Title: TRIP KIT ORGANIZER (Development Log)

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Instructor: Dr. Ron Khormaei

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Author(s):   Anjana Penumarti

              Alex Tacco Melendez

              Janet Rosenthal

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INTRODUCTION

The economic success of a company depends on the ability to identify the needs of the customers and analyzing the market[1]. In this process report we are going to highlight some of the techniques and concepts adapted from [1] for developing our product.

The Trip Kit is a product that is designed to be secured into a car seat, and secure various items that people tend to carry in their cars. There will be some fixed compartments for bottle/cup holders and some customizable dividers similar to drawer dividers. This prevents loose items in your car rolling about, driver needing access to items while driving, and securing food and drink items.

The paper covers all the characteristics required for a successful product development and the roadmap for the product development process.

MISSION STATEMENT

The mission statement is a product vision statement that gives a clear guidance to the product development organization. It may consist of some or all the information of the description of the product, proposition, key business goals, target market and stakeholders [1]. The mission statement of trip kit is as following, *The Trip Kit is a product that is designed to be set into a car seat, in order to secure and carry various items that people have in their seats for commuting and traveling. It is a versatile, safe and customizable according to the needs of your car.*

In creating the mission statement, we as a team took all the possible functional strategies required to make this a successful product. Our product requirements are taken directly from the customer needs. We used similar product reviews from several ecommerce websites like, Amazon and Consumer Reports to name a few, and a survey questionnaire. We gathered a lot of raw data from the customers which helped us come to an understanding of our target audience. The next few steps in our process shows how we interpreted the data and tried to build our business model.

IDENTIFYING CUSTOMER NEEDS

Since there are multiple products on the market that can be considered competitors, we decided to use that large amount of data we could find on line.   We picked the top reviewed items on Amazon, Pinterest, Consumer Reports, and Ebay. We came up with 4 items. A trunk cargo box, a set that hung from the back of a seat, and ice chest with cup holders, and a unit for a front seat console.

We then went through the reviews and mined them for data and started charting that data. For example, every time someone mentioned compartments for various items, we noted it for importance. After going through reviews on each website for each item, we had compiled a list of the features that were most important to the customers who had purchased these items. The list included folding ability, instills pride, multiple cup holders, spills won't seep into other compartments, cover easily opens, cost, handles, cleaned easily, lightweight, easy

instillation, durable, stable, and different sized compartments. From that list, we charted the importance of each need. The most important items were easy installation, multiple sized compartments, cup holders, and instills pride. This exercise was very useful. We did not anticipate how much people cared about the overall appearance of the product. We also had underestimated how much easy installation mattered.   Originally, we had anticipated a more complex folding set up, but after going through this exercise, we realized that it would negatively affect this customer need.   The cost of the item was very low on the customer need list. This meant that we could make a quality product, even if it cost a little more.

We went further in our analysis by creating a survey for potential customers. We received 11 surveys back.   Again, the overwhelming opinion of our survey responders was that ease of installation and compartment sizes were the most important features to them.   We responded to our customer needs in a few ways.   We took away the folding mechanism, and made the bag compressible.

We looked at our target audience, and the largest one was families. So, we made the cup holders accessible from two seats in the backseat of the car. Therefore, becoming a front or back seat unit. We made our compartments customizable with removable inserts that could be added or taken out of the bag, according to who was using the bag. We brainstormed multiple ideas for instilling pride.

PRODUCT SPECIFICATIONS

After defining our customers' needs, we had a clear idea of their areas of interest. However, this information was very subjective in regards to giving us specific details on how to design our product. In order to interpret our customers' needs, our team got together for a brainstorming meeting. We had the challenging task of "translating" their expressions and try to determine with precision what the product had to do to fulfill their needs. For example, for the customer need "provides different size compartments", the specification that we determined was "multiple size compartments".

Now, a product specification needs to be a precise description of what the product has to do. Therefore, we needed to define a metric and a value for each specification. Going back to our previous example, for the need "provides different size compartments", the metric is "multiple size compartments" and the value of the metric was defined as the number of compartments and sleeves that our product had to have in order to organize different types of objects: adjustable compartments and 4 sleeves for beverages.

At this stage of the process, we didn't need to worry about the possible limitations that we might have on addressing certain needs. Our task at that point was to define the product specifications for all of our customers' needs. For example, little did we know at that time that the Trip Kit was not going to be foldable and that instead we were going to make it more spacious. That is a typical trade-off that you encounter on later stages of the product development process: select product concept.

After defining all of the metrics and values to address each of the customers' needs, we collected competitive benchmarking information on the same parameters in order to do an objective comparison. The results gave us an idea on how our competitors were or were not satisfying the needs that we had identified in our research. In order to gain competitive advantage, we had to focus on identifying the metrics that had a high relative importance and determine our action plan. We were also able to obtain additional information by reading the competitors' customer reviews. For example, we knew that safety was a critical issue stated by a lot of people. But one person in particular wrote a description of what this meant; she had mentioned a time when her little girl had hit her head on a back-seat organizer after pushing hard on the brakes of her car.

CONCEPT SELECTION

We used our first sketch as the starting point. This design (group concept) was a pyramid shape with cup holders on the front of the box. There were multiple compartments that were fixed.   There was also a piece of material that provided a wedge to keep the box stable. There were 2 straps, one going around the back of the car seat, and one going around the top headrest. They each had a buckle and were adjustable. After that, we each came up with a separate design.

Alex's design was a rectangular design with pockets for the various compartments. Buckles were the same. Cup holders were on each side, on hard plastic for stability.
Janet's design was similar.   Rectangular box, same buckles.   Janet's design incorporated removable plastic dividers.   Cup holders were on each side and were plastic.   Anjana's design was the most creative. It was a hexagon shape.   She had the same buckle features. She put the cup holders on the front and then on the side.   Her compartments were fixed in place. We then charted each design against the needs matrix.   Anjana and Janet's designs scored the highest, due to the appearance and the customization of compartments. While Anjana's design scored high, we felt like we had to trade off too many other needs to make it work. In the end, we resolved issues by making changes to Janet's model.

Since we were picking a less attractive model then the pyramid or hexagon, we decided we could fill that need in a completely different way.   We would use different fabric designs for a more appealing product. We also started brainstorming licensing and logos that we could incorporate. This exercise was beneficial for us because we had been very stuck on our original idea.   Once we scored our concepts, we realized we could meet our customer needs by changing our concept in a few ways.

CONCEPT TESTING

We tested our concept first by making a model. This proved to be a little more difficult than we anticipated. We had to make decisions about size and weight.   Again, trying not to make too many tradeoffs by oversimplifying the design.   We came up with a Styrofoam box that was 7" high and 14" long on each side.   We attached pieces of Styrofoam on each side to

mimic plastic cup holders.   We then put it in our cars and simulated driving around with it. Immediately there was a problem. The hard-plastic cup holders were bothersome. In some car seats that were rounded, they forced the box to tilt to the side. Thus, being unstable and awkward.

Also, if the model was put into the back seat, in between two children's car seats, the plastic didn't fit if the car seats were large or the back seat was small. We threw out the plastic cup holder idea, and replaced it with mesh elastic material that would lie flat unless there was a drink in it. We incorporated Anjana's idea of putting the cup holders on the front and the side. We now had it perfect for front or back seat of any car.   The box itself was the perfect size.   We also realized that a zipper around the top of the box may be something people fumble with while driving. We attached a loop of cloth for ease of use.

We further tested by ordering materials from wholesalers in the United States.   We wanted to keep a quality product, and we aren't extremely sensitive to price. We ordered a heavy-duty canvas cloth. It was water proof, could easily be wiped off and cleaned inside and out. It was a highly durable fabric.   We also ordered a foam batting for the liner.   This was to keep the box open in a box shape, using the heavy liner, the black canvas, and over locked seams. The batting material was too delicate, and we needed to search for one that was more heavy duty.
We also ordered straps and buckles and tried them out for ease of use and durability.   We ordered mesh elastic fabric and tried taking a cup in and out of it to make sure it was stable (it was).

Once we had our materials and concept tested, we received a quote for a prototype from Rapidmade.com. Rapidmade talked to us over Skype about our product.   They went through each aspect and determined that it was feasible to make. They then quoted us $419 to make the prototype by using the materials we had already purchased.

PRODUCT ARCHITECTURE AND INDUSTRIAL DESIGN

After deciding on the product concept, our task was to determine the elements for building our product. We needed to specify the functional and physical elements used in its design. The functional elements refer to the factors that contribute to the overall performance of the product.

The physical elements refer to the parts and components used to address the predefined functions. For example: for "space and variety", we modified our original concept and moved the beverage compartments to the sides (using sleeves instead of compartments), which allowed us to gain some extra space. For variety, we designed a "divider system" that allowed customers to adjust their own compartments according to their needs. The dividers could be easily adapted using a "clip system" [2]. This compartment system made it difficult to obtain a "foldable" feature. Nevertheless, the fabric of which it is made of (canvas) made it compressible and easy to carry.

To "instill pride", we focused on the type of fabric, interior and exterior colors, cover, and sleeve design.

After some classroom feedback, we also included an extension at the end of the cover zipper to allow easy access while driving [2].
In regards to stability and safety, we added an extra pair of strap buckles to secure it to the seat. Our original model had only one pair of straps that originated from the center of the back wall of the product. The Trip Kit has two pair of straps that originate from the top and bottom of the back wall [2].

SEGMENTATION

The basic approach to get customer needs is to be receptive to customers. Gathering needs data is very different from a sales call. The goal is to get an honest answer and not to convince them with our ideas [1]. With the survey we distributed, we got 11 honest responses that helped us define our target market
 Our primary target market is Families, which includes parents taking kids to activities or to road trips, and our secondary target market is Business people and students.
Elaborating on our primary target, Families or individuals who take out food and want to secure   the boxes in a safe/compact place to avoid spill outs. The same applies for families that go on vacations and want a car organizer that holds kids toys, books, food, etc. and which can be reached out with ease for all without the driver being disturbed.
We attempted to strike a balance between our idea and our customer needs. The following concept of identifying customer needs and product selection is going to give an elaborate explanation of our approach.

DESIGN MANUFACTURING

Customer needs and product specifications are useful in guiding the concept phase of product development[1], but we as any team in an organization faced the problem of linking them with the specific design issues we think we may face. To address this issue, we are planning to use the *design for manufacturing* methodology as it directly looks at manufacturing costs. Manufacturing cost is an important economic factor in defining the success of our product. The following shows our approximate manufacturing cost and the potential profit margin.

Manufacturing   Cost   with   materials   = $15
Manufacturing   Cost   using   overseas   materials   &   site: $4-$10
Retail   = $35

We learned that economically successful design is therefore about ensuring high product quality while minimizing manufacturing cost. Looking at our numbers above, it can be interpreted that US manufacturing take $15, while overseas manufacturing takes $4-$10. And a retail price of $35 gives us a profit margin of $20-$30. But we are still in the process of defining our materials we have a plan to decrease our manufacturing to $4 and sell it in retail for $40 or $50. We did not want to cross the $50 price point as it may affect our primary target market. Our survey reports a majority of respondents for the price question to be

between the $20-$50 price bucket.

PATENTS & INTELLECTUAL PROPERTY

Within product development, intellectual property refers to the legally protectable ideas, concepts, names, designs and process for a new product[1]. Intellectual property of our product can be secured either by patents, trademarks, trade secret or copyright.

The shape of Trip Kit is a basic rectangle with deep storage space which can be customized by using separators. The side of the box i.e. rectangle base has two adjustable straps on either side with buckles at the end, so that it can be easily strapped to the back of the seat. The top of the box comes with a zippable cover that can be kept open/closed accordingly. Additionally, the top of the cover has netted slots that can hold small sized items like keys, wallets, etc.

There will be approximately 4 cup holders in total which can be folded when not used. TripKit is safe to be placed on both the front and back seats. Our design gives access to everyone to get what they're looking with ease.

Trip kit has a unique design of 4 cup holders, insulated inner lining, dividable drawer dividers, and buckle strap to keep it steady in the seat. In order to limit the number of competitors we are planning to get a design and utility patents on Trip Kit. In order to prevent the duplication of the name "trip kit" we are planning to trademark our "logo" and the word "trip kit".

We are positive that we can get a U.S. patent and Trademark for our product and move on to other global patents within the next few years.

PRODUCT DEVELOPMENT ECONOMICS:

In order to do the economic analysis of our project, we first determined the costs of the materials and the cost of manufacture for each unit. We also determined other costs related to the implementation of the project, for example, marketing costs. After the costs, we determined the price for the Trip Kit, taking into account that we wanted a profit of at least 60%. Therefore, the price was set at 25 dollars per unit (see appendix for financial data).[1]

We applied the cash flow analysis in order to determine the net present value of the project. We used a 4 year period and a rate of 10% to discount the cash flow for each year. Other assumptions for this analysis can be found in the appendix section of this paper. We obtained a NPV of $17.603.56. Theory tells us that if we have a NPV above zero we should take the project. We also calculated the Internal Rate of Return to confirm our answer, this value was 16.9%. This value should be compared to the cost of capital in order to confirm if it's an attractive alternative. In this case, the IRR is greater than the cost of capital which is 10%. This is a confirmation that it is an attractive project.[1]

We implemented sensitivity analysis to see how our project would change under certain

circumstances. We applied a negative scenario to determine if there were any conditions to make this project infeasible. And we also applied a positive scenario that would give us a clear perspective if conditions turned out to be better than expected. In then negative scenario, we increase the unit cost by 33% and maintain the remaining factors equal. In this case, we obtain a negative NPV and a IRR which is less than the cost of capital. The project would not be feasible under this modification.

On the other hand, in the positive scenario we obtain a NPV of $58.557 and a IRR of 28.61% by increasing the volume by 66%. This is an important insight that could be considered for midterm market expansion.

CONCLUSION

Perhaps it should come as no surprise that, due to the design of the class, our group's experience followed the patterns described in many of the lessons. Our first presentation led us right into our customer needs defining phase. Over the course of several weeks we went through Norming and developed understanding and familiarity as we worked together. By the end of the term, we were able to Perform and complete our project successfully by implementing most of the concepts from[1]. Following the product development roadmap is the basis for our initial product prototype and design.

APPENDIX

[1] Ulrich & Eppinger, Product Design and Development, 5th Edition Mc Graw Hill, 2012

[2] Cash Flow Analysis. Please find the attached Excel.