ADJUSTABLE CORRUGATED
TRUNK ORGANIZER

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March 14, 2013
ABSTRACT

Today, an increasing number of people own and drive their cars everyday. Many of them use their trunk, but own no organizer to keep items put in the trunk, which can cause the trunk to be very disorganized. This disorganization often translates to extra hassle for the person or results in damaged property. The majority of the population also uses a car to get to the grocery store and to transport their groceries home. Not only groceries, but many other miscellaneous items can be misplaced or damaged while in the trunk of a moving car for any period of time.

This project’s aim is to organize and prevent damages in the trunk of the consumer’s car. The solution is made from 100% corrugated paperboard and has removable dividers to enable the consumer to adjust the organizer to better secure the items inside. Included with the organizer is a collapsible box intended to replace a typical grocery bag, which was designed to fit modularly into two of the sections of the organizer. Of the people who used the organizer-box duo and completed a survey, 100% enjoyed using the product and 75% wanted to purchase one. The survey results and reactions from potential consumers validated the organizer design and its potential in the marketplace among competitors. This report documents the progress of this project.
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Jay Singh, Technical Advisor

Craig Edwards, Design Consultant
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SECTION I
INTRODUCTION

Problem Statement
This project was focused on creating an effective solution for unorganized trunks and preventing spills and damage from objects not being secured properly while driving. This trunk organizer aims to organize and prevent movement or damage to items in the trunk. The design of this product incorporates some of the features that are included in currently available products and will build off of previous designs. Included in the design is a collapsible box that fits inside of the organizer. One of the possible uses for this box is to replace typical grocery bags, because it is much stronger, can hold much more weight, and fits inside the organizer well. After completing the design phase, the product was tested in the trunk of a moving car. The test results were used to show the success of the product design and the areas for possible redesign.

Needs
An increasing number of people drive their cars everywhere today and do not have much time to neatly put things away in their trunk. This results in a haphazard trunk, where things are damaged and/or the person ultimately cannot find what he or she is looking for. This product aims to solve those problems by providing an inexpensive trunk organizer to make the trunk neater, easier to look through, and also to prevent any damage or spillage. The attributes to be included in this product are listed in Table 1 below. Each attribute is rated from 1 to 5, with 5 being the highest. This table has been referred to through much of the design phase to ensure that the design includes what is most important to the customer. Other important attributes, according to customer needs, are: adjustability, sturdiness, and ease of use. Many people keep items permanently in their trunk. This product offers those people a way to organize such items. Also, another need that is part of the final product duo is the grocery box. Since plastic bags have been outlawed, people need to bring their own bags/carriers or buy a ten-cent brown paper bag. The typical brown paper grocery bag fits in the modules of the organizer, but the box offers superior strength, size, and durability.
Table 1  Customer Needs

<table>
<thead>
<tr>
<th>Customer Need</th>
<th>Level of Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aesthetically Pleasing</td>
<td>2</td>
</tr>
<tr>
<td>Does not slide/move</td>
<td>5</td>
</tr>
<tr>
<td>Lightweight</td>
<td>3</td>
</tr>
<tr>
<td>Sturdy</td>
<td>5</td>
</tr>
<tr>
<td>Adjustable</td>
<td>5</td>
</tr>
<tr>
<td>Shrinkable/foldable</td>
<td>4</td>
</tr>
<tr>
<td>Pockets</td>
<td>3</td>
</tr>
<tr>
<td>Inexpensive</td>
<td>4</td>
</tr>
<tr>
<td>Recyclable</td>
<td>2</td>
</tr>
<tr>
<td>Long Lasting</td>
<td>3</td>
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<td>Silent</td>
<td>4</td>
</tr>
<tr>
<td>Handles</td>
<td>3</td>
</tr>
<tr>
<td>Stain/water repellant</td>
<td>3</td>
</tr>
<tr>
<td>Easy Installation</td>
<td>3</td>
</tr>
<tr>
<td>Easy access to items</td>
<td>4</td>
</tr>
<tr>
<td>Trunk compatibility</td>
<td>4</td>
</tr>
</tbody>
</table>

**Background or Related Work**

There are many products in the market that provide the basic needs of organizing objects placed in the trunk of a car. However, there is not one that fully capitalizes on all the previously stated attributes. One important fact is that all of the current products use expensive metals, fabrics, and plastics to make the product. There have been many different products created, but none have been made from corrugated paperboard. This material offers superb strength, is inexpensive and lightweight. This project uses this material exclusively. This sets the organizer apart from many other competitors in the marketplace.

**Objectives**

The objective of this project is to design and manufacture a trunk organizer that provides the user with a quick, easy, and effective way to organize their trunk, while securing items to prevent
damage, spills, and disorder. The product needs to be relatively sturdy and low cost. The design phase will be critical to the success of this prototype and product. Because of the projected low price of this product, the objective is not to make a product that will last for years, but to make it effective and cheap enough where it can repurchased if needed. For example, a trunk organizer would be very useful in transporting dirty oil after an oil change from a person’s house to an automotive store to dispose of it properly. The trunk organizer would prevent the oil from spilling and staining the trunk, but also if oil happened to get on the trunk organizer from the messy oil pan, the trunk organizer could be recycled and repurchased as needed for a very low cost to the user. The current products on the market offer a decent amount of the features listed in Table 1 above, but the available products can be improved upon, and that is one of the main goals of this project. The project objectives are:

1.) Design superior trunk organizer
2.) Construct prototypes
3.) Finalize product design
4.) Research market feasibility

**Contribution**
Although there are similar products in the market, many people do not know about or own a trunk organizer. This product aims to make the user’s trunk more organized and secure, resulting in less stress and hassle for them later. Ultimately, the end user will have less trouble transporting things in the trunk because of this product. By using this product it could save the user time by trying to find something lost in the trunk and also save them money by preventing damaged goods. This product would have a positive effect on the everyday user, helping them more effectively manage the items they put in their trunk.

**Scope of Project**
The primary scope of this project is mostly focused on the design, prototyping, and testing phases. Some research was conducted to look into the viability of the product in the market, but the project was centered on creating the product as opposed to creating a business plan to produce and sell it. This project does not involve mass-production of the product, or selling any
number of units. If this project were continued in the future, the design would continue to be improved upon and final units would be sold to prove the viability of this product in the market.
SECTION II
LITERATURE REVIEW

Purpose
The purpose of this project is to design a superior and inexpensive trunk organizer that can be adjusted to securely fit most items and that is also compatible with many different trunk sizes. To do this, corrugated paperboard, a material currently not being used in any competitor’s products, will be used. Today, most people own cars and store items temporarily or permanently in their trunk. This product’s purpose is to ensure the organization and preservation of such items. In addition, another problem people have with their trunks is that they can’t find certain items because it is in such disarray. This product will also help to keep the trunk neat and tidy to enable people to quickly find what they are looking for.

Importance of Literature Search
This literature review is important to this project because the main point is to design a product that builds off of previous works. It is critical to be familiar with what has been done before so that this project can truly add value to the previous works and avoid duplicating what has already been done. Researching competitor’s products has inspired new designs and ideas while continuing to solve the same problem. There are few scholarly sources and prior art on the subject of trunk organizers, so apart from two patents, most of this research has been conducted using competitor’s products and what is available on the market today, which is pertinent to the project’s success. Without a clear vision of past works and what needs to be done, this project would not be very successful in addressing the customer needs still out there.

Overview
This literature reviews covers several previous works related to the scope of this project. The review covers material from two patents and three competitor’s products. This review section only focuses on what is relevant and pertinent to this project and will give a good idea as to what is available today for people to buy and what can continue to be improved upon, which is the goal of this project.
Table 2 Competitors’ Needs

<table>
<thead>
<tr>
<th>Competitor Name</th>
<th>Hopkins</th>
<th>Space Mate</th>
<th>Cargo Pak</th>
</tr>
</thead>
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<tr>
<td>Aesthetically Pleasing</td>
<td>4</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Does not slide/move</td>
<td>4</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Lightweight</td>
<td>1</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Sturdy</td>
<td>4</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Adjustable</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Shrinkable/foldable</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Pockets</td>
<td>1</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Inexpensive</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Recyclable</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Long lasting</td>
<td>4</td>
<td>4</td>
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<td>4</td>
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<td>4</td>
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<tr>
<td>Easy installation</td>
<td>3</td>
<td>5</td>
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<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Trunk compatibility</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>47/80</strong></td>
<td><strong>58/80</strong></td>
<td><strong>59/80</strong></td>
</tr>
</tbody>
</table>

The Hopkins Collapsible Vehicle Trunk Cargo Organizer with Mesh Bins is comprised of three segmented compartments. It is made out of a plastic frame, steel tubing, and mesh fabric. It retails for $28.95 and weighs five pounds. See Figure 1.
The Car Cargo Organizer – Space Mate is comprised of 11 different compartments, including many pockets. It has Velcro on the bottom to prevent sliding and retails for $29.95. It has handles to facilitate portability and also folds up for easy storage. See Figure 2.
The *Cargo Pak Trunk Organizer* contains multiple compartments and has an easy pop open powered by a patented spring system. It contains Velcro strips on the bottom to prevent sliding as well, has handles, and is water resistant. It retails for $69.95. See Figure 3.
Judging from the totals in Table 2, the Cargo Pak best fulfills the needs and is the strongest competitor.

Two patents were found that related to this project. The first of which is a trunk organizer for an automobile with the main purpose of containing maintenance items for the automobile such as engine oil, transmission fluid, wiper fluid, coolant, and tools. Figure 4 shows a drawing of this organizer. This patent is not the main inspiration for this project. The scope of this project and the product described in this patent is different because this patented product is aimed more at organizing automobile maintenance items that will be stored permanently in the trunk of the car in case of an emergency. This project aims to create a trunk organizer that is universal for many items, permanent and temporary, and that is also adjustable, unlike this patented product. However, the basic principle of organizing and holding items is a common feature of both products.

Figure 4
The second patent is more closely related to the goal and scope of this project. It is described as a collapsible grocery bag holder that is secured to the floor of the trunk to prevent sliding while the car is in motion. Figure 5 shows a picture of this design. The problem that this product aimed to solve was spilled or ruined groceries due to sudden stops, accelerations, and turns while driving home from the grocery store. This is a common goal for both the product and this project. The summary paragraph of this patent makes another good point: people tend to drive differently when trying to prevent slippage of the items in their trunk. This product tries to eliminate these odd temporary driving habits by securing the items. In the need of a sudden stop, the driver can apply full pressure to the brake and not have to worry about the items on the trunk. There are also other important features of this product that this project aims to build upon. First, is the ability to fold up the trunk organizer and put it aside in case of the need of the entire trunk. Second, is the adjustability of the compartments to accommodate different size objects. Third, is the items can be easily accessed and moved within the organizer. Fourth, is the organizer is adaptable to different trunk sizes. Fifth, is easy installation and security of the organizer to the floor of the trunk.

Figure 5
**Benchmarking**

There have been many different types of trunk organizers over the past couple decades. Some of which have had slightly different goals. Many of the features used in previous designs will be incorporated into this design because of the basic function they serve to the user. This design will be fully functional and will not have any design feature that does not serve a purpose or solve a problem.

**What this project adds**

This project aims to build upon the concepts of previous designs, but also to have a new and unique design to solve the disorganization problem many people have in their trunks. All previous works mentioned and discussed above are made out of various materials, but none are made from corrugated paperboard. This project will be the first to use corrugated paperboard as the only material. Using this material to construct the product will make it very different from previous products. It will be recyclable, lightweight, and very inexpensive, in addition to building off of other previously discussed features. Table 2 shows the competitors that lack adjustable compartments, are not extremely lightweight, and that retail at more expensive price points. These are the areas that the project will focus on, as well as serving the rest of the basic needs discussed previously.
The final solution aims to address as many of the customer needs as possible at the highest quality level possible. All designs have been made from corrugated paperboard as the only material, which was a goal of the project. Using corrugated paperboard addresses many of the tabulated needs described in Section 1. This material is also very practical for this project because of the access to ArtiosCAD, the Kongsberg cutting table, and corrugated material. The number one design concern is the adjustability of segments of the trunk organizer. This, and the material, is what set this organizer apart from other alternative products already available in the market.

The following section shows each and every prototype to display the progression and setbacks of the design stage.

**Prototype #1**

This design (not to scale) has three fixed walls with one or possibly more sliding components to secure the items exactly.
Prototype #2

This design (not to scale) is like the previous prototype, but the sliding mechanism is along the width of the organizer. The dividers were separated into a small, medium, and large section for variety.
Prototype #3

This is the first full-size prototype. It consists of a basic shipping box without a top and with cutouts on the sidewalls for the partitions to slide into. The overall dimensions are based off of four grocery bags, but can be adjusted to fit much larger, or smaller items. This prototype also has the capability to be partitioned both ways (width and length), as shown in the second picture.
Prototype #4

This was not a completely separate prototype, but this picture shows another possible mechanism to connect the dividers. This tooth-hole combination is not very easy to figure out and secure which might result in damaging the tooth to the point where it does not function properly. These are both weaknesses of this mechanism. One upside to this design is that it takes out much less material than the inserts in prototype #3, which left the end pieces very vulnerable and weak. This tooth-hole mechanism doesn’t decrease the strength of the divider as much, which is good for the durability of the final product.
Prototype #5

This prototype is not of the proper dimensions, but shows more closely what the final dividers will look like. The top flaps of this RSC were creased, folded over, and glued to the vertical sidewalls. Once glued, the flaps were slit down the middle to fit the partitions. One shortcoming of these “T” partitions shown fully inserted in the box is that they do not lay flat when taken out. Because each piece of paperboard is glued perpendicularly, the partition becomes very vulnerable and weak when lying loose. In addition, manufacturing these partitions requires glue and does not always dry perfectly square.
Prototype #6
This is the first prototype that focused on a collapsible mechanism. The bottom is barely functional and does not fit together properly. Also, this prototype needed major dimension changes, visible in the picture.
Prototype #7

This is another version of the same basic design as prototype #6 with more dimensional changes needed. It was extremely hard to get this mechanism to fit properly together.
Prototype #8

Again, this is another prototype of the same design concept but with the top partition mechanism included this time to see if it functioned as planned. This prototype still needed dimension changes as visible in the bottom section of the box.
Prototype #9

This is the first design where the collapsible bottom functioned properly, however it did not sit flush because there was not enough friction holding the bottom pieces together. To solve this problem, slots were cut by hand to see if inserting the extra flap material would hold the bottom together properly. The slot cut outs solved that problem, but made another problem evident. This organizer could not hold much weight. Almost anything placed inside of the organizer, made the tabs slide out of the slots.
Prototype #10
In order to ensure the organizer could hold a considerable amount of weight, a second slot was added and the extra material from the tab was elongated to slide into the second tab in an “S” like fashion. After testing this prototype, it proved to be able to hold a good amount of weight, but it was obvious that after time or if compromised in any way, the bottom mechanism would fall apart and items would fall out of the bottom of the organizer. This was deemed unacceptable.
Prototype #11
After prototype #10, a different collapsing mechanism was pursued to preserve the strength and weight bearing characteristics of the organizer. The bottom is double wall. The first flap folds up to become parallel to the longest sidewall and perpendicular to the bottom. The bottom-most flap has angle creases that allow it to be folded into itself to collapse. Also, a different shape of divider was used. These dividers are “L” shaped and are creased at the 90-degree angle, not glued. This avoids gluing in the manufacturing process and also allows the dividers to lay flat while not being used in the organizer, thereby preserving the life of them, and making them less vulnerable to damage.
Prototype #12
It was determined in prototype #11 that two dividers was too many for a box that size (15 inches by 12 inches), so only one partition was used in this prototype. The insert along the sidewall needed to be changed drastically to avoid it breaking near the crease on the outside wall.
**Prototype #13**

This prototype changed the direction of the product again, drastically. The overall dimensions were changed from 15 inches by 12 inches to 25 inches by 13 inches, which fits three brown paper grocery bags lengthwise. This prototype goes back to a similar design as seen in prototype #3. The reason for the drastic design change was due to problems with strength and collapsibility. Many of the prototypes that featured a collapsible mechanism could not bear much weight. Prototype #12, which could hold a considerable amount of weight, did not address enough of the needs of this project, and no longer mirrored the original intent of this project. However, this prototype is still small enough where it can be pushed all the way to the back of the trunk in a compact car. As is evident in both pictures below, the partition insert channels in the sidewalls needed to be redesigned for strength and functionality.
Prototype #14

This prototype was elongated to fit four grocery bags lengthwise and fixed the sidewall inserts by moving them back so the material did not rip because of the pressure from the crease. By moving it back so the divider sits flush with the outside wall of the organizer, it also solved the problem of having the two pieces that jut out being vulnerable and likely to fold. By making them a little thicker, these pieces that stick out to hold the divider in place can take more wear and tear. It may seem like the side channel that holds the dividers is much too thick for the thickness of the divider, but again, this is to preserve the life of the two jutting out sides, as was seen as a weak spot in previous prototypes.
Prototype #15

Once the basic design of the organizer was established, the next design to finalize was the collapsible box that fits into the organizer. It was decided to include this box as an accessory, to possibly replace the typical grocery bag and to still include the collapsible feature in the project. The two pictures below show two of the three prototypes it took to perfect this design. As is shown in the pictures, the creased angle lines were off, and needed to be changed so extra material did not come out from the bottom when collapsed.
**Final Product**

The final organizer is 30 inches long by 13 inches wide and can hold four brown paper grocery bags. The bottom layer has four flaps, two of which are completely overlapping to add strength. The handholds are to facilitate moving the organizer, which can hold a substantial amount of weight due to the overlapping bottom flaps. From the left, the widths of the modules are: 5, 7, 7, and 10 inches. The center two (without the horizontal divider in) fit brown paper grocery bags. The left is smaller, and the right is larger.
If the horizontal and the right-most divider are taken out, the collapsible box fits comfortably inside the organizer. The dividers pictured below are the two different sizes. The horizontal divider that creates the four smallest boxes is the longest divider. The three vertical dividers creating the four modules are shorter. However, all four dividers have the same height and design principle. The dividers are comprised of two boards of c-flute glued together and creased at the edges to make a “T” formation. These dividers are very strong because they are double wall, but also lay flat when taken out of the sidewall channels, which preserves the strength of these dividers and makes them less vulnerable to damage while laying loose. The last picture aims to show the collapsing mechanism of the grocery box. Once the creased bottom flap is pulled up using the tab, the box turns in a parallelogram and lies flat, if needed to be tucked away to save space.
ArtiosCAD Drawings of Final Product

Figure 6  Trunk Organizer

Figure 7  Vertical Insert
Tools Used
The main tools used to design and prototype this product were ArtiosCAD software, Kongsberg Cutting Table, box-cutters, hot glue gun, and a measuring tape.
SECTION IV
RESULTS

This product aims to facilitate organizing items in the trunk of a consumer’s car. Through using the adjustability dividers, the consumer can more accurately fit and secure items in the organizer. The final design was printed on the Kongsberg cutting table four times and assembled so that these four samples could be given to people to test. The purpose was to validate the final design and want/need for this product in the marketplace.

Advantages/Disadvantages of Prototypes
Each prototype served a purpose in the design stage. Either it proved a feature would work, or it proved that it would not work. Unfortunately, most of the prototypes showed what wouldn’t work, elongating the process. However, these failures ultimately led to the final design.

Four completed trunk organizers were given out to people with a survey. A copy of this survey is located in the appendix. Their task was to use the organizer and collapsible box however they saw fit, submit a picture of how they filled it, and complete a survey about the functionality, and suggestions for improvement. This interactive survey tests the ergonomics and customer satisfaction, while also testing the sturdiness and usefulness of the product. These surveys validated the design and exposed weak areas of the design, which still need to be improved. The survey asks the participant to rate the sturdiness, adjustability, effectiveness, and how easy it is to use. They were also asked how much they would pay for this product. The averages for these are show in the table below.

Table 3 Survey Results

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Average Value</th>
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<tbody>
<tr>
<td>Sturdiness (on a scale of 1-10)</td>
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</tr>
<tr>
<td>Adjustability</td>
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</tr>
<tr>
<td>Effectiveness</td>
<td>8.7</td>
</tr>
<tr>
<td>Easy to Use</td>
<td>9.5</td>
</tr>
<tr>
<td>Price</td>
<td>$12.14</td>
</tr>
</tbody>
</table>
Interpretation and Justification of Survey Results

The trunk organizer scored reasonably high on all four attributes using a scale of 1 to 10. The attribute that scored the lowest was adjustability, receiving an 8.5. The highest scoring attribute was easy to use with a 9.5. Using these survey results to continue to improve the project, the first area to work on would be to increase the adjustability of the organizer. The average price the surveyors were willing to pay was $12.14. With the target price point of $10, this shows that the business plan is accurate and could possibly even charge a little more for the organizer and box duo. Overall the survey results were very positive, with no negative remarks or experiences, only suggestions for improvement.

Table 4    Final Design Tabulated Needs

<table>
<thead>
<tr>
<th>Customer Need</th>
<th>Final Product Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aesthetically Pleasing</td>
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</tr>
<tr>
<td>Does not slide/move</td>
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<tr>
<td>Lightweight</td>
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<td>Sturdy</td>
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</tr>
<tr>
<td>TOTAL</td>
<td>60/80</td>
</tr>
</tbody>
</table>
**Evaluation of Final Product Grade**

This product received the highest grade of all the competitors evaluated in the Previous Works section. The highest grade was the Cargo Pak which received a 59/80 and retails for $69.95. This is a much more expensive product and does not address the consumer needs as well, according to Table 4. This further validates the business viability for this project. If a product is able to provide features just as good or better than a competitor while undercutting the price significantly, the product will sell.
SECTION V
CONCLUSIONS

The main challenges of this project were designing, making, and constantly changing the prototypes to ensure the success of the final product. It was crucial that the final design be well received by the surveyors. Most of the time and effort was put in during the design stages because the most important part of this project was creating a high-quality product. Without an exceptional product, the results from testing will turn out poorly and the business plan will fail. Each prototype was necessary in order to achieve the final product. The prototyping stage took much longer than expected, but was very important to the goal and purpose of this project. The original scope of this project was 60% design, 30% testing, and 10% business planning. Because the prototyping stage took much longer than expected, as it usually tends to do, these percentages changed to 80%, 10%, and 10%, respectively. However, this project ultimately has created a product that consumers have a need for and are willing to buy.

Observations
The possible customer demographic is so vast because a large percentage of the population owns and drives cars. Therefore, his product could potentially be sold in very high quantities. Furthermore, plastic bags are starting to be banned all over California. The accessory box is a very attractive product as well and a possible alternative for many people who don’t want to use bags at all. It is 100% recyclable, lightweight, sturdy, and easy to use. This box can hold a substantial amount of weight. It can hold more weight than is comfortable for the average person to carry around. In that case, the consumer would simply put the box in the grocery cart and fill it up that way, leaving their hands free while shopping. Finally, the rigid shape of the box keeps items in place, and makes it much tidier than a lose bag, whose dimensions are constantly changing.

Conclusions
This is a very viable product for market, and is very attractive to many people. Because the survey responses were so positive, the final design, although there is still room for improvement, has been validated by consumers.
What I Have Learned

This project has taught me a lot about product design and prototyping. There is always room for improvement and this process take a lot of time and effort. I learned to not get discouraged with every failed prototype, because it had taught me something I didn’t know before and ensured that I would not make that mistake again.

ArtiosCAD was absolutely critical to this project. Early in the prototyping stages, I was sketching on paperboard scraps and using a box-cutter to make the organizers. Once I had more of a direction for the overall design, I started using ArtiosCAD to draw my designs. I did not know how to use this program at all before this quarter, so there was a very fast learning curve. I really enjoyed using the software and believe it made a huge difference in my ability to prototype and the speed and accuracy in which I was able to do so. The Kongsberg cutting table was another crucial piece of machinery to the success of my project. I had seen the machine run many times before, but had never run it on my own. Once I became completely comfortable with the machine, it was very helpful in the design stages. There is a huge difference from what you think you have designed in CAD to how it actually looks and fits when it’s cut out. Therefore, ArtiosCAD and the Kongsberg table were both of equal importance.

Another thing I learned was how to create an effective survey that yielded useful information for your project. Creating a survey with questions that will help improve/validate the design/business plan was important to gauge how successful the product was. It is important for it to be short, so the person does not lose interest and focuses on the question. Also, The questions have to be specific, and ask what you actually want to know about their experience using the product. Ask few questions, and make sure each question is absolutely needed.

Another thing I learned was the importance of planning ahead, especially when designing a new product. Prototyping is a very long process, usually much longer than expected, and I did not foresee or account for that in my scheduling. Also, roadblocks further deter this schedule. There were several times when I needed to cut a prototype, but the Kongsberg table was not working. This made it difficult to move forward without being able to look at the design and see where further changes needed to be made.

Finally, I have learned that you need to have a market for the product. It can be a very innovative product, but if there is no want or need, it will not sell. The marketability and profitability of this product were key considerations throughout the whole project. Ultimately,
the point of a business is to make money. If the product does not sell, or make enough profit, the business will fail.

Table 5  Senior Project Capstone Experience

<table>
<thead>
<tr>
<th>Major</th>
<th>Class #</th>
<th>Title of Class</th>
<th>Slightly Used</th>
<th>Moderately Used</th>
<th>Heavily Used</th>
<th>Knowledge/Skill</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT</td>
<td>330</td>
<td>Fundamentals of Packaging</td>
<td></td>
<td></td>
<td>X</td>
<td>Corrugated Materials</td>
</tr>
<tr>
<td>IT</td>
<td>407</td>
<td>Applied Industrial Product Design</td>
<td></td>
<td></td>
<td>X</td>
<td>Product design, prototyping, and launch</td>
</tr>
<tr>
<td>IT</td>
<td>408</td>
<td>Paper and Paperboard Packaging</td>
<td></td>
<td></td>
<td>X</td>
<td>ArtiosCAD, Kongsberg cutting table</td>
</tr>
<tr>
<td>IT</td>
<td>406</td>
<td>Industrial Sales</td>
<td>X</td>
<td></td>
<td></td>
<td>Identifying customer needs/wants</td>
</tr>
<tr>
<td>IT</td>
<td>475</td>
<td>Packaging Performance Testing</td>
<td>X</td>
<td></td>
<td></td>
<td>Strength and durability of design</td>
</tr>
<tr>
<td>BUS</td>
<td>346</td>
<td>Principles of Marketing</td>
<td>X</td>
<td></td>
<td></td>
<td>Product, Place, Price, Promotion</td>
</tr>
</tbody>
</table>

Open Problems & Future Work

If given more time, the adjustability of the product could have been improved and could have been made more modular. Given the time restriction, a final design had to be decided on. There is still room for improvement in product design area. Also, another difficulty during the design stage was figuring out a way to make the organizer collapsible while maintaining its strength. Ultimately the large organizer is not collapsible, but the modular box that fits into the organizer
is. This was a compromise. If this project were continued in the future, the modularity, adjustability, and collapsibility of the organizer would be improved upon.

**Future Implementation**

Many of the people who participated in the survey and others that have seen the final product are very interested in purchasing one. In the future, a small production run could be started depending on the total number of pre-orders. Due to the results of this survey, the price point would likely be in the $10-$15 range. Selling these products would further validate the business plan and the want/need for this product in the market.
REFERENCES


Survey

Adjustable Corrugated Trunk Organizer Survey

***Please take a picture of however you fill it and text me the picture @ 818 926 2212

Name ____________________________________________________________

1.) Did you find this organizer helpful?
   a) yes       b) no

Please explain your answer:
____________________________________________________________________

2.) What price would you pay for this organizer and collapsible box duo? (Please circle ALL that apply)
   a) $5-$10       b) $10-$15       c) $15+

3.) How often would you use this if you owned one?
   a) Everyday     b) Couple times a week     c) Once a week     d) Rarely

4.) How did you like using the organizer?
   a) Loved it     b) Liked it     c) Indifferent     d) Hated it

5.) Please rate the following on a scale of 1-10. (10 being high)

   Adjustable     _______
   Sturdy          _______
   Easy to Use     _______
   Effective       _______

6.) Please write any comments/suggestions you may have for me below!
Additional Pictures

How one surveyor used the organizer.
This surveyor used the organizer to go grocery shopping.
This surveyor used the product to organize items he keeps in his trunk permanently.
The grocery box held very heavy items successfully without any damage whatsoever to the box. This box was too heavy to hold comfortably by hand, validating the strength of the box.
This shows that the organizer can be tucked away in the back of the trunk of a compact car (Mercedes C-Class) to allow room for much larger items to be placed in the trunk such as luggage or a golf bag.