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Customer-Driven approach in Entrepreneurship Innovation

Bala Maheswaran (Professor)

Bala Maheswaran is currently a senior faculty in the College of Engineering, Northeastern University. He has contributed and authored over one hundred publications consisting of original research and education-related papers, and conference proceedings. He has over twenty years of experience in teaching at Northeastern University. He is the Chair of the Engineering Physics Division, ASEE, Chair and executive board member, ASEE NE Section; the co-chair of TASME Conference (Technological Advances in Science, Medicine and Engineering, Toronto, Canada), Academic Member and the Unit Head, Electrical Engineering, ATINER (Athens Institute for Education and Research, Athens, Greece). A charismatic educator, Dr. Maheswaran has received several awards including the Northeastern University first-year Engineering Outstanding Teaching Award twice, the ASEE-Northeast Section Outstanding Teaching Award, the ASEE Division Distinguished Educator and Service Award. He was also the nominee for the ASEE National Outstanding Teaching Medal and nominated to be the ASEE Fellow. Honoring his outstanding contribution, the TASME presented an award in his name at the 24th year award ceremony: “Dr. Bala Maheswaran Junior Faculty Award 2020 for Excellence in Science Education”, and awarded him the Life Time Achievement Award in 2021.

Thomas Griffin

Dongye Shen

Customer-Driven Approach in Entrepreneurship Innovation

Bala Maheswaran, Dongye Shen, Yankai Wang, Maulik Patel, Taiki Chung, Grant Lee,
Thomas Griffin, Haoran Li, Jaison Patel, Jåthun Ãrjan, William Opet, and Asees Singh Sarna
College of Engineering
Northeastern University

1. Abstract

New ideas and new products are the major strengths for revenue growth in today's vibrant commercial setting. The growing popularity of customer-orientated technological innovation has led to different approaches that feature customer involvement in new product development. The transition from an old model with no or little customer involvement to a customer-based approach that values customer feedback on innovations requires more attention to competitors in the field as their products are based on similar concepts. Innovation based on the customers' needs is a more commercially beneficial and interactive approach to fulfill the market need. Importantly, involving customers in the innovation process requires a new set of concerns, concepts, and decision-making: customers have a lot of options, and companies have to compete for business ever more intensely.

When preparing a survey for market research, the main goal should be to validate consumer needs and willingness to buy the product. Determining the demographic to which the product appeals to can narrow down a target market and the features of the product that interest customers. Additionally, customer surveys, market analysis, and business plans are some important elements for success. How to conduct market research is especially vital. This article will focus on successful market research methods, sample survey questions, survey samples, results, and an analysis of productive innovations. New product designs developed by undergraduate students using market research will also be summarized. In addition, this work teaches students to master various skills, such as research, persistence, design, construction, and technical writing.

2. Introduction

This work is part of the Dialogue of Civilizations course activities at Northeastern University [1]-[3]. The course titled "Customer-Driven Technical Innovation: Silicon Valley" studies the role of engineering innovation in addressing customer needs in early start-ups, and the need to conceive a successful innovative engineering design as part of the commercialization strategy. It emphasizes understanding how engineering innovation can meet real technical market needs and how to gather the necessary, relevant technical information early in the innovation process to produce a successful engineering design.

The course analyzes common shortcomings of early technology startups and creates an understanding of successful innovation design and commercialization strategy in Silicon Valley. The key to success is in correctly identifying, understanding, and developing a good relationship with one's customer. Particular emphasis is placed on understanding market needs, and how to gather relevant information to make an educated decision early on. The course benefits students of all disciplines as it demonstrates, in essence, how to assess one's capabilities. This is achieved through a series of projects and exercises to find and communicate with the end-users and clients in order to develop a product to fit their needs. Topics covered include an overview of technology

transfer, innovation models, customer discovery, lean startup, open innovation and its implication, interview and analytical techniques, competitive intelligence, competitive advantage, value proposition, and presentation skills and techniques. It also includes field trips to various companies in the Silicon Valley area.

Customers in the innovation process demand a host of new concerns, concepts, and management decisions [4]. Transitioning from an old model with little or no customer involvement requires a focus on different types of customer innovation, organizational missions, and organizational structures. Customers can tell the company the exact product features they want and point them in the right direction, but ultimately, the company designs the solution [5]. The growing popularity of customer-driven innovation has led to a variety of different approaches featuring customer involvement in new product development [6]-[8]. The purpose of this paper is to demonstrate the importance of customer-driven innovation in technology design, and the degree to which customers care about the products they purchase.

3. Method and Approach

As part of the course, students were required to prepare a customer survey questionnaire for new product ideas. When preparing the survey for market research, the student teams' main goal was to validate consumer needs and their willingness to buy the product. They set out to also determine potential customer demographics to narrow down a target market, and what features of products interested the customers.

Data was also collected through in-person interviews or online surveys involving all lifestyles. Survey recipients ranged from friends and family to complete strangers and potential customers. The number of survey samples varied depending on the product-marketing considerations and potentiality. Collecting a lot of data is always beneficial for analysis and predictions. Some key concerns are summarized:

- Identifying customers
- Performing interviews
- Methods to encourage customers to answer questions, ("what's missing") in markets.
- Market consideration and demographics

We successfully researched several product ideas, i.e. each team developed a different product idea and assembled the survey. This report details three product ideas, including survey questions, results, and analysis. The survey questions were developed by student teams for their products, using brainstorming teaching to generate questions based on sample surveys.

3.1 Product Idea 1: SeatTracker

The goal of SeatTracker [9]-[13] is to find a seat. The target audience for this product are mainly those who frequent school libraries and cafes. The display could be installed at the entrances of school libraries and cafes. The application can also be integrated with school web services. As for the specifics of the design, this will be testing the types of sensors and power sources for the circuits during the initial prototyping phase. The viable options as of now for the different kinds are solar sensors, flexible pressure sensors, or distance sensors. As for the power sources, the viable options are using a replaceable battery or a solar cell as well as a capacitor.

In this case, the customer market is also the focus of the investigation; we have two categories of customers:

- Clients are the universities and cafes / public workspace owners
- End users are college students who like to study in a public productivity space

We also have two growth potentials:

- Smartphone app
- Productivity application

Based on these considerations, we brainstormed several potential issues and queries for interview questions, some of which are listed below:

- Do you do your work in a public/common workspace? If so, what is that workspace? (Ex: Library, corporate office…)
- On average, how many hours do you spend in a public/common workspace during any session?
- If you don't work in a public/common workspace, why not?
- What issues, if any, do you have with finding space?
- How long do you typically spend looking for space?
- Are any existing solutions helpful / has your problem been addressed? (for a workspace)
- What is your comfort level with sitting on a circuit?
- Where would a non-intrusive placement of sensor be?
- Features questions with scale of importance (How important is this)
    - Map of open seats?
    - Numerically, how many seats on the floor are open?
    - Graphical or textual display of seat information?
- Level of interest in purchasing our product?
- Reasonable price to pay for the product
- Have you come across any similar products?
- What is your occupation/are you a full-time student
- Age?
- Gender?
- Comments or suggestions for improvement

3.2 Product Idea 2: QuickSpot

QuickSpot.io is designed to reduce the time spent searching for parking spots in public parking spaces, while reducing the stress people experience while parking. We began our research looking for issues that occur in one's daily life. The idea came to us when we were driving around Intel's campus parking lot, looking for spots for the big van. We then looked at the statistics about the parking process and found that a lot of time was wasted per person every day looking for a parking spot.

We brainstormed several potential issues and queries for interview questions, some of which are listed below:

- For parking lot sensors, the main customer base is larger corporations and local governments that own large parking lots/parking garages
- Looking to improve efficiency of parking lots when traffic is high and there is a lot of congestion

- Following a B2B business model, where the product is marketed towards other businesses for their use
- Does your business have a parking lot/parking garage?
    - How large is that parking lot?
    - What is traffic like during peak hours?
    - Have you had any personal experience having trouble finding open parking spots during congested hours? Would you prefer that it was easier to find open spots?
- Do you think that adding a system to detect and display open spots would be something that you would possibly implement into your lot?
    - What drawbacks to this system do you see?
    - How do you think customers would react to this new system?
- What is a rough estimate of the maximum amount you would pay for a system like this?
- Difficulty reaching corporate offices of large businesses
- Most responses were positive for increasing the efficiency of parking lots.
    - The majority of people who were interviewed have at some point experienced this issue.
- It was hard to get responses to the maximum price question.
    - We were directed to corporate to answer that question, but corporate was hard to reach without connections.
- Some have seen similar systems in parking garages, but not as prevalent in parking lots
- Based on this, we could possibly shift focus to solely outdoor parking lot and use of both an app and displays in the lot to relay information

We then came up with multiple survey questions to find if there was a market for our product on the consumer side.

Questions to the business

- Do you currently have a system that allows for more efficient parking?
- How much would you be willing to spend on an IOT parking system that would increase customer flow by providing an app that allows consumers to find instant parking? *(The results to these questions were inconclusive)*

Questions for the consumers

- How many days per week do you struggle with finding parking at everyday locations, whether it be a mall, movie theatre, or a supermarket chain such as Whole Foods?
- Would you be willing to download a free mobile application that would allow you to instantly locate a free parking spot in a large parking complex?
- Would you be willing to pay 3 dollars to reserve a parking spot 15 minutes in advance at a busy parking complex?

We conducted a survey that we sent out to 30 businesses and received critical feedback for our prototype.

3.3 Product Idea 3: SmartStand

The traditional music stand [14]-[17] is designed for anyone who plays music, from elementary scholars to professional music enthusiasts alike. However, there were some flaws that made the stand's height adjustment difficult. The difficulty is caused by the stand's material and its original manual design. The goal of this product was to simply boost efficiency and relieve the stress that

accommodates every standard music stand. The Smartstand uses a stepper motor on the bottom of the stand's shaft that spins a worm gear vertically. As the worm gear spins clockwise or counterclockwise the shaft of the stand will either rise or fall gradually since the inside of the shaft is quasi-hollow and threaded. Now, this stepper motor is controlled with a button-like mechanism with two pedals at the bottom of the stand, one to raise the shaft, and another to lower it. The power for the motor will be derived from a simple battery pack between the pedals. This battery pack can be later removed and charged, which removes the need for having a cord to power the motor and keeps the product compact and portable. With all these additions, the product offers an efficient, hands-free music stand for musicians to use.

A survey was conducted using Google Forms via email, direct messaging, and Facebook to gauge interest in an automated music stand and request information on each individual's experience with a music stand in the past. For consumers, questions were separated into broad and specific categories to collect demographic data and determine correlation between individuals' instrumental abilities and their opinions on this new product. For businesses, the survey questions focus more heavily on bulk purchasing abilities.

For consumers:
Broad

- What is your age?
- For how many years have you played a musical instrument?
- What instrument do you play?
- What type of ensemble did you perform in? (jazz band, marching band, orchestra, quartet, etc.)
- Do you typically rent your equipment or purchase for new?
- Are you comfortable with performing music memorized?
- What percentage of your performances (solo or w/ ensemble) were done without needing to memorize music?

Specific

- Do you often struggle with the weight of music stands?
- Do you often find music stands stiff to adjust?
- How frequently do you encounter a wobbly stand?
- How much extra would you be willing to spend on a music stand that would require little to no manual adjustment? Given the average music stand costs around 25 dollars.
- How long do you expect your stand to last for, after purchasing?
- Rank the following three qualities: weight, durability, adjustability

For businesses:

- Are you a
    - Private music instructor
    - band/orchestra director
    - concert/venue organizer
    - other_____
- How many stands does your venue own?
- What is your annual budget for purchasing music stands?

- How much extra would you be willing to add to that budget for purchasing music stands that would require little to none manual adjustment?
- How much extra would you be willing to add to that budget for purchasing music stands that would be adjusted mechanically?
- How often do you make a bulk purchase for music stands?
- Rank the following three qualities: weight, durability, adjustability

In all, 91 responses were received from participants ranging from 17 to 22 years old, with a median of 19. Information related to our products has been aggregated.

4. Results and Discussion

After the interviews and surveys were completed, we analyzed the results of the customer interviews. Figures 1-3 show the questions and results for the three different products described above.

4.1 SeatTracker

Figure 1a: On average, how long do you spend at a public workspace in a single session (90 responses)

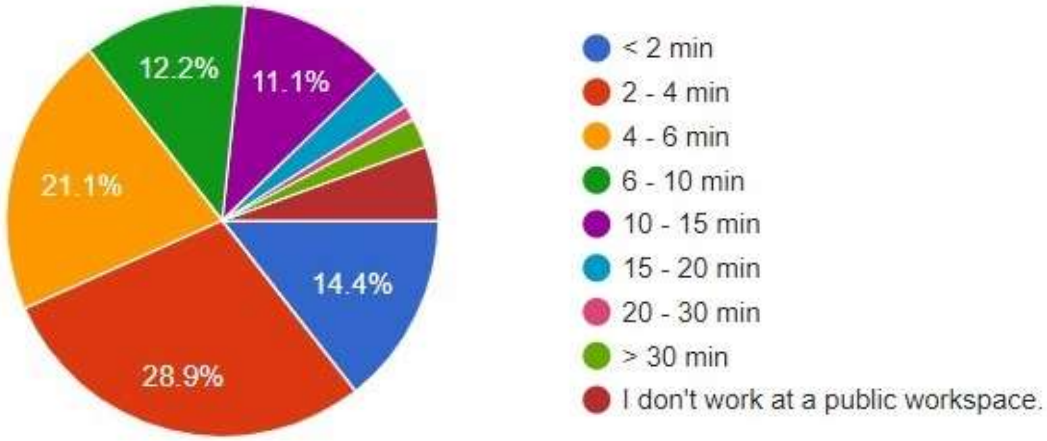

Figure 1b: How long do you usually spend looking for a spot to sit at the public workspace? (90 responses)

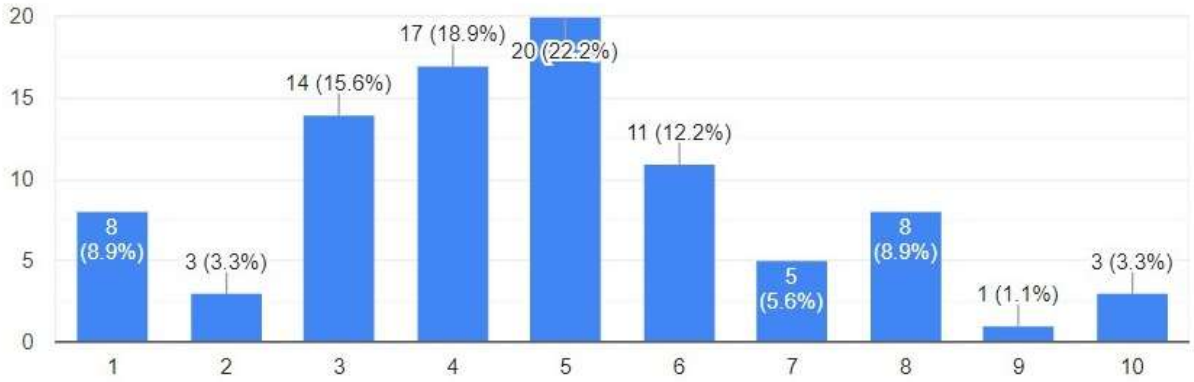

Figure 1c: On a scale of 1-10, how well have your problems in finding a seat been address in the past? (90 responses)

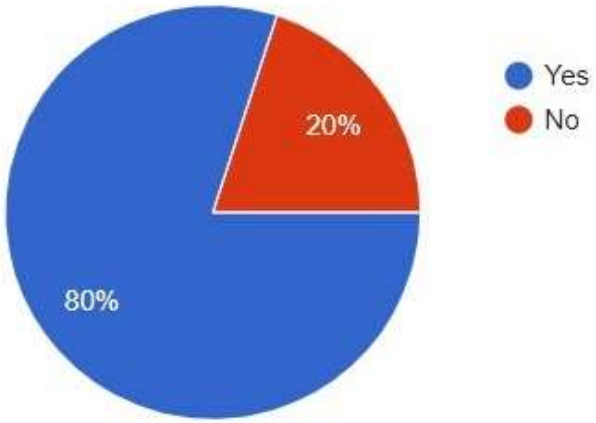

Figure 1d: Our goal is to help people save time finding seats. Our idea is a smart phone app that tracks seats in live time to tell you when a seat in a public workspace (such as a library) is occupied or not. Would you be interested in using such a product? (90 responses)

In the seat tracker survey, the results in the figures provided the following valuable information.

- Figure 1a: 64.5% of students spend 1 - 3 hrs at workspaces
- Figure 1b: 50.0% of students spend 2 - 6 min looking for a spot to sit at workspaces
- Figure 1c: 81% say their problems in finding a seat have not been addressed well in the past
- Figure 1d: 80% would be interested in using our product

We have learned some key issues listed below:

- Students who don't work at public workspaces tend to not work there because:
    - It takes too long to find a seat at public workspaces (51 responses)
    - There are not enough seats in the space to work (54 responses)
    - They are more productive at home (11 responses)
- This problem is more prevalent in the East Coast (USA) than in the West Coast due to large campuses and more space to do work.

- 81% of students say their problems in finding a seat have not been addressed well in the past
- 80% of students would be interested in using our product

4.2 QuickSpot

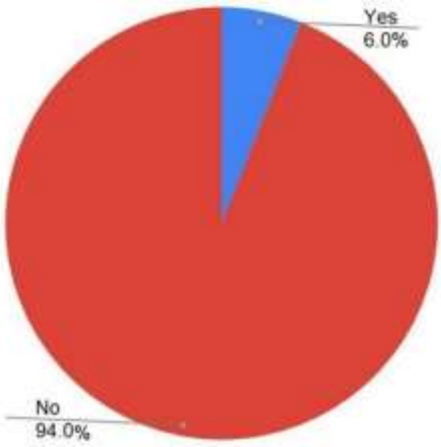

Figure 2a: Do you currently have a system that allows for more efficient parking?

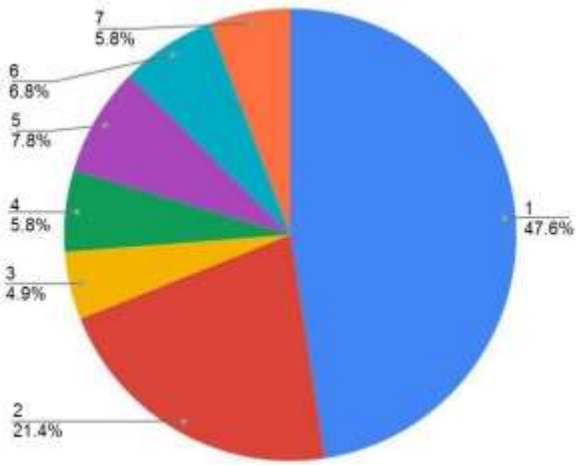

Figure 2b: How many days per week do you struggle with finding parking at everyday locations, whether it be a mall, movie, or a supermarket chain such as Whole Food?

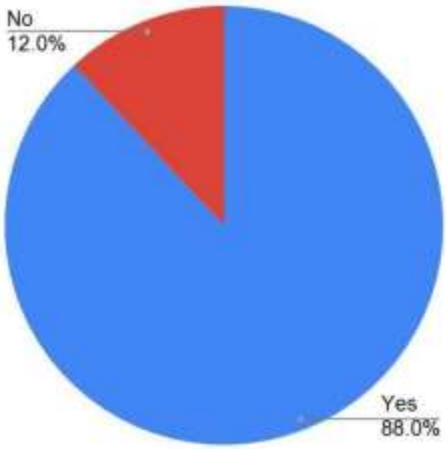

Figure 2c: Would you be willing to download a free mobile application that would allow you to instantly locate a free parking spot in a large parking complex.

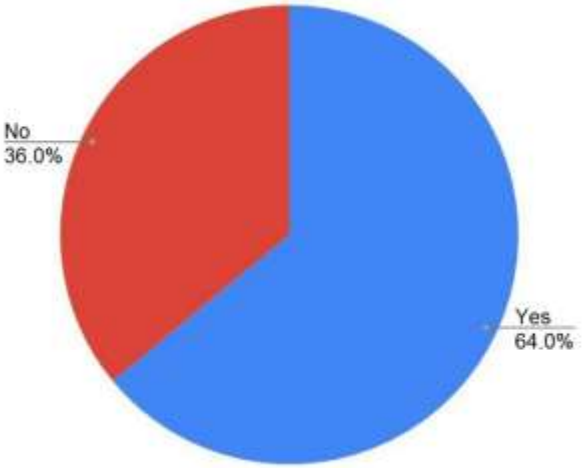

Figure 2d: Would you be willing to pay 3 dollars to reserve a parking spot.

We asked the question,

- "Do you currently have a system that allows for more efficient parking?" The results from this question showed that 94% of the businesses that we surveyed do not currently have an efficient parking system.
- Additionally, we asked the businesses how much they would be willing to pay for our particular product. However, the results from this question were inconclusive, as the people available to ask were not in a position to accurately answer our question.

Eventually, we found that a large percent of people having an issue with parking for about two days a week; they said they would enjoy using a service to improve the process. We initially asked the question,

- "How many days do you struggle with finding parking." The results proved that around 47% of the people we surveyed struggle with finding parking at least once a week. This information provided substantial evidence that yes, there currently is a need for a product such as ours.

- We followed up on this question by inquiring if they would be willing to download a free mobile application that would accurately find a parking spot 15 minutes before arriving at the destination. There was an overwhelming 88% positive feedback for this. Once receiving feedback on our free mobile application, as well as our 'premium' service, we concluded that people do think that parking is a pain, and they would benefit from our product. After analyzing the data received from our surveys collectively, we deduced that there is a need for our product in the current status quo. With this information, we proceeded to design and begin research and development for our QuickSpot devices.

4.3 SmartStand

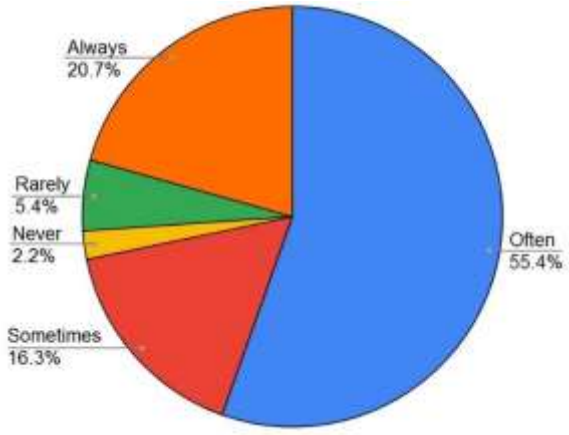

Figure 3a: On whether music stands are too stiff or loose to adjust.

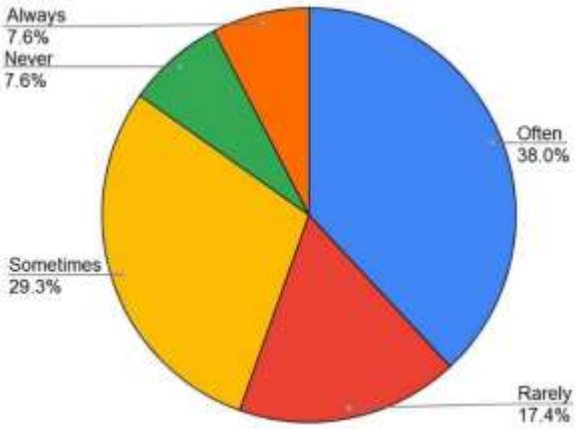

Figure 3b: On whether music stands are unwieldy to carry.

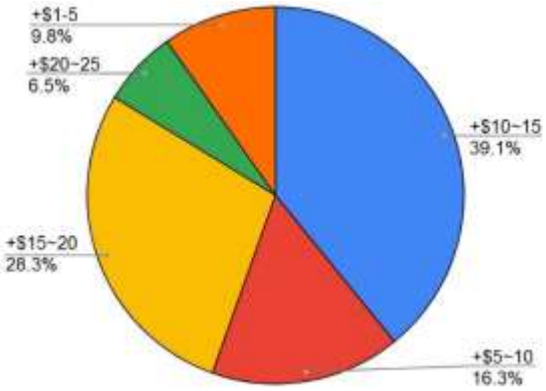

Figure 3c: Amount individuals are willing to spend on a music stand that would minimize manual adjustment.

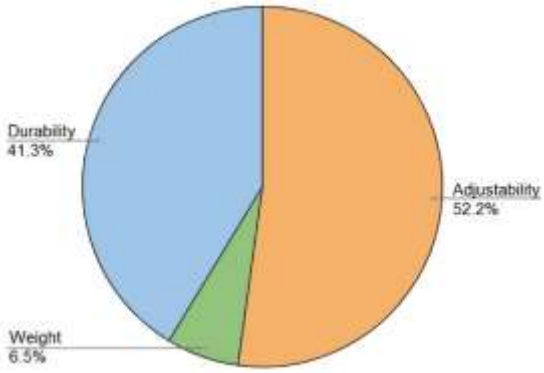

Figure 3d: Quality musicians prioritize.

According to the project's surveys and interviews, there is a demand for SmartStand. The information relevant to our product has been aggregated as follows:

- Figure 3a: 55.4% of those surveyed often found it difficult to adjust music stands, and 20.7% stated that it has always been a problem.
- Figure 3b: Fewer individuals found music stands to be often/always unwieldy (38.0%, 7.6% respectively) than their counterparts in Fig 3a.
- Figure 3c: 71.9% of respondents are willing to spend an additional $10-15 on top of the average price of a music stand, $25.
- Figure 3d: The majority of musicians prioritizes adjustability when purchasing/using music stands. Weight is the least important concern.

This product has been designed for different customers, including school kids, casual band members, and professional musicians. The material was changed to polymers and aluminum to replace the original iron alloy material as it tended to rust. Meanwhile, the stand weight and cost were lowered due to this new material replacement. The new SmartStand added a motor operable by a foot pedal, which makes height adjustment possible without the use of hands during a music performance. About 66.0% of those who replied said that they often find music stand unstable and indicated that they had performed in either a pep band or a jazz band (33 out of 50 “often” responses). That increased to 73.7% for the proportion of jazz/pep members who have always found music stands unstable.

These calculations correlate with the fact that jazz and pep band performances usually feature more movement than those of traditional orchestral, concert, or pit performances. It can be inferred from these figures that jazz and pep band members will make up a significant portion of our customer base. Surprisingly, people surveyed who performed in custom ensembles such as “small combo” or “basement gigs”, performances that also feature movement, tended to ignore the need for music stands. Small-scale venues such as these tend to rely on improvisation so heavily that the need for sheet music or chord changes are unnecessary.

Members of the jazz and pep venues will be the main beneficiaries of the SmartStand technology, while orchestral, concert, and pit performers will show medium to strong interest. Venues that rely too heavily on improvisation such as pop or contemporary concerts will not be part of our target demographic. Even though there seems less purchasing power in a lightweight stand, SmartStand will still strive for a lightweight design that would act as a supplemental feature to its automatic adjustability. This survey is also not an exact representation of the musician population within the US, let alone the world: only 91 responses were recorded. Given that roughly 54% of US households has at least one person who plays a musical instrument, about 384 responses would be needed to achieve a 5% margin of error. For the sake of this project as part of a course assignment, these inaccuracies can be excused. The target consumer market's general needs and wants can be derived from these results. Clearly, most end users prefer a sheet music stand that can be mechanically operated without the use of hands. Most want such a product to be priced within the $35-45 range. The majority prioritizes any innovative adjustable function over a lighter product. Still, our interest is trying to implement and improve both.

5 Conclusion

The study was part of a customer-driven innovation project and was completed within a four-week period for new product development and product ideas. In addition to customer interviews and surveys, we conducted market analysis and developed a business plan for each new product idea. Furthermore, a prototype was made to demonstrate the concept, which is not presented in this report. This paper showcases how student projects can emulate the customer-driven innovation framework present in current product design in the real world: surveyed individuals guided student teams in the general direction, and teams compiled this information to design their solutions. This paper also showcases how to involve customers in the product ideation and innovation process. The three examples provided within are invaluable information for educators interested in teaching students about customer-driven technological innovation or similar courses.

Acknowledgement:

We want to thank students and customers who participated in the Dialogue of Civilizations project and their contributions to the survey and research. Also, we would like to thank all the Silicon Valley companies that supported and helped us with the company visits.

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