

# **Design of a packaging solution for iFixit's retail venture**

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## **ABSTRACT**

One of the chief concerns of any business is to maintain steady, profitable growth in a rapidly evolving marketplace. The only way to achieve this goal is to constantly evaluate the company's strength and position within that marketplace, and look for ways to improve. The iFixit company has established itself as a leader in providing quality replacement components, tools, and repair instruction for customers who wish to repair their own modern electronic devices. iFixit approached the students at Cal Poly to develop a solution for differentiating their primarily online business into a retail sales environment.

This senior project is a collection of packaging recommendations for iFixit and its expansion into a new market sector. Specifically, it contains directives for implementing point-of-purchase displays and secondary promotional packaging for two of iFixit's repair toolkits. The project team has evaluated the product and determined the critical features to emphasize in the plan for iFixit's first retail launch. The following report is a documentation of the entire process leading up to the completed solution for iFixit's new venture. It has been reviewed and approved by the company's marketing team, as well as the co-founder and owner of iFixit, Luke Soules. Luke also assisted the project team as technical advisor.

## **Acknowledgements**

The completion of this design project could not have taken place without the aid from certain individuals. The staff members at iFixit proved to be an invaluable resource throughout this project. We would like to thank our technical advisor Luke Soules for his willingness to participate in all phases of the design process. His knowledge and expertise were enormously helpful, providing input that influenced many of our design choices. Our main contact, Collin MacGregor, was our direct line into the busy workplace of iFixit. We would like to thank him for his constant contact and communication, which allowed our team to make informed decisions according to schedule. Within the iFixit organization, we also would like to recognize Tim Asp. Tim worked with our criteria to create professional and aesthetically-pleasing drawings for the design proofs. Our team is extremely thankful for his efforts and his flexibility. Another crucial contact was John Babos of Miner's Hardware. John provided valuable feedback concerning design features and requirements, from a retailer's point of view. Finally, we would like to express our gratitude to Professor Djassemi. His advice and feedback was vital to our project goals. The time and effort he put into reviewing and guiding this project is greatly appreciated by our design team as well as the iFixit staff.

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## **Project Diary**

### **Milestones and Achievements**

September 22- Met with Senior Project Faculty Advisor Professor Djassemi to choose project and confirm partnership. iFixit sent information about three possible projects which was reviewed by the team and Professor Djassemi for eligibility. the project team arranged a meeting on location with iFixit via email for the following Monday.

September 27- Travelled to iFixit's premises on Higuera St. for a tour of the facility and meeting with the Project Technical Advisor(s), Collin and Luke. the project team reviewed the three possible projects, evaluating each one for feasibility and personal interest.

1. Toolkit Re-Design- iFixit reported problems stemming from inconsistent quality of their tool kits. Namely, several casings had unclasped during shipping, allowing their contents to spill and become lost within the container.
2. Battery Repair Kit Packaging Re-Design- The clamshell packaging containing new batteries and tools was durable, but its generic form allowed the components to move too freely, causing concern for the tools to touch the battery and cause shorts. Additionally, the printed inserts were cost effective but not customizable based on the individual product replacement parts. iFixit is looking for a new packaging design that addresses both of these concerns.
3. Toolkit Retail Packaging and Displays- Primarily an Internet and mail-order business, iFixit is looking to venture into retail sales in hardware stores and hobby shops. Though many of their products are too individually specific to expect high sale numbers, their toolkit offerings are expected to attract consumers with even limited repair experience. Currently, the toolkits are not packaged to sell in a retail environment, so the proposal is twofold: design and implement secondary packaging for units intended for retail, and also to conceive and fabricate a point-of-sale display unit for the toolkits to be stored and sold from.

October 1- Out of the three projects, the project team's team chose to pursue the third one. While each proposal was interesting and challenging, the toolkit packaging and display design seemed the most plausible for completion. Luke, the project team's Technical Advisor, advised us that package re-designs would take several months to implement changes in production overseas in China. The toolkits' secondary packaging and display units could be prototyped and executed in small experimental numbers without altering primary production in China. This permits more internal team control and creativity as well as a more suitable timeframe to see the final project completed.

October 11- A team meeting was conducted to begin working on the requirements for the first progress report. the project team began the framework for the project team's progress throughout the two quarters by creating the Gantt Chart, and the preliminary literature review was broken into two segments for each team member to undertake: marketing and packaging. Additionally, the first section of the final report (Introduction) was split up to begin execution.

October 22- First of three progress reports (to be) handed in for evaluation.

October 28- In order to get a firm grasp of package design in industry the project team visited various retail stores. Due to the lack of information on POS and secondary packages as well as the ridiculous variety of both, it was necessary to get first hand experience with the products. the project team gained extensive knowledge and insight from visiting the stores.

November 1-A team meeting was conducted to analyze the critique of the project team's first progress report. Based on the necessary revisions and the information gathered while visiting stores, the project team synthesized a plan of attack to facilitate a high quality second progress report.

November 9- the project team met with Professor Singh to discuss applicable sources for the project team's literature review. Given that Professor Singh has published multiple articles on packaging related topics, the project team assumed he could point us towards relevant sources for the project team's literature review. Moreover, the project team had been having issues finding peer reviewed materials that were relevant to the project team's project. Although he was unable to provide us directly with any legitimate sources, he was very helpful and brought up some interesting ideas that will no doubt play a role in the project team's final project.

November 11- A team meeting was arranged to discuss the information provided by professor Singh. During this meeting the project team addressed how the project team can incorporate these new findings and ideas into the project team's existing plan. Moreover the project team discussed the project team's individual progress on various tasks to ensure the project team were on task for the next deliverable.

November 17- A final Team meeting was held to assemble and edit the project team's second progress report.

January 5- A team meeting was arranged to prepare for the face to face presentation.

January 10- To ensure continued progress, the project team's team met to lay out the remaining tasks and the project team's plan of action. During this meeting the project team recorded what steps still remained to produce a working prototype. This meeting was also used to determine what information the project team needed to obtain from iFixit before moving forward.

January 13- Face to Face Presentation

January 21- Met with iFixit to explain the project team's progress thus far. Moreover the project team asked them a series of questions regarding optimal color schemes, overall dimensions, and graphics to be used.

February 4- Met with a representative from Miners hardware to determine common display sizes and how much counter space the project team would be allowed.

February 10- Held a prototype session to hand cut various paperboard secondary slips.

February 12- Held a team meeting to analyze various corrugate display suppliers and printing locations.

February 15- Held a team meeting to determine which display units and product layouts would best facilitate iFixit's retail display unit.

February 21- Met with iFixit to show the project team's proposed product display units and secondary package designs. Also during this meeting the project team met the graphics team to provide them with the necessary dimensions to begin the graphic design process.



February 21- ArtiosCAD session was held to finalize the hand cut prototypes that were selected at the previous iFixit meeting.

February 23- Finalized prototypes and display insert were cut out on the Kongsberg table.

February 25- Met again with iFixit to discuss which graphic designs best represent their company image. Since corrugate display wraps are limited by the supplier, troubleshooting was required to facilitate cohesion between the display color, graphics, and the secondary packages.

## **Problems**

Thus far in the project team's project the main issue has been finding peer reviewed information on secondary packages or POS units. Although these items are abundant in industry there is little published data that explains what makes them successful, common designs or construction methods. The project team will continue to search for legitimate and relevant sources, as well as research alternatives to peer reviewed sources. Some examples of alternatives include analyzing current secondary packages/POS units and contacting companies for valuable information on what types of these packages they use and why?

## **Outlook and New Risks**

The next phases of the project will prove to be the most time consuming. Careful management of time and resources will be necessary in order to execute them effectively while maintaining the rest of the coursework the project team's team members are responsible for this quarter. Since neither of the team members share classes, similar schedules, or exams and study requirements, finding enough time to meet during the week may prove difficult. However through the use of email and weekend meetings the project team should be able to complete all objectives.

As will be stated later the display unit the project team purchased required the construction of a corrugate insert to properly store and display the tool kits. Moreover the project team desired to have one prototype secondary slip for both the large and small tool kits. In order to have high quality prototypes the project team decided to cut the material on the Kongsberg table. Since it was decided to broaden the project scope later on in the year, the project team was faced with a time crunch. This time crunch coincided with other projects taking place in IT408 where the students were also using the Kongsberg table. The circumstances made gaining time on the table

nearly impossible. The project team was able to produce one slip for both the small and large tool kits as well as one stage, however were unable to produce the 10 stages that would be needed for all Miners locations.

One hurdle that the project team has been battling is the collaboration with the design team at iFixit. Although it is not in the scope of this project to have all the units produced by the end of the project, the project team decided to aid in the procurement of the units. By adding this factor to the project team's project, the project team now had to determine final graphics, order the units, and work with suppliers to obtain the products along with the project team's other objectives. In order to place the display unit orders the graphics had to first be finalized. With time running out, the project team was eager to order the units to have them in hand by the final delivery of the project report. However, since the graphics were being finalized by the iFixit staff, the project team was at the mercy of their availability. Although the staff was extremely helpful and knowledgeable, the project team was unable to obtain the graphics far enough in advance to have the units by March 10<sup>th</sup>.

## Introduction

### Problem Statement:

iFixit is a high-tech company that supplies its customers with replacement parts for a variety of electronic devices. In order for their customers to install the parts they have purchased, iFixit also sells a multiple piece tool kit. This tool kit has been a one of their top selling items.

Although the tool kits have been a resounding success on the web, iFixit would like to expand their sells to the retail world. Since this company is new to the world of retail it will be necessary to design and build a point-of-sale display as well as a secondary package in order to showcase the value of their product.

### Needs:

Although many people can benefit from the ownership of an iFixit toolkit, the current packaging and its market visibility make it difficult for the consumer to understand their personal need for such a device. With this in mind, the secondary package and the POS unit need to be designed in a way to deliver this crucial message to the consumer. Below is a table that explains what details will accomplish the packaging goal and how important they are to the success of the display.

**Table I**


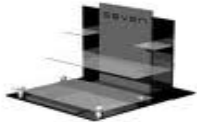


	<b>POS/Secondary Package Needs</b>	<b>Importance</b>
1	Visual Attractiveness	4
2	Size (meshes with retail layout)	3
3	Display of Pertinent Information (printability)	5
4	Design Package for Proper Storage	3
5	Volume for Efficient Storage	2
6	Design Package with Minimal/Sustainable Material	3
7	Design Package to Increase Overall Sales	5
8	Feasible for iFixit to produce	5

5= Very Important 1=Not Important

**Related Work:**

As this is an applied project, this section will show and explain similar products that are in the market. Since there are numerous manufacturers of POS units and secondary packages, they will be grouped by material or basic design, not their company of origin.

**Table II**

Type/Material	Example
Common cardboard/foam board POS display	
Plastic/perspex/plexiglass POS Display	
Shrink wrapped secondary package	
Cardboard/Paper slip secondary package	

## **Objectives**

Our team's objectives include:

1. Conducting market research and developing a unique marketing strategy for iFixit's new retail venture.
2. Prototyping, selecting, and providing implementation procedure for intermediate packaging for iFixit's toolkits.
3. Development and implementation plan of unique point-of-sale displays to accompany and promote the toolkits.
4. If units arrive before project completion, observe and measure performance and customer response.

## **Contributions**

Besides complementing and bolstering iFixit's online revenue generation with a new form of market segmentation, the intention of this project is the promotion of iFixit's mission of empowering the consumer with repair knowledge. Additionally, prolonging the use of electronics by repairing instead of replacing them lessens the strain that e-waste places on the environment.

## **Project Scope**

This project aims to help a local business maneuver into a new retail-based market for their toolkit product lines. This will involve selecting/designing a product display unit and a secondary package for two sizes of tool kits. The project will mostly focus on selection and simplistic design to limit the procurement complications after the completion of this project. Therefore, the design team will strive to determine a package combination that does not unnecessarily consume iFixit's limited resources and budget. If time permits, this project will include analyzing the retail success of the tool kits, but will not extend to widespread manufacturing and implementation within the designated two-quarter timeline. If the project proves successful, iFixit may elect to mass produce versions of this project's deliverables and even develop new products to meet growing demands.

## **Literature Review**

### **Marketing (Tory)**

Marketing is a complex system of planning designed to secure customers and encourage sales of a company's goods or service. No commerce exists today without some form of marketing, and the most carefully executed examples yield the greatest results in sales and overall company worth. iFixit has established itself as an online resource for tools, replacement parts, and freely available repair procedures. The online community is a very expansive and savvy customer base that requires a specific marketing strategy to excel in, and iFixit appears to have gained a very secure foothold within this community. In an effort to expand itself and gain attention from the off-line customer base, iFixit is looking to move into a retail environment by selling its specialized tool kits in stores. This maneuver will require a different set of marketing techniques than they currently employ for their internet business. It is important to review these techniques in their application and execution, in order to formulate a strong plan for iFixit's new venture.

Since iFixit has already established itself as a company, it has assuredly determined requisite principles such as its business mission and model; therefore the first step to undertake in this new partition of sales is to identify and evaluate its new opportunities (Grewal & Levy, 2008). This process is divided into three steps: segmentation, targeting, and positioning. Since no single product or marketing strategy can appeal to every single consumer, iFixit and the project team must decide on what market segment(s) will respond to their products the most positively. Alternatively, iFixit may develop different products and services in an attempt to include a broader range of segments. Once the segments are defined and identified, the most likely candidates must be selected for targeting. After targeting, the project team must determine how to position iFixit and its product lines in order to attract and secure this new selection of potential customers.

The next step in a sound marketing strategy is to consider the four P's: product, price, place, and promotion (Grewal & Levy, 2008). iFixit has selected a few products that it deems suitable for retail sale, and the project team's task includes defining those products and creating value for them. Customers seek products that offer them value in return for their monetary investment,

which leads into the next point of pricing. This team's project does not include developing pricing strategies for iFixit, but it is an important consideration for them all the same. Their shift to retail must take into account the differences of price points compared to their online market, shipping costs, and supply chain expenditures. Third on the list of marketing factors is placement. iFixit's primary area of expertise is in the realm of online sales, and this project calls for a successful foray into a retail enterprise for an introductory selection of their goods. The last concentration of promotion is what the project team will focus primarily on. This area of marketing is what will differentiate the online sales from retail business the most strikingly. An online customer base is extremely different from those that are shopping in a retail environment, and it is the goal of the team's investigation to promote iFixit's products to this new customer segment effectively.

Upon initial completion of any new marketing venture, a comparative evaluation of performance must take place in order to measure the relative success or failure of the enterprise (Grewal & Levy, 2008). The most common and applicable metric for measuring the project's success is to estimate numbers of sales for a given time period, and then comparing them to actual sales. This evaluation process is critical for determining quantifiable performance of a given undertaking. Initial investments, sales numbers, revenues, expenses, and consumer response are just a sample of the items to keep track of and review for assessment.

Part of the team project's goals includes developing point-of-sale displays for iFixit, which have a distinct range of characteristics suited to a particular marketing strategy. iFixit does not plan to launch brick-and-mortar locations, nor does it have the resources to allocate sales staff to assist customers in their purchasing decisions. Instead, iFixit must forward their products for resale at locations that are already established. In order to promote their products without these traditional hallmarks of commerce, iFixit must communicate the value of their products effectively and in a unique way. A marketing strategy that offers a solution to this dilemma is the point-of-sale display.

## **Point-of-Sale Displays**

Point-of-sale displays are a convenient way to inform customers about the benefits of a given product. However, the overall success of these units is based on whether or not the consumers' attention is captured. Therefore to facilitate a successful design for iFixit, it is crucial that the project team determines and understands the aspects of a display that consumers react to.

The first facet to break down is the comparison of common well-known styles versus less conventional methods. Common sense would dictate that in order to separate the iFixit products the project team should attempt a new, interesting method. However, according to an article titled "Consumers fail to notice newer POS formats" this is not necessarily a true assumption. The article explains that "people are less likely to see the less conventional formats as advertising." This is to say that although a point-of-sale unit might draw the consumer's eye, the fact that they are unused to this style deters them from pursuing the products it contains. Additionally, this article also states that the conventional unit types get noticed by 63% of consumers, while unconventional methods only got noticed by 34%. With this data in mind it is clear that incorporating conventional aspects of a point-of-sale unit is a must. Moreover it explains the risk of attempting to reinvent the wheel, and if a new design is to be created, ensure that the unit design will not scare away potential customers.

According to Gaebler's Resources for Entrepreneurs article (Point-of-Sale Displays, 2007), point-of-sale displays have their own set of guidelines, limitations, and advantages. The first of these protocols is the necessity of visibility using bold, vibrant colors to attract consumer attention. Colors are especially crucial when considering the theme of brand recognition. Herman and Rosel note the power of color consistency in their senior thesis, directly attributing it to consumer brand recognition. Coca-Cola is cited as an example of a company who has used this concept with much success, by fiercely protecting their trademarked shade of red (2003). Branding represents a relationship to the customer, and successful companies work very hard in order to preserve and improve this relationship. Horiszny (2003) notes that "Global brand giants like Nike, Starbucks, or BMW spend millions in image development, advertising, and sponsorships creating and maintaining a distinct brand personality carefully crafted to appeal to a particular target market." iFixit is still a small company, but creating a promotional identity through their unique brand is essential to growth.



Research shows that a majority of purchase decisions made in the store do not take longer than 10 seconds, and that consumers will rarely pause to view every single offering from every competitor. Therefore, it is in iFixit's best interest to develop and implement an eye-catching, unique display. Additionally; in order to attract the most attention, it is most desirable to place the bulk of the display at eye-level. If there is a competitor present who is considered the leading brand, placing the display closest to theirs is advantageous. As Lee (2006) notes in his senior project, "While the information revolution has greatly increased the power of the average consumer by providing them with broader and more informative choices, a potential customer has little other stimuli than physical packaging, cost, and previous experience when faced with a point-of-purchase display."

Once a point-of-sale display has attracted attention to itself, it must effectively communicate the value of its products. The display should have plenty of available space reserved for informative advertising, in order to close the sale. The information should be clearly expressed and carefully worded to convince the selected market segment that the products are right for them. Finally, it should be noted that there isn't and shouldn't be a single, clear-cut format for all point-of-sale displays. Each brand and line of products should have their own custom-designed units that are uniquely developed to complement their distinct marketing strategy (Point-of-Sale Displays, 2007).

## **Packaging**

Individual product packaging is the other focal point of this project, and the team evaluated the packaging industry to determine critical features for integration.

"Pedergast and Pitt review the basic functions of packaging, and define them by their role in either logistics or marketing. The logistical function of the packaging is mainly to protect the product during movement through distribution channels. In the marketing function, packaging provides an attractive method to convey messages about product attributes to consumers at the point-of-sale. It may be difficult to separate these two package functions, as they are usually needed. The package sells the product by attracting attention and communicating, and also allows the product to be contained, apportioned, utilized, and protected." (Silayoi & Speece, 2004).

The primary function of packaging is to protect and contain the product within. Promotional features, while considered secondary functions, are still critical. Packaging is the selling company's way of communicating with the customer; it has often been referred to as "the silent salesman". It represents the consumer's first interaction with the product, and directly influences their purchasing decisions.

## **Materials Reviewed (Myles)**

### **Polyethylene Family**

In order to properly analyze the material options for this project, various substrate properties must be studied. One of the options for the secondary packages is a shrink-wrap application. Shrink-wraps tend to be manufactured from polyolefin polymers. The most common polyolefin used is polyethylene (PE). Polyethylene is a light and versatile synthetic resin that is made from the polymerization of ethylene. Polyethylene is the most widely used plastic in the world, which makes resources on the material easy to find and costs low. The ethylene monomer is simply  $\text{CH}_2 = \text{CH}_2$ ; however, after polymerization the double bond is broken and the unit is repeated thousands of times to form the finalized polymeric material. This reaction can be manipulated in ways to form molecules that are branched or linear.

High density polyethylene (HDPE) is linear and low density polyethylene (LDPE) is branched. LDPE is more commonly used in shrink-wrap applications. LDPE is created by pressing gaseous ethylene to extremely high pressure of approximately 50,000 psi and high temperatures of about 350 °C. The reason the LDPE has a low density is due to the branching explained above. The branches inhibit the ability of the molecules to pack closely together. Although its density is not extremely high, the structure allows for LDPE to be extremely flexible; which in certain applications, like shrink-wrapping, is considered extremely desirable. The melting point of LDPE is approximately 110°C; however this value varies depending on the grade used. In contrast to LDPE, HDPE is formed under low pressure and temperature. Moreover its linear structure allows this material to stack very tightly which results in its high density and inability to bend. Its melting point is 120°C, which is 20° higher than LDPE.

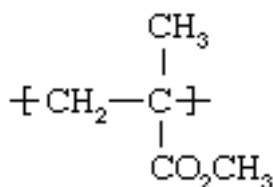
The history of using PE in manufacturing dates back as far as 1933. It was created by the Imperial Chemical Industries laboratory, which is based in England. The LDPE formation

process was discovered by testing the effect of high pressure and temperature on the polymerization of PE. Imperial Chemical gained a patent for this process in 1937 and began commercially producing the material in 1939. HDPE was unknowingly discovered in 1930 by the company now known as DuPont; though in first tests the company failed to recognize the material's potential. The Max Planck Institute of Cole Research, however, did discover the material's benefits and was credited for inventing HDPE in 1953 by catalyzing the reaction at low pressure with an organometallic compound.

### **Acrylic**

Acrylic displays are rapidly growing in the retail display realm. Although commonly referred to as Acrylic, Plexiglas, or Perspex, the chemical name for this material is Polymethyl Methacrylate or PMMA. This material is produced using free radical initiators forming repeated units of the molecule shown below.

**Figure I – PMMA Monomer**



This unit structure inhibits close packing of molecules, which results in a transparent and rigid material. PMMA is able to retain these properties throughout its lifecycle, which makes it an optimal glass substitute. The properties of this material have made PMMA the material of choice for internally lighted signs, swimming pool enclosures, instrument panels, and more.

### **Paper Packaging**

Corrugated and paper-based materials have been widely utilized in packaging applications since their conception. The creation of paper-based materials begins with the collection of fibers. The most common source for acquiring fibers is trees, however recycled paper, corrugate and even rags are now commonly used. The fiber to be collected from the trees is cellulose; or as chemists call it, linear polysaccharide. Trees are mostly comprised of cellulose and lignin, which is the

glue that holds the fibers together. Different types of trees are required for different paper applications. For example the fluting material inside of corrugate is constructed using short fibers, so the material can have high compression strength while being able to bend to the fluted shape. These short fibers can be obtained from hardwood trees, which produce fibers of .5-1.5mm. Conversely the smooth surface required for writing paper is comprised of long fibers. Longer fibers are gathered from softwood trees and range from 2-4mm. Once trees have been debarked they must be processed to produce clean and usable fibers. The processes used are separated into mechanical, chemical and semi-chemical processes. Again the selection of processes is based on the output material required and type of wood being processed. Depending on the application, bleaching and washing would be the next step. This process is commonly applied to materials such as writing paper, where a bright white finish is required. To further prepare the fibers a beater application is used. The beater facilitates many changes to the fibers including sizing. In order to have consistency within the paper products consistent fiber length is crucial. The beater tanks are massive structures and can hold anywhere from 135 to 1350 kg of pulp. The mechanical action of the beater separates the fibers and allows them to be penetrated with water.

Since cellulose is hygroscopic, it absorbs moisture, which is essential to the papermaking process. The presence of water allows the slurry of fiber and water mixture to easily flow and increases the fibers flexibility. The mechanical action of the beater also creates what are called fibrils. When fibrils are exposed the fibers have more hydroxyl groups exposed which results in increased bonding strength later in the papermaking process. Most beaters are also set up to introduce various additives. Common additives include sizings, fillers, and dyes. After additives are introduced the fibers are now ready to be converted into paper sheets. The water and fiber mixture, or slurry, is fed onto a wire through a unit called the headbox. At the headbox the slurry is approximately 2% fiber.

Once transferred to the wire, the mesh shakes and moves forward, allowing for water to drain, and fibers to align. After traveling down the wire, the slurry is picked up by a dandy roll, which increases the surface characteristics of the sheet and transfers the material to the press section. In the press section, intense pressure is applied to further remove moisture, increase fibril bonding, and control the paper's surface characteristics. After leaving the press section the slurry

has now been reduced to approximately 60% moisture content. The next operation is known as the drying section. The drying section commonly is composed of 40-70 steam-heated rollers. These rollers obviously are designed to further reduce the moisture content of the material. Although the paper is now at an appropriate moisture level, finishing and converting operations are now required to produce a consumer ready product.

For the past 100 years coatings have been applied to enhance certain properties. Commonly the finished paper rolls are coated with titanium dioxide, calcium carbonate, satin white, or combinations of these, which result in high quality surface characteristics. These surface characteristics are crucial for printing contemporary printing techniques, and result in paper with a uniform surface. Recently, extruded coatings have become popular. One such coating is the application of polyethylene which results in a paper material that is resistant to water, grease, and gases. Regardless of the coating, the secondary material can be applied before rolls or produced, or in a separate process. After coatings are applied the paper is finally wound into large rolls that are ready to be sized and converted into various products. The properties of paper drastically vary depend on the strength of the individual fibers, the average length of the fibers, the interfibre bonding ability of the fiber, and the structure and formation of the sheet. One such property is the tensile strength. The breaking of paper can vary from 500 meters for extremely soft paper materials such as tissue, all the way to 14,000 meters for sheets of paper made under ideal lab conditions. Paperboard, such as the type that will be used as an option for the secondary packages, is classified by being .3mm or greater.

## Solutions

The purpose of this project is to select a secondary package and POS display unit that will help the tech company iFixit broaden their tool sales to the retail world. Each product has a unique set of requirements that will result in a successful product. At this point the materials have been reduced to either polymer based or paper based materials. Below is data describing the materials, process, natural advantages, and disadvantages of various packaging solutions. The advantages/disadvantages have been formulated by the project team's analysis of similar packages in a retail setting in collaboration with the project team's personal knowledge of packaging processes and material properties. This section will explain the type of packages the project team feel will best facilitate that need, as well as what data/testing the project team will perform to validate the project team's recommendations.

### Secondary Package #1

Material: Thermoformed polymer wrap

Advantages:

- Professional appearance
- High graphic quality
- Light weight
- Seals/Protects contents

Disadvantages:

- Only cost affective with high volume
- Not feasible for prototyping
- Possible to tear/rip

### Secondary Package #2

Material: Paperboard slip

Advantages:

- Cost effective with low or high volume
- Easily prototyped
- Sustainable

Disadvantages:

- May appear “cheap” to customer
- Slip could slide off during transport/storage

### Secondary Package #3

Material: Silk Screened Vinyl Sticker

Advantages:

- Cost effective in high/low volume
- Multiple suppliers available local/online
- Fast application
- Strong adhesion to products
- Little material used

Disadvantages:

- Easy to wrinkle
- May appear “cheap” to customers
- May tear underlying shrink-wrap

### POS Unit #1

Material: Corrugate

Advantages:

- Cost effective in low/high volume
- Serves as both display unit and packaging for products
- Easily prototyped
- Light weight (reduces shipping costs)
- Sustainable

Disadvantages:

- Easily damaged
- Overly used in industry (doesn't stand out)

## POS Unit #2:

Material: Plexiglas (acrylic)/Metal

Advantages:

- Extremely attractive
- Communicates high quality to customer
- Durable
- Attention grabber (due to rarity in retail settings)

Disadvantages:

- Heavy
- Non-sustainable (Plexiglas)
- Expensive
- Most likely will not also serve as package for products

Testing/Selection:

Due to the fact that the mechanical properties of the packages above are known, the majority of the project team's testing was based on consumer data. Consumer information is critical and will serve as a comparison between the project team's perceived notions of materials and consumers interpretation. In order to gather pertinent information the project team designed a survey, comprised of strategically designed questions. Below is a sample of the questionnaire:



## Figure II- Consumer survey

### iFixit Survey

- 1) Do you consider yourself a tech savvy person? Y/N
- 2) Do you work on your own electronic devices? Y/N
- 3) In your opinion what type of material better demonstrates value
  - a) Plastic
  - b) Paper/Corrugate
- 4) Which of the following color ways is more attractive?

iFixit Website Colors	iFixit Business Card Colors	iFixit Manifesto Colors

- 5) Which of the following product displays do you find to be more attractive?



- 6) In your opinion which of the following do you consider to be better for the environment?
  - a) Plastic
  - b) Paper

We were able to gain crucial information from this survey. Of the 45 people that participated in the survey only 24 said that plastic appears to be of higher value. As can be seen by the project team’s selection table above, the project team expected higher values. Surprisingly, 38 of those surveyed thought that the corrugate display was more visually attractive than the acrylic model. This could be in partly due to the graphics; however this explains that with the addition of high quality graphics, corrugate can be visually stunning. Although there is data evidence to reference in terms of environmental impact, it is key to analyze the project team’s target markets beliefs as well. As expected, 40 of the 45 surveyed believe that paper based products are better for the environment. All in all, the project team learned that the material data and consumer opinion commonly conflict. Therefore the project team’s final solution will have to take into

account material specifications and abilities for both substrates, as well as consumer opinion, if the project team wishes to be successful in the retail market.

Although materials have inherent properties that make them optimal for certain applications, both materials can be altered in a manner that will satisfy the project's criteria. For example, although plastic materials such as acrylic (PMMA) naturally have better surface characteristics than corrugate, wraps or printing can be utilized to elevate the visual attractiveness of corrugate displays. However, one uncontrollable variable is the project feasibility for iFixit. It is paramount that units be designed in a manner that iFixit will be able to sustain and procure multiple units in the future with the resources they currently possess. Therefore, it is crucial to examine how the product is designed, manufactured and supplied in order to determine if the said material and process are achievable for iFixit. Moreover, there will be information regarding the roadblocks to using plastic materials that are outside of the project team's control.

### **Product Display**

Printability is a crucial aspect of a product display, as it is necessary to have information on the unit to inform the consumer. With acrylic units, the printing process can be complicated. After hours of internet research, it is very clear that there are no distributors that will provide acrylic displays with custom high quality graphics, especially in low volumes. Therefore the printing process would have to be outsourced to a printing facility. Although printing directly onto acrylic is possible, the acrylic cannot be fastened to the displays during printing. Therefore to obtain an acrylic display, iFixit would have to order the units, ship the units to another location; then they would have to strip down the units, print on them, reassemble them, then finally ship them back to iFixit. The additional costs, complication, risks, and wasted time are not justifiable. This is especially true since this project is the test pilot into the retail world for iFixit. With no insight as to expected sales, crucial resources cannot be wasted idly on the logistics of display ordering. In contrast, corrugate displays are the perfect canvas for promotional printing. In many situations the company from which the units will be ordered can facilitate the printing in house. Once the initial design fee of only fifty dollars is covered, the displays can be replicated at a cost that is under twenty dollars regardless of volume. By choosing a corrugate display,

iFixit would be able to order finalized displays with one phone call. Obviously, the battle over minimal material/sustainable is dominated by corrugate. Since iFixit prides itself on reducing electronic waste, this aspect of the design is agreeable. The weight of an acrylic display would greatly exceed that of a corrugate model. This is exemplified by the fact that corrugated paper density is approximately 30-90 kg/m<sup>3</sup>, whereas acrylic has a density of 1150 kg/m<sup>3</sup>. This weight increase would result in higher logistics costs during shipment. Moreover, the recycling rates of cardboard are significantly higher. Although acrylic (PMMA) can be recycled, it is not commonly practiced. In contrast, corrugate has a recycling rate of 70.1%. The use of corrugate would protect the image of iFixit as an earth conscious technology supplier. Alternatively, the use of PMMA could be regarded as contradiction to their business practice.

As described above, the corrugate industry is very well-developed in regards to product displays. There are a gambit of existing display units and printing technologies available. This would allow iFixit to easily outsource their display needs. Moreover, the technologies used to print and produce displays can be tailored to small runs or mass production. In the case of acrylic, the consumer is constricted by the abilities of PMMA. There are suppliers of preassembled acrylic displays; however they do not offer printing services. This would require iFixit to add another manufacturing operation and resultant costs. The lack of development in the PMMA industry would rob iFixit of their time and therefore is not feasible for iFixit's short term low volume needs.

### **Secondary Package**

Both plastic and paperboard substrates facilitate the functions necessary for a secondary package. The distinction between the two is drawn from the feasibility of implementation. The paperboard model would be feasible in small or large quantities. In a small quantity situation, the sheet of paperboard would first be printed on. This would be followed by cutting out the required size of paperboard and fastening it around the product using a bi-directional adhesive or friction tab. In large quantities, iFixit could outsource this operation to a printing facility and receive the slips in a manner that are ready to be fastened to the product.

In the case of a shrink-wrap operation, there are other concerns. The graphic would still be printed on a plastic film similar to the paperboard. However, the process to attach the film is more complex. This could not be facilitated by iFixit and would have to be outsourced. This would then require iFixit to send all their toolkits to a separate facility and then back to their warehouse. Moreover, this type of operation is not commonly applied to low volume production. In large scale production, the use of a plastic wrap could no doubt be beneficial as plastic has great printing properties, low weight, and is tamper proof. Therefore, in the future plastic would be a feasible option if they continue to desire retail-ready products. However, due to the scope of this project and the small quantity of the tool kits that will be sold in a retail setting, establishing a complex packaging system presents too great of a risk; at least without obtaining data on the toolkits' retail success.

## **Results**

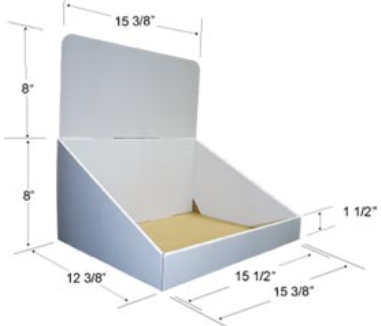
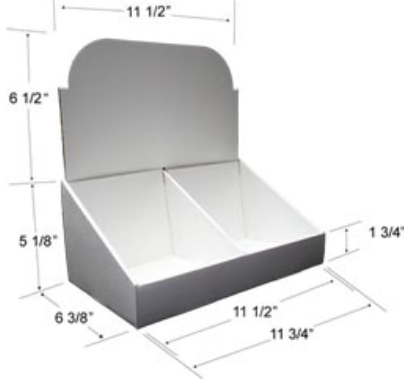
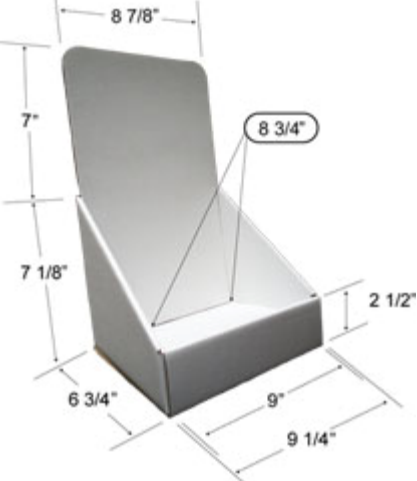
The purpose of this project is to design/select a product display unit and a secondary package that will allow iFixit to sell their tool kits in a retail setting. By analyzing the manufacturing operations necessary for acrylic displays and shrink-wrap secondary packages, the project team have decided to exclude polymer based packaging options. Corrugate and paperboard will be the project team's focus from this point on. In order to produce a high quality unit that satisfies the needs of iFixit, the project team must create various prototypes for both the display and the secondary package. Below is a summation of the design process and the various paper-based options the project team explored.

### **Product Display**

Even though it was decided to use corrugate for the display, the project team still had to determine the type and size of the display to use. Since the implementation of the units will continue far after this project ends, both the project team and iFixit felt it would be best to order the units from a supplier instead of custom-designing a unit. This would allow iFixit to replenish their display inventory without having to order custom-designed displays. In order to facilitate easy replenishment, the project team researched the internet to determine which suppliers could best handle the needs of iFixit. The project team found a solution in the Recom Group. This company was a perfect fit for this project since it sells units in low or high volumes at a reasonable price. Other suppliers required minimum orders of up to 100 units, which is far beyond the quantity iFixit wanted to order. Moreover, Recom Group does printing in house, offers a plethora of display units in various sizes, and can produce the units in multiple colors.

With the supplier selected, the project team embarked on the task of determining which pre-built unit could best house the tool kits. The project team narrowed the choices down to the following three designs and product layouts.

**Table III**

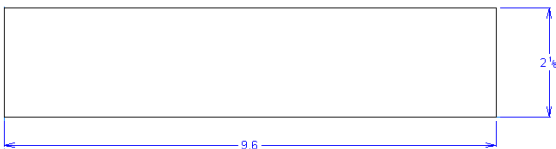
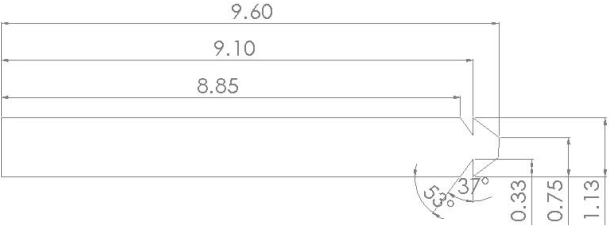
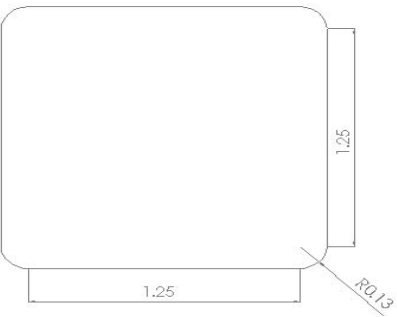
Design	Layout	Strengths/Weakness
	<p>-Small kits 2 deep and 4 wide (8 total) on end</p> <p>- 4 large units lying flat side by side</p>	<p>Strengths- Larger size attracts more consumers/communicates importance. Units when in described layout fit tightly into the unit.</p> <p>Weakness- Stage insert will have to be built to elevate the larger units so they are visible.</p>
	<p>-Small Kits form T shape (9 units)</p> <p>-Large kits surround the lower portion of the T (6units)</p>	<p>Strengths- Although an insert will have to be built it will be incredibly simple.</p> <p>Weaknesses- The layout is awkward and may deter consumers. The larger units will be blocking prime advertising space.</p>
	<p>-Large units 2 deep and 2 wide against the back of the display (4 Units)</p> <p>-3 Small units lying on their side next to three small units standing vertically. (6 Units)</p>	<p>Strengths- High packing efficiency.</p> <p>Weaknesses- Semi complex angle insert must be designed to prop up the back units. Some area of the display will be blocked.</p>

With the main choices in hand the project team sat down with the iFixit staff to see which unit they felt would best promote their products. The project team recommended the 15 inch unit for many reasons. The large unit would occupy a moderate amount of counter space, without being overbearing. Moreover, the large size allows for maximum branding, information, and stands out from the other displays. iFixit agreed with the project team’s recommendation and has decided to use the 15in display as the foundation of their new retail layout.

### Secondary Package

As was explained in the solutions section, the project team has ruled out plastic shrink-wrap as an option, and from this point on will be analyzing paper based solutions and stickers. In order to understand what designs and materials work best in a retail setting, several prototypes were constructed. Below is a table that depicts the various options and their strengths.

**Table IV**

Design	Features	Pros/Cons
<b>54 Piece Kit</b>		
	Material: Paperboard Fastener: Adhesive or Tape	Pros: Can be tightened to any length, naturally locks into package valley Cons: Overlap not extremely attractive
	Material: Paperboard Fastener: Friction Tab	Pros: Tab looks professional in comparison to overlap, ease of assembly Cons: Unable to adjust length for optimal fit, slips easier to remove than glue/tape
	Material: Paperboard Fastener: Adhesive	Pros: Extremely easy application Cons: Surface may be warped due to wrinkles of shrink wrap
<b>26 Piece Kit</b>		

	<p>Material: Paperboard Fastener: Two sided tape</p>	<p>Pros: Simple construction, easy application Cons: Partially blocks bits, package slip doesn't lock slip onto unit</p>
	<p>Material: Paperboard Fastener: Two sided tape</p>	<p>Pros: Interesting shape, maximizes print area, without blocking bits Cons: Package shape doesn't lock slip onto unit, curvature feature would require advanced cutting operations.</p>
	<p>Material: Paperboard Fastener: Friction</p>	<p>Pros: Fast application Cons: Slightly blocks bits, friction tab limits tension and doesn't tightly wrap to unit</p>
	<p>Material: Paperboard Fastener: Adhesive</p>	<p>Pros: Extremely easy and fast application, locks to package Cons: Surface may be warped due to shrink-wrap wrinkles.</p>



## **Conclusion**

### **Summary**

After two quarters of applied research and work, the project team has presented iFixit with what it feels is an actionable solution. Designs for the point-of-purchase displays and the secondary packaging are finalized and approved for implementation by the industry advisors at iFixit. Additionally, the primary materials and processes for the solutions have been determined, and are now in the execution stage. Meetings with representatives from Miner's Hardware stores have resulted in an agreement for iFixit's first retail launch, which will take place in the entire seven store chain.

The team's decisions and rationale concerning the final design for the displays and packaging answer directly to the matrix of needs presented within the report. Any compromises that are presented in the solution have been made only in the interest of decreasing costs and increasing feasibility.

### **Final Recommendation**

The point-of-purchase displays are to be supplied by the Recom Group, complete with coloration and custom printing. This decision was reached after it was determined to be the most flexible, cost-effective, and professional option. An important consideration for the project team was to provide a solution that could accommodate for iFixit's fairly small product launch, yet be able to expand into other, larger ventures if so required. Nearly all custom advertisement and display manufacturers require minimum orders numbering in the hundreds, and even thousands, before agreeing to produce custom display units. The Recom Group, besides being conveniently located in nearby southern California, prides itself on small and large custom production orders alike. By choosing Recom Group as the source for manufacturing, the project team has exacted a solution that can grow with iFixit as it moves into new venues.

As determined by the team, the first and most critical function of the display units was the ability to contain and showcase the product. Prototypes were sampled to evaluate the size and layout requirements for displaying the toolkits. After demonstrating several arrangements, one was chosen for its adequate sizing and requirements for presentation. The sizing of the overall display

was important to acknowledge for more reasons than being able to hold the toolkits, however. Specifically, the overall size contributed to two other needs that the team considered important, yet conflicting. Firstly, a larger unit size allows for more graphic real estate and branding opportunity. A larger unit is liable to attract more attention and interaction from potential customers, simply by being easier to notice. With that in mind, it would be easy to assume that the largest display possible should be chosen. However, this contrasts with another important factor of retail sales: space and its availability. Any given store of today is selling thousands and thousands of products, and the management of space for products in relation to their potential sales is constantly being evaluated for efficiency. Most store product managers are reluctant to commit too much square footage to a single product because it comes at the expense of reducing available space and consumer attention for other goods. The project team consulted with John Babos, the sales manager for Miner's Hardware, to determine limits that the display would have to follow before settling on an appropriately sized unit.

Once a model was chosen, the team recognized that it could not be implemented in stock form, without optimizing its ability to display the toolkits. Since the containment floor-plan of the chosen unit is bare, the toolkits could not be arranged in any fashion except for unorganized piles. A custom solution was called for in the form of a tier system, developed by the project team to effectively divide and organize the toolkits into neat arrangements. The tier system was designed and executed in corrugate material to complement the construction of the rest of the display. It is dimensioned to optimize the fitment and layout of the variously-sized toolkits, making them easy to see and handle by consumers. The display unit, with the custom tier system, has the capacity to effectively hold and display eight of the small toolkits, and four to eight of the large toolkits. The final footprint design can be seen in Figure V, on page 41.

The second feature-set of this solution was the ability for graphics and branding to be applied to the point-of-purchase displays. Besides containing and arranging the units in a neat and ordered fashion, the display unit's second most important function is the opportunity to communicate the product effectively to the potential customer, in order to attract and secure sales. This is achieved by extending the branding of the product to the display unit, in the form of printed graphics and information. This is another reason why the Recom Group was chosen as the manufacturer of the final display solution. They offer professionally applied printed graphics for a nominal fee per

unit, as well as consultation for optimizing the graphical layout. Admittedly, the project team members have very little experience with graphic design and its unique criteria concerning printing processes and substrate selection. The sales and tech teams from the Recom Group were able to answer all of the project team's questions and provide input on submitting a suitable design for production. These considerations; coupled with the low cost and flexible order sizes for printed graphics to be integrated with the display assemblies, proved Recom Group as the clear choice for the team's manufacturing needs.

iFixit's newly appointed graphics developer, Tim Asp, spearheaded the graphic design and layout. The project team provided Tim with criteria concerning the desired information to display, which he used to generate a series of eye-catching and aesthetically pleasing illustrations. There are several key elements to observe in the final graphic design. The first consideration is the relay of information to the customer concerning the contents of the toolkits. This communication is the most important for consumers who are looking for a particular product, and whether it will meet their needs. The display also includes iFixit's logo and several choice slogans, along with the address for iFixit's website. These elements serve to tie the branding together for the company, which promotes a message of self-repair empowerment. The dot-com address is especially crucial; it serves to direct traffic to the company website, which is iFixit's primary venue for sales and customer service. Whether or not the customer decides to purchase the toolkit, the potential for attracting new customers to the website should not go unrealized. Lastly, even the color choices for the point-of-purchase display serve as a means to identify with the customer. The colors chosen for the unit were selected to parallel the color schemes on the company website, in order to promote brand identification and familiarity from the new customer base.

The toolkits themselves required an update in order to be more suitable for a retail environment. From their supplier, iFixit's toolkits are manufactured with packaging that is decidedly minimalist. As an online mail-order store, the need for promotional material on the kits is negligible. All of the information and promotion is displayed on the website for the customer to review before he or she decides to purchase the product. iFixit approached the project team with some ideas about improving the packaging on their toolkits, to make them more accessible to customers in a retail store. It's important to note that the existing configuration addresses most of

the primary functions of packaging: containment, protection, and information. The toolkits' hard casing contains and protects the components within, while the shrink-wrap serves to reinforce the closure of the kits. Information concerning the contents is presented in two fashions: through printed text and by visual presentation. The bit sizes and styles are printed in list form, either directly on the case or on a sticker applied to the back shell. A small iFixit logo is also discernible on each product. The most important and engaging aspect of the toolkits is the visibility of the contents that the clear case (or in the case of the smaller units, a window cut-out) allows.

All of these characteristics were determined to be critical features by the project team, and efforts were made to ensure that additional packaging solutions would not compromise their utility. Furthermore, iFixit stipulated that the existing packaging should continue to be applied by their production facilities in China, for ease of parallel (online and retail) implementation. Since the members of iFixit anticipate fractionally low sales in comparison with their online business, they wished to maintain the low costs of the production already in place. Lastly, the secondary packaging should be cost effective to produce in small numbers for their initial launch, yet expandable for larger, future orders. With that in mind, the team focused on how to improve the promotional aspect of the packaging through a means of additional media.

After documenting and organizing all of these considerations into a list of needs, the project team evaluated them for their relative weight and import. After prototyping sessions, it was determined that the secondary packaging for the larger toolkit should consist of a printed cardstock band, wrapped around the midriff of the case. Initially, the same treatment was intended for the smaller toolkit as well; albeit applied longitudinally on the side of the unit with a sectional cut out. However, after consultation with iFixit's promotional team, this idea was scrapped for several reasons. iFixit rationalized that the slip applied to the side was not as secure as the band for the larger kit, which "locked in" to a slimmer section on the case. Furthermore, the slip required a crescent-shaped cutout on one edge, to make the window features viewable. While aesthetically pleasing, the cutout presented additional complication and potential costs in the form of custom die-cuts for the straps. At the suggestion of Tim, iFixit's promotional graphics expert, the project team pursued the idea of a decal (sticker), applied directly to the shrink-wrap. While offering less printable real estate for branding purposes, the decals are

decidedly more stable than the longitudinal bands that the team prototyped, and require less custom manufacturing processes at a cheaper price. R&R Industries in San Clemente offers custom promotional decal printing at economical prices, and represents the project team's official recommendation. Printing designs for both toolkits were also developed by Tim Asp, who was able to integrate the necessary promotional information and branding in an appealing design.

## **Weaknesses**

Upon evaluation, there are several dimensions of the project team's final recommendation that were found wanting. These are areas of the project that could be improved and refined for future development.

Considering the point-of-purchase displays; while the design is aesthetically pleasing and includes the promotional material the team sought after, it lacks the important aspect of personalization for different retail environments. The design is intentionally generic and does not attempt to lend itself to specialized demographics that might change, depending on the location they are presented in. For example, it is likely that the marketing strategy and promotion will need to be adjusted to be more effective in a large electronics retail store, such as Best Buy. Hardware stores, electronics chains, and hobby shops are all likely to have unique dynamics and customer bases that should be examined and catered to, to boost consumer interest and sales. Again, the project team's recommendation was intended to serve as a flexible, small-scale launch that iFixit would study for customer reaction, so personalization was not considered to be the most important feature of the display; but it should be considered for future development.

Another aspect of the solution that the team concedes could use improvement is the design of the stage tier. While it presents an effective way of organizing and displaying the toolkits, its configuration requires custom manufacturing and construction techniques. While cutting out small batches on a CAD-driven machine such as the Kongsberg cutting table is not taxing, these requirements make it less economical to produce in large numbers. Additionally, the design's angled surface areas leave considerable amounts of unused material within the required footprint. This excess material can only be scrapped as waste. The design has the potential to be refined

further, and perhaps a stock-dimensioned solution could be repurposed as a new tier system, making them easier to source.

### **Implementation**

iFixit has selected the project team to carry out their recommendation for the new product launch. An agreement with Miner's hardware for has been reached to distribute and sell the toolkits in their seven local stores. With a modest budget provided by iFixit, the project team will be responsible for each stage of ordering, construction, and distribution for the first launch.

### **Reflection**

One of the greatest obstacles this team has had trouble overcoming is “seeing the solution” ahead of time, before the cursory research and processing groundwork are established. The request from iFixit for developing retail packaging is a straightforward one, but the necessary concepts and requirements for executing any successful project efficiently should not be overlooked in lieu of “jumping” to the final conclusion. Many times, the team has had to slow down, or halt the project entirely, in an effort to reconstruct the proper preparatory tasks. Tasks and problems that appeared to have obvious solutions proved in fact to be just the opposite when examined thoroughly. Other difficulties that were overcome included scheduling conflicts with iFixit and Miner's, and learning how to coordinate project directives with respect to delays and disagreements. Finally, the project team has learned firsthand the value of teamwork and communication.

## References

- Grewal, D., Levy, M. (2008) *M: Marketing* (Ed.) Columbus, OH: McGraw-Hill/Irwin
- Herman, K. M., Rosel, V. A. (2003) The concepts, conditions and packaging industry trends that influence package design. (Unpublished senior project). California Polytechnic State University, San Luis Obispo
- Horiszny, K. (2003) Guess who's coming to dinner. *Wine Business Monthly*. Iss. 8, 56
- Kerfoot, S., Davies, B., & Ward, P. (2003). Visual merchandising and the creation of discernible retail brands. *International Journal of Retail & Distribution Management*, 31(3), 143-152. doi:10.1108/09590550310465521
- Lee, A. G. (2006). Trends and innovations in creative packaging within the alcoholic bottling industry. (Unpublished senior project). California Polytechnic State University, San Luis Obispo
- Major Industrial Polymers. (2011). In *Encyclopædia Britannica*. Retrieved from <http://www.britannica.com/EBchecked/topic/468698/industrial-polymers>
- Papermaking. (2011). In *Encyclopædia Britannica*. Retrieved from <http://www.britannica.com/EBchecked/topic/1357055/papermaking>
- Point of Purchase Selling (2007). Gaebler's resources for entrepreneurs. Retrieved from <http://www.gaebler.com/Point-of-Sale-Displays.htm>
- Polyethylene (PE). (2011). In *Encyclopædia Britannica*. Retrieved from <http://www.britannica.com/EBchecked/topic/468511/polyethylene>
- Silayoi, P., Speece, M. (2004) Packaging and purchase decisions: an exploratory study on the impact of involvement level and time pressure. *British Food Journal* [Bradford], Vol. 106, Iss. 89, 607.
- Young, S. (2004) Breaking down the barriers to packaging innovation. *Design Management Review* [Boston] Vol. 15, Iss. 1, 68

## Appendices

Figure III - 54 bit slip graphics

**54 Piece Bit Driver Kit**  
You can fix it. We make it easy.

**Break something?**  
We make it easy for you to fix things yourself with our online step-by-step repair guides, troubleshooting tips, and a thriving community of repair technicians who want to help.  
Our goal is to provide you with everything you need to fix things yourself.  
For more tools and parts - Visit [iFixit.com/Tools](http://iFixit.com/Tools)

[iFixit](http://iFixit.com)  
visit us @ iFixit.com

Figure IV- Display header graphics

**iFixit**  
Visit us @ [iFixit.com](http://iFixit.com)

**WHAT CAN YOU FIX?**  
Visit [iFixit.com](http://iFixit.com) - The free repair manual for every device.

**Great for electronics repair!**

**26 Piece Bit Driver Kit**

Magnetized Driver  
60mm extension  
Specialty tweezers

**Bit Types Included:**

- Hex sizes 1.5, 2, 2.5, 3, 4 mm
- Star sizes 2, 3 mm
- Tri-wing size #0
- Slot sizes 1.5, 2, 2.5, 3 mm
- Phillips sizes #000, #00, #0, #1, #2
- Torx sizes T4, T5, T6, T7, T8, T9, T10, T15, T20

**54 Piece Bit Driver Kit**

Magnetized Driver w/ Swivel Top  
130mm flexible extension  
60mm extension

**Bit Types Included:**

- Posidrive sizes #0, #1, #2
- Star sizes 2, 3 mm
- Square sizes #0, #1, #2
- Triangle size 3 mm
- Tri-wing sizes #0, #1
- Drop size 1 mm
- Slot sizes 1, 1.3, 1.5, 2, 2.5, 3, 3.5, 4 mm
- Phillips sizes #000, #00, #0, #1, #2
- Spanner sizes 2, 2.2, 2.6, 3 mm
- Torx sizes T3, T4, T5, T6, T7, T8, T9, T10, T15, T20
- Hex sizes 0.7, 0.9, 1.3, 1.5, 2, 2.5, 3, 3.5, 4, 4.5, 5, 6 mm



Figure V – Stage tier design

