

# ECE 140B MVP Final Project

## <Inter-act Live>

### MVP Development Process

Kimberly Johnson (A16046941; krj003@ucsd.edu)

Ankeen Arestakesyan (A16576570; aarestakesyan@ucsd.edu)

Christian Bissett (A15345034; cbissett@ucsd.edu)

Seok Jun Park (A15745118; sjp002@ucsd.edu)

### *Executive Summary*

Our company makes a product designed to fill a small but specific market for streamers who want to allow an audience of viewers to donate to a physical object to make it perform an action when a predetermined donation goal has been met. Our team is capable of handling all web based and technical aspects of this product but could use an artist and someone who is good at building custom hardware. The market for this product is small, but as we refine our product to meet the needs of streamers, we could expand what we learn in order to meet the goals of other personas, such as other donation-based organizations or artistic public interactions. Currently there isn't a platform that both (A) collects donations and (B) interacts with physical objects upon donation. However, there are many competitors that collect donations and have digital interactions. This product would start small and we estimate that it could conservatively pull in \$10-20 K a year in sales primarily by charging a small and minimal fee on every dollar donated and by selling more systems. This product doesn't really have any ethical issues outside of the issues that arise any time you have a physical object that can be controlled remotely.

### *Company Synopsis*

1. The members of this team are Ankeen Arestakesyan, Kimberly Johnson, Seok Jun Park and Christian Bissett. We are all Electrical Engineering (EE) students in the ECE department at University of California San Diego (UCSD), specializing in different depths and in different years of our education.
  - a. Ankeen Arestakesyan - I am a third year EE transfer student at UCSD. My depth is Power Engineering, and I will be graduating in Fall 2022.
  - b. Jun Park - I am a senior ECE transfer student at UCSD. My depth is Machine Learning, and I am graduating in Summer I 2021.
  - c. Kimberly Johnson - Junior ECE transfer, Computer System Design, graduating in Spring 2022.
  - d. Christian Bissett - Senior EE transfer, Machine learning depth.

2. What makes this the right team for building our product and entering the entertainment market is the skillset that each individual in this team possesses. We have experience building and hosting websites, working with microcontrollers, building circuits and modelling parts. Combining our knowledge and experience allows us to bring forth a great product.
3. Our company culture is one that is team-based and emphasizes employee participation on all levels. We strive to provide a great product with a simple and efficient user interface, allowing anyone to be able to use our product. These qualities outline our brand and we aim to maintain them as we grow and develop more products.
4. Since all four of us are most knowledgeable in the fields of technology, we would handle that side of the company. However, we would need members to manage the financial and economic aspects of the company. Therefore, as we expand our company and add new members to our team, the first five roles to be filled up would be:
  - a. Artist: Creates multiple lines of interactive toys for people to buy.
  - b. Customer Service Representative - As a developing product to a small market tailoring toys to meet user requirements is a MUST.
  - c. Chief Marketing Officer (CMO) - A CMO is an important addition to our team because only through excellent marketing, promotional skills and targeting the right audience will we be able to promote our product and succeed in the market.
  - d. Chief Financial Officer (CFO) - A CFO is necessary for our team since they play a key role in keeping the business funded and overseeing the capital structure of the company.
  - e. Business Development Manager - A Business Development Manager and a Sales manager would both help our business grow from both a marketing and sales standpoint, which would be essential as we move forward.

## *Market Overview*

1. Total market size:
  - a. At any given moment there are around 7.5 million active Twitch streamers per month.
    - i. Of that 7.5 million 10% get the majority of the views.
    - ii. Of that 700k our product would be a good fit for most of them.
2. Addressable market size:
  - a. A reasonable market goal would be to reach 10k streamers.
  - b. For most streamers, video and audio interactions that pop up on screen and are controlled digitally are enough.

3. Features of the market that make it a challenge to enter:
  - a. A lot of streamers have a setup already so wouldn't search/find our product.
  - b. Since nothing like our product exists people may not think about looking for it.
4. Adjacent markets that might be accessible after becoming successful:
  - a. Accepting payment to trigger large public ways ex: causing a fountain to spray water, an art installation to trigger, a noise to play in a public space.
  - b. Organizations with booths setting up interactive toys to attract people's attention.

## *Competitive Analysis*

1. The major competitors are services that provide the same service, but only for digitally triggered events and Twitch streamers who use switchboards to manually trigger events following reaching their donation goal. Some of these services take a portion of the donations.
2. Whitespace analysis
  - a. Opportunities to upsell are:
    - i. Introducing new toy lines to users and ways to interact.
    - ii. Introducing higher powered products.
    - iii. Introducing different integration tools.
    - iv. Creating hardware for physical kiosks to be placed and accept different forms of payment.
  - b. Opportunities to cross sell:
    - i. Having our website become the primary donation tool.
    - ii. Writing tools to integrate directly into Discord or Twitch.
3. The niche we are planning to enter would be Twitch streams:
  - a. If all went well, we would move into a platform for installing larger pieces in public spaces.

## *Customer Personas and Customer Interview Highlights*

1. Personas:
  - a. Average streamer who interacts with their base by granting different forms of interaction with donations to allow users to feel connected to their community.
  - b. Owners of amusement parks, bars, art exhibits, or public spaces who want to allow people to interact with the space using money for aesthetic or personal enjoyment reasons.

- c. Non-profit organizations tracking the current status of a donation goal as a gimmick.
2. Interview Transcript:
- a. Interview 1 with Twitch streamer (anonymous):
    - Q: Hi, my name is Ankeen, I'm working with a team to create a product for our product engineering final project and I was wondering if I could ask you a few questions.
    - A: Hey, yeah sure.
    - Q: Do you use any means of communication with your audience currently, like when they donate to you or something like that?
    - A: No not really, I get a notification on my screen and say thank you. I have seen streamers who do have stuff pop up like clips and stuff but I never really thought about it.
    - Q: Well if you ever consider having something interactive, what do you think of a toy that goes off, like buzzes or has an led flash or does something when the viewers donate, or like when the donations hit a specific goal?
    - A: Oh like some tech toy?
    - Q: Yeah like an among us character for example with a flashing led hat or a buzzer hat that could go off.
    - A: That is a pretty cool idea to be honest. I think if I have more viewers I would definitely consider it.
    - Q: Alright cool thanks for your time!
    - A: Of course, no problem.
  - b. Interview 2 with Twitch streamer (Ryan):
    - Q: Hey, I'm Christian, thanks for agreeing to do this interview A;
    - Hey, no problem!
    - Q: How do you interact with the people who donate to you when you stream?
    - A: I usually get a notification that pops up and thank them. I recently had it start playing a sound byte whenever someone does a larger than 5 dollar donation.
    - Q: How would you feel about interactive toys and a website which you can go to to connect to the toy through Wi-Fi and have the toy go off when it is donated to.
    - A: That would be pretty cool.
    - Q: Yeah and we have different toys that can do different things.
    - A: Do they sing or something?

Q: They could, we are still developing toys but that is something totally possible.

A: Oooo yeah that would be cool, especially if it's easy to set up. Q: Yeah we're making it so that all you need to do is scan a QR code or put in a link and then you can enter the donation room kinda thing, almost like how you join a Kahoot if you know what that is.

A: Ok it might be kinda hard I know some streamers already have Discord, Twitch, and their own donation things set up. Maybe if you could integrate it through there somehow.

Q: Thanks! And thank you again for the interview.

A: Oh no problem, have a good one.

Q: You too!

### 3. Journey map:

#### a. JIMBO the streamer

- i. Has a base of watchers who like to pay money to have a funny audio clip play and wants to have more ways for his community to interact with each other.
- ii. Jimbo asks his fellow streamers what they use to interact.
- iii. Someone recommends this platform.
- iv. They browse the toy selection and find a setup that flashes lights and blows an air horn when his daily donation goal is reached.
- v. He sets up the system and uses it during a stream.
- vi. His viewers enjoy it as a nice touch to the experience.

#### b. Don Chino the CASINO owner

- i. There is a giant fountain system in his main lobby that fires off twice a day. It costs about 100 dollars each time to trigger the array and he would like to run it more if he could monetize it.
- ii. He looks for an app to take donations.
- iii. He sees our product does hardware integration.
- iv. He asks for a custom quote on how to get his specific system running.
- v. Someone arrives to give him a free quote on what it would take.
- vi. Our team is able to do it for about \$1,000 and a day of labor.
- vii. Customers can go to the link in the lobby and pay to trigger the installation or donate towards the installation triggering.

#### c. Karen the nonprofit owner

- i. Karen runs a vanity non-profit while living off of her inheritance. She wants something to show off to other people how much progress she is making for her charity.
- ii. She sees our product and buys a giant oversized thermometer that she puts

- up in her office and asks everyone who walks in to “look at how much progress I have made”.
- iii. Her friends have mixed feelings.

## *Customer Acquisition Plan*

1. Word of mouth would be the primary channel:
  - a. A beginning strategy would be to give streamers the platform to show off.
  - b. Users would be able to see and interact with the product and look us up.
  - c. If this was successful, Twitch advertising would become a good opportunity.
2. Cost to target and acquire targets:
  - a. Cost of development.
  - b. Hardware costs for the sample group.
  - c. Monthly advertising costs ~10% of any money we make outside of initial investment.
3. Projected LTV of customers:
  - a. The customers would be the MOST valuable part of our business models because its use is what would get the product in front of more customers.
  - b. One person could probably passively sell one system and accessories would be key.
4. Customer retention plan:
  - a. The key customer retention plan would be to seasonally release new interactive toys and tools to keep the product appearing fresh and custom. Staying on top of trends to make every customer feel like they are catered to.
  - b. Ease of use would be a key customer retention plan. IOT is a difficult space and making it accessible is a key goal.

## *How The Product Works*

1. Product features:
  - a. Product owners can login and turn on their device and host a donation page.
    - i. Benefit: provides control and ways to accept payment.

- ii. Nice to have: a standard feature expected from all web applications but no competitive advantage.
- b. Users can quickly login and donate to a product's goal.
  - i. Benefit: provides a way of interaction with the larger community.
  - ii. Nice to have: a standard feature expected from all web applications but no competitive advantage.
- c. The product then monitors the status by making GET requests to a specific location in our backend.
  - i. Benefit: Live feedback and self-monitoring.
  - ii. Competitive advantage: The current process which is manual monitoring by people.
- d. Once the goal is reached the microcontroller sends a signal to one of the many attachable devices and triggers the event.
  - i. Benefit: custom toys provide a way for the participants to connect to the host physically and interact with the other participants watching.
  - ii. Competitive advantage: having a physical item separates our product from the rest of the market.

## *Product Design*

### 1. Key hardware

- a. Arduino MKR Wi-Fi circuit board is programmed to make GET requests to a location.
- b. It then parses the request and sends a digital signal out to its pins.
- c. A secondary hardware accessory is coupled to the system and triggers based off signal (in this case an LED turns on).

### 2. UI UX IA

The website is designed to be aesthetically appealing yet simple, direct, and very user friendly. As we built the website, our goal was to make it feasible for just about anyone.

#### a. User Interface:

- i. Large blue and purple themed buttons.
- ii. White speckled background.

- iii. Multiple pages that can be accessed from the home page.
- iv. Simple yet appealing design with easy and intuitive navigation.

b. User Experience:

- i. Purchase toys:
  - 1. Press “Shop Toys” button.
- ii. Make donations:
  - 1. Press “Inter-Act!” button.
  - 2. Use QR code or link to access a live toy.
  - 3. Donate and watch the progress bar fill.
- iii. Configure toys to accept donations:
  - 1. Press “Activate Toys” button.
  - 2. Log in as new or existing user.
  - 3. For new toys: pick a name and check its availability then use name and toy ID which comes with toy to register toy.
  - 4. Registration only needs to be performed once.
  - 5. Press “Go LIVE” to begin accepting donations.
  - 6. Set goal amount using the toy name.

c. Information Architecture:

- i. MySQL server holds two tables
  - 1. Toy owner information
    - a. Name email etc.
    - b. Balance
  - 2. Toys
    - a. Name
    - b. Serial number /Toy ID
    - c. Status (accepting donations or not)
    - d. Owner information
    - e. Donation goal
    - f. Amount of donations collected
- ii. The Arduino makes constant GET requests to a location and the backend sends out a simple yes or no response on if it met goals.
- iii. The website has multiple forms which populate that field.



1. In the future the active toys table will auto clear inactive toys after 24 hrs.
3. The biggest accessibility issues related to our product
  - a. People can't hardcode an Arduino in the way we did and we need to design our hardware out further to make it so no code or technical knowledge is necessary.
  - b. Not everyone has access to reliable internet all the time for the device to work.
  - c. Toys that focus on lights and visual appeal could be harmful to users with epilepsy.
  - d. Feedback with the product owner needs to be seamless so they know what to do if there is a problem.

## *Revenue Model*

1. A small fee when donation goals are reached will be our primary source of revenue.
  - a. Accessories and updated toys will be a secondary source of revenue.
  - b. Platform sales will also be a source of revenue.
2. \$0.50 or 0.1%, whichever is higher from every donation goal reached.
  - a. 30% of every accessory sold or ~3-10 dollars per accessory.

## *Progress/Traction to date*

1. What went right and wrong:
  - a. What went right:
    - i. Week 1 pivoting product to this idea.
    - ii. Ankeen and Kimberly decided on a unified artistic style for the website by week 5.
    - iii. Rough structure for website completed by week 9.
    - iv. Jun was able to get an Arduino interacting with a template website online by week 4.
    - v. Ankeen 3D printed fun looking toys.
  - b. What went wrong:
    - i. Hardware issues connecting to the world wide web.
    - ii. Had to abandon the taser demo due to unreliability and frying a batch of hardware.
    - iii. Had to refocus the website to its key detail and focus on features which were pretty and easy to implement.
    - iv. Dynamic creation of toy access links had random bugs.
2. RATs:

- a. Risks
    - i. The market might be too small.
  - b. Assumptions
    - i. People will want donations to cause physical triggers.
    - ii. Streamers are willing to have a percentage of donations be taken as service payment.
  - c. Tests
    - i. Michal Reeves has a drill that spins when people donate and his users love it.
3. Pivots:
- a. Project pivots
    - i. Entire project idea pivot weeks 1 and 2.
    - ii. Narrowed scope of project weeks 4-6.
      - 1. Decided hosting streaming was out of scope for project.
      - 2. Decided that sending video and audio clips to hardware to play was out of scope for project.
  - b. Hardware pivots
    - i. Arduino Uno with Wi-Fi dongle had tons of compatibility issues.
      - 1. Pivoted to Arduino MKR 1010 system with Wi-Fi built in and supported.
    - ii. Taser and higher voltage applications fried electronics.
      - 1. Switched to a coupled system of the MKR and AT Mega microcontrollers so that problems with toy wouldn't fry Wi-Fi controller.
    - iii. Final solution was LED control as proof of concept for MVP.
  - c. Software pivots
    - i. We transitioned through three different web hosting services before Digital Ocean was recommended.
    - ii. Initial text file database wasn't robust enough and caused problems.
      - 1. Switched to MySQL maintained database for all actions.
    - iii. Switched from querying Arduino from web server to a system where the Arduino made continuous GET requests to a server address with device ID for control.
4. What was easier/harder than we anticipated:
- a. Harder:
    - i. Managing a team and integrating different sub projects was extremely difficult remotely.
    - ii. Connecting the Arduino to a live nonlocal website was harder than expected.
    - iii. Setting up an 8-year-old 3D printer was impossible.

- iv. Navigating through all the different web hosting services.
- b. Easier:
  - i. Buying a domain name and routing to the web server.
- 5. What could we have done with better information:
  - a. Saved time sorting through Arduino documentation to connect to Wi-Fi.
  - b. Built a more robust login system.
- 6. SWOT:
  - a. Strengths:
    - i. No direct competitors in the market.
    - ii. Gaming industry is a big and growing industry.
  - b. Weaknesses:
    - i. UX design is difficult:
      - 1. Arduino is hard coded at the moment.
      - 2. Website has a couple of quirks.
      - 3. Hard to accurately assess both the experience of streamers and donators using the product without a physical device and live scenario.
  - c. Opportunities:
    - i. Would be easy to scale once an initial product is made.
  - d. Threats:
    - i. Larger companies could invade and overtake our product niche.
    - ii. We literally got DDOSed when we first deployed our site and had to invest in security through Cloudflare.

## *Financials*

- 1. Product development and manufacturing costs:
  - a. Arduino uno Wi-Fi \$30
  - b. 3dprintpen \$100
  - c. Minor electronics components \$10
- 2. Estimated sales and marketing costs:
  - a. ~5 month for the first year.
  - b. Due to projected low sales at first marketing costs would be based on volunteering.
- 3. Estimated revenue:
  - a. \$30 for the system
  - b. \$10 dollars per toy
  - c.  $\sim 5 \times 12 \times 3$  probably around 200 customers
  - d.  $200 \text{ customers} \times \$40 = \$8,000$
  - e. Revenue from donation tax
    - i. Avg donation goal \$100-\$300

- ii. 3x a week at 0.1% tax
  - iii. ~1 dollar per stream earned as “tax”
  - iv.  $\$1/\text{user} * 200 \text{ users} * 3/\text{wk} * 52 \text{ wk/yr} * 3 \text{ yr} = \mathbf{\$62,000}$
- 4. Estimated operational costs:
  - a. Servers  $\$30 \text{ per year max} * 200 \text{ devices} * 3 \text{ years} = 18,000$
  - b. Website maintenance part time ~ 10k/year \*3 years
  - c. 48,000 total over 3 years

## *Ethical Considerations*

1. Who could be adversely impacted by your product?
  - a. This product is just a fun product that doesn't have any overwhelming reach into the ethical domain. It adds to a viewing experience online that is already happening.
2. How safe is your product, and what happens if it's used in unintended ways?
  - a. This could easily be used in unintended ways. One of its goals is to make IOT toys more accessible. People could design custom toys that are malicious ex: tasers and explosives that interface with our product which could be triggered remotely with Wi-Fi.
3. What regulatory issues might arise related to your product?
  - a. Meeting standard safety and security requirements.
4. How will you handle privacy/security issues?
  - a. “Contracting” logins and financial servicing to a popular framework or service that specializes in handling those issues.