

## Section 1: Overview of your Primary Stakeholder Group

Climbers are individuals who climb surfaces as a sport or hobby. There are many different types of climbing, each having its own requirements for skills, equipment and conditions, but the goal is the same; to reach the top of a wall or a specific destination.

Types of climbing include<sup>[1]</sup>:

- Artificial Wall Climbing: Climbing artificial walls designed with grips/holds for hands and feet. Typically indoors, the aim is to reach a top hold and touch it using both hands simultaneously before descending; climbable with or without a rope or safety harness, depending on the height of the wall.
- Bouldering: Clambering short routes at low heights performed without a harness or rope. Usually an indoor sport, however, it is also practised outdoors using a crash mat.
- Big Wall Climbing: Ascending long multi-pitch routes typically in teams, requiring hauling equipment and portaledge to sleep and recuperate. Specialist gear includes food/water, ropes, gear racks, and a haul/zip line, all contained within a haul bag.
- Free Solo: Climbing above 40 metres, allowing only standard gear like climbing shoes and chalk for equipment.
- Ice Climbing: Ascending ice formations such as glaciers and frozen waterfalls; Requires specialist equipment such as an ice axe, ice climbing boots, ice screws, gore-tex gloves and carabiners.
- Mountain Climbing "Mountaineering": Mountaineering is navigating to reach the highest points in mountainous regions. This form of climbing requires goes to traverse multiple terrains, including rock, snow and ice.

Due to the nature of the sport, climbing is a dangerous activity requiring climbers to have technical knowledge of proper techniques, how to descend and how to use specialist equipment (if applicable). When not done correctly, climbers can become injured as the sport can lead to spine damage<sup>[2]</sup>, excessive UV exposure from solar rays and death, among other dangers.

Common knowledge among most forms of climbing is "how to properly descend and fall/land safely", "how to tie proper knots and safely use a harness device", and "proper climbing form". Five pieces of equipment apply to most forms of climbing, they are:

- Climbing Shoes
- Chalk/Chalk Bag
- Helmet
- Harness
- Rope

Among the examples mentioned, bouldering and artificial wall climbing are mainly indoor activities; danger and risk are much lower as they take place in controlled environments. However, other forms of climbing, such as Mountaineering, Ice Climbing and Free Soloing, occur outdoors where conditions are harsher, with more variables and reliance on the weather; Outdoor climbers must be able to read and comprehend weather information to make informed decisions on the safety of an ascent.

In regards to weather, the main conditions of note that climbers monitor comprise<sup>[3]</sup>:

- Temperature
- Humidity
- Wind Speed and Direction
- Cloud Coverage
- Possible changes of weather like snowing, thunder or rain
- Fog/Visibility<sup>[4]</sup>

In conclusion, (outdoor) climbing is a very technical sport requiring climbers to have proficiency with many different techniques and specialist tools, depending on the type of climb. Due to the quantity of information and the technical skill of climbers, the presentation of data should be extensive yet concise to be (relatively) simple to use in urgent situations.

## **Section 2: Identification and Description of Wider Stakeholders**

### **Secondary stakeholders:**

Hikers/trekkers – These are people who walk long distances across a trail or path. They may rely on mountain guides, where they are “essential to a safe and interesting hiking experience”<sup>[5]</sup>. Mountain guides know the optimal trails and paths, by checking their state and safety<sup>[5]</sup>. Hence in the interaction context, knowing an optimal route in real time will be crucial for climbers, as they need to recognise their circumstances constantly, and make critical choices.

Campers – These people involve themselves in an outdoor activity, by staying at night in protective shelter, which is out in nature. Campers always have to be prepared, where they “Dress for utility”, and have “shelter that is resilient to rain, snow, or excessive sunlight.”<sup>[6]</sup>. Therefore, preparations for climbing can also be applicable in the same sense, where climbers will require adequate shelter for arduous trips.

**Tertiary stakeholders:**

News organisations – A news organisation reports noteworthy events that take place. These reports vary depending on the news coverage and such. They range from local news, national news, to international news. In particular, since local news reports within their local area, climbers may want to indulge in any of their featured climbing activities. Additionally, any popular “climbing news” can be reported by national news. Essentially, climbers may want to be updated on general “climbing news”, hence news organisations can thrive off the success of the system, by having new climbers that indulge in their content.

**Facilitating stakeholders:**

Front-end Developers – These developers handle the front-end of the system, i.e., the user interface of the application. The front-end developers are the ones that design the layout of information that’s displayed, such that reading, and navigation of information is straightforward. Hence, the user interface will be a principal element of the system, because climbers will have specific requirements of information, like temperature and humidity, that need to be displayed in an appreciable manner.

Administrators - An administrator maintains the functionality of the system. This functionality for example being, the performance of the system, the errors or bugs prevalent, reliability and relevance of information presented etc. The administrator has to maintain the system up to standards for the climbers, such that the usability of the system and accuracy of information, is overall suitable for climbers to facilitate with.

## Section 3: Data Gathering

We used user interviews to obtain data, which is a flexible, convenient and accurate way of collecting data. We designed the survey questions in advance based on general and subjective ideas, and some situations may not have been well thought out. During the interviews, the survey questions can be adjusted or expanded based on respondents' feedback. If the interviewees do not understand the questions, they can ask questions and ask for explanations; if we find that the interviewees misunderstand the questions, we can also explain or guide them in time. As the communication process is somewhat quick, respondents often cannot think for very long when answering questions, so the answers they get are often spontaneous and more truthful and reliable, with very little fudging or forgery. In this way we can get a very accurate and intuitive picture of the weather conditions that are of most concern to climbers before they climb.

From our data we surmised that climbers monitor six main weather conditions:

### **Temperature:**

Temperature vastly impacts climbing performance in a few aspects. Lower temperatures result in a more significant coefficient of friction<sup>[7]</sup>, allowing climbers to grip holds and surfaces with less strain; colder environments reduce precipitation preventing sweat from lubricating surfaces and decreasing the rate at which climbers need to hydrate. Research has proven that temperatures at least as low as (10°C) result in significantly increased finger endurance and recovery<sup>[8]</sup>.

Temperatures too low or high result in adverse effects. Outside of impacts to the body, in the case of ice climbing/mountaineering, if the temperature is too hot/cold, the integrity of ice formations is compromised, resulting in "slushy"/brittle surfaces<sup>[9]</sup> that are hazardous to traverse.

### **Weather cycle**

Climbing is a very time and physical sport and weather cycles can help climbers to plan their climbing schedules in advance. We understand that activities at lower altitudes are not as dependent on good weather as those at higher altitudes, so climbers will give due consideration to reserving good weather cycles for higher altitude activities, depending on the previous weather cycles in the area. On multi-camp ascents, it is possible to move ahead and take advantage of the 'bad weather' that precedes the good weather cycle at lower altitudes to increase the chances of encountering good weather at higher altitudes and in difficult terrain.

**Humidity:**

Humidity is a measure of moisture in the air; High humidity increases the dampness of holds/surfaces<sup>[5]</sup>, raising the difficulty of a climb due to reduced friction.

**Wind Speed and Direction:**

Wind direction can raise or lower the strain of a climb. If behind the climber, the force provided decreases the burden, whereas the opposite applies in front<sup>[10]</sup> in addition to reduced visibility (if precipitating), increased energy usage and risk of hypothermia.

Regarding wind speed, higher speeds affect balance beginning from values exceeding (30mph) putting climbers at risk of falling into harm.

**Ultraviolet index**

The UV index is a measure of the intensity of the sun's ultraviolet rays. High values usually mean that your skin and eyes are quickly burned by UV rays. However, the right UV rays can enhance protein metabolism and promote secretion of the stomach, thyroid and adrenal glands. When climbing, you need to be aware of the UV index at all times so that you can change your clothes in time to find a suitable place to rest or take advantage of the right UV intensity to lighten your climbing load.

**Visibility**

The size of the fog directly affects the visibility level, low visibility means that the water vapour content in the air is too high, causing climbers to inhale too much water vapour which affects the oxygen intake, the visibility also makes the climber's judgement of the surroundings more inaccurate and increases the risk of climbing, we understand that the best visibility for climbing is between 2-30km.

## Section 4: Requirements Development for your Primary Stakeholder

**Aims:** From our data we found out that climbers have many reasons why they climb, some of which are:

- The enjoyment of the outdoors, with success being: able to climb in good weather and in a range of locations
- The Personal challenge, with success being: climbing harder climbs as they improve
- Physical fitness, with success being: improved fitness health, strength, endurance and flexibility

**Source of Satisfaction:** One source of satisfaction is overcoming a difficult climb that they have been struggling with. This proves to them that all the effort they put in was worth it and that they have improved as a climber. Another source of satisfaction is when outdoor climbers reach the top of the mountains and experience the beautiful view that many don't. This gives them the feeling that the difficulty in the climb was well worth it. A source of satisfaction that indoor climbers experience is after beating a personal best in a climb through many months of training and practice.

**Knowledge and Skills:** Beyond climbers having knowledge and skills in climbing, such as how to tackle a specific climb, they have a plethora of knowledge in safety. This could include how to fall properly and first aid as climbing could be very dangerous. They are also skilled in using climbing equipment such as climbing harnesses and carabiners, while some may also be skilled in technology used to track the outdoor condition, such as temperature and humidity when climbing outdoors.

**Attitude to Work:** Climbing requires a lot of skills, dedication and adaptability. This is why they are open to change and technology. Climber's need to be adaptable as they climb are large range to different walls that requires different skills and technique, this is why they would be open to changes in technology especially if it can help them climb safer outdoors as outdoor climbing could be very dangerous.

**Work-Group Attributes:** Outdoor climbing can be very dangerous. The dangers can include the stability of the rocks they are climbing on to the climate conditions that are out of there control. This is why there is a need to monitor the climate conditions as if they begin climbing when it is raining it is even more dangerous as the rocks will be slippery.

**Features of activity:** The frequency in which climbers climb can range from daily to yearly depending on the individual. If the climber wants to climb outside they must first plan beforehand by preparing the right equipment and choosing a good location. When they get there they must first put on their safety equipment before climbing.

**Responsibilities:** Climbers do not have a specific responsibility to anyone however they may care about their privacy as if they are planning where they want to go to climb outdoors they do not want to be easily tracked by apps stores the locations they searched and the specific day and time they are looking at as this will reveal their location at that time.

**Working Conditions:** This system will be used by outdoor climbers who need to know about the outdoor conditions before they climb or during the climb. They will use the system before they climb when they are planning where they are going to climb as they need to know if the locations will be in a suitable condition to climb. They will use the system during the climb if they begin to feel the outdoor condition change and where it is safe to continue climbing.

## Section 5: Design

The design is very simple and extremely quick and easy to use, for instance in order to check the temperature or weather conditions of the current location, a user simply has to open the app and it is displayed to them on the first screen.

Our design allows users to customise the main screen but retains the current location temperature block on the top which ensures the basic need of checking “today's weather”. The customising idea was highlighted by the apple widget. This design allows the climber to view information of their favourite cities or area that they found and added using the search bar in one page. We aim to make all features within three clicks. By clicking the widget, it directs the user to the location's precise information page. By clicking the search bar, it will also pop up some recommended areas (with good climbing weather) for the user to reference. The button on the top left contains the features ‘editing’ and ‘login’. Editing allows the user to adjust the size of the budgets and delete unwanted budgets apart from the current location's budget. Login is an additional feature for this weather app. It is only required when the user wants to use the weather app on the other device with the saved favourite cities' information.





**-18°**

London

H: 20°

L: 15°



⇒<sub>2</sub>

70



16°



17°



19°



20°



18°



16°



16°

Now

10am

11am

12pm

1pm

2pm

3pm



**-18°**

London

H: 20°

L: 15°



⇒<sub>2</sub>

70



**-18°**

London

H: 20°

L: 15°



⇒<sub>2</sub>

70



**-18°**

London

H: 20°

L: 15°



⇒<sub>2</sub>

70



**-18°**

London

H: 20°

L: 15°



⇒<sub>2</sub>

70



Search

## Section 6: Project Roadmap

### Potential Problems

Problem	Action Taken
Lack of Communication and poor time management	Update teammates via Discord on a regular basis.  Every 2-3 Days send a message to the server telling group members any issues with the work or any progress.
Missing Skills	Group members learn the technologies required.
Missed Deadlines	Consistent communication and set a roadmap for incrementally finishing work
Unexpected technical issues	Try to resolve it immediately if it's core for the app, otherwise work around it by fixing it later, or excluding the feature if necessary.
Scope Creep	Reevaluate the application occasionally as well as abide by the initial design
Version Control	Upload work to the discord with detailed descriptions of any changes or work added.
Group Conflict	Attempt to resolve the issue internally before getting a demonstrator or teacher to intervene.
Poor user interface	Ensure the style of the app is consistent, i.e. the format of text, headers, etc. are all similar. Also ensure important information is easily accessible and readable.

### Strengths of the Group and Task Allocation

Group Member	Strengths/Skills	Task	Reasoning for task
Leon	Strong programmer as well as a good learner of new technologies.	Back-End Implementation	Back-end API calls are complicated and requires a period of rigorous learning
Josh	Familiarity with back-end design	Back-End Implementation	Existing familiarity with back end design is suitable for the task.
Fangshu	Strong designer and good learner	Design and formatting of App	Formatting the app is an extension of existing skills and work on the front page

			design in this document.
John	Strongly committed to tasks, and is meticulous with work.	Front-End Implementation	Wants to ensure the app is readable and aesthetic for the user, which requires flawlessness.
Chang	Strong learner and critical thinking skills.	Front-End Implementation	Appropriate decisions are required for implementing the interface, i.e. for the layout and aesthetic.

## Project Roadmap

Group Member	Task	Deadline
All	Learn Basic Codebase (Do the example exercises) + Install Boilerplate Code	1st March
All	Generate an Open Weather API Key and learn its functionality (Only need 1 in the code)	1st March
John & Chang	Create the structure for the Main Screen with spaces available for API data to be stored (API functionality is for Back-End)	8th March
John	Create the burger menu and the search overlay that is applied onto the main screen.	8th March
Leon & Josh	Create API calls and extract weather information for each factor included in the Data Gathering	15th March
Leon & Josh	Integrate API calls into the existing front-end structure to fill widgets with weather information	15th March
Fangshu	Use libraries and CSS to add design layouts to the functional app	18th/19th March
Fangshu	Create widgets that present data retrieved from existing API calls that fit within the front-end structure	21st March
All	Finish the App	21st March
All	Gain feedback on the app on the 22nd and make any necessary changes to prepare final submission	23rd March

## References:

1. *Types of climbing* (2021) National Parks Service. U.S. Department of the Interior. Available at: <https://www.nps.gov/subjects/climbing/types-of-climbing.htm> (Accessed: February 9, 2023).
2. Pennington, P. (2020) *Is rock climbing dangerous? the facts may surprise you*, Rock Climbing Central. Available at: <https://rockclimbingcentral.com/is-rock-climbing-dangerous-the-facts-may-surprise-you/> (Accessed: February 9, 2023).
3. Walker, N. (2022) *A beginner's guide to climbing conditions*, Grippd Magazine. Available at: <https://grippd.com/news/a-beginners-guide-to-climbing-conditions/> (Accessed: February 9, 2023).
4. Mountain Safety Met Office. Available at: <https://www.metoffice.gov.uk/weather/guides/mountain/video> (Accessed: February 9, 2023).
5. Aguirre, C. (2018) *What is hiking? equipment, best season, top spots*, Explore. Available at: <https://www.explore-share.com/blog/what-is-hiking-equipment-best-season-to-p-spots/> (Accessed: February 13, 2023).
6. *Everything you need to know about camping Everything You Need to Know About Camping* | Pegasus Airlines. Available at: <https://www.flypgs.com/en/extreme-sports/camping> (Accessed: February 13, 2023).
7. McCarthy, C., Savage, H., & Nettles, M. (2017). *Temperature dependence of ice-on-rock friction at realistic glacier conditions*. *Philosophical transactions. Series A, Mathematical, physical, and engineering sciences*, 375(2086), 20150348. Available at: <https://doi.org/10.1098/rsta.2015.0348> (Accessed: February 10, 2023)
8. Phillips, K., Noh, B., Gage, M., & Yoon, T. (2017). *The effect of cold ambient temperatures on climbing-specific finger flexor performance*. *European journal of sport science*, 17(7), 885–893. Available at: <https://doi.org/10.1080/17461391.2017.1328707> (Accessed: February 10, 2023)
9. Memedovich, M. (2022) *Judging ice climbing conditions: How to know when to go*, Ascentionism. Available at: <https://ascentionism.com/judging-ice-climbing-conditions-how-to-know-when-to-go/> (Accessed: February 10, 2023).
10. *Wind speeds in the mountains* MCoFS. Available at: <https://www.mountaineering.scot/safety-and-skills/essential-skills/weather-conditions/wind-speeds> (Accessed: February 10, 2023).

11. *Dangers in alpine climbing* Outdooractive. Available at:  
<https://www.outdooractive.com/en/knowledgepage/dangers-in-alpine-climbing/57554250/> (Accessed: February 12, 2023).

## **Contributions:**

### Leon [29%]:

Completed the initial section on "Overview of your Primary Stakeholder Group".  
Wrote the descriptions of what weather conditions mean for climbers and how they affect climbing within the "Data Gathering" 500 word summary section; Data was gathered from research and interviews.  
Created the bulk of the Project roadmap including the potential problems, skills of group members and the milestones.

### John [19%]:

Completed the second section on "Identification and Description of Wider Stakeholders".

### Chang [14%]:

Wrote the description of our data gathering method as well as extended upon the summary of what weather conditions climbers monitor from the research.

### Josh [19%]:

Completed the fourth section on "Requirements Development for your Primary Stakeholder"

### Fangshu [19%]:

Created the design of the main app screen as well as detailed the reasoning and functionality behind the design