# project 1

## design documentation

### for

CGT 17208

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### TEAM 12

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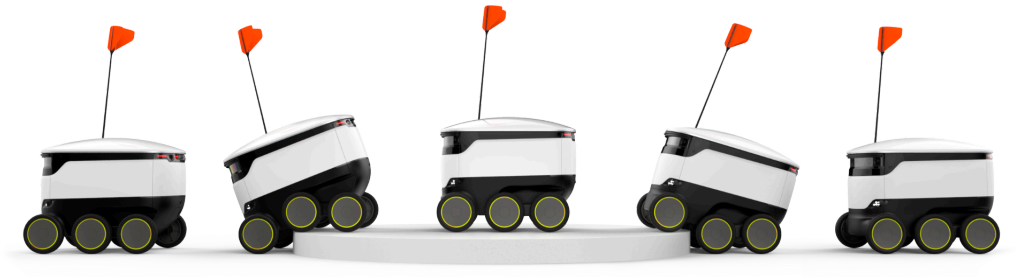


# content library

# 1. introduction

This project's aim is to repurpose Starship robots that are currently used to deliver food to and other goods to students at Purdue University. Our goal is to design a unique Starship delivery system that goes beyond food service and produces new kinds of human-human connections. We will be analyzing the attitudes that Boilermakers have towards these robots and explore problems that occur on Purdue's campus that could potentially be solved by Starships.

# 2. Starship exploration

*Ideas Explored:*

- Getting Starship in buildings to deliver items
- Bookstores
- PUSH prescriptions
- Amazon returns
- ***Rental umbrellas for the rain***
    - One of the biggest inconveniences about attending college is walking to class in adverse weather conditions, and a problem that occurs within this is that students are often not prepared for these conditions when they arise. Imagine it unexpectedly starts raining while you are on campus and you do not have an umbrella with you. Students are often dressed nicely for presentations, have to carry projects or papers that can't get ruined, or they, simply, don't want to get soaking wet while walking around campus. To solve this problem, Starships could deliver rain gear (rental umbrellas, ponchos, plastic protective covers for objects) around campus to those who forgot rain gear.

# 3. design space

**Problem Statement**

Purdue students of many different majors (engineering, art, etc.) struggle to remember to bring rain gear to class when it unexpectedly rains, and they struggle to stay dry and keep their belongings from getting ruined.

**Design Question**

How can we use Starship to deliver umbrellas, water resistant covers, and rain ponchos to students in a timely fashion?

**Human-Human Interaction**

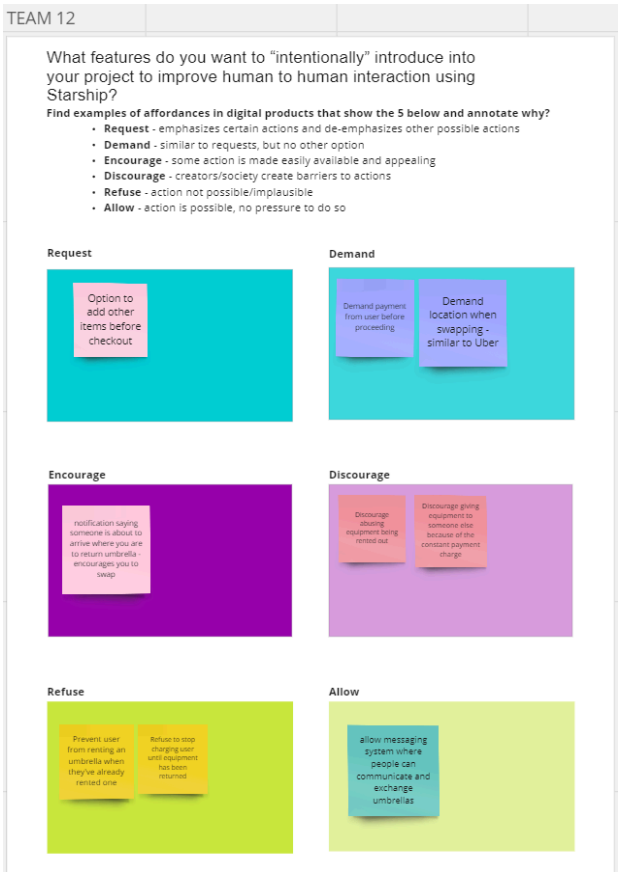



*Figure 1: In class Miro activity showing the affordances of our project idea and how human-human interaction can be improved with our idea.*

To improve human-human interaction within the rental umbrella idea, there would be a system that promotes individuals to swap umbrellas if they are in close proximity. When ordering a rental umbrella on the Starship app, it will detect if there is anyone close by that is about to end the rental on their umbrella. To be able to detect this, the app would need access to the user's location, and the user would have to pick a drop off location and approximate the time that they will return their umbrella to this location. If someone is detected that could swap, the receiver would request and a notification would be sent to the individual with the umbrella and they could accept or deny this transaction. If they accept, a map similar to Uber would appear tracking where the umbrella is and the approximate time they will arrive. Through the app, there would be confirmation on both sides to ensure that the rental fees were transferred to the receiver. This interaction would be optional, as users may not want their location to be tracked or they might not know exactly where and when they are going to drop their umbrella off.

# 4. secondary research

In our research we searched for information regarding college students, delivery, starships, weather, and rain gear to explore how we can use Starship to deliver umbrellas, water resistant covers, and rain ponchos to students in a timely fashion? In prior work by PR Newswire (2020), they dive into Starship's first partnership with a grocer, the rise of Starship Technologies, and the features of these robots. Starship Technologies gained importance and popularity during the pandemic because of its safe and contactless delivery system. It was extremely convenient during this time and not outrageously priced in comparison to other delivery services. Another work by Aeschilman & Stathopoulos (2023), focused on the delivery field, the advancements that it is undergoing, and the user's attitudes towards these advancements. These many advancements are taking place through robots, autonomous vehicles, drones, etc. Specifically, this study analyzed autonomous vehicles, aerial drones, sidewalk robots, and bipedal robots. The acceptance of these technologies were investigated, showing that older generations are less accepting, while younger generations, those with higher education, and those with higher technology affinity were more accepting. Furthermore Maswood et al. (2020) found that Internet of Things (IoT) is a popular technology that changes everyday life and contributes in changing the way of using other technologies. IoT connects things with the internet. By means of IoT, one can be notified about the weather status beforehand using sensors. Weather conditions can be observed and collected for further use. Weather status data can be stored in a website and Raspberry Pi can read this stored information to send a set of instructions to the objects. Then, objects can respond according to the information on the website. In this work, a weather notification system is proposed where the system collects the weather status from the website and sends instructions to the things. It is a common problem of many people to forget about taking the umbrella everyday while going outside. Our system can notify the weather status by turning ON an LED attached with the umbrella and sending SMS to the user equipment at user specified time. Therefore, this smart umbrella can make everyday life more comfortable. Hong, et al. (2023) researched how FDRS (Food Delivery Robot Service) affects ordering food via mobile apps. As these services grow quickly in the US, customer loyalty and satisfaction aren't fully realized (albeit very important factors). The study being issued further goes into the topic of how FDRS impacts said factors. Additionally, Lee et al. (2022) found that delivery robots, such as Starships, struggle to traverse university campuses. The article proposed changes to improve the navigation systems on delivery robots. It also noted that even with these improvements, delivery robots suffer from degraded performance in adverse weather conditions. Lastly, Jeong et al. (2020) focuses on using robots/technology to improve the mental health of college students. Using social robots that interact with students have positive psychological effects on their

wellbeing. Robot companionship and expression of concern are just some of the things they appreciate.

# 5. data collection

***Goals:*** In our interviews, we hope to find the interviewees opinions on starship. This includes whether they have used it before and how their experience was. We also want to know if they have any experiences with getting stuck in rain on campus to explore if this is a pressing issue.

***Questions:***

1. Before we start the interview, could you please tell us a bit about yourself?
    a. Name
    b. Age/grade
    c. Major
2. What does your class schedule look like?
3. On average how long does it take for you to walk to class?
4. Do you typically carry an umbrella or other rain gear with you?
5. How often do you check the weather?
6. Do you often check for rain  before walking to class?
7. Has there ever been a time where it has unexpectedly rained and you didn't have any rain gear? If so, how did you approach this problem?
8. Have you used the Starship Delivery service?
    a. If so, how has your experience been?
        i. How long did your delivery take?
        ii. What do you typically use Starship to deliver?
    b. If not, what's your opinion on these services?
9. If it was an option, would you be motivated to use Starship to deliver rental umbrellas in cases of unexpected rain?

*Closing Questions*

Those are all the questions we have for you. Are there other questions you think we should have asked you that would be of our interest?

Thank you for your time and this conversation!

# 6. data analysis

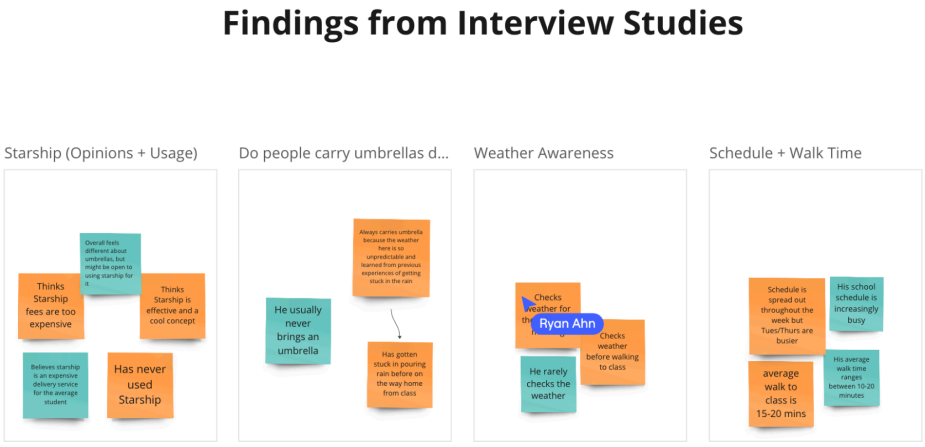



*Figure 2: Miro Board categorizing our group's interview findings.*

***Summary of Interview Findings:***

Each team member completed one survey, asking a current Purdue student our set of questions. Throughout these four interviews, there were many similar responses that helped us empathize with the user. There were varying responses in whether our interviewees currently carry rain gear with them at all times. Some do, because of previous experiences of getting stuck in the rain, and some do not. All of our interviewees responded that they usually check the weather at least once a day, which is especially interesting because three out of four of them have gotten rained on at least once during their time at Purdue. Additionally, one of our questions asked the respondents what they do when it starts raining unexpectedly, and they responded that they just have to walk in it and get rained on. This proves that the weather is very unpredictable, confirms that our product would be solving a problem that exists, and that there is no current solution to this problem. Our respondents all have little to no experience using Starship, but most agreed that it is an innovative service and would consider using it to deliver rain gear.

# 7. prototyping

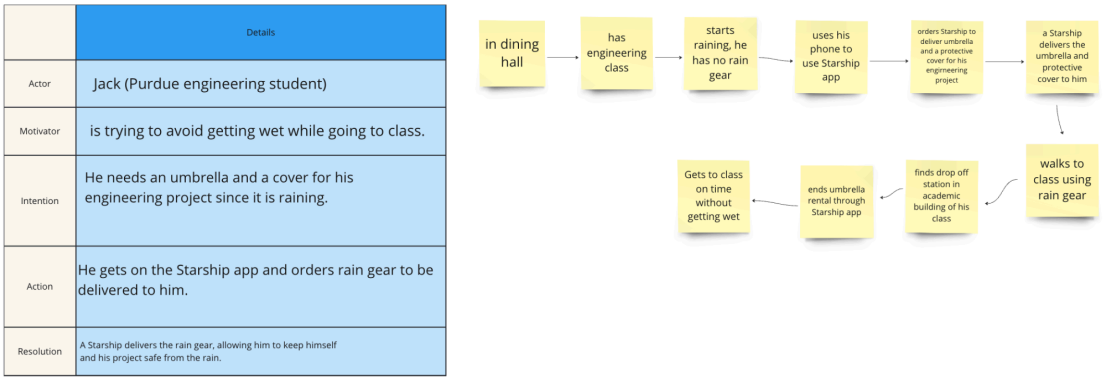
We explored many different scenarios where our repurposed Starship would be beneficial:

- You are on a campus tour of Purdue, and it unexpectedly starts raining.
- You just finished an important engineering project, but it just started pouring outside.
- You're at a basketball game, and it starts raining right as the game ends.

- You are going to an event for a club you are involved in at the PMU, and you need an umbrella for the walk there. You want to be able to drop it off when you get to the PMU because it would be annoying and inconvenient to carry around while you are at the event.

**Scenario that we further analyzed:**

*It wasn't raining before class, but it is after class before your walk home.* The user would open up the Starship app to order the rain gear they need. In this case, the user ordered a rental umbrella. Once the order is confirmed, the estimated time of arrival estimates that the Starship will be there in approximately 10 minutes. Once the Starship arrives, your rental time starts. The user walks home utilizing their gear, and returns the umbrella at the drop off station in their dorm, and they confirm the end of rental through the app.

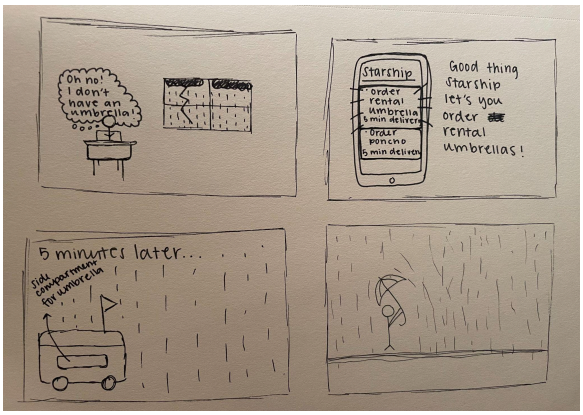


| | Details |
|---|---|
| Actor | Jack (Purdue engineering student) |
| Motivator | is trying to avoid getting wet while going to class. |
| Intention | He needs an umbrella and a cover for his engineering project since it is raining. |
| Action | He gets on the Starship app and orders rain gear to be delivered to him. |
| Resolution | A Starship delivers the rain gear, allowing him to keep himself and his project safe from the rain. |



*Figure 3: Miro Board covering a scenario in which our product would be used (correlating storyboard is shown in Figure 7).*

# storyboards:



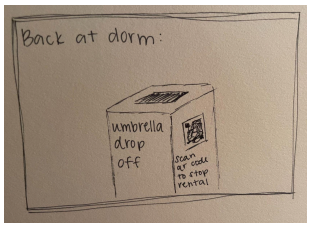



*Figure 4: Storyboard by Isabelle analyzing a scenario where it started raining during class, and a student ordered an umbrella through Starship for their walk home.*

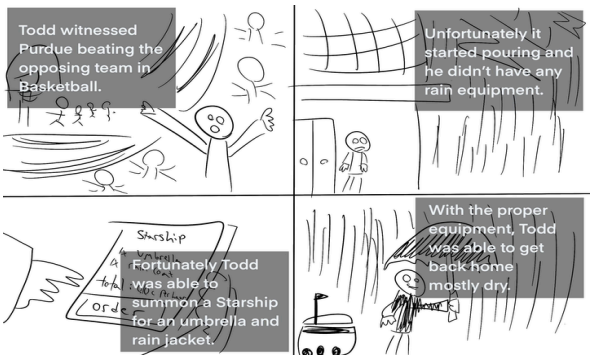



*Figure 5: Storyboard by Ryan analyzing a scenario where it started raining during a Purdue basketball game and Todd ordered rain gear for his walk home.*

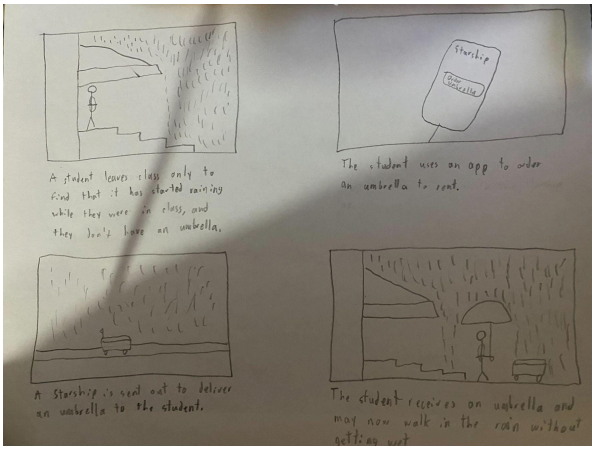



*Figure 6: Storyboard by Ethan analyzing a scenario where it started raining during class and ordered rain gear for his walk.*

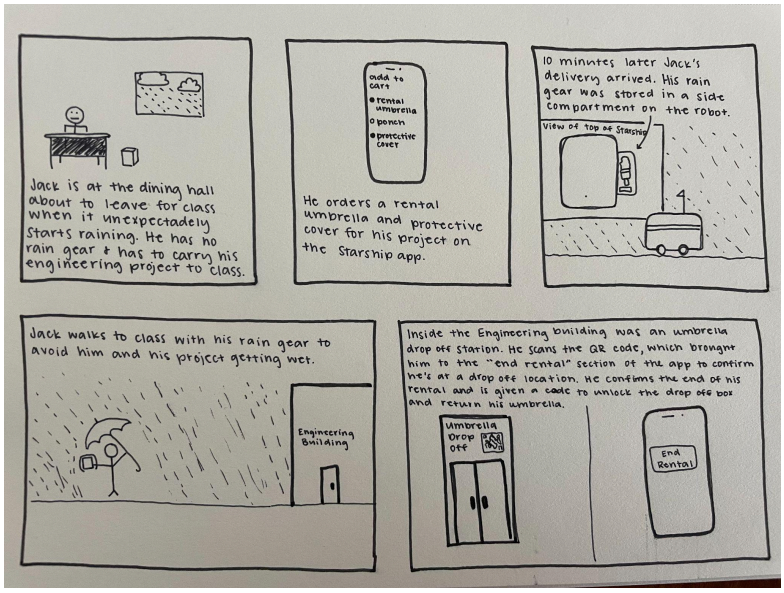



*Figure 7: Storyboard by Isabelle showing Jack in the dining hall about to go to class, but it started raining and he has no rain gear. He has his engineering project with him that he does not want to get ruined. He orders a protective cover and umbrella through Starship and walks to class dry and his project remains unharmed.*

# 8. conclusions

For this project, we first spent time thinking of many ideas in which Starship could be repurposed. Including, using Starships for Amazon returns, using them to deliver items into buildings, and PUSH subscriptions. We eventually decided upon an idea where Starships could be used to deliver rain gear, including umbrellas and protective covers for belongings. We thought about why a Purdue student would want to use Starships to rent umbrellas, which helped us figure out our problem statement and design question. Furthermore, we conducted interviews asking Purdue students various questions that were relevant to our project, and we conducted secondary research in order to learn more about how Starships are used. We analyzed the results, and ultimately found that our idea would be solving a problem that has not yet been solved. This research also helped us come up with scenarios and create sketches and storyboards where Purdue students would rent rain gear through Starship.

Ultimately, our preparation and our work throughout the design process helped us design a product that has a *purpose*. We found an issue that does not have a current solution, and designed it in favor of the target audience: Purdue students. Based on our feedback, our peers seemed to resonate with our idea and found it useful. If allocated more

time, our team would have explored creating more mid to high-fidelity prototypes of how this new system would look in the current Starship app.

## 9. contributions

***Isabelle:*** Analyzed and summarized two research sources (“Robots at your doorstep..” and “The Save Mart Companies...”), completed research summary, completed two storyboards, worked on presentation, created script, made final revisions on design documentation (rewrote many sections, turning bullet points into paragraphs, improved mine and teammates writing for better flow)

***Ryan:*** Analyzed and summarized two research sources ("Robots that interact with humans: a review of safety technologies and standards" and “Mobile application and Server Management System for autonomous robot deliveries”*),* sketched storyboard, created presentation, redesigned design documentation and worked on final script

***Ethan:*** Analyzed and summarized one research source, completed the conclusion, sketched one of the storyboards

***Zack:*** Analyzed and summarized one research source, analyzed and summarized information from interviews, edited and corrected/improved wording for documentation

## 10. reflections

**Isabelle:** Throughout this project, I have learned a lot more about the design process as a whole. We came up with an idea and critiqued it, researched the topics surrounding it, and made changes throughout the process. Since this is our first project, it has been a little difficult to understand the expectations and requirements, but it has been a beneficial learning process regardless. It has been nice to meet and work with new people in the class that I have not worked with before. This also presented some challenges, though, as I feel we were not all on the same page with our goals, motivation, and work ethic for this project. However, this helped push me to be a better and more confident leader in group settings, which was something I needed to work on.

**Ryan:** So far for Project 1, although I have learned much about the design process and what things need to get done to create a high quality project, I have struggled to find articles that relate to our use cases (for the project). In addition, I realize that sometimes I can come off as a bit too upfront/harsh and will need to work on communicating differently with my team even though the conditions aren’t ideal. This also has presented a learning experience for me with navigating these issues.

**Ethan:** While working on this project, I've found that it can be difficult to find articles that are specifically about what you're working on. I've also realized that my personality makes it difficult for me to find people to interview, so I'll need to work on overcoming that. This project has also reminded me that I typically struggle to come up with ideas, especially in the morning, so hopefully we'll reach a part of the project where I'll be able to work more effectively.

**Zack:** Throughout Project 1, I've gained skills and insights into the real design process by experiencing firsthand the process of brainstorming, research, interviewing, and critique. Collaborating with the group and getting input from interviews brought fresh perspectives and made the visions clear. I've also learned certain aspects and practices for interviews like making fair and responsible use of recorded interviews.

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## appendix

Completed interview protocol:

- ***Interview Protocol - Isabelle***
- ***Interview Protocol - Ryan Ahn***
- ***Interview Protocol - Ethan Baxter***
- ***Interview Protocal - Zack Wang***