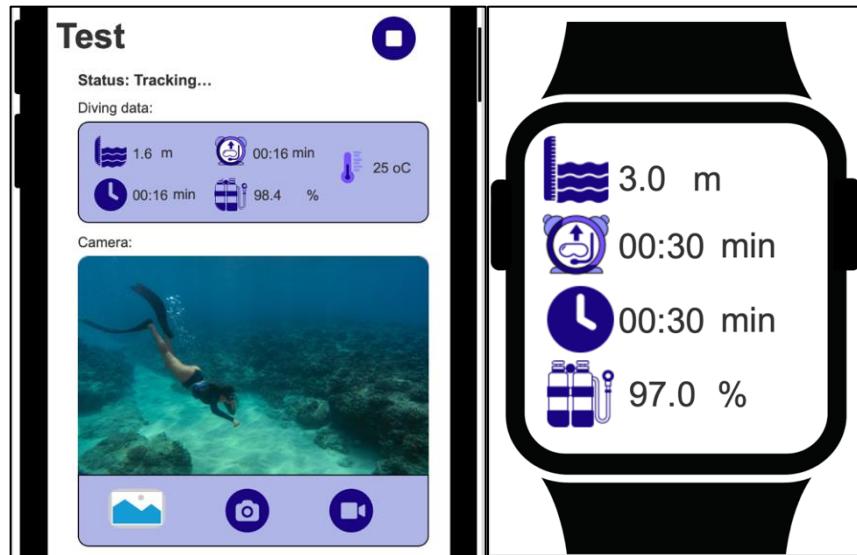


Figure 29: Add new track function

The app allows real-time parameter changes on phones and watches during diving following the **Instructing** interaction of (Branco, et al., 2021), allowing users to take photos and record movies. The stop button completes the process and saves it to the device's tracklist (*from Figure 30 to Figure 35*).



a) Tracking interface on mobile b) Tracking interface on watch
Figure 30: Tracking dive interface on the phone and watch while tracking



Figure 31: Taken a photo while tracking

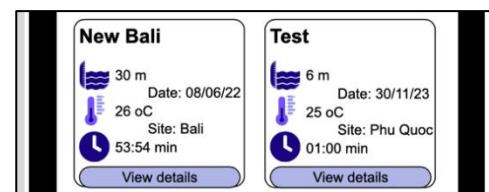


Figure 34: The track is visible



Figure 32: Recording videos while tracking



Figure 35: Track details of recent track

The user clicks media to view full-size (Figure 36).

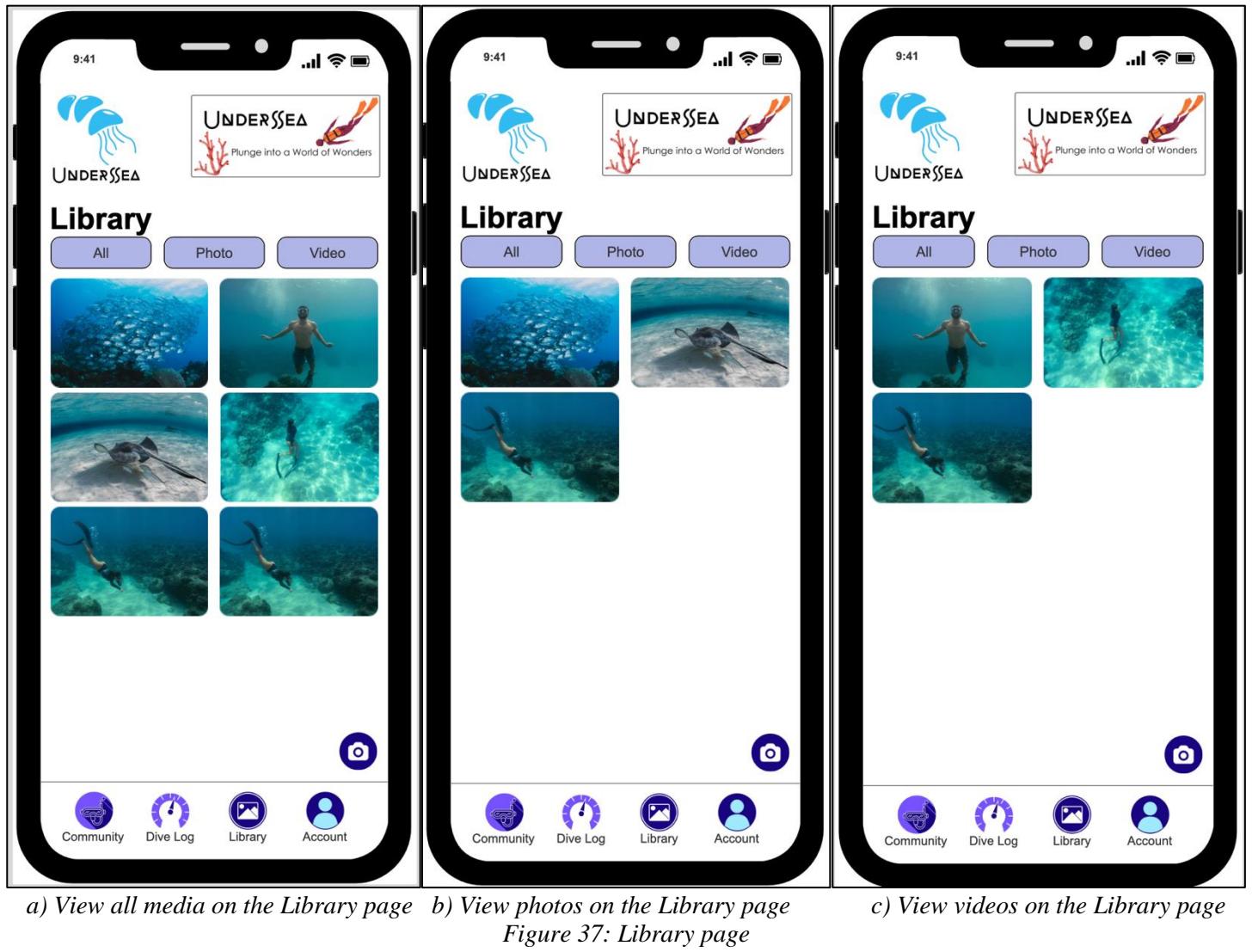


Figure 33: Successfully tracked dive



Figure 36: Full size of the media in track details

- **Library page:** This tab displays all images and videos taken with the app (users can choose to view all media, photos, or videos) and permits users to take, record, delete, and share their media (*from Figure 37 to Figure 45*).



a) View all media on the Library page

b) View photos on the Library page

c) View videos on the Library page

Figure 37: Library page

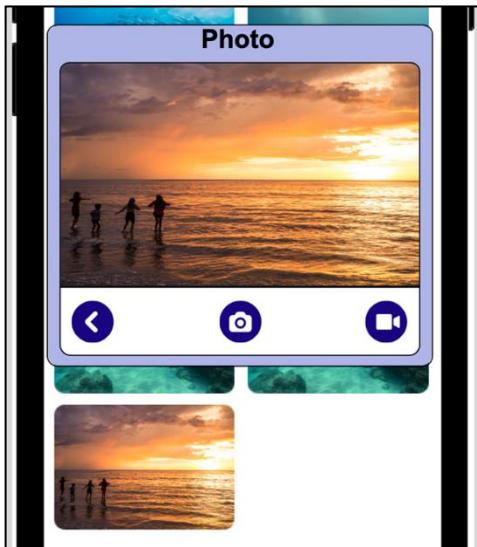


Figure 38: Taken photo

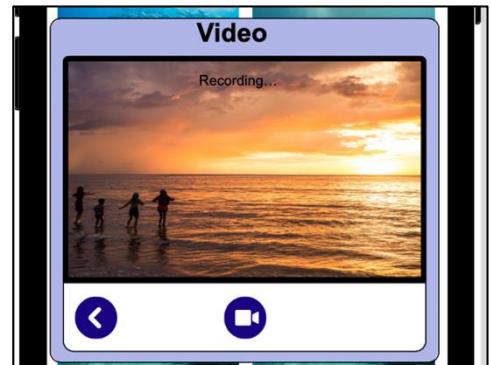


Figure 39: Recording video

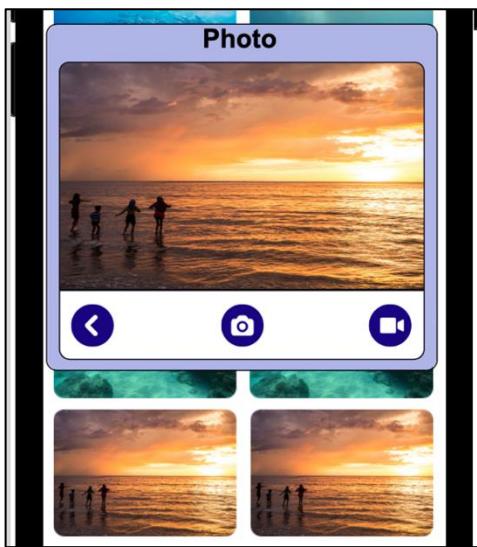


Figure 40: Recorded video

When a user taps on the share button of a photo in the library in the app, the platforms present strictly at that share button area for the user to pick from (*Figure 42* and *Figure 43*) per the **Mapping** principle of (Norman, 2002) and **Recognition** of Cognitive Psychology of (Lu & Dosher, 2007).

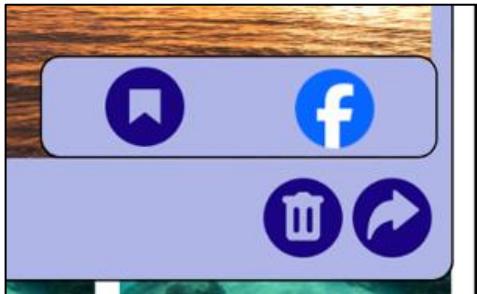


Figure 42: Usual share photo/video interface

Or they can delete the photo/video (*Figure 44* and *Figure 44*).

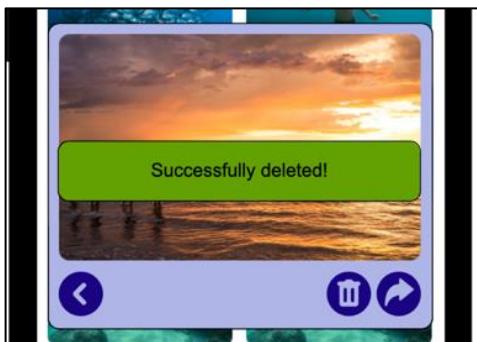


Figure 44: Successfully deleted interface

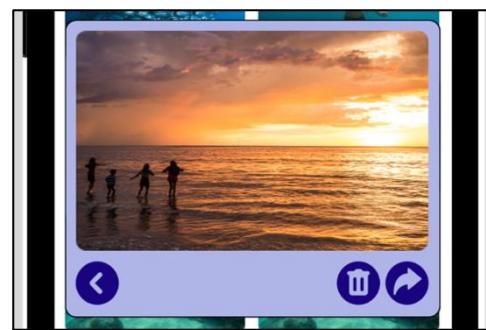


Figure 41: View full-size image function

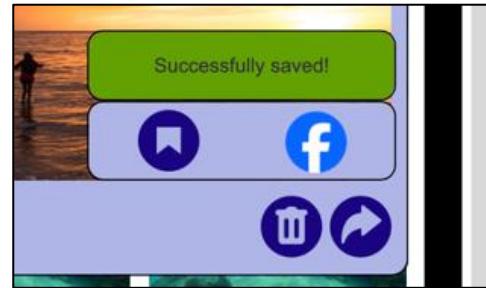


Figure 43: Successfully shared photo/video interface

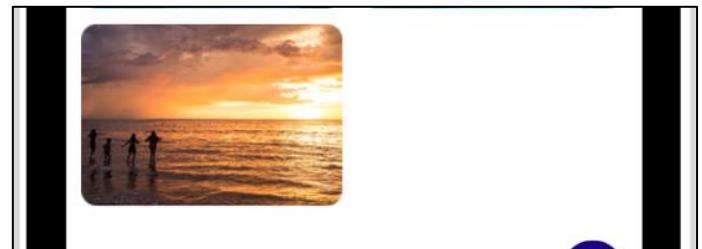


Figure 45: The photo/video is invisible

- **Account page:** It maintains user accounts, allowing users to change information, delete accounts, modify shared posts, engage with posts, switch alerts on/off, and access device settings (*from Figure 46 to Figure 56*).

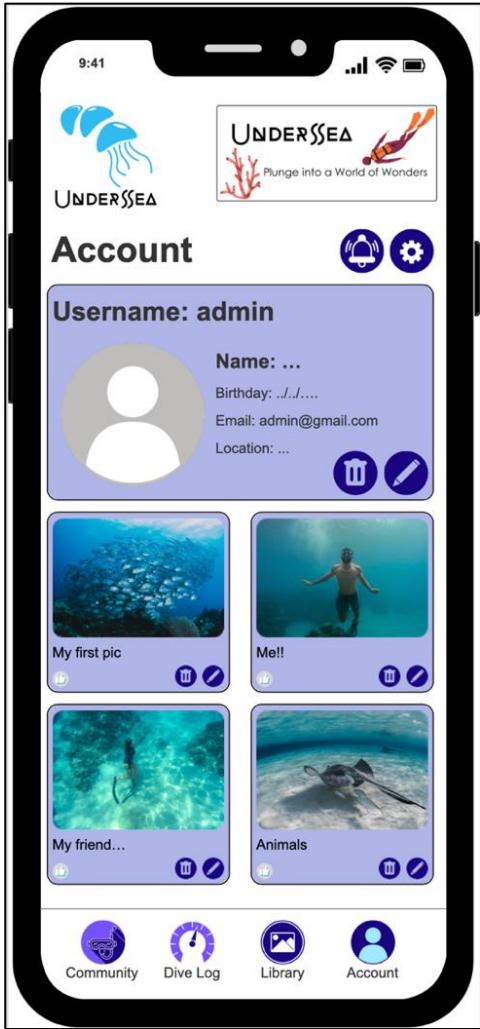
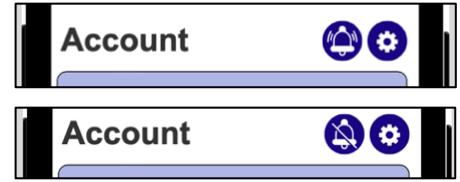


Figure 46: Account page



- a) Turn on the notification function interface
b) Turn off the notification function interface

Figure 47: Turn on/off notification function



Figure 48: Interact with liking posts

The system will show a warning before removing an application account (*Figure 49*) per the **Constraint** principle of (Norman, 2002).

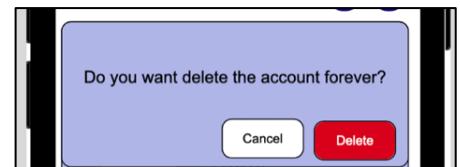
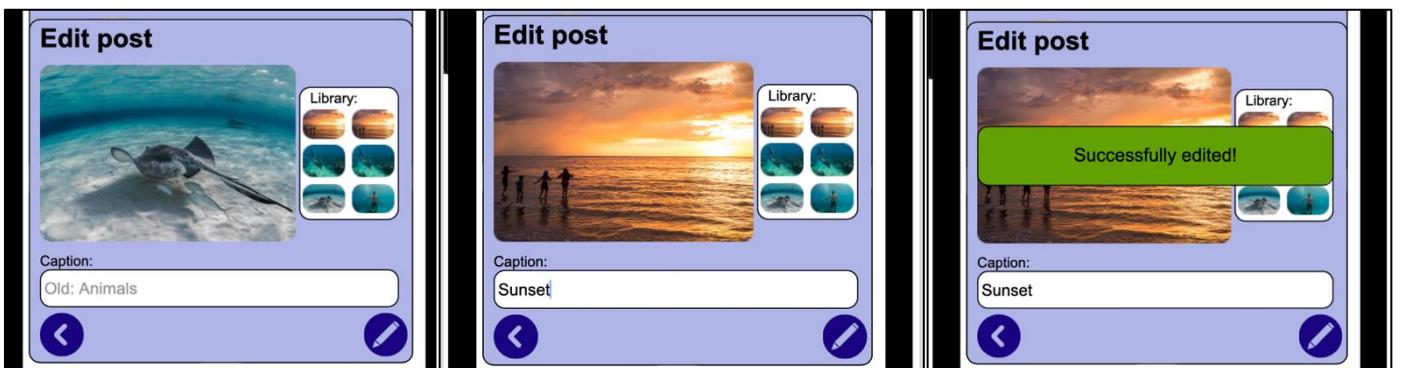


Figure 49: Delete account alert

Users may alter their photographs, videos, and captions by clicking on the edit icon on a post (*Figure 50* and *Figure 51*).



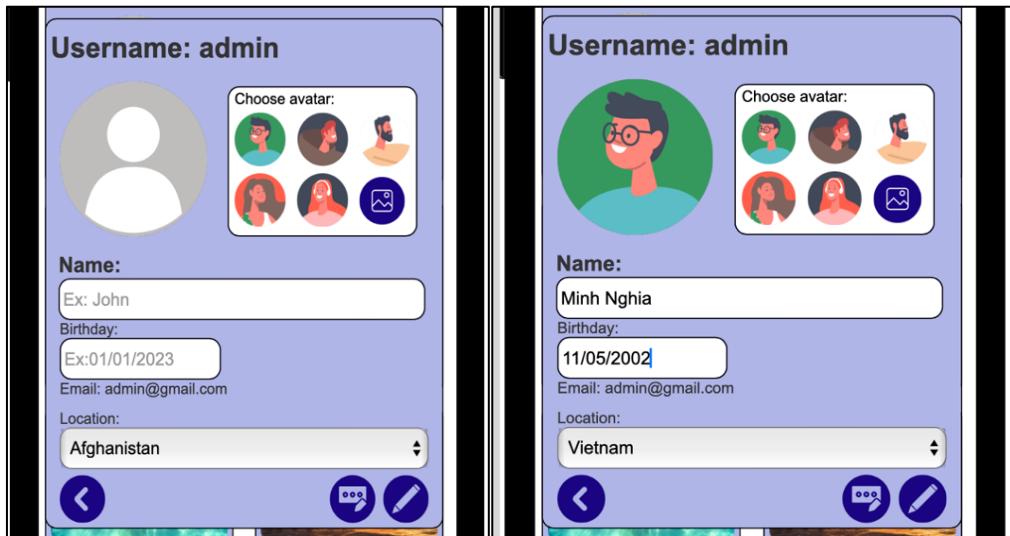
- a) Usual edit post function interface b) Editing post function interface c) Successful edit post function interface

Figure 50: Edit post function with usual editing and success

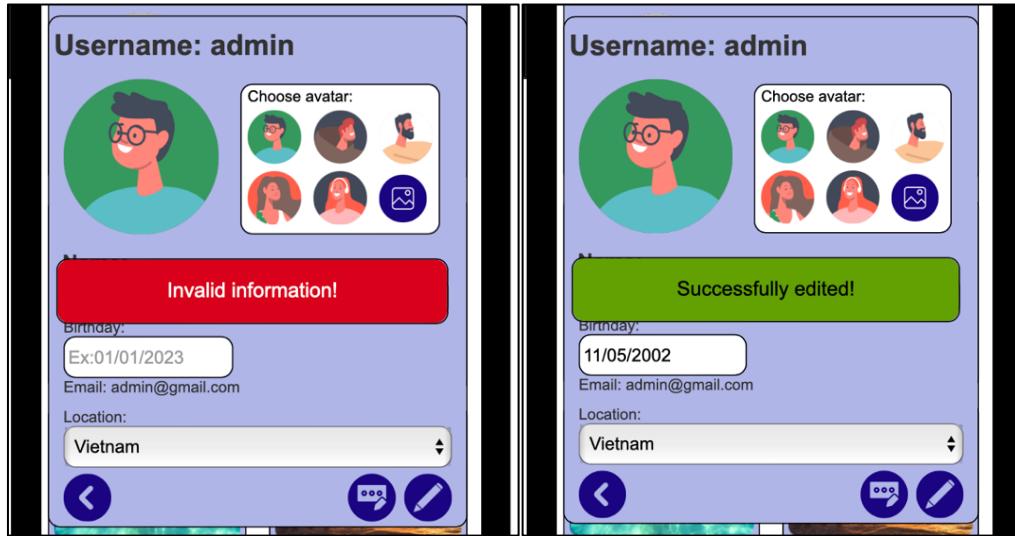


Figure 51: The post changed

Users can remove or change their profile information by clicking on the button in the area. The application warns users when they click on the delete account button. With access to the editing pop-up, they may change their avatar, name, birthdate, location, and password (from Figure 52 to Figure 56).



a) Usual edit profile function interface b) Editing profile function interface
Figure 52: Edit profile function with usual and editing



a) Unsuccessful edit profile function interface b) Successful edit profile function interface
Figure 53: Edit profile function with fail and success

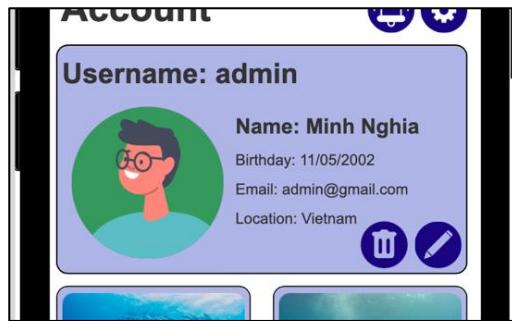
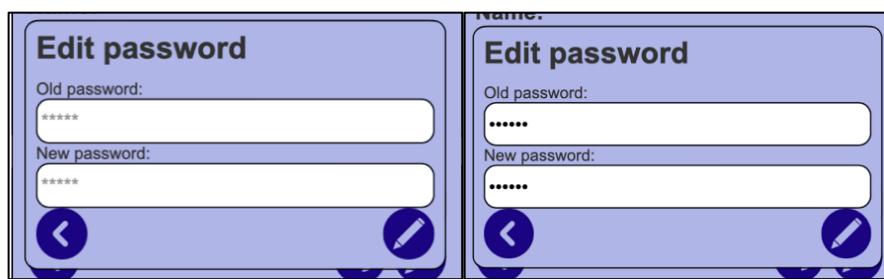
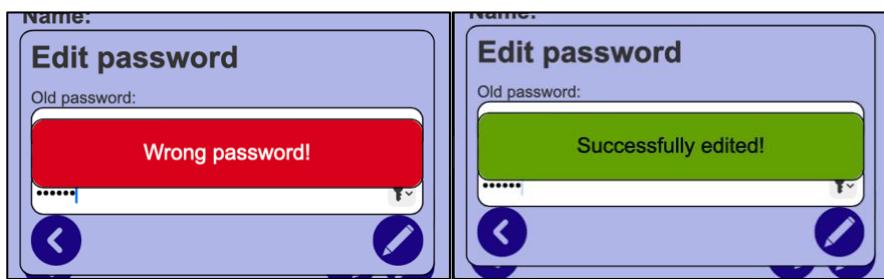


Figure 54: The profile changed



a) Usual edit password function interface b) Editing password function interface

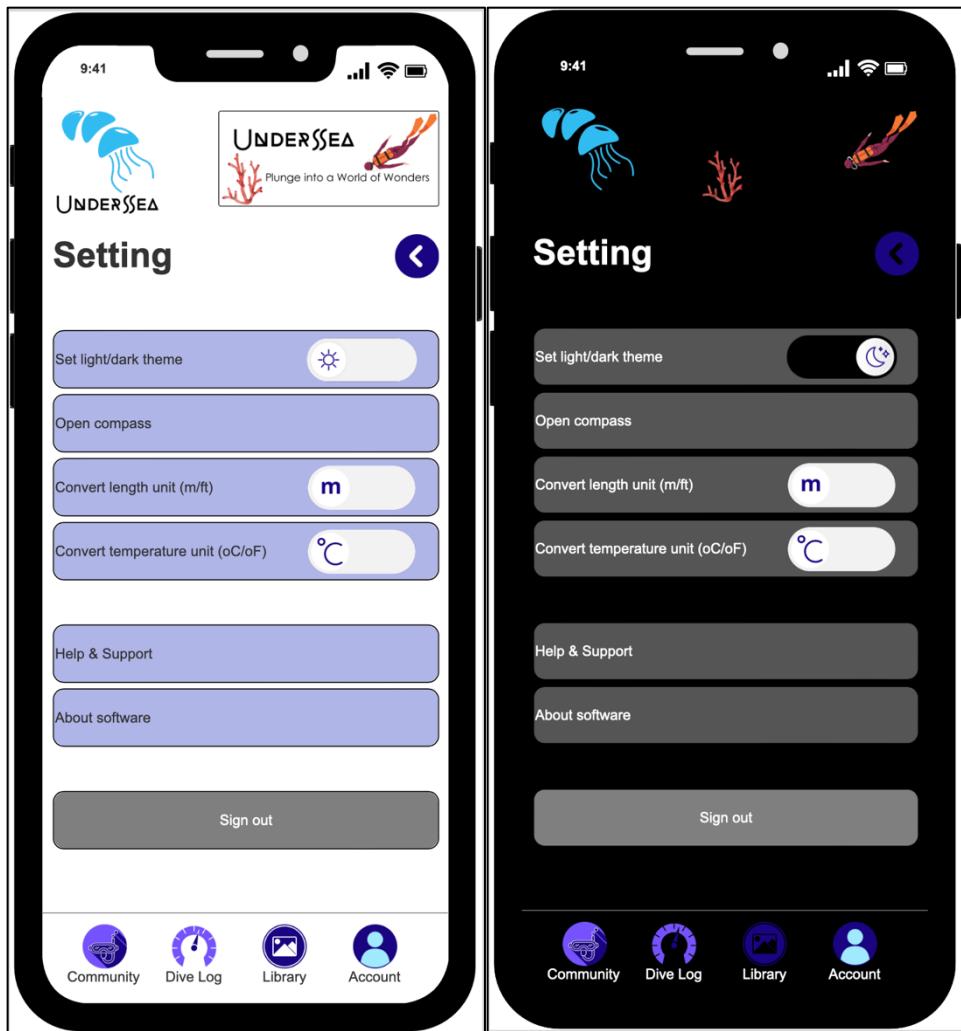
Figure 55: Reset password function with usual and editing



a) Unsuccessful edit password function interface b) Successful edit password function interface

Figure 56: Reset password function with fail and success

- **Setting:** Users may utilise the device to change the light/dark themes, open a compass, convert length and temperature units, get assistance and support, learn about software and sign out the application (*from Figure 57 to Figure 62*).



a) Usual (light) theme

b) Dark theme

Figure 57: Setting page with a usual (light) and dark theme

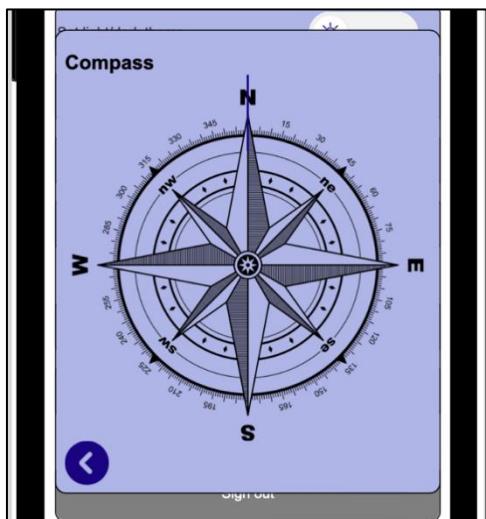
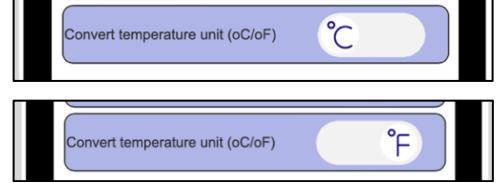


Figure 58: Open compass function



a) Length unit: m
b) Length unit: ft

Figure 59: Convert length unit



a) Temperature unit: °C
b) Temperature unit: °F

Figure 60: Convert temperature unit

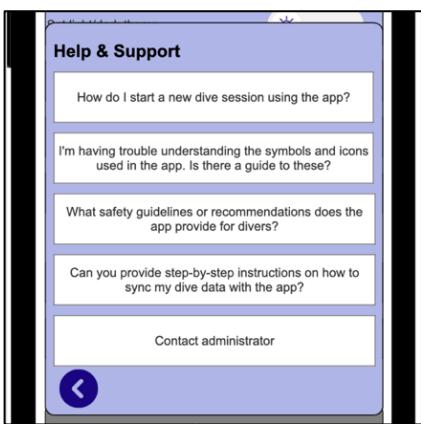


Figure 61: Help & Support function

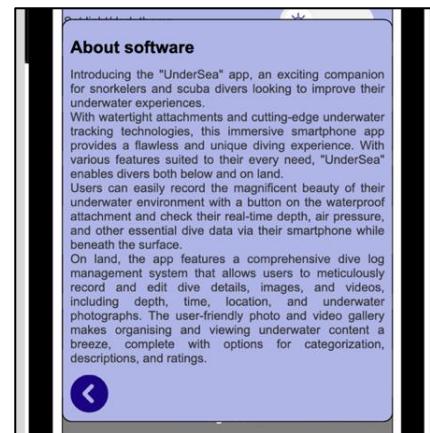


Figure 62: About software function

4.3. Physical Prototype

The waterproof system is demonstrated in *Figure 63* below through three devices of diving equipment to assist users:

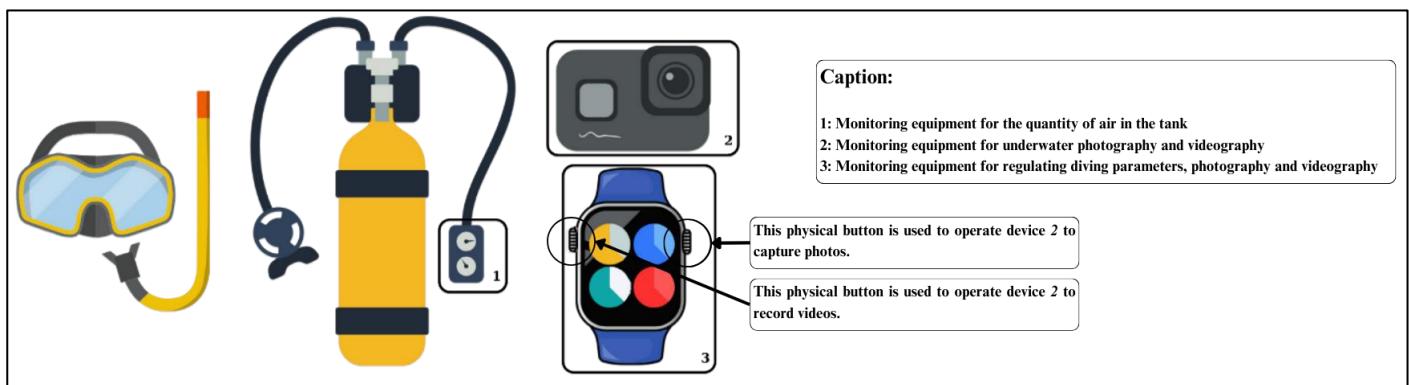


Figure 63: Physical design of the project

The waterproof system of three critical devices supports track monitoring programmes to provide the best results:

- The gas monitoring gadget is fitted to the connecting tube between the tank and the diver's breathing tube. This gadget will use Bluetooth to send data to the application.
- Underwater photography and filmmaking equipment for divers. The user wears the gadget on their shoulder. Through the interaction of physical buttons on the watch, the device will accept user requests to take photos and record videos using Bluetooth.
- The wearable gadget (watch) shows vital diving parameters and controls the photography and videography through physical buttons using Bluetooth.

5. Research Study

This UnderSea project of mine has been confirmed dependable by study, which includes my two key hypotheses, which are as follows:

- **Hypothesis 1:** UnderSea offers a straightforward UI.
- **Hypothesis 2:** UnderSea is a diving application with easy-to-use functions.

To guarantee the precision and reliability of the survey conducted on UnderSea, a diverse group of eight individuals aged 18 to 50 was meticulously recruited. This cohort was carefully curated to ensure gender equality, encompassing amateur and professional divers. These individuals have actively become part of the "Vietnam Diving Community - Hoi Lan Bien VN" on Facebook, fostering a platform for collaborative engagement and information exchange within the diving community. This intentional and inclusive approach not only enhances the breadth of perspectives but also reinforces the comprehensiveness and credibility of the gathered data.

The survey employed qualitative and quantitative methods, opting for an online format for its cost-effectiveness, time efficiency, and the likelihood of respondents providing more honest answers (Bhat, 2023). This approach aligns with contemporary research practices, promoting methodological rigour and ethical considerations.

The platform used for the survey (*shown in Appendix B*) is Google Forms. *Table 1* below is a questionnaire of the study to improve hypotheses:

Table 1: The questionnaire that explains two project hypotheses

No.	Hypothesis	Question
1	UnderSea offers a straightforward UI.	How would you evaluate the application's straightforward?
		How would you evaluate the application's usability?
		How would you evaluate the application's accessibility?
		How would you evaluate the overall interface of UnderSea?
		Please provide your feedback on potential updates to the system's UI in the future.
2	UnderSea is a diving application with easy-to-use functions.	How would you evaluate the application's monitoring metrics function?
		How would you evaluate the application's capturing moments function?
		How would you evaluate the application's connecting everyone in the community function?
		How would you evaluate the overall benefits for the divers of UnderSea?
		Please provide your feedback on potential updates to the system's functions in the future.

The survey findings for the UnderSea program reveal a consensus on its attractiveness, accessibility, and user-friendly interface. The program's features have proven highly effective in enhancing users' diving efficiency. Furthermore, there is identified potential for further growth by incorporating additional functionalities, as suggested by participants. *Appendix C* contains the analysis of all responses.

The demonstration of the Heuristic of mid-fidelity used for UnderSea will be shown in *Appendix D*.

6. Conclusion

The project, UnderSea, has been completed successfully. Many accomplishments have come from this research, including understanding interaction design principles, patterns, frameworks, types of interaction, modes of interaction, and cognitive psychology. The following achievements include hierarchical and conceptual design, low-fidelity, mid-fidelity and physical design. We comprehend the significance of mid-fidelity in developing comprehensive apps.

To enhance our project, prioritise adding more comment features for articles and videos on divers' watches, as survey feedback indicates. This will foster engagement and improve user experience.

While delving into my application, we must extend the features of commenting on posts and adding friends to the community function.

In the future, it is planned to continue developing high-fidelity prototypes for UnderSea and bringing them to market for consumers to utilise across several operating systems. Furthermore, this inspires our efforts to create applications catering to various water sports in the future, including swimming, kayaking, surfing, and more.

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Appendix A – The list of metaphor plan to use for UnderSea

Table 2 below lists some metaphor icons that will be used in the UnderSea project:

Table 2: Metaphor icons with the explanation of the coursework

No.	Metaphor icons	Explanation
1	Track dive icon	Stand for the tracking dive interface
2	Add new track icon	Stand for the add new track function
3	View dive track icon	Stand for the view dive track function
4	Update dive track icon	Stand for the update dive track function
5	Delete dive track icon	Stand for the delete dive track function
6	Search dive track icon	Stand for the search dive track function
7	Share dive track icon	Stand for the share dive track function
8	Start/Record dive track/video icon	Stand for the start a dive track or record video function
9	Stop dive track/video icon	Stand for the stop dive track or stop video function
10	View details dive track icon	Stand for the view details dive track function
11	UnderSea icon	Stand for the UnderSea application
12	Facebook icon	Stand for the Facebook application
13	AppleID icon	Stand for the AppleID application
14	Twitter icon	Stand for the Twitter application
15	Save to device icon	Stand for the save function
16	Take photo icon	Stand for the take photo function
17	Record video icon	Stand for the record video function
18	View photo/video icon	Stand for the view photo/video function
19	Delete photo/video icon	Stand for the delete photo/video function
20	Share photo/video icon	Stand for the share photo/video function
21	Discover icon	Stand for the UnderSea blog interface
22	Setting icon	Stand for the setting function
23	Turn on/off notification icon	Stand for the turn on/off notification function
24	Compass icon	Stand for the compass interface
25	Help and support icon	Stand for the help and support function
26	Edit account icon	Stand for the edit account function

Appendix B – The questionnaires in the survey

The figures (*from Figure 64 to Figure 71*) below depict the survey questions that were used to poll respondents:

SURVEY ON NEW DIVING APPLICATIONS - UnderSea

Welcome to the comprehensive user survey for the demo edition of UnderSea. We highly appreciate your dedicated participation, as it plays a pivotal role in shaping the future of our application. To better understand your experience, we have divided this survey into two substantial sections. The first section focuses on evaluating the application's user interface, while the second section delves into the utility of the application's functionalities. Your candid responses will provide valuable insights and serve as a foundation for a detailed project analysis. This analysis will help us identify the application's strengths and weaknesses, paving the way for substantial improvements and enhancements in the program.

Please answer these questions honestly after immersing yourself in the demo edition of UnderSea for a few days. Your feedback is integral to our mission of crafting a more exceptional user experience. Thank you for your valuable assistance in our ongoing project.

nghianmgcc200100@fpt.edu.vn [Switch accounts](#)

Not shared

* Indicates required question

What is your name? (Optional)

Your answer

Figure 64: The questionnaires in the survey (1)

What age are you? *

Under 18
 18-29
 30-39
 40-49
 Over 50

Are you a snorkeler or an amateur scuba diver? *

Snorkeler diver
 Amateur scuba diver

[Next](#) [Clear form](#)

Figure 65: The questionnaires in the survey (2)

SURVEY ON NEW DIVING APPLICATIONS - UnderSea

nghianmgcc200100@fpt.edu.vn [Switch accounts](#)



✉ Not shared

* Indicates required question

Evaluation of user interface

How would you evaluate the application's straightforward? *

- Very good
- Good
- Neutral
- Bad
- Very bad

Figure 66: The questionnaires in the survey (3)

How would you evaluate the application's usability? *

- Very good
- Good
- Neutral
- Bad
- Very bad

How would you evaluate the application's accessibility? *

- Very good
- Good
- Neutral
- Bad
- Very bad

Figure 67: The questionnaires in the survey (4)

How would you evaluate the overall interface of UnderSea? *

Very good

Good

Neutral

Bad

Very bad

Please provide your feedback on potential updates to the system's UI in the future. *

Your answer _____

[Back](#) [Next](#) [Clear form](#)

Figure 68: The questionnaires in the survey (5)

SURVEY ON NEW DIVING APPLICATIONS - UnderSea

nghianmgcc200100@fpt.edu.vn [Switch accounts](#) 

 Not shared

* Indicates required question

Evaluation of application function

How would you evaluate the application's monitoring metrics function? *

Very good

Good

Neutral

Bad

Very bad

Figure 69: The questionnaires in the survey (6)

How would you evaluate the application's capturing moments function? *

Very good

Good

Neutral

Bad

Very bad

How would you evaluate the application's connecting everyone in the community * function?

Very good

Good

Neutral

Bad

Very bad

Figure 70: The questionnaires in the survey (7)

How would you evaluate the overall benefits for the divers of UnderSea? *

Very good

Good

Neutral

Bad

Very bad

Please provide your feedback on potential updates to the system's functions in * the future.

Your answer

Figure 71: The questionnaires in the survey (8)

Appendix C – The analysis of the responses of all survey takers

Below is a summary and analysis of the responses of all survey takers for this UnderSea:

- **Section 1:** The questions used to get personal information from those surveyed are listed (*from Figure 72 to Figure 79*) below:
 - + **Question 1:** This inquiry is designed to elicit the respondent's name (*Figure 72*).



Figure 72: Question 1 in the survey

- + **Question 2:** This inquiry is designed to elicit the respondent's age (*Figure 73*).

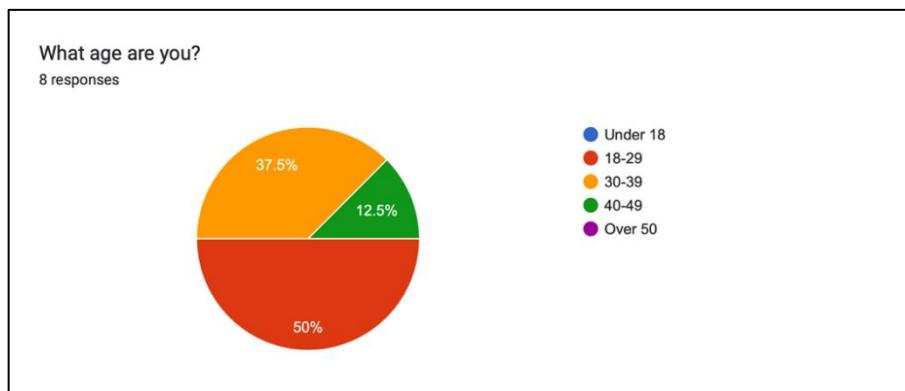


Figure 73: Question 2 in the survey

- + **Question 3:** This inquiry is designed to elicit the respondent's diving experience (*Figure 74*).

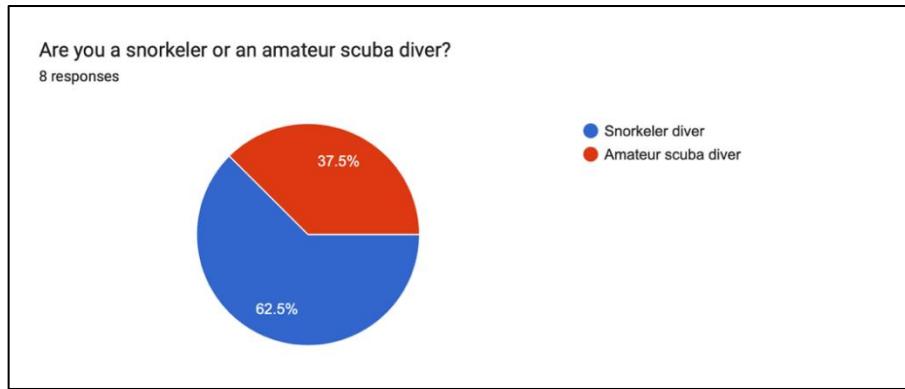


Figure 74: Question 3 in the survey

- **Section 2:** The questions used to prove the application's hypothesis 1 is correct are listed (*from Figure 75 to Figure 74*) below:
 - + **Question 4:** The programme was rated extremely easy by most respondents (87.5%), with a tiny minority (12.5%) rating it good, but none rating it neutral, terrible, or dreadful (*Figure 75*).

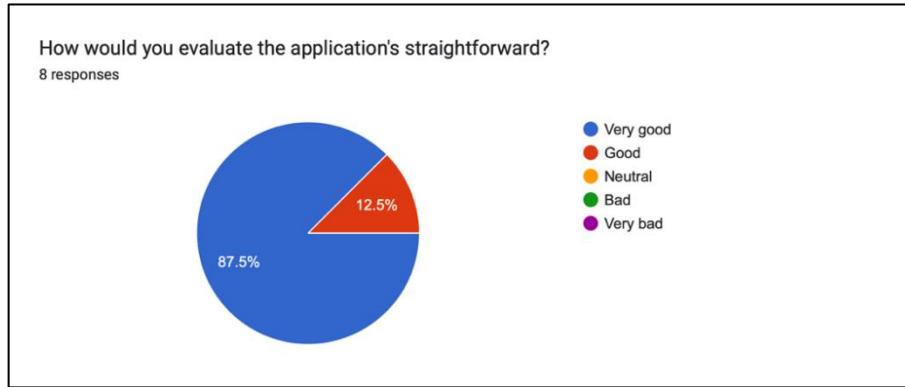


Figure 75: Question 4 in the survey

- + **Question 5:** This demonstrates that all respondents (100%) regarded the application as highly usable. None thought it was good, neutral, poor, or bad (*Figure 76*).

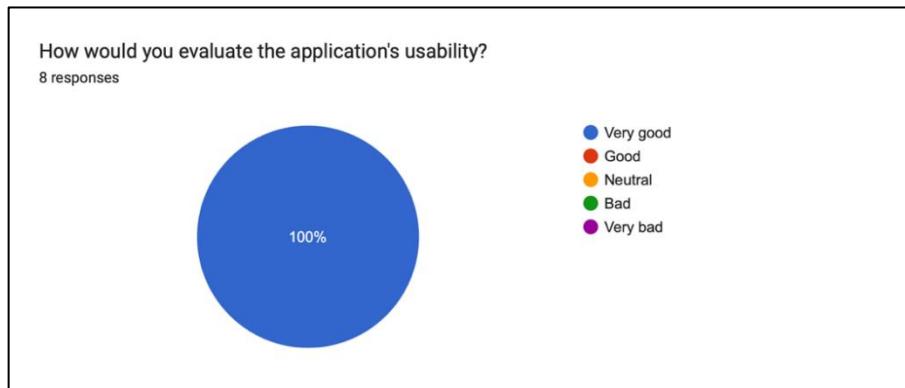


Figure 76: Question 5 in the survey

- + **Question 6:** The programme was rated highly accessible by most respondents (87.5%), with a tiny minority (12.5%) rating it good, but none rating it neutral, terrible, or dreadful (*Figure 77*).

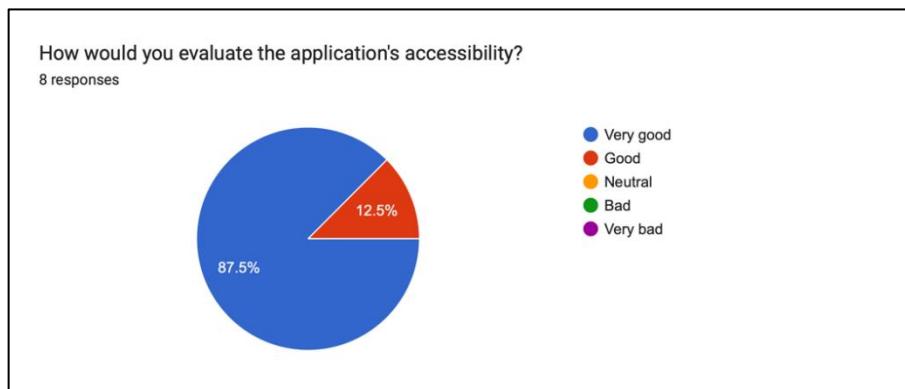


Figure 77: Question 6 in the survey

- + **Question 7:** This demonstrates that all of the respondents (100%) regarded the application as a perfect UI. None thought it was good, neutral, poor, or bad (*Figure 78*).

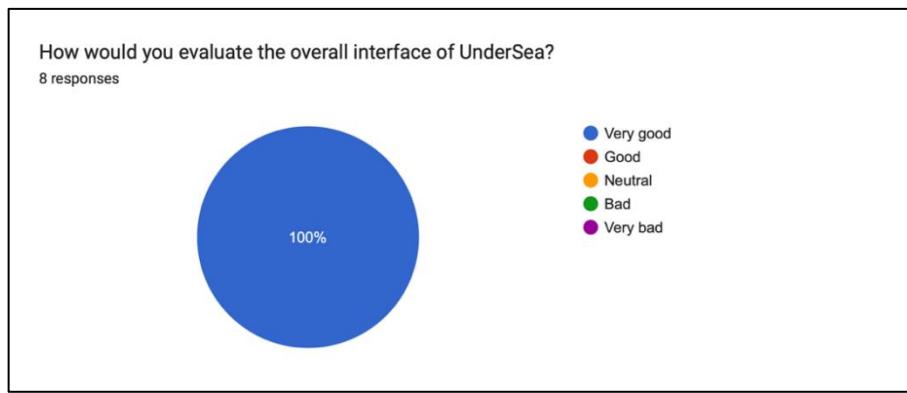


Figure 78: Question 7 in the survey

- + **Question 8:** In response to this question, everyone responded that the app's UI is now operating very well and has no contribution in the future (*Figure 79*).

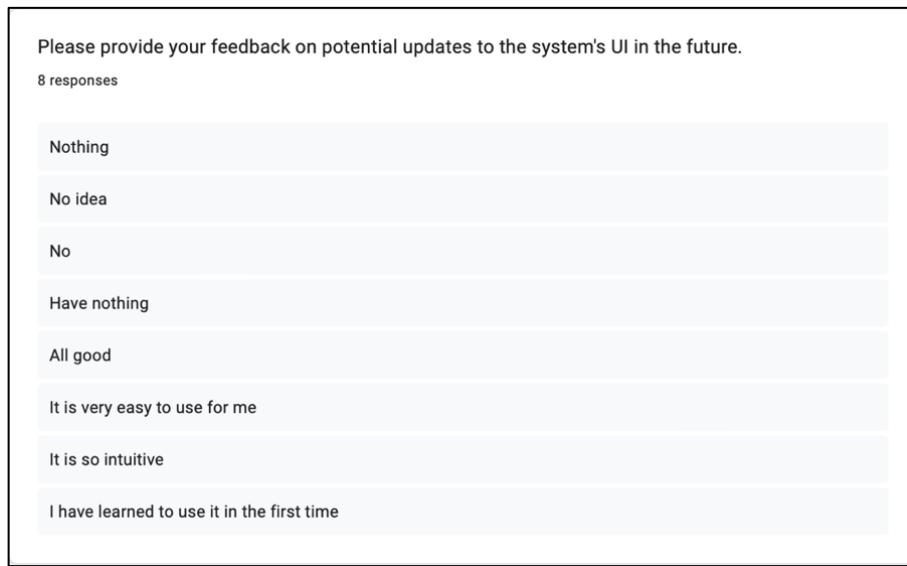


Figure 79: Question 8 in the survey

- **Section 3:** The questions used to prove the application's hypothesis 1 is correct are listed (*from Figure 80 to Figure 84*) below:

- + **Question 9:** This demonstrates that all of the respondents (100%) regarded the application's monitoring metrics function as excellent. None thought it was good, neutral, poor, or bad (*Figure 80*).

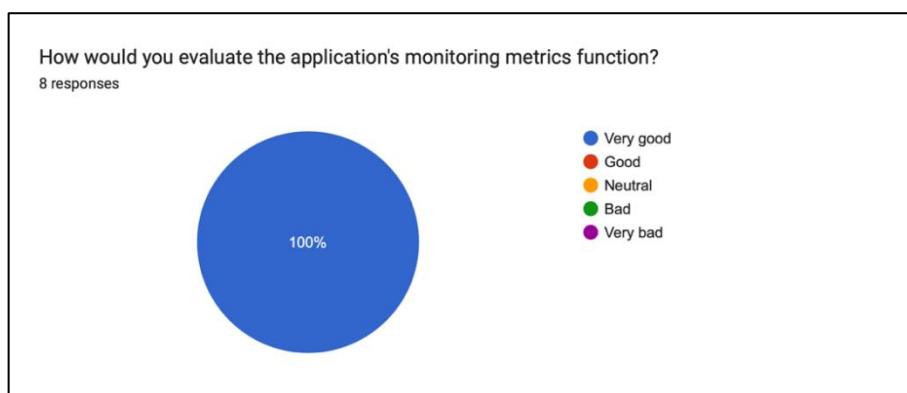


Figure 80: Question 9 in the survey

- + **Question 10:** The application's capturing moments function was rated excellent by most respondents (87.5%), with a tiny minority (12.5%) rating it good, but none rating it neutral, terrible, or dreadful (*Figure 81*).

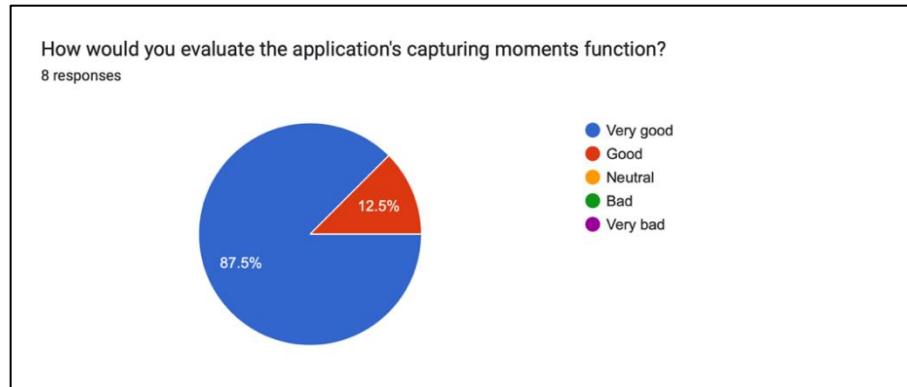


Figure 81: Question 10 in the survey

- + **Question 11:** The application's connecting everyone in the community function was rated excellent by most respondents (87.5%), with a tiny minority (12.5%) rating it good, but none rating it neutral, terrible, or dreadful (*Figure 82*).

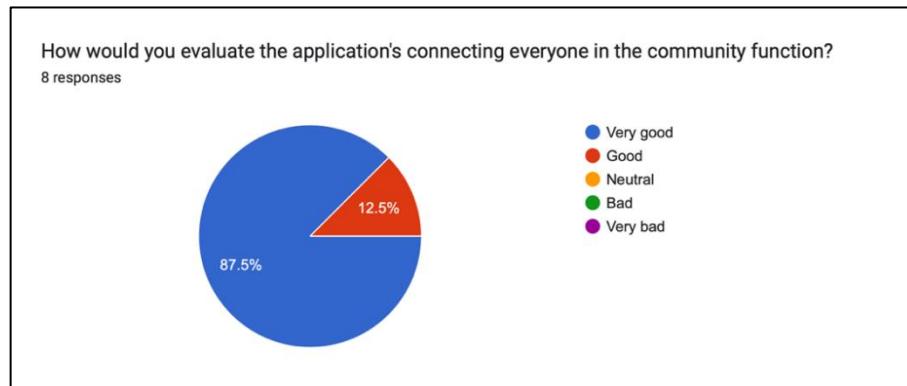


Figure 82: Question 11 in the survey

- + **Question 12:** This demonstrates that all of the respondents (100%) regarded the application to be excellent functions. None thought it was good, neutral, poor, or bad (*Figure 83*).

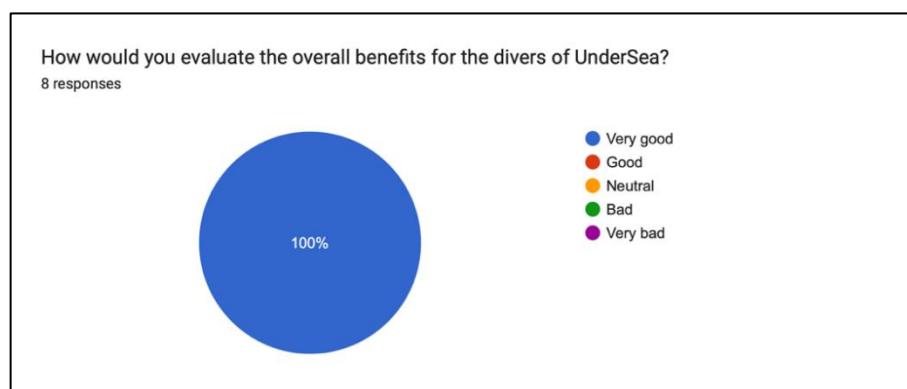


Figure 83: Question 12 in the survey

- + **Question 13:** The system is functioning well, with no issues. However, suggestions suggest improving commenting and adding friends on community page posts and enhancing the community page's functionality (*Figure 84*).

Please provide your feedback on potential updates to the system's functions in the future.

8 responses

Nothing

Let's me comment on everyone post

I want to add friend with people

I don't have

Your application helped me a lot of thing in diving at Phu Quoc

It works so good

Easy to use

It is very useful

Figure 84: Question 13 in the survey

Appendix D – The list of Heuristic of mid-fidelity used for UnderSea

The Heuristic of (Nielsen & Molich, 1990) and (Nielsen, 1994) is used to analyse the UnderSea application's mid-fidelity prototype (*from Figure 85 to Figure 94*):

- **Visibility of system status:** The parameters of the add track page will automatically change in real-time when the user clicks the play button (*Figure 85*).



a) The parameters change on the mobile b) The parameters change on the watch
Figure 85: The figures demonstrate the "Visibility of system status" of UnderSea

- **Match between the system and the real world:** The icons in the programme show items and events that are most closely comparable to real-life circumstances (*Figure 86*).

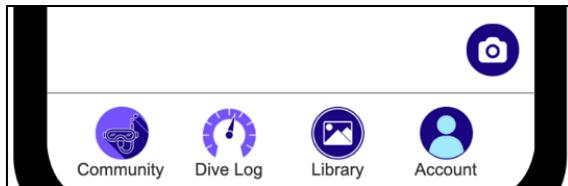
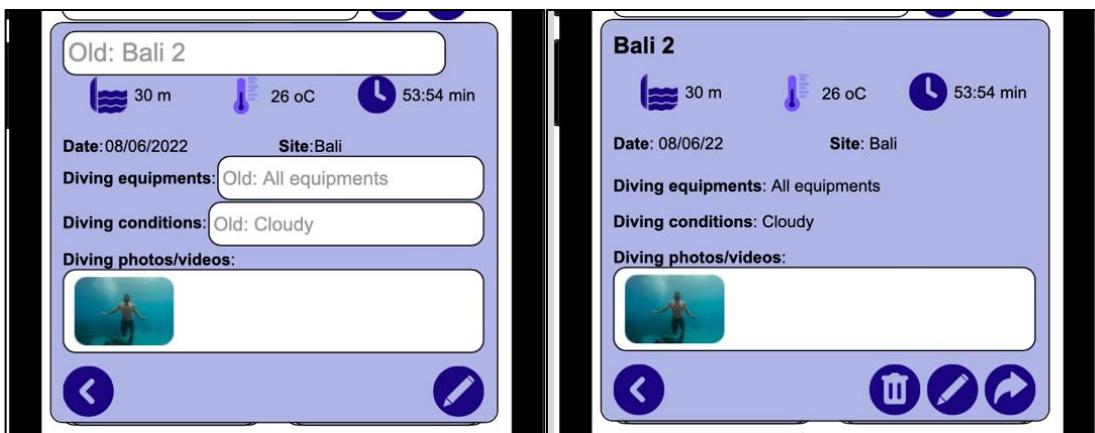


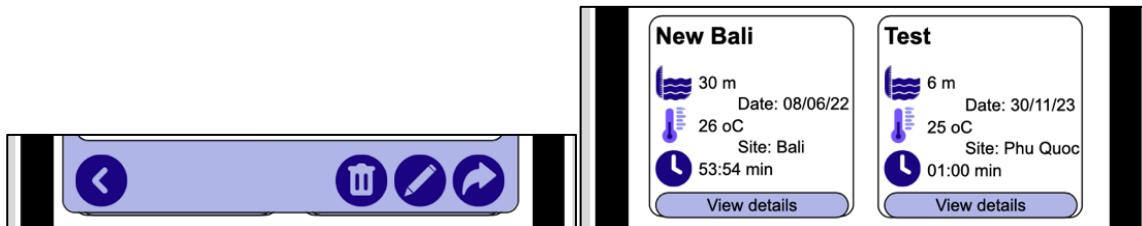
Figure 86: The figures demonstrate the "Match between the system and the real world " of UnderSea

- **User control and freedom:** Users can quit a track editing session without changing the prior data by clicking the back symbol (*Figure 87*).



a) The parameters change on the mobile b) The parameters change on the watch
Figure 87: The figures demonstrate the "User control and freedom" of UnderSea

- **Consistency and standards:** The colours of the icons and typefaces in the application's UI are consistent (*Figure 88*).



a) The colours and icons in the function b) The colours and icons in the track interface
Figure 88: The figures demonstrate the "Consistency and standards" of UnderSea

- **Error prevention:** The application prompts users to decide whether to permanently delete their account by clicking on the delete account icon (*Figure 89*).

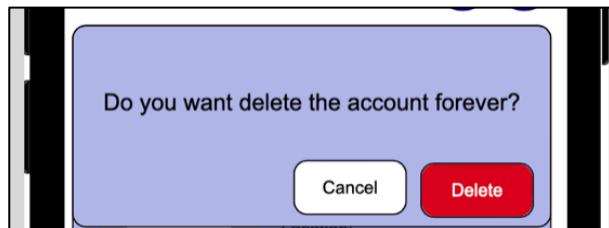


Figure 89: The figure demonstrates the "Error prevention" of UnderSea

- **Recognition rather than recall:** The system displays tracks with similar locations to the search content when users search for tracks by location, hiding the remaining tracks (*Figure 90*).



Figure 90: The figure demonstrates the "Recognition rather than recall" of UnderSea

- **Flexibility and efficiency of use:** Users may swiftly move between pages by clicking the icons beneath the navigation bar (*Figure 91*).

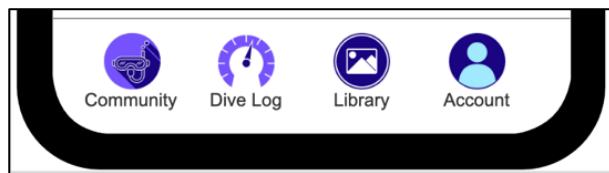
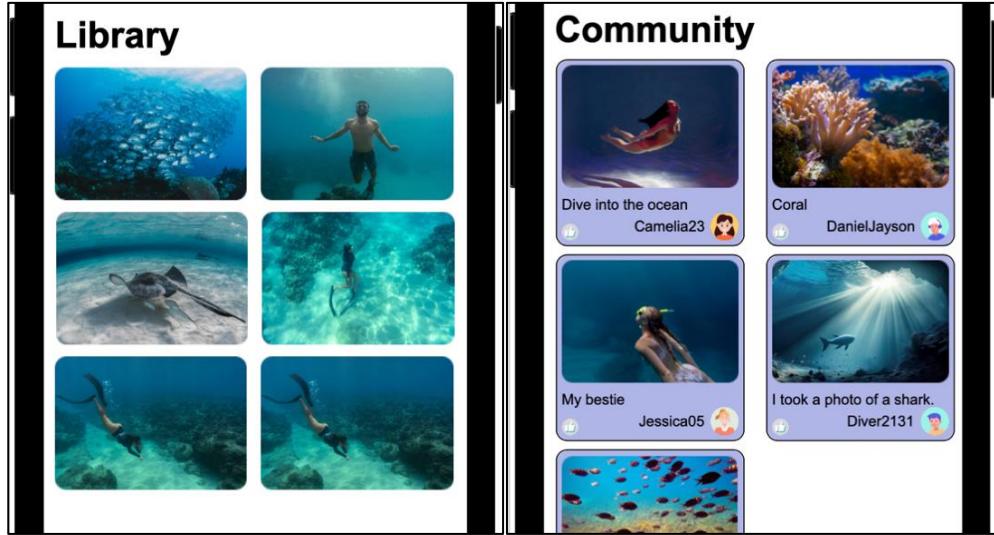


Figure 91: The figure demonstrates the "Flexibility and efficiency of use" of UnderSea

- **Aesthetic and minimalist design:** The application's interface is straightforward, with no unnecessary design elements (*Figure 92*).

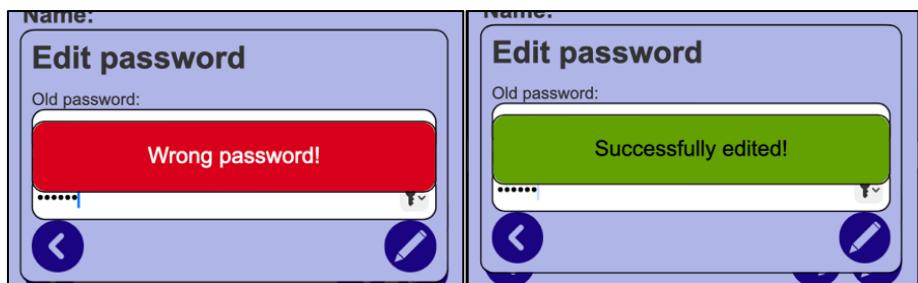


a) The Library interface

b) The Community interface

Figure 92: The figures demonstrate the "Aesthetic and minimalist design" of UnderSea

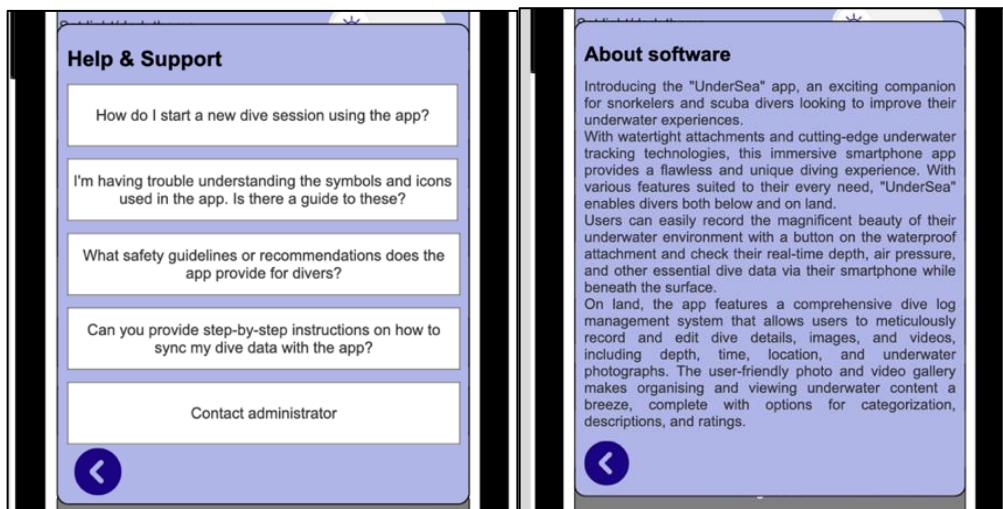
- **Help users recognise, diagnose, and recover from errors:** The system either displays an error when the user inputs the incorrect username/password or a success message when the user inputs the correct data (*Figure 93*).



a) Unsuccessful edit profile function interface b) Successful edit profile function interface

Figure 93: The figures demonstrate the "Help users recognise, diagnose and recover from errors" of UnderSea

- **Help and documentation:** The settings page of the programme includes "Help & Support" and "About software" sections, allowing users to address problems and improve their understanding of the software (*Figure 94*).



a) Help & Support function interface b) About software function interface

Figure 94: The figures demonstrate the "Help and documentation" of UnderSea