Part 4: Final Prototype Evaluation

Team Possible

Team Number 8

Backpacks

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Executive Summary

In this project, we explored the backpack. Despite immeasurable changes in its user base since its inception, the backpack has largely remained the same. We plan to create a modern bag by starting from the ground up with today's users in mind. As it stands, a backpack only carries materials. However, many stakeholders use it throughout their day, so why not take advantage of its pervasiveness in everyday life? We will leverage the backpack's day-long use to create features centered around the tech-savvy, on-the-move users of 2018. Our end users will be empowered to charge their phones at will, make themselves--and others--visible at night, and call for help in a discreet way when they are uncomfortable.

There were many parts of our final design that were successful solutions to the design criteria that we focused on. The lights that were added to the straps contributed to safety as well as allowed the backpack to be more versatile to the user. Additionally, potential users believed that the retractable pocket would hold items that they typically kept in the small front pocket of their backpack like phones, keys, chapstick, etc. While those features of the backpack showed evidence of being successful, there are still some parts of our design that need to be further addressed. Currently, the lights on the backpack are activated by the user pushing them one at a time; however, it would be uncommon for the user to want only one light on at any given time. We also found some conflicting opinions on whether users would prefer a silent alarm over one that makes sound, leading us to potentially conduct more user research to see which option is more desired. Through this project, most of our focus was on developing each stand-alone feature. Future iterations of this prototype would aim to allow for interaction between features e.g solar panel acting as the power source for the lights and alarm. While we lack clear solutions to these problems currently, additional testing with the stakeholders would help to determine how we could address these to further fulfill the design criteria we focused on.

1. Stakeholders

1.A. Original Stakeholders

- **College Students:**
  This stakeholder group was included in our final evaluation. These people use their bags for academic life - anywhere from packing lunches to storing school supplies. They mainly want a backpack that is versatile. It needs to be able to transition to different activities as they move throughout their day.

- **Commuters:**
  This stakeholder group was included in our final evaluation. These are students or professionals that rely on various means of transportation to get to campus including cars, bike, bus, MARTA, etc. They are concerned with safety, especially when they are traveling in places that are unfamiliar or during later hours.

- **Working Professionals:**
  These people need a way to carry their work belongings along with anything they will require throughout the day once they leave their residence.
  We dropped this stakeholder group after Part 2. Based on the design criteria we were evaluating, the interests of working professionals were not different enough from commuters to be considered a distinct stakeholder category. The main difference in Commuters and Working Professionals was that the professionals were more concerned with having a backpack with a professional appearance, but both groups were interested in safety and versatility.

1.B. New Stakeholder Category

- **Security Professionals:**
  These people are concerned with backpack safety in places such as the library, stadiums, etc. They are also concerned with the safety of the people that are in the places mentioned above. These stakeholders want to make sure that the backpack will not cause any harm to the people at the event or location where they are present. We considered including this as a stakeholder in Part 1, but ultimately decided to use Working Professionals as our third primary stakeholders because they were more accessible during user research.

2. Design Criteria

- *Versatility*:
  The backpack needs to be able to transition well between various tasks someone needs to complete throughout their day. The success will be determined by how modular the

product is. The user must feel as if they have control over how they organize their backpack, and must not feel limited by the form of the bag. This can be measured by the number of distinct tasks that can be done with the bag. We will measure how modular and versatile the bag is by giving people different scenarios that could occur during a typical day and determining if the users are able to pack their bag to complete these tasks. Tasks could include situations like charging a device with a low battery, going to the gym, going to class, etc. If the majority of users are able to complete the tasks that are requested of them, the solution will be successful in implementing this criteria.

- *Individual Safety*:
  The backpack can also be thought of as the eye to the back, so we decided to take advantage of this fact by improving the safety of the user. Our team found that many people hold valuables within their backpack, so we are looking to increase the safety of the backpack as a whole. The backpack must put the user at ease as they travel through their day, whether they are walking during the day or night, are in class or at work, or traveling in between. The safety options must be easy to use and easily accessible by the user. They also must work reliably as to not put the user in further danger. The safety will be determined by how quickly the user has access to the safety options. Our team will time the user and determine the speed at which they are able to reach the headlights and the silent alarm button. If the time falls below a certain predetermined threshold then that aspect of safety will be deemed successful. The safety of the backpack will also be determined by how the user feels while walking at night with the backpack. This will be measured through a short survey given to users during in a pilot study. They will provide feedback after they have walked somewhere with the backpack at night.

- *Convenience*:
  Most people have their backpack with them constantly as they move throughout their day and are only without it when they reach home. Our team decided to make the backpack work for the users wearing it. The backpack should have features that work towards fixing common problems experienced by the user throughout their day. One of the largest problems is accessibility of items in the backpack that are of importance. This will be tested by how quickly the user is able to access items in their bag. The team will time users with their normal backpack and the new prototype (with the retractable pocket) to determine if they have faster, easier access to certain objects like their phone, wallet, or keys.

3. Modifying the UI based on Principles

Problem #1

1. Description: The lights and the silent alarm button are too close to each other. If someone wanted to use one of these features, they may have trouble at night. Because of their similarity in shape and size, the user might accidentally press the light button when they meant to press the alarm. This is not ideal because we want users to be able to activate the silent alarm in time-sensitive situations. The close proximity might also make users think that the alarm button turns on the lights.

2. Principle: In Chapter 2 of *Designing with the Mind in Mind*, the principles of proximity and similarity are explained. It stated that items that are close to each other or look the same appear grouped.

3. Demonstration and Revised Wireframe: To modify the prototype, we will make sure the lights and the alarm have a different size. We will also move the alarm farther away. This will help prevent accidental presses.

Problem #2

1. Description: The user does not currently get feedback on whether the police have received their alarm signal and are responding to the call.
2. Principle: In Chapter 6 of *Designing With the Mind in Mind*, the authors emphasize how poor our peripheral vision is. "Heavy artillery", or uncommon methods, may need to be used to get the user's attention. Our prototype mainly relies on visual techniques (e.g. lights) to give feedback. This chapter of the book helps us consider approaches to the other senses.
3. Demonstration and Revised Wireframe: To modify the prototype, we will add feedback for the alarm, so users know when the police have been notified. The backpack will vibrate when their signal has been received.
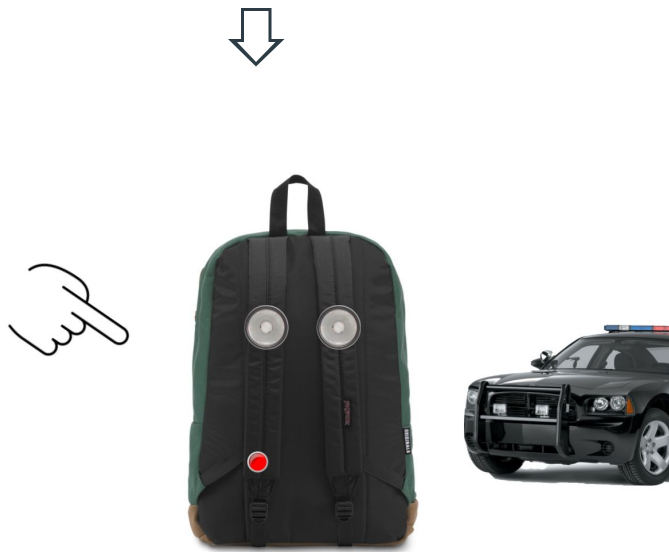
4. Design Team Evaluation Exercise

Rationale

We chose heuristic evaluation as we would rather focus on long-term usability than initial learnability. This is a function of a backpack's lifespan: often used for many years by a single user. Furthermore, we have a very small number of target tasks, calling for little to no user exploration after their first interaction. We plan to have proper documentation to introduce the target tasks, so we can focus more on making those tasks easy to accomplish over time.

Demonstration of Understanding

To prepare for the heuristic evaluation that we would complete individually and then as a team, we created four benchmark tasks that we would specifically look at when creating our usability bug reports. These tasks were turning on and off the lights, using the alarm to call the police, charging your phone via the embedded solar charger, and getting your keys from your backpack without taking it off. Using these tasks ensured that we were focusing on the same features that are most important to the design criteria that we were trying to address.

Before going through the heuristic evaluation as a team, we each spent about an hour individually reviewing images of our prototype. We created bug reports for any issues that we saw, specifically relating to the benchmark tasks mentioned above (see Appendix A). As we each individually went through the prototype, we evaluated it using the 10 Usability Heuristics created by the Nielsen Norman Group to find issues in our design. Through this individual

brainstorming, we developed a solid list of issues with our prototype that we would address in future iterations.

After we completed the individual brainstorming and developed usability bug reports, we met in person. We compiled a master list of issues. We went through each one and gave it an overall severity rating on a scale of 0 (not severe) to 4 (most severe). To develop the final list, we ranked each item in relation to those that got the same severity rating and that is what created our final, prioritized list of issues.

Evidence of Execution

Bug reports from each group members' independent evaluations are in Appendix A. After debriefing all of our ideas, we created the following list of bugs, ranked from most to least severe. Full descriptions of these bugs, their rationale, and their severities are also in Appendix A.

1. Our prototype currently doesn't have proper (or any) documentation
2. Currently there is no feedback from pressing the alarm button, the user does not know if the call has gone through, so they may call too many times
3. There is no way to cancel the alarm or turn it off
4. There is no way to check the charge on the solar panel
5. How much weight can the retractable pocket hold
6. Users could accidentally press the alarm button.
7. User can't set pattern on the alarm
8. Users probably don't want to just turn on one light, both should turn on together
9. Alarm button is too obvious, the goal was to be stealthy
10. It is unclear how we power the lights and alarm
11. User may accidentally turn on the lights
12. User may not be able to reach and press the alarm in certain situations.
13. Is there a user preference on which side of the backpack the retractable pocket is on?
14. A user may not understand how to turn the lights on initially
15. Safety of the contents of the retractable pocket

Summary of Recommendations

Solving our first two bugs actually solves several more down the list. By creating some simple tags to go with our backpack, we can provide users with instructions on how to use each of the features. There will be instructions for turning the lights on and off, setting a pattern for the alarm, triggering the alarm, and canceling the alarm. It was our intention to use a pattern for the alarm, to avoid accidentally triggering it, but it was never previously stated anywhere. We would

also add vibrations as feedback once the alarm is triggered. We would also add a status bar to the solar panel, indicating how much power is charged and available.

5. Stakeholder Evaluation

Rationale

Our group decided to run focus groups in order to get stakeholder feedback on our final prototype. When we were working through which stakeholder evaluation would be best, we considered both think aloud and focus groups. We determined that think aloud was more oriented toward working through a prototype and getting feedback on the process of using it and how intuitive the it is. This lends itself more to walkthroughs of true user interfaces. Focus groups functioned better for receiving feedback on how the prototype fits user needs, our design criteria, and the modifications we made. Since we did not have our physical prototype to walk through and most of the systems we added to the backpack did not involve walking through a process, we decided to go with a focus group. This allowed us to show the video of our prototype and have open discussions about what they saw in terms of the features, usability, and how well our design criteria were addressed.

Understanding of Process

When preparing for the focus groups, we did what we could to obtain participants that did not previously know each other. Despite this effort, there ended up being a couple people in each group that were friends with each other; however, it did not seem to affect to discussion that took place. While we were all working to find participants for the focus group, we created a script to be followed during the focus group, the script we used can be found in Appendix B - Evidence of Focus Groups which included the questions that we planned to address in each group.

As the participants we recruited trickled into the room prior to the focus group, we asked them to sign in, make a name tag for themselves, and help themselves to the snacks that we brought. We began each focus group by giving a brief introduction to the project and described that we were holding this group to get feedback on the prototype that we developed for Part 3. Within this part, we wanted to make sure that the participants in the group knew that any feedback that they gave would remain anonymous and none of it would be discussed outside of the context of this project. We described the ground rules of the focus group to ensure that everyone understood what was being expected of them and to establish respect for one another before discussion began. We then moved into introductions next and had everyone in the group tell us their name, year in school, major, and their favorite thing about their current backpack.

To start off the discussion, we first showed the video that we created to showcase the features that we designed for out backpack. At the conclusion of the video, we briefly described the criteria that we were trying to address and asked for the participant's preliminary thoughts about

the prototype that they just saw. After receiving their preliminary feedback, we asked about each design criteria through the lens of the features that we added that addresses that criteria. Through this, the participants gave us a lot of helpful feedback and with some additional prompting explained the rationale behind their thoughts and additional ideas. Once we received feedback on all of the pieces that we hoped to address, we left the floor open for them to provide us any other feedback that the felt like they had not had the chance to address. As the discussion wrapped up and people were not adding any new comments, we concluded the groups by summarizing what was discussed and allowed them one more chance to address any questions. They were then thanked, dismissed and the focus group was competed.

We ran two focus groups in the way described above. We left some time in between to give us a chance to debrief about what we just heard.

Evidence of Execution

Through running the focus groups, there were a few piece of evidence that we collected, all of which can be found in Appendix B - Evidence of Focus Groups. The Appendix includes the script that was used to run the focus groups, images of the sign in sheet that all the participants filled out when they arrived, and the notes that were taken while the focus group took place. We also took an audio recording of each group. This was used to ensure the notes that we took covered all the relevant information that was brought up in the group but we did not include that in the appendix.

Summary of Recommendations

Overall there was lots of positive feedback. The groups enjoyed all the features added and believed they would be beneficial. The groups particularly liked the retractable pocket and the idea of a solar panel charger.

Recommendations:

- Great opportunity to focus greater on the safety of the backpack and its contents
- Cover the solar panels in order to ensure greater safety of the backpack
- Worried about safety of retractable pocket
  - Maybe allow it to tuck back into the backpack
- Use a switch on the side of the lights, so they don't accidently turn on
- The alarm should make a sound
- Ensure that it is waterproof so the electronic components don't go o the fritz
- Add reflectors on the back to increase visibility
- Allow people to pick their own button pressing pattern
- The ability to charge multiple things including their computer

- Make more than one pocket retractable

6. Reflection

Preparation

There were many ways in which Parts 1-3 informed and provided insight for Part 4. The main topic of this portion was to evaluate the prototype we created in Part 3. The individual components included evaluating the UI based on heuristics and determining improvements, conducting a group evaluation through either cognitive walkthrough or heuristic evaluation (of which the group chose heuristic evaluation), and conducting a stakeholder evaluation through either think aloud or focus groups (of which the group chose focus groups). Throughout the entire process we have been learning how to not work off of what we think is correct, but what the user thinks is correct. This became vital for this portion of the project. In order to critically evaluate our prototype we had to think in the mindset of our user and be open to the opinions of our users and criticism of our prototype. This proved to be much easier since we have been using this mindset since Part 1. Throughout this semester we have had many opportunities and moments where we have interacted with users that well prepared us for running a focus group and practice in not asking biased questions through our work with surveys.

The aspects we were the most prepared for throughout the class were the ones where we were either given examples of previous well done techniques or where we interacted with the activity ourselves during class. The activity we felt the strongest in was video prototyping where we were shown actual examples of video prototypes varying in fidelity, given the steps to complete and create a lo-fi video prototype, and then given a small amount of time during class to apply this to our project and receive feedback on what we had created. This allowed us to have a trial run and get feedback on what was necessary and not for this kind of assignment. It eliminated the guessing game of whether we were doing the activity correctly or not which was a relief when we started working on our final video prototype. Another portion that was well fleshed out was creating the storyboards. There was a portion of class devoted to what the different views of a storyboard portray and the faces of the characters within the storyboard which gave us a good idea of how to create an effective storyboard. Along with a section of class devoted to coming up with a storyboard related to the contact exchange application which allowed us to get live feedback on our creation. Both of these tasks gave us prior experience with the activity and allowed us to improve upon them when we were working on the actual deliverable portion for our project.

There were a few aspects of the project where we felt a little astray. One of those being recent when we were determining which UI heuristics to change based on the UI principles found in *Designing with the Mind in Mind.* All of the examples given in the book had to do with designing a digital user interface which is very different from working with a physical object.

When we were reviewing the material in class, we once again went over the same examples from the book which were not oriented toward physical objects. With almost no examples of these principles applied to an object with no digital implications it was extremely difficult to find principles that applied to our prototype. Certain aspects, where the explanation from class did not fit what we needed to do for our project, led us to frustration in attempting to accurately and correctly complete them.

Lessons Learned

Several parts of our final design showed evidence of being successful solutions to the problem we focused on. We found that the lights contributed to not only safety, but also versatility. Participants in our focus groups thought the lights were good for visibility and told us that they would use the lights when they got to their room and it was dark. It would also be more convenient for them to use than a phone flashlight. Potential users also believed that the retractable pocket would be good for placing their keys and accessing smaller items. They thought that the solar charger would be good for when they were traveling. This shows evidence that certain parts of our final design were successful.

There are still some parts of our design that do not have a sufficient solution. Our focus groups revealed issues that our design team did not consider. The lights on the backpack can be activated one at a time. However, it is uncommon that the user would need only one light on. Instead of pressing both, a new iteration of the prototype could have a simple switch that would activate/deactivate both lights. Participants in the focus groups also had concerns about the silent alarm. We believe we should conduct additional user research to figure out if users prefer the silent alarm over one that makes sound. We still need to figure out the logistics on how the alarm works: if it is a phone call or simply sends a GPS location and who the location is sent to. Is it the nearest police station or 9-1-1 operators or just a friend of the person that owns the backpack? Either way, the alarm will need some sort of battery. It might even be connected to the solar charger. As of now, most of our time was spent developing each stand-alone feature and not how they may interact with each other. We don't have clear solutions to these parts of the problem yet, but more discussions with our stakeholders will help us determine if our product fulfills our design criteria.

If we were to do this project all over again, we would do more iterations on our prototype and ask for more user feedback. Our team created a physical prototype, but it was only temporary for our video. Even though we showed the video to focus groups participants, we believe we would have received more valuable feedback from users who interacted with a physical prototype for an extended period of time. This would have allowed us to measure how well our prototype performed against our design criteria. For example, if our participants used the backpack for a week, they could tell us how many places they took the bag (versatility) and how often they used

the lights and silent alarm (individual safety). We would also be able to gather information on if they were able to retrieve items from the retractable pocket easily (convenience).

This semester's design problem of designing interactions for an everyday object helped our team put things into perspective. Most of our group expected to learn how to create a user interface that emphasized digital interactions. With most of us coming from a computer science background, it was interesting for us to learn that there is an process that occurs before the implementation of a product. It was a good topic for us to learn the principles and processes of human-centered design because with our backpack prototype, we learned that good design in a physical product is just as important as design in a mobile app. We can now look at items that we use our daily lives and see whether or not they follow common design principles. Because it was an object we all were familiar with, this project was a bit challenging for us. We learned to step outside of our own shoes and think from the user's perspective.

Appendices

A. Evidence of Heuristic Evaluation

Individual Heuristic Evaluation Usability Bug Report:

Evaluator: Angel
Heuristic(s) violated: Error Prevention and Help and documentation
Brief description of the issue raised:
Turn on the left light
Error: Possible that the light doesn't turn on
Suggestion: Consider a way to replacing the lights/batteries and including it in a manual
Severity: 1

Evaluator: Angel
Heuristic(s) violated: Error Prevention
Brief description of the issue raised:
Turn on the left light
Error: Accidental presses; user turns on the light when they didn't mean to
Suggestion: Consider making the lights a press and hold feature, so they turn on when users want them to turn on
Severity: 2

Evaluator: Angel
Heuristic(s) violated: Visibility of system status
Brief description of the issue raised:
Users don't know if police were dispatched/if the silent alarm signal went through
Severity: 4

Evaluator: Angel

Heuristic(s) violated: User control and freedom
Brief description of the issue raised:
User somehow entered the pattern for the silent alarm by accident, and aren't able to cancel
Severity: 3

Evaluator: Angel
Heuristic(s) violated: Aesthetic and minimalist design
Brief description of the issue raised:
The alarm button is red, which can be assumed to be some kind of panic or emergency button.
It's function may appear obvious. If we want users to feel safe, we should disguise this button a
bit more, either make it a neutral color or put it in a somewhat obscure place.
Severity: 1

Evaluator: Angel
Heuristic(s) violated: User control and freedom
Brief description of the issue raised:
Pocket may not retract back to the bag (just hangs). Ensure the pocket does what it says it will
do.
Severity: 1

Evaluator: Angel
Heuristic(s) violated: Consistency and standards
Brief description of the issue raised:
In the retractable pocket wireframe, the pocket is the same color as the bag and looks like a
normal pocket. It doesn't have a distinguishable look to it for users to know that it actually is
retractable.
Severity: 1

Evaluator: Angel
Heuristic(s) violated: Visibility of system status and Help and documentation
Brief description of the issue raised:
No way to set the pattern (key) to use the alarm. The design team hasn't established whether or
not it is one code everyone knows, or if the user can set it. This could be included in docs.
Severity: 4

Evaluator: Angel
Heuristic(s) violated: Match between system and the real world
Brief description of the issue raised:
It isn't made clear where the charger is.
Severity: 3

Evaluator: Angel
Heuristic(s) violated: Visibility of system status
Brief description of the issue raised:
It is not clear if the power source is low or full (if it needs to be put in the sun). The user may

assume that they can charge the phone all the way but the source might not have enough energy.
Severity: 3

Evaluator: Sheri
Heuristic(s) violated: Help users recognize, diagnose, and recover from errors
Brief description of the issue raised: Currently no feedback from alarm button. User may not be sure if the alarm button called the policed, so they call multiple times or call by accident
Severity: 3

Evaluator: Sheri
Heuristic(s) violated: User control and freedom
Brief description of the issue raised: Will the stretchy part of the retractable pocket wear out? Will it be able to carry any weight that is added to the pocket?
Severity: 2

Evaluator: Sheri
Heuristic(s) violated: Help users recognize, diagnose, and recover from errors
Brief description of the issue raised: Will there be an easy way to change the battery in the lights?
Severity: 1

Evaluator: Renee
Heuristic(s) violated: help and documentation
Brief description of the issue raised: Users might not understand how to turn the lights on and off on the straps of the backpack
Severity: 2

Evaluator: Renee
Heuristic(s) violated: view of system status
Brief description of the issue raised: Currently, the user cannot view when the solar panel is fully charged for them to be able to us
Severity: 3

Evaluator: Renee
Heuristic(s) violated: User control and freedom
Brief description of the issue raised: If the user somehow accidentally hits the button to call GTPD, there is currently no way to undo that or know that they called.
Severity: 4

Evaluator: Renee
Heuristic(s) violated: recognition versus recall
Brief description of the issue raised:User might not always remember which side the extendable pocket is on so they could reach for one side mistakenly
Severity: 2

Evaluator: Renee
Heuristic(s) violated: flexibility and efficiency of use
Brief description of the issue raised: User might have trouble attaching and removing the extendable pocket
Severity: 1

Evaluator: Rachel
Heuristic(s) violated: Visibility of System Status
Brief description of the issue raised: Do not receive feedback on if the police have received call
Severity: 4

Evaluator: Rachel
Heuristic(s) violated: User Control and Freedom
Brief description of the issue raised: May be situations where you need to press the alarm but are unable to
Severity: 2

Evaluator: Rachel
Heuristic(s) violated: Error Prevention
Brief description of the issue raised: Unable to prevent others from accessing valuables in the retractable pocket. It is too easy to pickpocket.
Severity: 1

Evaluator: Spencer
Heuristic(s) violated: Match between system and real world
Brief description of the issue raised: Controls for the lights should control both lights the same way rather than individual controls
Severity: 2

Evaluator: Spencer
Heuristic(s) violated: Help and documentation
Brief description of the issue raised: We don't have any official documentation for the backpack yet. Ideally it'd come with an instruction booklet or attached tags with instructions.
Severity: 4

Evaluator: Spencer
Heuristic(s) violated: Error prevention
Brief description of the issue raised: On first look, it seems like the alarm button would be a control for the lights, rather than the lights themselves.
Severity: 3

Group Final Heuristic Evaluation Usability Bug Report Prioritized List:

Rank: 1
Heuristic(s) violated: Help and Documentation
Brief description of the issue raised: Our prototype currently doesn't have proper (or any) documentation. This would be helpful for users to know how to activate/deactivate the lights and alarm. Users may also be curious about how much weight the retractable pocket can hold.
Severity: 4

Rank: 2
Heuristic(s) violated: Error prevention
Brief description of the issue raised: Currently there is no feedback from pressing the alarm button, the user does not know if the call has gone through, so they may call too many times or be unaware if they somehow accidentally called.
Severity: 4

Rank: 3
Heuristic(s) violated: User control and freedom
Brief description of the issue raised: There is no way to cancel the alarm or turn it off. This is important because we don't want the police/authorities to be called if it is a false alarm.
Severity: 4

Rank: 4
Heuristic(s) violated: Visibility of system status
Brief description of the issue raised: There is no way to check the charge on the solar panel. Users need to know if they are actually able to charge their personal devices.
Severity: 3

Rank: 5
Heuristic(s) violated: Error prevention and Help and documentation
Brief description of the issue raised: It is unclear how much weight can the retractable pocket hold. User may overfill the pocket, causing it to fall and not retract.
Severity: 3

Rank: 6
Heuristic(s) violated: Error prevention
Brief description of the issue raised: Users could accidentally press the alarm button. Again, we don't want the authorities to be notified if it is a false alarm.
Severity: 2

Rank: 7
Heuristic(s) violated: Help and documentation

Brief description of the issue raised: Users can't set pattern on the alarm. Users need to know if setting the pattern is even an option, or where they can look to find out what it is.
Severity: 2

Rank: 8
Heuristic(s) violated: Match between system and real world
Brief description of the issue raised: Users probably don't want to just turn on one light. Both should turn on together.
Severity: 2

Rank: 9
Heuristic(s) violated: Aesthetic and minimalist design
Brief description of the issue raised: Alarm button is too obvious, the goal was to be stealthy.
Severity: 1

Rank: 10
Heuristic(s) violated: Flexibility and efficiency of use
Brief description of the issue raised: It is unclear how we power the lights and alarm. Users need to know if they need to change the bulbs or if the features are connected to the solar panel charger.
Severity: 1

Rank: 11
Heuristic(s) violated: Error prevention
Brief description of the issue raised: User may accidentally turn on the lights.
Severity: 1

Rank: 12
Heuristic(s) violated: Error prevention
Brief description of the issue raised: User may not be able to reach and press the alarm in certain situations.
Severity: 1

Rank: 13
Heuristic(s) violated: Match between system and real world
Brief description of the issue raised: Is there a user preference on which side of the backpack the retractable pocket is on?
Severity: 1

Rank: 14
Heuristic(s) violated: Match between system and real world
Brief description of the issue raised: A user may not understand how to turn the lights on initially.
Severity: 1

Rank: 15
Heuristic(s) violated: Flexibility and efficiency of use
Brief description of the issue raised: Safety of the contents of the retractable pocket. The retractable pocket may be more attractive to thieves
Severity: 1

B. Evidence of Focus Groups

Focus Group Script

Good afternoon. Thank you all for taking the time to be with us today. My name is _____ and I am going to facilitate our discussion. This is ____ and he/she will be taking notes during the discussion and keeping time. The purpose of this group discussion is to talk about the prototype that we developed in order to solve issues that we found when doing user research about backpacks.

We are going to be talking for about 30 minutes today and we want you all to feel comfortable to share your ideas. So, before we get into the real discussion, let's take some time to get to know each other. I would like each of you to tell us your name and tell us briefly about yourself (major, year). Then I want you to share what your favorite thing about your current backpack is. I will go first.

Ground Rules
  ● only 1 person speaks at a time
  ● everyone gets an equal chance to speak, don't dominate, don't stay quiet
  ● respect everyone's opinion; don't put down or criticize harshly
  ● but you can and are expected to disagree or have unique opinions
  ● respect people's privacy during and after FG
  ● you can use name tags so that everyone can be addressed by first name

Now that you all understand the ground rules and what is expected of you, we are going to show you the video that we created to showcase the features in our prototype.
<show video>
As you saw in the video, the features that we added were a retractable pocket, a silent alarm, two forward facing lights, and a solar panel to allow for the charging of devices. Through these added features, we were hoping to address two main criteria: user safety and convenience. For user safety, we were specifically focusing on how the user feels when travelling to and from places with their backpack not the safety of the contents within the backpack. And for convenience we were trying to think of ways to make the user's life easier when keeping in mind most college students have their backpacks with them pretty much at all times.

Topics/Questions
1. What are your initial thoughts/ reactions to the prototype?
    a. Problems
    b. What do you like / dislike?
2. Introduction to criteria, before we start talking about those bad boys
    a. Individual Safety: To what extent does a user feel safer when they use our bag?
    b. Convenience: Is it more convenient to use than an average backpack?
3. Safety
    a. What are your general reactions to the lights and alarm button?
    b. What do you think about the usability of these aspects?
    c. Would the alarm button make you feel safer?
    d. Does it seem intuitive?
    e. Do you think that you would use the lights when walking home in a dark place?
        i. Why or why not?
        ii. Would you use it to make yourself more visible on a bike?
    f. How well do you think it addresses safety?
        i. Other aspects of safety that are more important / should be addressed?
4. Convenience
    a. Would you use the retractable pocket? If so what would you use it for?
        i. If they get stuck, suggest keys, wallet, headphones, etc.
    b. Would you use an internal charger?
    c. What devices do you think you would want to charge?
    d. How many devices do you think you might want to charge at one time.
    e. How do you feel about the look of the solar panel on the backpack
    f. Is there something else that would make the backpack more convenient to use?
    g. How well do you think it addresses convenience?
        i. Anything else that you think we should try to address?
Conclusion
1. Summary by facilitator or note keeper
2. Address any remaining questions that the participant have
3. Thank participants

Sign in Sheets:

Focus Group #1 Sign in Sheet

Focus Group #2 Sign in Sheet

Notes from Focus Groups

<u>Focus Group 1:</u>
- Liked idea of retractable pocket, noticed it didn't retract very well
    - Work like a front pocket, like a small pocket for phone or key
- Like solar panel because he keeps phone charger, sustainability
- When do the lights turn on?
    - Pressing of the light would be good - possibly double tap
    - Switch on the side, can hold straps without pushing
    - In the retractable pocket??
- Safety
    - Really unlikely to press the siren button
        - Clarified that the police would actually be sounded because was not shown in the video. Most do like the the backpack would actually make a sound because it would scare away most people.
    - Like the lights, light up your path
    - Liked the sound actually going off along with calling the police
    - Use lights when they get to their room when it's dark
    - More convenient than a phone flashlight, cover more area
    - Room to address safety of the contents in the backpack
    - Option to cover the solar panel
    - Be able to cover the solar panel for the safety of the contents (people might want to steal it more
    - Thinks that we covered it well, parents would like it for the kids going to school
- Convenience
    - Use mainly for keys and other small things that need to be accessed
    - Uses right side pocket to hold keys and water bottle currently
    - Safety concerns about people seeing the small pocket

- ○ Put on the back of the backpack
- ○ Doesn't ruin the portability of the backpack
- ○ Need to make sure that the retractable pocket stay on and doesn't flop around
- ○ In the retractable pocket would be good
- ○ Specific compartment in the backpack for it
- ○ Put in the front pocket
- ○ Feasible to charge computer would be great
- ○ Snake cords around but keep them from getting in the way
- ○ Could be an add on to the backpack to make it more affordable
- ● Best idea was the retractable pouch, arm length
- ● Addressing how the solar panel would be affected when it gets wet
- ● Water resistant is important

Focus Group 2:
- ● Initial thoughts/reactions
  - ○ They like the retractable pocket, not a fan of the full turnaround/frontpack
  - ○ They like the lights for personal safety/being visible
  - ○ Idea: call a friend with the alarm button
- ● Would you use it/do you understand?
  - ○ Yes?
- ● Safety
  - ○ "How easy would it be to trigger the alarm button?"
  - ○ They like the subtle placement of the alarm button
  - ○ They would use the lights; one even uses her phone flashlight sometimes
  - ○ None of them biked but imagine it would work
  - ○ They like the subtleness of the buttons
  - ○ Reflectors on the back to increase visibility
- ● Usability
  - ○ "I'd like it for easy access to like a pen or phone charger"
  - ○ Sunglasses could be a good use
  - ○ More external pockets/even double retractable pockets
  - ○ It could help, but not a deciding feature to purchase a bag
  - ○ Mostly just concerned with being able to fit all of her stuff
- ● Conclusion
  - ○ One likes comfy straps
  - ○ Would you need phone service to call from the backpack?
  - ○ GPS would help GTPD find you
  - ○ They'd prefer a simple pattern (should we let them pick their own pattern or provide our own)
  - ○ Charger would have good applications for travelling/hiking