SIGNAL CORE

User Perception and Validation of a Wearable Safety - Support Concept

Module

User Research (CT7URES)

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Abstract

This report outlines an exploratory user research study for Signal Core, an emerging wearable safety-support concept for individuals who may feel uncertain, unsupported, or disconnected in outdoor, remote, or unfamiliar scenarios. The study investigated if users recognised the problem, how they interpreted the product concept and what would influence trust, usefulness, and adoption.

Mixed methods were employed. One method was an online survey with twenty-three adult participants. The second method consisted of six semi-structured interviews with the support of a non-functional 3D printed prototype. Survey data were analysed using descriptive statistics and interview responses and open-text survey answers were analysed thematically.
The results indicate that the problem space is large. In the survey, twenty-two of the twenty-three participants reported experiencing uncertainty, lack of support or risk in outdoor or unfamiliar environments.

Currently, mobile phones were the most widespread support tool used, but interviews indicated that they can be unreliable due to lack of signal, dead batteries, unclear navigation, or unsafe usage in some public situations. Signal Core was perceived as a safety or emergency-signalling concept with a mean purpose clarity score of 4.04 (out of 5). The ease of understanding was scored lower at 3.61, which suggests the need for clearer interaction cues of the concept. Both usefulness and trust had a rating of 3.57, which indicated a positive but conditional acceptance.

The report recommends that the Signal Core transition to a more refined functional prototype stage. Further development should include battery life, reliability, confirmation feedback, comfort, flexible carrying options, accessibility and real-world testing before the concept can be considered a reliable safety product.

1. Executive Summary

Signal Core is a wearable safety-support concept designed for situations where users may feel uncertain, unsupported, or disconnected. The idea is not intended to replace a mobile phone. It is meant to be a safety object as a backup when normal support, such as a phone, map, other people, or internet connection is not available or not enough.

The research was conducted to determine if Signal Core should be pursued further. The study used twenty-three survey responses and six semi structured interviews. Participants in the interviews handled a non-functional 3D printed prototype and could thus give feedback on the size, shape, lid, central dial, wrist strap and touch-and-feel of the product. The prototype was not equipped with any working electronics or emergency-signalling capabilities, so the study was more about validating the concept than testing technical performance.

The study revealed strong early support for the issue. Most survey respondents were exposed to uncertainty or risk in outdoor or unfamiliar circumstances. Participants mostly used mobile phones, but interviewees gave examples of situations where phones were not sufficient, including dead batteries, no network, dark streets, confusing navigation, remote mountains, and unfamiliar cities.

Essentially, Signal Core was a safety, signal, or emergency support device. The strongest use cases were travelling alone, hiking, or outdoor activities, unfamiliar environments, and emergency situations. Other use cases emerged during the interviews such as road trips, villages, scary roads at night, older or disabled users, and people living alone. These broader groups were not directly tested as target users and therefore should be considered as opportunities for future research.

The main barriers to adoption were battery life, reliability, size/comfort, price, ease of use, durability, and false sense of safety. Trust was not automatic. People wanted proof that the product would work before they trusted it in a situation of importance. The next design stage should therefore not be based on appearance alone. Reliability, confirmation feedback, charging, waterproofing, durability and a clearer interaction system should be the priority.

The client's recommendation is to proceed with refinement. Signal Core shows early signs of user value but is not production ready. Before we can make stronger claims on real-world safety use, we need more realistic testing and a functional prototype.

2. Introduction and Project Context

The project started from a simple concern: people often rely on their phone when they are outside, travelling, hiking or in unfamiliar places. A phone provides maps, calls, messages, location sharing, light, and internet access in one device. However, it can become unreliable at the exact moment someone needs help. It can lose signal, run out of battery, give confusing directions, or feel unsafe to use openly in certain public situations.

Signal Core was created to address this problem. It is a wearable safety-support concept that gives people a simple physical back-up in uncertain situations. Instead of a screen-heavy interface, the idea is to use fast emergency signalling. The current design is a wrist-worn form with an opening lid, side button areas, a central control knob and danger/medical mode markings. The non-functional 3D printed model was developed and used in the interviews. The report does not state that Signal Core is a finished product or a certified safety device. The prototype in this study was only a concept model in physical form. It was good for talking about form, size, comfort, and interaction, but it could not test signal reliability, battery performance, waterproofing or emergency response.

The aim of this report is to evaluate the concept from a user research perspective. The main question is whether Signal Core seems useful and trustworthy enough to users that it deserves to be developed further, and if not, what needs to change before it can move forward. This makes the report a user validation study not a design-build report.

Figure 1. Non-functional 3D printed Signal Core prototype used during semi-structured interviews.

3. Research Context

3.1 User research and early concept validation

User research is important in the early stage of a product because it helps to avoid designing only from assumptions. A concept can be interesting, but you still need evidence that people see the problem, get the proposed solution and see enough value in it. User-centred research methods allow designers to explore behaviour, needs, expectations and barriers before investing in detailed development (Goodman, Kuniavsky, & Moed, 2012; Lazar, Feng, & Hochheiser, 2017).

For Signal Core, we used user research to validate the idea before building a more complex working prototype. The research is based on a pragmatic research logic, which includes collecting raw data, converting it into results, analysing it as user insights, and translating it into design or client actions. A good user research report should not be a list of survey results or quotes. It should say what the evidence means and what should be done next.

3.2 Wearable technology adoption

Wearable products are intimate to the body. This suggests that adoption is a matter not only of utility but also of comfort, size, social acceptability, ease of use and trust. Previous research on the adoption of wearable technology suggests that factors such as perceived usefulness, ease of use, comfort and fit with the everyday life of the individual can influence the acceptance or rejection of a wearable device (Adapa et al., 2018; Venkatesh et al., 2003).

This is especially critical for Signal Core, as the product is built for uncertain or stressful situations. In those moments, it is not always possible for users to work through complicated controls. The interaction must be simple, clear, and physically obvious. This also connects to Norman's (2013) argument that good design should make actions visible and understandable to the user.

The survey therefore measured clarity, ease of understanding, usefulness, trust, and willingness to carry or wear. The interviews were then used to probe the reasons for participants' responses and what would need to change to build trust in the device.

3.3 Trust in safety-support products

Safety-related products are a matter of trust. People may find some concept useful but not want to rely on it in a critical situation unless they think it will work. Both perceived usefulness and perceived ease of use are important in technology acceptance research, but for safety-related products, reliability and confidence in the system become even more important (Davis, 1989; Venkatesh et al., 2003).

In Signal Core, trust is a combination of battery life, reliability, durability, emergency connection, and clear feedback after activation. The prototype was not functional, and so this study can only talk about perceived trust. It cannot show that the product will work in a real emergency. This is why the language in this report is careful. The results are encouraging, but do not prove safety performance.

3.4 Phone reliance as the key problem

Research found that when people are unsure, they consult their phones for support first. That is not surprising, but it is important. The product opportunity for Signal Core is born out of the limitations of phone dependency. Interview participants reported dead phones, no network, unfamiliar places, and situations where it did not feel safe to take out a phone.

So Signal Core should not be seen as a phone replacement. It should be perceived as a backup support object, to be used when the phone is not available, not dependable, or not sufficient.

3.5 Accessibility and inclusive safety design

The safety support device should be suitable for diverse types of users and under difficult conditions. Some of the interview participants mentioned accessibility concerns, such as the understanding of danger and medical markings by visually impaired users, and whether a button would be easier than a dial for older users. Inclusive design is important because products are not intended to add to effort and confusion in stress but to decrease them (Preece, Rogers, & Sharp, 2019).

This does not prove that the current design works for older or disabled users, as those groups were not directly recruited as a target sample. However, it shows that accessibility should be considered in the next design stage at an early stage.

4. Research Aim, Objectives, and Research Question

4.1 Research aim

The aim of this study was to evaluate user perceptions of Signal Core as an early-stage wearable safety-support concept and to determine whether the concept addresses a meaningful user need in outdoor, remote, or unfamiliar situations.

4.2 Research objectives

1. To understand how participants experience uncertainty, lack of support, or risk in outdoor or unfamiliar environments.
2. To identify what participants currently rely on in those situations.
3. To evaluate whether participants understand the purpose of Signal Core.
4. To assess perceived usefulness, ease of understanding, trust, and willingness to wear or carry Signal Core.
5. To identify concerns, adoption barriers, and design improvements.
6. To translate the findings into client-facing recommendations for future prototype development.

4.3 Research question

To what extent do users perceive Signal Core as a useful, understandable, trustworthy, and acceptable wearable safety-support concept for outdoor, unfamiliar, or emergency situations?

4.4 Working hypothesis

Users will perceive Signal Core as a potentially useful backup safety-support concept, especially for travel, hiking, unfamiliar environments, and emergency situations. However, trust and adoption will depend on reliability, battery life, comfort, ease of understanding, and evidence that the device works in real-world conditions.

5. Methodology

5.1 Research design

The study adopted an exploratory mixed-method research design. It was non-experimental in that it did not test a working product or compare controlled conditions. The objective was to explore user needs, perceptions, concerns, and adoption conditions regarding an early concept.

A mixed methods approach was chosen as the study needed measurable trends from the survey and deeper explanations from the interviews. Mixed-methods research is useful when quantitative data shows broad patterns and qualitative data explains the patterns in a context (Creswell & Plano Clark, 2018).

This approach was appropriate because Signal Core was not ready for technical testing. A full field trial was unsuitable because the prototype could not send alerts, create real SOS signals, track location, or test battery life. However, the physical model had matured sufficiently to allow concept validation and touch-and-feel feedback.

- online survey with twenty-three adult participants
- six semi-structured interviews
- handling of a non-functional 3D printed prototype during interviews
- descriptive statistical analysis of survey responses
- thematic analysis of interviews and open-text survey answers

5.2 Method justification

The survey was used to obtain wider perception data. It helped to identify patterns in current behaviours, perceived usefulness, clarity, trust, situations of use, willingness to wear or carry and concerns. This provided a measurable sense of how a larger group reacted to the idea.

Interviews were carried out to understand the reasons for the patterns. They allowed participants to describe real situations, explain their concerns, manipulate the prototype and comment on the physical form. The interview structure began with genuine experience questions, followed by questions about prototype interpretation and concept reaction and rating. This helped to counter the risk of asking only product-led questions.

The 3D printed prototype enhanced the study as participants could respond to a physical object versus merely viewing the product in images. Participants could comment on wrist fit,

size, lid opening, mode dial, comfort. However, this study only measured perceived usability and trust and not actual emergency performance as the system was not functional.

Given the small and exploratory nature of the sample, the survey data were analysed using descriptive statistics. The results were reported using frequencies, percentages, means and standard deviations. The interview data were analysed thematically to identify recurring issues, patterns, and design implications. This was appropriate because the goal was to identify themes, meanings, and patterns in participant feedback rather than to test a statistical hypothesis (Braun & Clarke, 2006).

The full survey instrument can be found in Appendix D and the interview guide in Appendix E.

5.3 Analysis framework

The analysis followed this structure:

Raw data ▸ Finding ▸ Insight ▸ Client/design action.

Raw data	Finding	Insight	Client/design action
Battery life and reliability were the most common concerns	Participants saw value but were cautious	Trust depends on confidence that the device will work	Prioritise battery life, reliability, and feedback
Some participants did not understand the prototype at first glance	Purpose became clearer after explanation	Physical interaction needs clearer cues	Improve labels, icons, tactile cues, and instructions
Participants described no signal and dead phones	Existing tools can fail	Signal Core should support users when phones fail	Position as a backup safety-support device

6. Participants

6.1 Survey participants

The online survey received twenty-three valid responses from adult participants. All participants confirmed that they were eighteen or older, understood the study, understood their right to withdraw, agreed to anonymous data handling, and consented to take part.

This sample was useful for exploratory concept validation, but it should not be treated as representative of all outdoor users, hikers, older adults, disabled users, or emergency workers.

Age group	Frequency	Percentage
18 to 24	7	30.4%
25 to 34	15	65.2%
45 to 54	1	4.3%
Total	23	100%

Gender	Frequency	Percentage
Woman	14	60.9%
Man	9	39.1%
Total	23	100%

Occupation	Frequency	Percentage
Student	10	43.5%
Employed full-time	6	26.1%
Employed part-time	3	13.0%
Self-employed	3	13.0%
Unemployed	1	4.3%
Total	23	100%

6.2 Interview participants

Six adult participants took part in semi-structured interviews. They discussed outdoor, remote, or unfamiliar situations and then handled the non-functional 3D printed Signal Core prototype. The interview sample was suitable for collecting deeper qualitative insight and explaining the reasons behind the survey trends.

7. Materials and Apparatus

7.1 Online survey

The survey included screening questions, consent statements, multiple-choice questions, Likert-scale questions, and open-text questions. It explored participant experiences, current support tools, perceived purpose, clarity, usefulness, trust, willingness to carry or wear, concerns, and suggested improvements.

7.2 Interview guide

The interview guide was semi-structured. It included an opening explanation, questions about outdoor or unfamiliar experiences, first interpretation of the prototype, a brief explanation of Signal Core, concept reaction questions, rating questions, concern questions, and improvement questions.

7.3 3D printed prototype

The main physical material was a non-functional 3D printed Signal Core prototype. It represented the intended wearable form and included a wrist strap, main casing, side button areas, opening lid, central control knob, and danger/medical mode markings.

The prototype had no working electronics, lights, sound, GPS, satellite connection, or emergency signalling. It was used only to support discussion of form, size, interaction clarity, comfort, and touch-and-feel.

Photos of the non-functional 3D printed prototype are included in Appendix I.

8. Procedure

8.1 Survey procedure

Participants completed the survey on-line. They verified consent and eligibility first. Then they answered questions concerning outdoor or unfamiliar experiences and what they rely on in those situations. They saw a brief description and photographs of Signal Core and responded to questions about the product's purpose, clarity, ease of use, usefulness, trust, potential use situations, desire to carry or wear it, and concerns.

8.2 Interview procedure

The interviews started with a brief introduction to the project, confidentiality, voluntary involvement, and permission to record. First, participants shared their experiences outside or in unexpected situations: what they depend on and if it is enough. Then the prototype was shown without any explanation. We asked participants what they thought it was for. This helps evaluate clarity at a first glance. Signal Core was then explained as a wearable safety-support concept for outdoor or unfamiliar situations. Participants then discussed usefulness, trust, comfort, concerns, and improvements. They also offered rapid scores from 1 to 5 for clarity, ease of use, comfort, usefulness, and trust.

9. Ethical Considerations

Before collecting participant data, ethics were reviewed. The ethics documents described the experiment as a research study with adult participants, a secondary online survey, semi-structured interviews, consented audio recording, and engagement with a non-functional 3D printed prototype. Study participants were informed of its objective and participation. Voluntary participation. Participants could skip questions and withdraw before data analysis. There were no financial incentives. Low-risk study. When asked to recall times when they felt uncertain or unsupported, participants were told they might stop or skip questions. The prototype was managed safely and presented as non-functional. No one was misled into thinking it was an operational or safety-certified device.

Analysis did not require names, addresses, phone numbers, or places. Anonymous responses and quotes were reported. Audio recordings and transcripts were saved for research and maintained securely.

Appendices A, B, and C contain the ethics, Participant Information Sheet, and consent forms.

10. Survey Results

10.1 Experience of uncertainty or risk

Response	Frequency	Percentage
Yes	22	95.7%
No	1	4.3%
Total	23	100%

This shows that the problem context was recognisable to most survey participants.

10.2 Frequency of feeling uncertain or underprepared

Frequency	Count	Percentage
Rarely	9	39.1%
Sometimes	12	52.2%
Often	2	8.7%
Total	23	100%

Most participants did not feel uncertain constantly, but many experienced it sometimes. This supports positioning Signal Core as a situational backup product rather than something used every day.

10.3 Current support tools

Mobile phones were the dominant support tool. This is important because the interviews showed that phones can fail in the same situations where users need help.

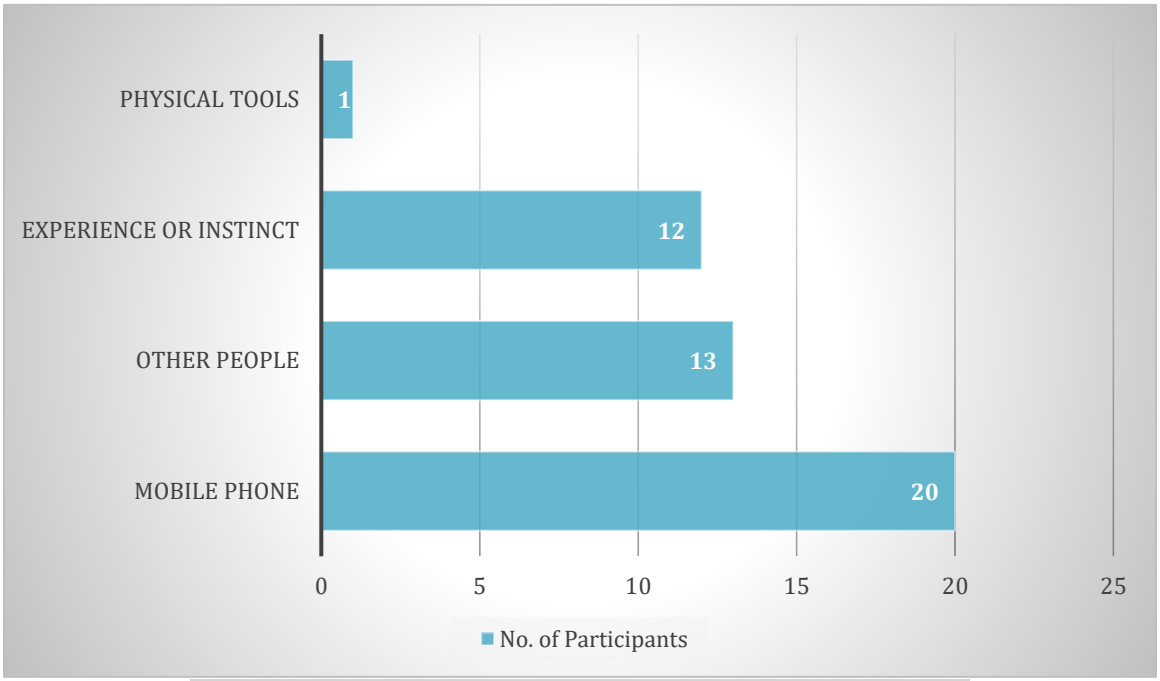


Figure 2. Current support tools participants rely on in outdoor or unfamiliar situations.

10.4 Difficulties described by participants

Open-text responses showed recurring difficulties such as panic, fear, not knowing what action to take, needing someone to respond, getting lost, walking home late at night, and battery or phone reliability.

- "Trying not to panic and keep myself level-headed to do the next thing."
- "With no help, it is hard to decide what action should be taken."
- "Walking home late night."
- "Panic and being uncertain where to go."

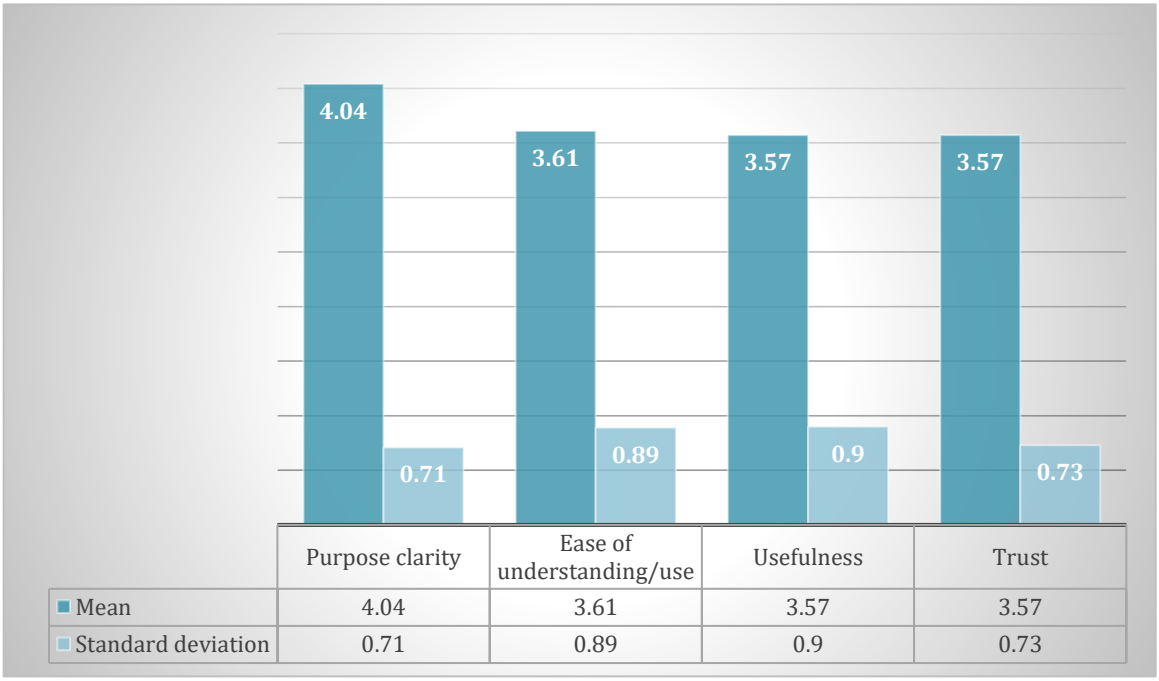
These responses show that the problem is emotional as well as practical. Users need reassurance and a simple action path in stressful moments.

10.5 Understanding of Signal Core

Participants commonly interpreted Signal Core as a safety device, signal device, emergency support tool, tracking or location-support device, or a product for dangerous situations. This suggests that the broad concept was understandable. However, some participants were less clear about how the device would contact help or how the physical controls would work.

10.6 Key rating results

Purpose clarity was the strongest rating. Participants understood what Signal Core was for. However, ease of understanding was lower, suggesting that the physical interaction and emergency process need clearer explanation. Usefulness and trust were positive but not high enough to claim full validation.



	Purpose clarity	Ease of understanding/use	Usefulness	Trust
Mean	4.04	3.61	3.57	3.57
Standard deviation	0.71	0.89	0.9	0.73

Figure 3. Mean and standard deviation survey ratings for Signal Core.

10.7 Use situations

The strongest use case was travelling alone, followed by hiking and unfamiliar environments. This suggests that Signal Core should not be positioned only as a hiking device. It also has potential for solo travel and unfamiliar places.

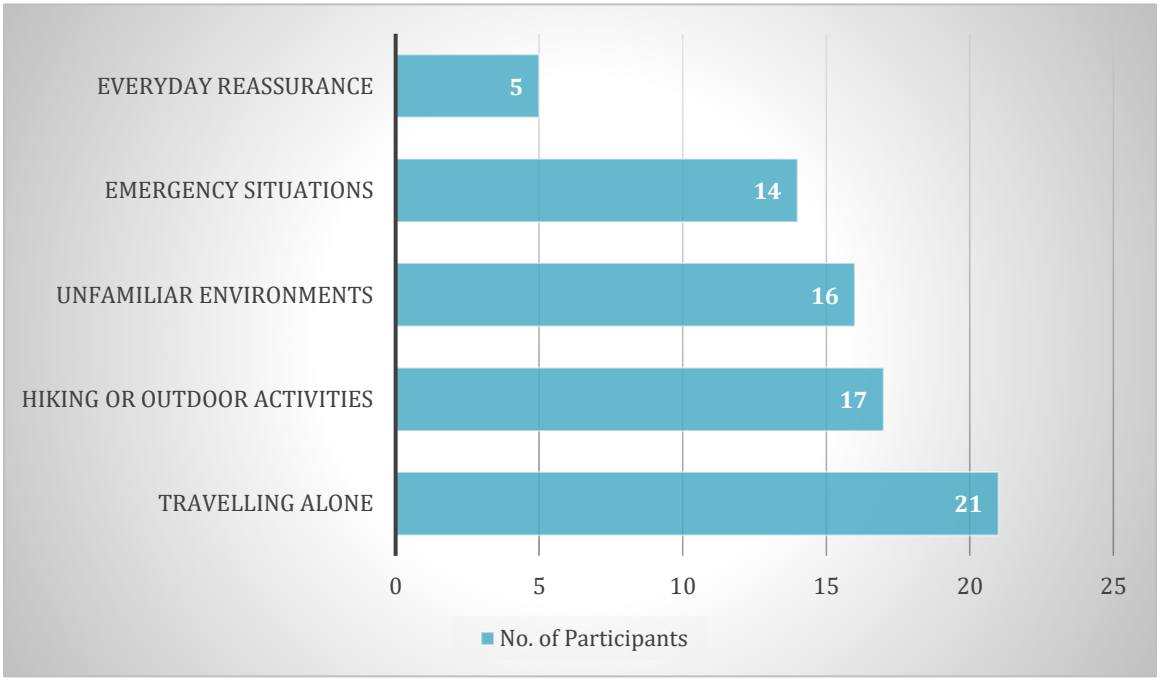


Figure 4. Situations where participants would consider using Signal Core.

10.8 Willingness to carry or wear.

Only one participant said no, which is a positive adoption signal. However, the considerable number of "maybe" responses shows that adoption depends on design quality, reliability, comfort, and price.

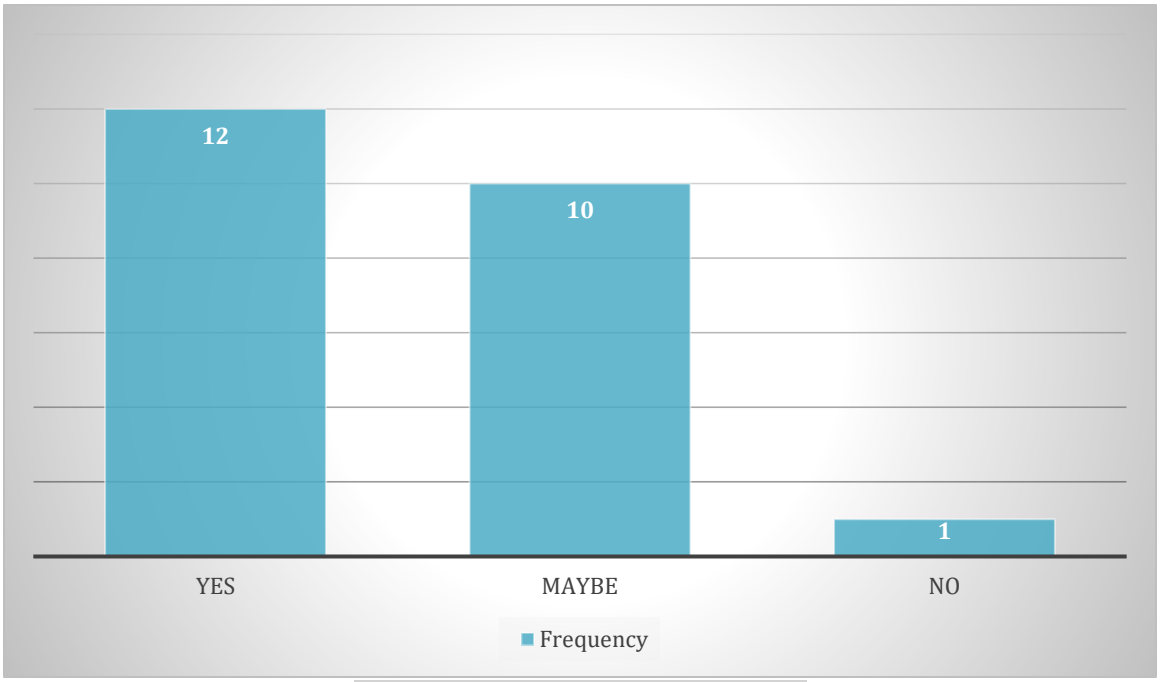


Figure 5. Willingness to carry or wear Signal Core.

10.9 Main concerns

Battery life and reliability were the strongest concerns. This means future development must focus on whether users believe the product will work when needed.

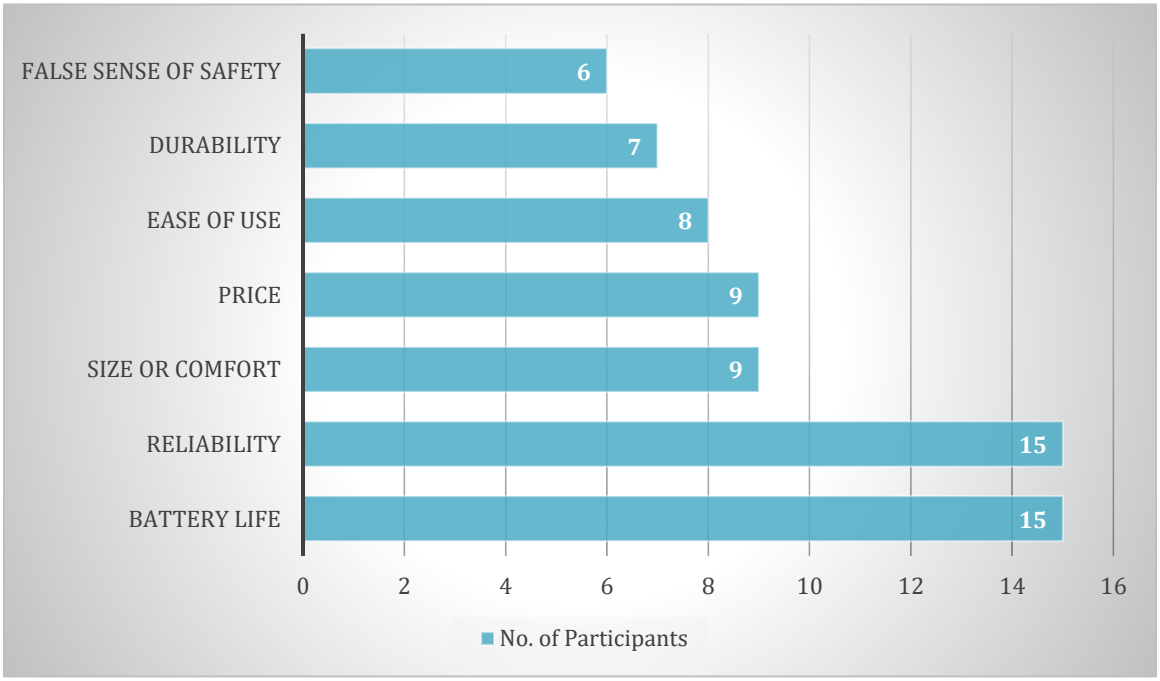


Figure 6. Main concerns about Signal Core.

10.10 Survey findings summary

The survey suggests that Signal Core addresses a recognisable issue. Most people use mobile phones and have encountered uncertainty or lack of support in outdoor or unfamiliar environments. Signal Core was considered a safety or signalling device; however, trust and usability were uneven. Solo travel, hiking, unfamiliar environments, and emergencies were the main uses. Battery life, reliability, comfort, pricing, ease of use, durability, and false sense of safety were the key obstacles.

Full survey results and summary tables are in Appendix F.

11. Interview Findings

Interviews revealed why participants valued Signal Core and what would limit adoption. Codes and themes were created from repeated participant comments to assess interview data. This approach was appropriate because the aim was to understand meanings in the data and user problems, not only count responses (Braun & Clarke, 2006). Five main ideas emerged.

11.1 Theme 1: Current support tools can fail

Participants described relying on phones, people, memory, directions, signs, and instinct. However, these tools were not always enough. Some participants described no phone signal, dead phones, being lost at night, or using footpaths and visible signs in the environment to find their way back.

Finding: Participants had real experiences where normal support tools were limited or failed.

Insight: Signal Core responds to a gap created by reliance on phones and informal support.

Client action: Position Signal Core as a backup safety-support device for moments when phones, maps, or other people are unavailable or insufficient.

11.2 Theme 2: Signal Core is useful beyond hiking

Participants connected Signal Core to hiking and remote outdoor activities, but they also mentioned travelling alone, road trips, car breakdowns, remote villages, unfamiliar cities, scary roads at night, older or disabled users, and people living alone.

Finding: Participants saw Signal Core as relevant beyond extreme outdoor activity.

Insight: The product may support wider safety-reassurance contexts, especially solo travel, and unfamiliar environments.

Client action: Keep hiking and emergency use as core scenarios, but also explore solo travel, road trips, and unfamiliar urban environments as secondary use cases.

11.3 Theme 3: Trust depends on proof

Participants liked the concept, but trust was conditional. Some said they would trust it more after trying it, practising with it, or seeing proof that it works. Participants asked about battery life, charging, signal connection, waterproofing, durability, and whether help would respond.

Finding: Users may like the idea but still hesitate to rely on it.

Insight: Trust depends on proof of performance, not just explanation.

Client action: The next stage must include a functional prototype, reliability testing, battery testing, and visible confirmation feedback.

11.4 Theme 4: First-glance clarity needs improvement

Some participants did not immediately understand what the prototype was for. They asked about the buttons, lid, dial, D/M markings, signal process, and cancellation. The product became clearer after explanation, but it was not always self-explanatory at first.

Finding: The concept is understandable after explanation, but not always clear.

Insight: Emergency products need clear affordances because users may be stressed when using them.

Client action: Add clearer labels, tactile symbols, quick-start cues, activation feedback, and a clear cancellation process.

11.5 Theme 5: Wearability and accessibility affect adoption

The physical prototype helped participants comment on size and comfort. Some found it comfortable, while others worried it might be too large for smaller wrists or awkward to wear with a watch. Participants also raised inclusive design concerns, such as how visually impaired users would understand the markings and whether buttons might be easier than a dial for older users.

Finding: Wrist-wearing is acceptable for some users but not all.

Insight: Adoption depends on comfort, flexible carrying options, and accessibility.

Client action: Explore wrist strap, belt clip, bag strap, and carabiner-style attachment options. Future designs should also explore tactile icons, haptic feedback, audio cues, and larger controls.

11.6 Interview rating summary

Participant	Purpose clarity	Ease of use	Comfort/carry	Usefulness	Trust
P1	5	5	5	5	5
P2	4.5	5	5	5	5
P3	4.5	4.5	5	5	3
P4	4	5	4 for self / 2 for general users	3	4
P5	5	5	5	5	Conditional, after practice
P6	Five after explanation	3	4	4	4

The ratings show positive responses, especially after explanation. However, lower, or conditional ratings for ease, trust, and comfort show that the design still needs refinement.

The anonymised interview transcripts are included in Appendix G, and the interview coding table is included in Appendix H.

12. Combined Discussion and User Insights

Phone dependency creates a safety gap. The survey found that mobile phones are the primary support tool, and interviews revealed why this can be problematic. Phones can lose service, run out of battery, or feel dangerous to use openly in unfamiliar environments. This lends support to Signal Core's role as a backup safety support object.

The product should not just be for hikers. Participants in the survey preferred travelling alone over any other use situation. Interviewees also noted unfamiliar cities, road trips, villages, and unsafe roads at night. This shows that Signal Core serves a broader safety reassurance role than hiking alone.

Trust is the primary requirement for adoption. The survey gave both usefulness and trust a score of 3.57, which is positive but insufficient for full validation. Interviews revealed that participants demand proof. The following stage must consequently prioritise working reliability, battery performance, and confirmation feedback.

Clarity must improve prior to emergency use. Purpose clarity was more important than ease of understanding. This implies that participants grasped the concept but not always the interaction. For emergency use, the product must be understandable instantly and without lengthy explanations.

Comfort and accessibility must be considered early in the design process. The prototype highlighted size, wrist fit, and comfort concerns. Participants also expressed accessibility problems. These data suggest that Signal Core should evolve into a versatile carry system rather than just a wrist device.

13. User Validation

The study gives compelling early evidence that the problem is identifiable. Most survey respondents had faced uncertainty or a lack of support, and interviews revealed real-life examples of no signal, dead phones, isolated regions, unfamiliar cities and panic. This verifies the issue space, not the entire product.

Survey usefulness was rated 3.57 out of five. Interviewees frequently described the notion as valuable, particularly in emergency or last-resort scenarios. This shows that Signal Core has an initial perceived value.

The purpose clarity scored 4.04, while the ease of understanding earned 3.61. The concept is clear overall; however, the interaction details need refinement.

The trust score is 3.57. Willingness to carry or wear was good, with twelve people responding yes, 10 saying maybe, and 1 saying no. However, the maybe responses indicate that adoption is dependent on reliability, battery life, comfort, pricing, and clear use.

Signal Core is supported as an exciting early-stage concept, but not as a finished product. The research recommends moving on to a revised functioning prototype, provided that the next stage addresses reliability, clarity, comfort, accessibility, and real-world testing.

14. Client and Design Implications

Prioritise reliability and battery longevity. Battery life and reliability were the primary issues. Future development should prioritise lengthy standby time, consistent activation, clear charging behaviour, waterproofing, and long-lasting performance.

Improve understanding at first glance. The product should have clearer labels, tactile D/M symbols, elevated icons, mode separation, and brief quick-start signals. Users should not require a lengthy explanation to grasp the emergency interaction.

Include confirmation and cancellation feedback. The participants wanted to know if the alert had been received and how false activation would be managed. Future versions should have simple feedback options like vibration, LED patterns, sound pulses, or a small status indicator. Design for flexible carrying. The wrist-worn version should not be the sole alternative. Future development should investigate wrist straps, belt clips, bag straps, and carabiner-style attachments.

Address accessibility first. Future versions should investigate tactile controls, haptic feedback, audio cues, high-contrast markers, larger controls, and testing with older or impaired users, if revised ethics allow it.

Avoid feature overload. Signal Core's power lies in its simplicity. Extra features should only be included if they aid in emergency situations without affecting battery life, clarity, or reliability.

15. Stakeholder Validation Matrix

The stakeholder validation matrix translates research findings into client-facing decisions. This is included to show how the user research evidence directly informs whether Signal Core should proceed, pause, or be refined.

Research finding	Evidence source	Strategic interpretation	Client decision implication
Most participants experienced uncertainty or risk	Survey, n=23, 22 yes responses	The problem context is recognisable	Continue concept exploration
Phones were the dominant current support tool	Survey, twenty selected mobile phones	Users rely heavily on phones	Position Signal Core as backup support
Phones can fail through no signal or dead battery	Interviews	Existing support is not always dependable	Design around last resort use
Purpose clarity was positive	Survey mean 4.04	Users understand the broad concept	Retain safety-signalling direction
Ease of use was lower than clarity	Survey mean 3.61, interviews	Interaction cues need improvement	Redesign labels, controls, and feedback
Usefulness was moderate-positive	Survey mean 3.57, interviews	The concept has early value	Proceed to refined prototype
Trust was conditional	Survey mean 3.57, interviews	Users need proof before relying on it	Build and assess a working prototype
Battery and reliability were top concerns	Survey, fifteen selections each	Adoption depends on reliability	Prioritise battery and signal performance
Comfort and carrying options mattered	Survey and interviews	Wearability affects adoption	Explore multiple carry options
Accessibility was raised	Interviews	Inclusive interaction is needed	Assess tactile, haptic, and audio cues

16. Limitations

The study has a few limitations. First, twenty-three people took the survey, and six people were interviewed. This is appropriate for exploratory studies, but insufficient for population-level assertions.

Second, the sample was obtained through convenience recruiting. It may not reflect all hikers, solo travellers, older adults, disabled people, or emergency personnel.

Third, the prototype was not functioning. Participants could assess shape, size, comfort, and perceived interactivity, but not actual emergency signals, battery life, connectivity, waterproofing, or durability.

Fourth, the interviews were conducted in safe indoor or controlled environments. They did not mimic actual emergency stress, darkness, bad weather, injury, or inaccessible terrain.

Fifth, some participants gained a better understanding of the product following explanation. Future testing should separately assess unaided first-look comprehension.

Finally, older and disabled users were highlighted as potential users, but they were not specifically recruited as a focus group. As a result, accessibility recommendations should be viewed as future research directions rather than confirmed assertions concerning specific groups.

The findings should be interpreted as exploratory rather than statistically representative due to the small sample size and convenience of recruitment. This is appropriate for early-stage user research, where the goal is to discover trends, risks and design priorities rather than making broad assertions (Lazar et al., 2017).

17. Future Research

Future research should shift from conceptual validation to functional validation. A functioning prototype should have emergency signalling, lights, sound, battery indicator, and activation/cancellation feedback.

Future testing should incorporate controlled outside conditions including low-light walking, hiking trails, and simulated lost-navigation tasks. Battery life and signal dependability should be checked, as these were the most pressing concerns.

Following revised ethical approval, accessibility testing should be carried out with appropriate participants. This should incorporate tactile symbols, haptics, audio feedback, larger controls, and mode identification that does not rely only on vision.

Once several design possibilities are available, further research might evaluate wrist-worn, belt-clip, bag-strap, and carabiner versions to determine the most appropriate carrying form.

18. Research Retrospective

If I were to do this study again, I would make three improvements.

First, I would seek out more specific participants, such as experienced hikers, solo travellers, elderly users, disabled users, and those who frequently spend time in remote places.

Second, I would employ a think-aloud method during prototype handling to record confusion as it occurred, rather than simply asking participants to explain later. Think-aloud techniques can highlight moment-to-moment confusion and decision-making as users interact with a product or prototype (Nielsen, 1994).

Third, I would test a working prototype. Many participants expressed concerns about battery life, reliability, signal confirmation, and trust, which could not be completely assessed using the non-functional model.

Despite these constraints, the study helped identify the primary user needs, use contexts, adoption conditions, and design risks. It provides useful information for determining the next development stage.

19. Conclusion and Client Recommendation

This study investigated users' opinions of Signal Core as a wearable safety-support concept for outdoor, unfamiliar, and emergency scenarios. The study included twenty-three survey responses and six semi-structured interviews, as well as a non-functional 3D printed prototype.

The data indicate that Signal Core addresses an identifiable user concern. In outdoor or unfamiliar situations, most survey participants reported feeling uncertain, unsupported, or at risk. Participants depended heavily on mobile phones, although interviews revealed that

phones can fail due to a lack of service, a dead battery, difficult navigation, or unsafe use in particular areas.

Signal Core was widely regarded as a safety, signalling, or emergency support idea. Participants valued travelling alone, hiking in unfamiliar environments, road trips, villages, unsafe roads at night, and emergency situations. However, the findings indicate that the concept is not ready for deployment. Trust is conditional. Participants require confirmation that the product works.

The client's recommendation is to proceed with refinement.

Signal Core should progress to a refined working prototype stage. The following phase should prioritise long battery life and reliable emergency signalling; clear activation, confirmation, and cancellation feedback; improved first-glance clarity via labels, icons, and tactile cues; a smaller and more comfortable physical form; flexible carrying options; waterproof, impact-resistant, and weather-resistant design; accessibility features; and real-world testing in controlled outdoor scenarios.

The current evidence suggests future development but not full deployment. Signal Core has shown promising early results as a backup safety-support wearable, particularly when marketed as a last-resort reassurance device rather than a replacement for mobile phones.

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Appendices

Appendix A: Ethical Review Form

(Attached Separately)

Appendix B: Participant Information Sheet

(Attached Separately)

Appendix C: Consent Form

(Attached Separately)

Appendix D: Survey Questions

(Attached Separately)

Appendix E: Interview Questions

(Attached Separately)

Appendix F: Survey Results Summary Tables and Open-Text Themes

This appendix presents supporting survey summary tables and open-text response themes used to support the main report findings. The survey received 23 valid responses. The bar charts are included in the main report, so they are not repeated here.

Appendix F.1 Survey summary tables

Measure	Result
Experienced uncertainty/risk	22 of 23 participants (95.7%) said Yes
Most common current support tool	Mobile phone (20 participants)
Strongest use context	Travelling alone (21 participants)
Purpose clarity	Mean = 4.04, SD = 0.71
Ease of understanding/use	Mean = 3.61, SD = 0.89
Usefulness	Mean = 3.57, SD = 0.90
Trust	Mean = 3.57, SD = 0.73
Willingness to carry/wear	12 Yes, 10 Maybe, 1 No
Top concerns	Battery life (15), Reliability (15)

Appendix F.2 Open-text response themes

Open-text area	Recurring themes
Biggest difficulty	Panic, fear, not knowing what action to take, needing someone to respond, being lost, late-night walking, phone reliability.
What Signal Core is for	Safety device, emergency support, signalling, alerting, tracking or location support, dangerous situations.
Most intuitive parts	Emergency signalling, LED/flashlight-style lights, physical mode knob, wearable form, speaker/alert function.
Unclear parts	How the signal reaches help, connectivity method, danger/medical modes, confirmation of alert, cancellation, how far lights can be seen.
Trust increases	Testing, expert approval, real user evidence, battery information, waterproofing, reliable GPS/location, connection to emergency services.
Improvements	Solar charging, waterproofing, cancel button, better battery, smaller size, easier use, affordability, pilot testing.

Appendix G: Interview Transcripts

This appendix presents anonymised and lightly cleaned interview transcript extracts from the six semi-structured interviews. The transcripts were cleaned to remove names, repeated transcription artefacts, and irrelevant false starts, while keeping the meaning of participant responses. Participant IDs P1-P6 are used instead of names. These extracts are the parts of the interviews used for thematic coding and analysis in the main report.

Appendix G.1 Interview overview

Participant	Context discussed	Main relevance to Signal Core	Rating notes
P1	Unfamiliar UK environment and jungle/travel situation	Phone signal and compass were not enough; user relied on memory and guidance from others	Rated all assessed areas 5/5
P2	Hiking, mountains, outdoor activity, and being lost at night	Dead phones and darkness made the situation difficult; raised need for high battery and durability	Purpose 4.5; ease, comfort, usefulness, trust 5
P3	Remote village/highland area with no reception	Phone was not reliable; raised accessibility question about D/M labels	Clarity 4.5; ease 4.5; comfort 5; usefulness 5; trust 3
P4	Travelling abroad, unfamiliar cities, dark streets	Phone use may not feel safe; strong size/fit concern for smaller users	Clarity 4; ease 5; comfort 4 for self / 2 for general users; usefulness 3; trust 4
P5	Moving to university, going the wrong direction at night	Maps were confusing; people helped; saw value if battery lasts longer than a phone	Clarity, ease, comfort, usefulness 5; trust conditional after practice
P6	Mountain valley/village area with no network	No phone network and lack of resources; relied on footpaths; saw wider use beyond sporty hikers	Clarity 5 after explanation; ease 3; comfort 4; usefulness 4; trust 4

Appendix G.2 P1 transcript extract

Area	Anonymised transcript extract / summary
Experience context	P1 described feeling unfamiliar after arriving in the United Kingdom and recalled travel/outdoor situations where direction was difficult. P1 gave an example of being in a jungle-like environment without reliable navigation and needing to be guided by another person.
Current support tools	P1 said they had a compass, but it was not very useful because they were not confident using it. They also said there was no phone signal, so they relied on memory and trying to remember where they had been.
Relevant extract	"There was one time I got into a jungle. It was so hard to find a direction. I did not have maps or navigation, so basically, I needed to be guided by a person."
Relevant extract	"We had a compass back then, but it was very vague to me because I was not very good at looking at direction by seeing the compass. In the jungle I did not really have a phone. There was no signal."
Reaction to Signal Core	P1 responded positively to the idea and saw it as useful when normal tools are not enough. They also asked how the user would know the alert had worked or whether help was coming.
Design implications	The response supports the need for simple emergency interaction, confirmation feedback, and reassurance after activation. P1 also supports the finding that existing tools can be present but still not usable under stress.

Appendix G.3 P2 transcript extract

Area	Anonymised transcript extract / summary
Experience context	P2 described going to parks alone but felt more responsible and cautious when with someone else. They gave a strong hiking example where the group became lost in mountains at night.
Current support tools	P2 said that during the hiking situation, the phones were dead and visibility was poor because it was night.
Relevant extract	"I am a big fan of hiking. We went to a place where you must walk eight hours inside the mountain… when we wanted to return, we got lost inside the mountain and it was at night, so you cannot see anything and all the phones are dead."
Reaction to Signal Core	P2 saw the product as personally relevant because of their interest in hiking and adventure. They discussed the need for high-performance battery life and durability in different environments.
Relevant extract	"If you have this in a terrible situation, it is going to be less stressful because you know what to do."
Design implications	P2 strongly supports Signal Core as a last-resort outdoor safety product. Their response links usefulness to battery life, durability, and emergency confidence.

Appendix G.4 P3 transcript extract

Area	Anonymised transcript extract / summary
Experience context	P3 described visiting a village/highland area after a long time away. The area felt unfamiliar and difficult to navigate.
Current support tools	P3 said their first instinct was to use a mobile phone, but this was not reliable because there was no reception.
Relevant extract	"In that specific place, there is no reception. There is no network, you cannot call, you cannot reach out. It is just a dead end."
Reaction to Signal Core	After the product was explained, P3 understood the concept and rated usefulness highly, but gave a lower trust score because they had not actually used it.
Relevant extract	"If phones are not working, we kind of panic. We need that one thing for a split decision."
Accessibility issue	P3 asked how people with disabilities, such as visually impaired users, would know what the D and M labels mean.
Design implications	P3 supports the need for backup support when phones fail and highlights accessibility as an important design issue. Their lower trust score also supports the finding that trust depends on real testing.

Appendix G.5 P4 transcript extract

Area	Anonymised transcript extract / summary
Experience context	P4 described travelling abroad and being in unfamiliar cities where taking a phone out may not feel safe, especially at night or when language is unfamiliar.
Relevant extract	"If you are travelling to other cities where sometimes taking your phone out is not necessarily safe, having some kind of navigation or alert would be a very good safety mechanism."
Relevant extract	"Occasionally being in an unfamiliar city when it is specifically dark outside, not necessarily the safest part, you do not know the language that well. There is that unease of the unpredictable."
Prototype reaction	P4 said the prototype looked good aesthetically but raised an important size concern. It fit their larger wrist but could be too large for smaller or average users.
Relevant extract	"For me it sits nicely, but I would say… a smaller person or an average person, this would be way too big for."
Design implications	P4 expands Signal Core beyond hiking into urban personal safety and travel. They also provide strong evidence for reducing size and offering flexible carrying options.

Appendix G.6 P5 transcript extract

Area	Anonymised transcript extract / summary
Experience context	P5 described moving away for university, going shopping alone, taking the wrong direction, and feeling scared because it was evening and getting dark.
Relevant extract	"I realised that I had gone the wrong direction and it made me feel a bit nervous."
Relevant extract	"This was during the evening, so it was quite dark. I did feel very, very scared. I was very alert because I did not know which way and who was around me."
Current support tools	P5 tried to use maps, but the directions were confusing. They were helped by people nearby.
Relevant extract	"I did try to check on my maps; however, it was showing me different directions, which was not really useful."
Reaction to Signal Core	P5 saw Signal Core as very useful if it could last longer than a phone battery. They said they would trust it more after practising with it and checking that it works.
Design implications	P5 supports the urban/unfamiliar-place use case, especially night-time reassurance. Their response also supports the need for training, simple onboarding, and trust through practice.

Appendix G.7 P6 transcript extract

Area	Anonymised transcript extract / summary
Experience context	P6 described going down a valley in Kashmir with friends. Going down was easy, but returning was difficult because the area was steep, the sun was setting, and the group got lost.
Relevant extract	"We got lost. Literally, we got lost. We could not find a place to climb up because it was a very steep mountain. At that time, we were panicking a lot."
Current support tools	P6 said they had no network in the village area and relied on narrow footpaths and signs of footsteps in the grass to find the way back.
Relevant extract	"There was no network over there. What we relied on were little narrow signs of foot on the ground… looking for footsteps and narrow areas."
Reaction to Signal Core	P6 understood the concept after explanation and saw it as useful not only for athletic hikers but also for normal people travelling through villages or remote places.
Relevant extract	"It can be helpful for normal people as well, like me."
Design implications	P6 supports the remote/rural travel use case and confirms that the concept should not only target professional hikers. Their lower ease rating also supports improving first-glance clarity.

Appendix H: Interview Coding Table

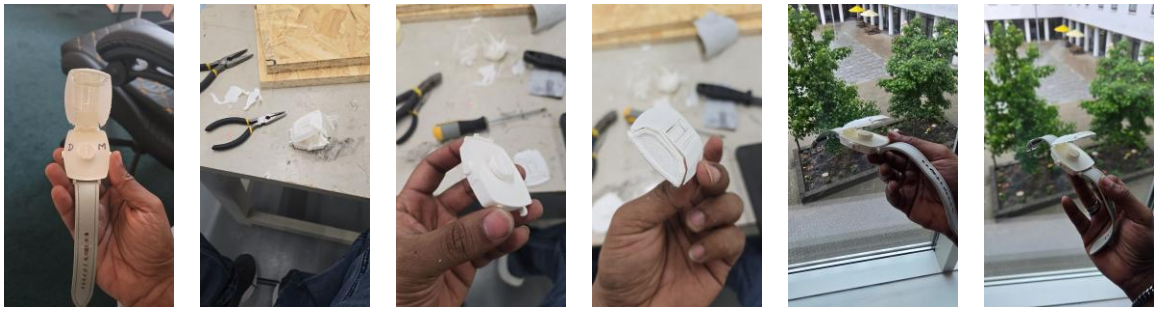
This appendix shows how interview responses were converted into codes, broader themes, insights, and client/design actions.

Appendix H.1 Interview coding table

Participant evidence / extract	Code	Theme	Insight	Client/design action
Phones had no signal in a remote area	No network	Current support tools can fail	Users need support when phones are unavailable	Position Signal Core as a backup device
Phones were dead while lost at night	Dead phone battery	Current support tools can fail	Battery failure creates vulnerability	Prioritise long battery life and low-power emergency mode
Relied on footpaths/visible signs to find the way back	Informal navigation	Current support tools can fail	Users improvise when digital tools fail	Design for last-resort reassurance
Taking out a phone in an unfamiliar city may not feel safe	Unsafe phone use	Beyond hiking	Signal Core may help in unfamiliar urban contexts	Explore discreet alert mode in future research
Useful for travelling alone	Solo travel	Beyond hiking	Use cases extend beyond outdoor sports	Include solo travellers in target scenarios
Useful for villages or remote places, not only sporty hikers	Rural/remote travel	Beyond hiking	Product may support normal travel as well as hiking	Broaden product positioning
Could help older or disabled people	Vulnerable users	Accessibility and inclusion	Future users may include people needing extra support	Recruit these users in future ethics-approved testing
Would practise first before trusting it	Conditional trust	Trust depends on proof	Users need evidence before relying on it	Run functional prototype testing
Trust lower because participant has not actually used it	Unproven reliability	Trust depends on proof	Concept trust is not enough for emergency reliance	Test real signalling and response feedback
Need high-performance battery	Battery concern	Trust depends on proof	Battery is central to adoption	Prioritise battery life and battery status feedback

Needs to work in water, mountains, pressure, cold weather	Durability concern	Trust depends on proof	Emergency products must survive difficult conditions	Test waterproofing and impact resistance
Participant asked what the buttons and central dial do	Control confusion	First-glance clarity	Physical interaction is not fully self-explanatory	Improve labels and affordances
D and M may not be clear for visually impaired users	Accessibility concern	Accessibility and inclusion	Visual labels are not enough	Use tactile icons, haptics, and audio feedback
Buttons may be easier than dial for older users	Control accessibility	Accessibility and inclusion	Physical controls need inclusive design	Test alternative interaction mechanisms
May be too big for smaller wrists	Size concern	Wearability and comfort	Fit affects adoption	Reduce bulk and test different wrist sizes
Wearing it with a watch may not feel ideal	Wearability conflict	Wearability and comfort	Wrist-only design limits adoption	Explore clip, bag strap, belt, and carabiner options
Need to know if help has responded	Confirmation need	Trust depends on feedback	Users need reassurance after activation	Add LED, vibration, or sound confirmation
Need a way to cancel if activated by mistake	False activation	First-glance clarity	Emergency interaction needs recovery path	Design cancellation and false alarm handling

Appendix I: Prototype Images



Appendix J: AI Student Acknowledgement Form

(Attached Separately)

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