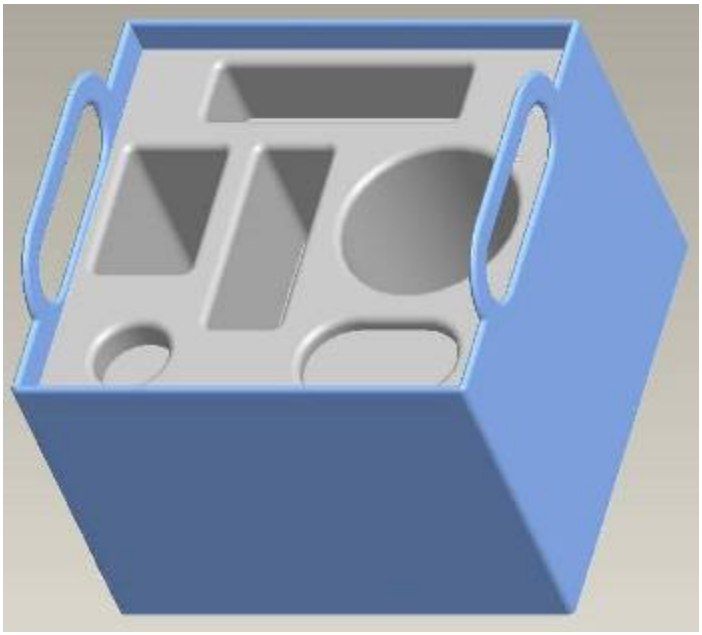
Contact Caddy

New Product Development Log



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Introduction

The Contact Caddy is an organizer for the home for all of a person's eye care needs, including contact storage and cleaning, glasses storage and cleaning, and a daily "travel" kit to take with them in order to have any care items that may be needed during the day. The following is a review of the new product development process undertaken for the Contact Caddy, from identifying the market need to developing a concept and evaluating its business merit. The processes followed for each phase are discussed, followed by a comparison to recommended processes and key learning.

Product Planning

Team Process

To kickoff a product development process, typically a team is developed and team structure decided upon given the project at hand prior to any actual product planning. In our case, the team was developed rather randomly from the pool of students in class. Fortunately, our team is multi-disciplined with a variety of background experiences to draw from. We selected a team leader right away to help keep us focused as well. As a team we discussed the type of product development process we would go through and given the timeframe and skills of our team determined that we would be developing a generic, market-pull product. With these things in mind, we began the product planning process.

Product Planning helped us in maximizing the effectiveness of the product development efforts by considering the set of potential projects that we could pursue, deciding which project is the most desirable and then launching the project with a focused mission. A number of project concepts were generated by the team members individually. As a group, we discussed all of the concept ideas and decided that many were too complex and that we needed to come up with simpler ideas all around. We repeated the brainstorming process. A list of generated ideas can be found in the Product Planning Appendix.

All product concepts were based on needs from our own experiences and/or observations and research into existing products via the internet. After much discussion of the pros and cons of each solution, we took a vote, followed by more evaluation of the complexity of each option. We decided to pursue the top vote-getter, the windshield cover, but because of its possible complexity selected a much simpler product to pursue in parallel – *the contact caddy* – through the customer data collection stage, at which time we would select the better option.

Shortly after the decision we discovered that the windshield cover concept actually existed. We decided to still pursue it, with the intent of improving the existing product based on feedback related to current products. This removed some complexity from the original product problem as well, making it more suited to the timeline and technological goals of the class. In addition, we investigated some of the other concepts and found that there were similar products for most (contact caddy being the exception). We decided to continue with the planned products.

In order to determine which of the market opportunities to pursue, we began by researching the windshield cover and contact caddy ideas. By discussing the relevant information available pertaining to each product, we could select the option best for this class. In a business, we would evaluate concepts based on our business competitive strategy, the way each fits into existing and target markets for our company, technology road mapping and by considering our overall product portfolio options and balancing them. However, given our situation we evaluated concepts based on the goals of the class: a 10-week timeline, low technology development, clearly identified customer needs and markets, and interest within the team.

After discussing all the relevant data on the two concepts, the team voted to develop the contact caddy and moved forward with pre-project planning by developing a mission statement for the team project, as seen in the Product Planning Appendix. After developing the mission statement, the team again researched and discussed on future assumptions and constraints to help maintain a manageable project scope and prevent any unnecessary project creep.

Recommended Process

As discussed in the book, we considered various product development opportunities through many sources, including suggestions from customers, team members, online research of similar products, and initial benchmarking of competitors. Product concepts were developed keeping our class goals, capabilities, constraints, and competitive environment in mind. Since there were no similar products corresponding to our contact caddy concept, our product development was classified as a new product platform project. We followed the five-step process in the book: 1)Identifying opportunities. 2) Evaluating and prioritizing our product concepts. 3) Evaluating resources such as time and money to check the feasibility of our concepts. 4) Selecting the optimal product concept and completing pre-project planning with mission statement. 5) Assessing the quality of the results and processes involved

Key Learning

- We spent a lot of time generating ideas, and put a lot of emphasis on coming up with new to the world concepts. It took us awhile to recognize that making improvements to existing products, or marketing them in new ways are also viable options and account for many products we see on the market today.
- We spent a lot of time discussing primary and secondary markets in terms of target customers with a lot of disagreement within the group. We finally decided that we could come back and alter that portion of the mission statement if necessary after evaluating the customer needs. Understanding customer needs can help identify where the most opportunity is from a market standpoint.
- We also spent a fair bit of time discussing actual concepts for each of the product opportunities. This was good in some sense – as it helped us fully visualize the needs and possibilities. However, it could have also dragged us into latching onto specific solutions before all of the requirements are even defined, which can be a problem. Finding that balance was a challenge that we seemed to finally understand during customer need development.
- Our team communicated well. No one was afraid to voice their opinions, stand up for their ideas, or consider new ideas. This was very helpful in concept development and selection.

Identifying Customer Needs

Team Process

The process for identifying customer needs is an integral part of the larger NPD process and is most closely related to concept generation, concept selection, competitive benchmarking and the establishment of product specifications.

After selecting our market opportunity and developing the mission statement, as a group we gathered raw data from existing customers via online reviews of similar products on websites such as Amazon.com and in-person interviews of potential customers, specifically, people we knew who wear contact lenses. A questionnaire was developed for structuring the interview process. A sub-group of our team took the responsibility of going through customer feedback and clearing out any redundant data. Afterwards, all the relevant statements were converted in to customer needs statements, which were then grouped into categories like design, storage, safety and cost and durability and further prioritized based on their

experiences and the customer feedback (See the Customer Needs Appendix for resulting tables). Their work was posted for the rest of the team to evaluate and provide feedback and recommendations. In parallel, each team member surveyed at least three additional customers to make sure we were addressing the needs of the home user in addition to travelers (most of the internet needs collected were related to travel users). This data was posted to the team's webpage and reviewed as a group.

Recommended Process

We followed the five steps recommended in the book to identify customer needs:

1. Gather raw data from customers.
2. Interpret the raw data in terms of customer needs.
3. Organize the needs into a hierarchy of primary, secondary needs.
4. Establish the relative importance of the needs.
5. Reflect on the results and the process.

However, we did not rely on any web-based surveys to gather initial raw customer data as they do not provide enough information about the use environment of the product, and they are less effective in revealing unanticipated needs. Also, rather than dividing interviewing customers into lead, extreme and normal users, we just considered two groups of potential customers – online reviewers and any people who wear contact lenses. The latter group was easily approachable, so we got detailed feedback as to what they expected from our product concept. Considering our busy schedule, it was impossible to set-up a focus group of potential customers for a group discussion, although it may have benefited us as development progressed.

Key Learning

- Although following a structured method for gathering data from customers was useful and probably lowered the inherent risk in developing a new product, certain risks were unavoidable, like for example - our initial research with regards to identifying the accurate market needs was limited and assumptions were made whenever we could not decipher vague customer feedback.
- There's a stark distinction between customer needs and product specifications. Customer needs are independent of the product that will be developed in the future – they are not specific to the concept that will be chosen eventually.
- It is important to identify customer needs without knowing if or how the product will eventually address those needs. On the other hand, product specifications do depend on the concept that will be selected.
- Interviewing potential customers (over phone and face-to-face) really helped us in assessing consumers' emotional intelligence. We were overwhelmed by varied, interesting feedback.
- Our in-class experience in coming up with customer needs statements for various vegetable peelers really helped us in structuring the needs – specifically, understanding what the product has to do, not how it might do and avoiding the words – "must" and "should".

Product Specifications

Team Process

After a thorough review of customer needs, we decided to divide up the work into three tasks: 1) Develop a list of metrics, 2) Collect competitive benchmarking information and 3) Establish target specifications.

We developed and reviewed a list of metrics based on customer needs and competitive offerings. The metrics were grouped with respect to their associated interpreted customer needs and units such as LxBxW, pounds etc. The resulting metrics table is located in the Product Specification Appendix.

Afterwards, we collected competitive benchmarking information for home organizers and travel kits for contact wearers. Information was gathered on existing products, pared down to 3 most relevant products for each category (H1, H2, H3 representing home organizers and T1, T2, T3 representing travel kits) and compared to customer needs and metrics in two different matrices (see Appendix ##). A needs/metrics matrix representing the relationship between needs and metrics with dependent and independent needs/metrics was also developed. As mentioned in the book, the matrix is a key element of the *House of Quality*.

Upon completion of the competitive benchmarking, target specifications were established by a portion of the team. Target specs are used to describe our product concept that we believe would succeed in the marketplace. However, due to confusion around the information provided for the benchmarking and the goals of the target specifications, they could not be completed on the expected meeting date. So, during our next meeting date, we again reviewed and clarified the benchmarking data and then used that and customer needs feedback to generate the initial target specifications (see the Product Specification Appendix). We had some difficulty separating the specs from specific product concepts and were not certain that the specs developed were the only or best way to reflect the customer needs. As a result, we had a lot of discussion around their development and had a tendency further along the development process to refer back more to the customer needs statements than the actual target specifications.

Once the target specifications were developed, a further detailed discussion was carried out to make sure what how we wanted our product to look like with respect to dimensions such as mass, length etc. The values were further refined and made more precise.

Recommended Process

The recommended processes are as follows:

1. Develop target specifications
    a. Prepare a list of metrics
    b. Collect Competitive benchmarking information
    c. Set ideal and marginally acceptable target values
2. Develop Final specifications
    a. Develop technical models of the product
    b. Develop a cost model of the product
    c. Refine specs, making tradeoffs as necessary
    d. Flow down specifications as appropriate

We generally followed the book processes in this portion of product development for developing target specifications. We developed metrics related to customer needs and using customer needs statements and competitive benchmark information developed nominal target specifications. We did not feel that we fully understood the acceptable range of these target specs based on customer information and as a result, did not set marginally acceptable values.

Given the simplicity of our product (a container really) we did not see the need or benefit of developing technical and cost models given that the primary goal was simply storage, and the range of methods for doing so would not vary significantly from technical or cost standpoints. Additionally, we had difficulty finding a way to address those models and tradeoffs prior to having a concept selected.

Key Learning

- Target specifications were developed with an understanding that future constraints (financial, technological etc.) and trade-offs could change the parameters.
- We realized that metrics values need to practical and make proper sense.

- A more complete application of the processes to develop final specifications may have given us more confidence in the results and allowed us to rely on the specs to insure compliance with customer needs rather than reverting to the customer statements throughout the development of the contact caddy.

Concept Generation

Team Process

Once the target specifications were determined, the team began the concept generation process. Each team member had perceptions of what a contact caddy might look like and we shared their ideas and drew some of them on a white board to help visualize. The team used analogies to explain some concepts – such as something that mounts on a wall or sits on a counter like a spice rack, or a technology organizer that has compartments for your phone, remotes, etc., or the example of a laptop docking station for a way to mount the travel kit. Some ideas that came out of the brainstorming are indicated in the appendix (Concept Ideas).

After discussion of the concepts, the team informally decided that the product really needed to fit in a drawer, and the only option that really suited this well was the single layer container with multiple compartments, so we decided to move forward with this approach. With this in mind, there were some key questions that the team felt needed to be answered before a final concept could be selected.

1. Are we including a travel kit, or providing storage space for one?
2. Do we provide separate liquid containers to transfer liquids from large containers into, or accommodate the large bottles?
3. Do we really need a separate compartment for each individual item, or can some be combined into one compartment? Which ones? What is the total number we need?

The team answered questions 1 and 2, then decided on a general concept, and addressed question 3 followed by the layout of the compartments for our final concept. After discussion around the pros and cons of including a travel kit as part of the product, the team decided to simply have storage space for a kit. If we then decided to include a kit as part of the container, it would fit in this space. If we opted not to for cost considerations, the space would allow accommodation of common kits on the market. We decided that with the space considerations it would be best if we had a compartment for the kit, rather than a docking scheme that allowed it to remain open for easy access to its contents even at home. This meant that we now needed to accommodate some of the items in the home kit to make them accessible, such as the contact case, glasses and eye drops. With this question answered we next addressed the issue of containers. Many customers expressed the need to clear up clutter with a contact caddy. So we wanted this to be something that could fit in a drawer and free up counter space. In order for this to be possible, we need smaller bottles that fit in standard drawers when vertical (to avoid spillage) or run the risk of leaking which customers dislike. Although pouring solution from the large store bought bottles into smaller ones may provide some hassle to the customer, it does enable families of users to share large bottles even if they are located in different rooms, makes the whole setup a bit more attractive, and provides a lot more storage location options. So we decided to add new containers. However, the compartment for these bottles would also accommodate most standard sized manufacturers' bottles so that if a customer would prefer to make the space tradeoff they can. Next, we discussed how many compartments we really needed. With accessibility as a customer need, we decided that it made more sense to consolidate the small items into one compartment rather than make people fish out the tiny items from tiny compartments. Also, we felt that it made sense to stow glasses and cleaning cloth together since they are used together and the cloth can protect the glasses. We decided that we needed the following compartments: one for multi-purpose solution container, one for eye drop solution container, the case and

inserter, one for wipes (either for cleaning glasses or hands), one for glasses and a cleaning cloth (and glasses case), one for spares, one for travel kit.

With our specifications a little more firm now, we decided on a layout for the container – the positioning of each compartment and the overall footprint. Given that this had to fit in a drawer, we compared overall sizes of other drawer organizers to get a feel for limitations on width, height and depth. After laying everything out (see Concept Generation Appendix for layout) we ended up with a kit that was 4.5" tall, 7.5" wide and 11.75" deep.

Recommended Process

The text book teaches concept generation as a five-step process

1) Clarify the problem – The team had a general understanding of the requirements of the contact caddy based on the mission statement and customer needs and voices. Since the product and the problem to be handled were not complex, there was no need for problem decomposition into sub problems. Again since the product was very simple, the team could not arrive at a meaningful functional diagram with input variables energy, material and signal.
2) Search Externally – External sources mentioned in the book like interviewing lead users, consulting experts, searching patents and published literatures were not done by the team. Since there were no other home-use contact lens caddy available in the market, benchmarking related products was limited to other home organizers, which helped identify size constraints and general visual expectations, but little else. The team primarily relied on information gained from hearing customer voices and understanding customer needs. Considerable internet research was done to capture customer needs.
3) Search Internally – This was the main process performed by the team for generating concepts. The team used the personal knowledge and adapted it to the problem on hand. This was done in a group session with open-ended and creative discussions. The team generated a lot of ideas in an informal way. The team members attempted to sketch their individual ideas on a white board for ease of reasoning and understanding. The team members used analogies when ever possible to explain their concept ideas. Other ideas like using related or unrelated stimuli and setting quantitative goals were not used by the team.
4) Explore Systematically – The systematic processes concept classification tree and concept combination table were not used by the team.
5) Reflect on the solutions and the process – This process is explained in the key learning section.

Key Learning

Though the team employed some good practices like sketching product concepts, making analogies, using visual aids during this process, it fell short on few critical aspects.

The team didn't do the greatest job of accepting unusual or "crazy" ideas in the beginning – often there was discussion around why something was bad or wouldn't work while that should have been kept to a minimum to encourage creativity. Ideas that were looked as crazy were not considered for further improvement and were not used as a source of a new product concept. Since some ideas were considered infeasible and ignored, the team would have lost on further creativity and the advantages of "wish and wonder" way of idea generation were not fully capitalized by the team.

Additionally, we essentially selected the concept during concept generation as we realized we did not have all of the customer data we needed. Jumping to this conclusion in an informal way definitely

separated the selection from true customer needs and also made some members of the team uncomfortable with the selection and path forward.

Structured Concept Evaluation & Selection

Team Process

After reflecting on the process, we decided that we had not followed a good structured approach for determination of the final concept and that we needed to make sure that we had not left good options on the table that met customer needs more precisely. So we returned back to concept selection during the next team meeting. We re-discussed concept ideas. Each of us shared ideas, some of which were new and some of which were discussed previously. We used visual aids: drawings and physical mock ups and also re-visited some of the customer needs specifically associated with where the caddy would be stored. The possible locations were: in a drawer, on a surface, in a cabinet/under sink, in a medicine cabinet, on the wall. We decided that the requirements were significantly different for each of these locations, and that a significant portion of customers could be addressed by putting it on a surface, such as a counter or shelf. The team decided the other requirements (other storage locations) could be addressed in follow-on products.

The concepts considered were the following: A combination of top load and slide out drawers, the concept developed in the previous week – top load, open containers, a carousel – style (lazy-Susan like with open containers), a shelf with 3 levels that sits on the counter or mounts to wall/mirror, a 3-drawer horizontal style, and a top load with a molded foam insert in it to secure items.

The next step was to develop selection criteria, in line with customer needs. Our criteria were:

1. Storage (holds all eye-care accessories in one place)
2. Convenience (accessibility, easy to clean, portable)
3. Function (the form factor, size)
4. Durability (of the caddy)
5. Aesthetics (does it look nice?)
6. Cost to manufacture (assuming relationship to customer costs)

We used the concept from the previous week as our reference and called it as the “Baseline” model, and evaluated each concept against the baseline using a +, 0, - scale for each criteria, and found that three of them had 0 or positive scores: The baseline concept, the top load with foam insert, and the carousel. (Appendix – Concept Screening Matrix) The team then discussed these concepts further in an attempt to clarify some design considerations and improve the concepts. We ended up with 5 concepts from the selected three to evaluate further: 1) “Baseline” concept, 2) Carousel with a single layer of compartments, 3) Carousel with a dual layer of compartments, 4) Top load with molded foam insert and a closing lid, and 5) Top load with molded foam insert and no lid.

The team went back to the selection criteria, determined that storage was not a differentiator (all met this need) so we removed it, and then determined the weight of each of the selection criteria. The weighing process was done as a group determining the priority ranking and then individually assigning a weight which we averaged for the final weighting. We then used a 1, 3, 9 scale to evaluate the concepts against each selection criteria, calculated the weighted score, looked at the final scores, and decided to move forward with 3 concepts through concept testing: the baseline concept, the dual-layer carousel, and the top load with molded insert and no lid. This process is shown in Appendix – Concept Scoring Matrix.

Recommended Process

The team strictly adhered to the systematic process mentioned in the book for concept screening and concept scoring.

Concept Screening: 1) Preparation of selection matrix, 2) Rating the concepts, 3) Ranking the concepts, 4) Combining and improving the concepts, and 5) Select one or more top concepts (Team selected 3 concepts)

Concept Scoring: The above process was followed for concept scoring with a scoring matrix chart (see the Concept Evaluation and Selection Appendix)

Key Learning

The team felt that the formal processes worked great for evaluations. It helped to keep concept selection in-line with customer needs. The two main benefits that the team could appreciate from going through this systematic approach are the importance of effective group decision making and the value of evaluating the concepts against customer-oriented criteria to derive a customer-focused product.

The 1-3-9 rating scale that the team followed during the concept scoring process helped to avoid any personal influence on the outcome and to get a clear winner. The team was successful in doing this.

Overall the team learnt that concept selection is an integral part of a product development process.

Concept Testing

Team Process

The team decided on the survey format and questionnaires were prepared with open-ended questions for the 3 selected concepts (see the Concept Testing Appendix). Interviews were taken and feedbacks were obtained from both original and new participants (target users). The results were consolidated into a matrix as shown in Appendix – Concept Testing Matrix, where the purchase-intent was measured in a scale of 5 categories (Definitely would buy, Probably would buy, Might or might not buy, Probably would not buy and Definitely would not buy). Results were interpreted and paired with market size research to determine our potential market (see Concept Testing in Appendix). Potential market size was determined based on the assumption that this product would be sold on the internet and initially, only in North America. Online research indicated the number of contact lens wearers in North America, as well as the number of Americans with internet access. Using these values, and adjusting for the fact that not everyone with internet access will see this product, the market size was determined.

Recommended Process

The text book teaches the concept testing process as a 7-step process. The team followed the process mentioned in the book but not to a complete extent.

1) **Define the purpose of concept testing** – The two main questions the team wanted to get a clear answer from the testing outcome are: 1) which of the 3 alternative concepts should be pursued? And 2) how can the concept be improved to better meet customer needs?

2) **Choose a Survey population** – This step was not done in a formal manner. The team did not determine the sample size of the survey. The goal was to get as many surveys as possible in the available time. The team was successful in getting around 50 surveys in a week time. The primary consumer segment for this product was the contact lens wearers (both men & women).

3) **Choose a Survey format** – The formats used by the team were: 1) Face-to-face interaction: This was done in the form of intercepts (stopping people at the mall and in school), 2) Telephone: Telephone interviews were done with friends and colleagues, and 3) Electronic Mail: The survey was sent as an electronic e-mail to friends and family members to gets their feedback.

One of the other sources that the team thought of using but could not do it due to time constraints was Internet.

The team attempted not to use the same target user for more than one concept interview. How ever, in some situations, the same target users were used to interview multiple concepts. In these situations, the users were requested not to compare and relate the concepts. A survey questionnaire was limited to just one product concept.

4) **Communicate the Concept**: Both a well defined verbal description of the product and a sketch were used to communicate the concepts. CAD tool (Pro-Engineer) and Power-point were used to communicate the carousel and baseline concept respectively. Pictures were used to communicate the "Top-lid" concept.

5) **Measure Customer Response**: Customer responses were analyzed to further improve the product concepts and to measure the purchase intent of each concept. The matrix captured the Purchase bias and Price estimations for each of the final 3 qualifying concepts.

6) **Interpret the results**: Quantity of products expected to be sold (value Q) on each of the 3 concepts were calculated based on the formula and methodology mentioned in the book and the concept with the maximum value of Q was selected as the concept to pursue further into product architecture phase. The 3rd concept, Top-load with insert, had the fewest number of responses that would likely NOT purchase while having more possible users that Might or would purchase.

7) **Reflect on the process** (see Key Learning)

Key Learning

The team ensured that the survey format and questions for surveys were consistent which allowed for direct comparison, aiding in selection.

"Pictures are worth a thousand words". The team was able to appreciate this. Visual sketches were key to communication of the concept clearly to the target users.

The target users were mostly limited to friends and family members. Though the team hit the mall and school zones to get diverse set of customers that were limited to just few instances. Better customer feedbacks might have been obtained by using the virtual survey websites and reaching a broad base of target users.

In this phase, the team got a fair idea on what the customers would be willing to pay for this product which helped in further phases like Product Architecture and Design for Manufacturing.

Product Architecture

Team Process

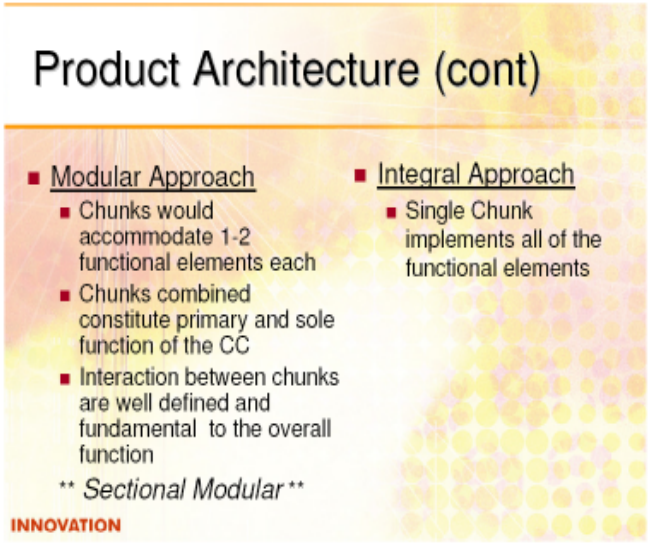
The simplicity of this NPD effort was the impetus for the team to take a step back instead of rushing into what appeared to be an obvious Integral Architecture. The chapter content was taken and discussed in more depth then originally predicted.

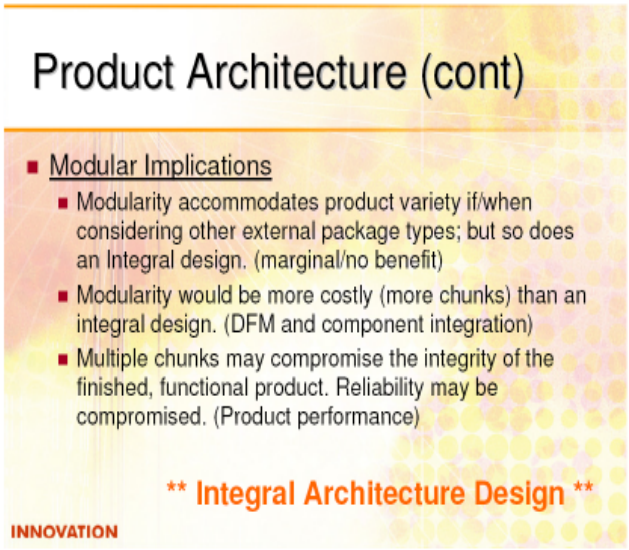
The team first outlined what the functional and physical elements were so that we had a clearer vision and understanding of how each influences our architecture options. Again, the chapter content, definitions and explanations were considered foremost over jumping to conclusions. The following were agreed upon by consensus and laid the foundation on how to proceed into developing the architecture:

1. The Functional elements contribute to the overall 'performance' of the product. The Contact Caddy's (CC) performance is dictated by how well the eye care sub-components are organized, and how reliably; effectively the compartments that make up what is the insert portion of this product.
2. Secondly, it was important to identify the physical elements. In the case of the CC, the physical elements were easily identified to be the sub-components comprising the eye care products, the insert/organizer itself (single or multiple at this point were still TBD) and the external package that contained all of the items.

This first step, albeit very basic, enabled the team to move easily into determining which architecture approach may be the better solution given our CC concept(s) to date. As in the step above, the dissection of these approaches consumed a good part of the tam meeting that day and the following resulted (see graphic below).

The Modular approach was considered in depth because we did not want to miss an opportunity to properly develop our concept while considering that product variety was still a design option. The graphic below highlights that the multiple chunks are viable though the value of each (in terms of integration into the overall product performance) is not known. This period of the discussions continued to a point where the module contributions to the final product were discussed in detail; various white board sketches resulted while all team members participated.





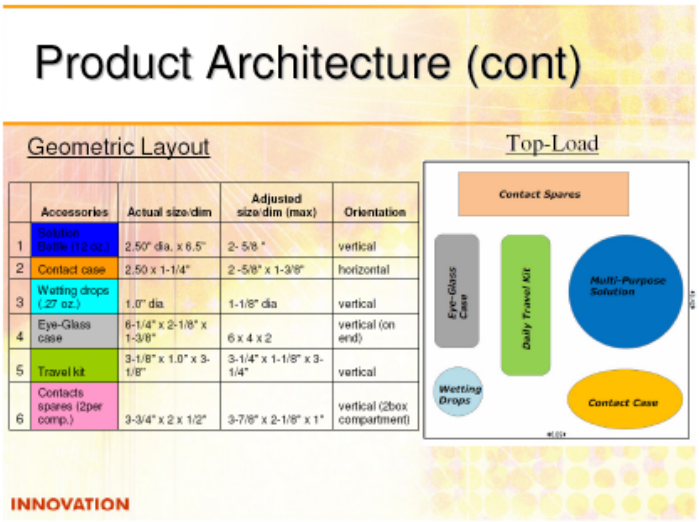
The graphic above was outlined in terms of how/if the modular approach provided greater value and benefit to the design while taking into account how Design-for-Manufacturing (DfM), component integration and overall product performance could be affected. The team concluded after much discussion that the Integral Architecture approach was the optimal way to proceed with development. The issue that a single external package would not fulfill every consumer's preference in terms of aesthetics and appeal was convoluted by the fact that few modules/chunks could not meet every package design. Said differently, taking a modular approach meant more pieces/parts, added tooling cost as a result without the benefit of being integrated into multiple external package designs for product variety as the concept

continued to evolve. The team reached consensus that the Modular-Sectional approach should be abandoned.

The team then proceeded by discussing this one-piece integral design and how best the sub-components could fit in the smallest 'footprint' considering customer responses to date. The following architecture objectives were discussed as outlined below:

- The single core chunk should be large enough to effectively organize and store the eye care products but within the smallest footprint.
- The sub-components needed to be organized considering how items may be removed and replaced when in use. Items should be contained reliably without influencing functionality or overall performance.
- The basic platform, the smallest footprint, would be leveraged in other product types. This would enable variety to be further targeted in the continued development.

The team recognized that varying this core chunk in either direction would allow for other rectangular packages, or other shapes for that fact. We also discussed and considered extra tooling charges, for the insert, would likely be minimal since the primary component area (layout) would not change, only the outer geometry. This graphic highlights the geometric layout and basic dimensions for the subcomponents and core insert (footprint).



Recommended Process

This section was followed closely in terms of the book content and definitions of major terms. The steps above reflect this approach. Where the team deviated from the remainder of the architecture discussions was during schematic and incidental interaction considerations. This was due largely because of the CC being primarily an organizer and packaging product NPD project. One component does not necessarily interact with other components making up this product. The efficiency of the layout became evident as all important when considering performance while keeping in mind yet qualified but heavily discussed DfM considerations regarding tooling and other material charges. Platform planning too was considered and a variant of the commonality plan was the candidate, based largely on the core insert discussed above. Variety was going to be managed via the external package, requiring further research via ongoing customer surveys when considering package types, colors, shapes and sizes.

Key Learning

The perceived simplicity of the CC lends to a rush of the development cycle without considering the fundamental issues surrounding the architecture approach options. The team began to realize this as the fast paced discussions led to an Integral architecture without considering the modular approach in detail. Dissecting the modular approach first without discounting it entirely enabled the team to better understand the product to be developed. This several hour discussion on both approaches and resulting implications helped solidify the Integral approach that was considered first but yet qualified. Due largely because we concluded that the optional Modular approach did not provide greater value to the desired performance, did not enable streamlined component integration and did not enable an efficient perceived assembly of the physical elements. After this somewhat debated session, the team discussed that the

outcome, albeit the initial 'guess', was the best way to proceed. This approach was chosen and qualified by considering first the less than 'expected' approach and dissecting it to a point that disproved its value while confirming our original yet unqualified suspicions of either architecture option. This process and side-by-side comparison was valuable to this NPD effort; perhaps a more complicated product would not make this a viable approach but it worked well for the CC development process.

Industrial Design

Team Process

Even though our product was innovative it was a commodity product, and investing in industrial design would be focal for the following reasons: first, the ability to capture more out of the customer pools from start, the "Wow" factor. Second, since our product is customer driven, competitors can easily introduce a like product. Unfortunately, none of our team members has a background in industrial design, however been customers our selves we used intuition and discussions to support the design of our contact caddy. Also concept surveys gave us an insight on what customer may take into consideration as to emotional appeal and product differentiation. Based on that information, we developed some industrial design factors for our product, as can be seen in the Industrial Design Appendix**.**

Recommended Process

As the chapter in the book outlines, ID is applied to a product to insure customer aesthetics and ergonomics acceptance. Since our product is customer driven the book proposes to take ID into consideration early in the NPD. ID would start as early as in the "identification of customer needs." ID would work with marketing as well as conducting customer focus groups and interviews. The role of ID continues to the detail design stage, where a final concept is selected and a finalized design is picked after approval from engineering and marketing.

Key learning

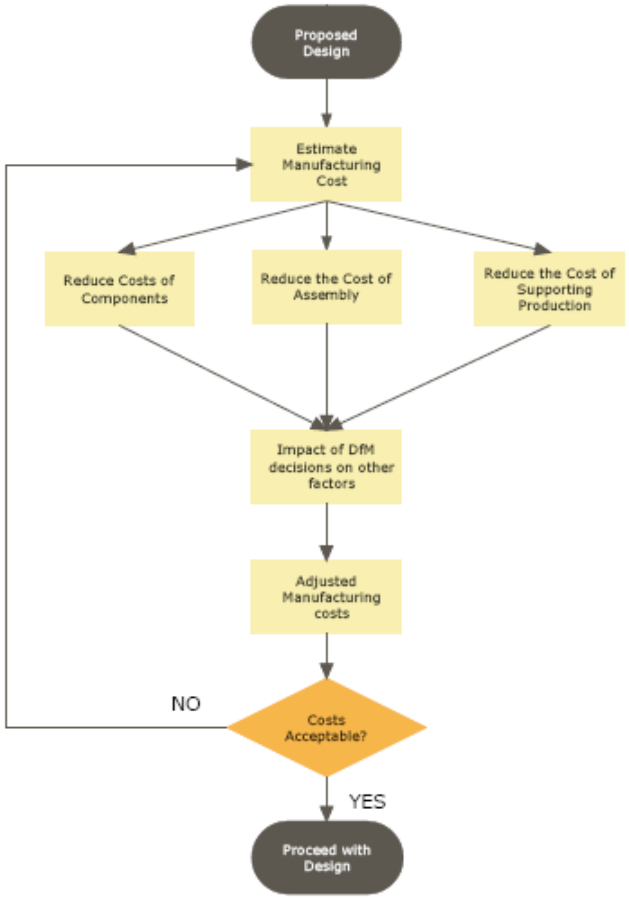
- For some of us the "Industrial Design" role in NPD was ambiguous. Most of us understood the importance, but did not get a feel for how we could employ the processes personally to produce a better product without the addition of an industrial designer to the team.
- Distinction of the ID role in technology VS commodity NPD.
- General categorize to be used in the assessment of ID.
- Importance of aesthetics and ergonomics from customer perspectives.

Design for Manufacturing

Team Process

The team began with the following flow chart in order to begin the cost reduction process beginning with estimating manufacturing costs.

The Components used in the CC include the purchased eye-care products, the organizer insert and the external package. The purchased components of the CC were cost evaluated by considering retail and wholesale prices where applicable and available. Unfortunately, higher volume pricing was not available though the team did itemize target/projected values for DfM considerations. It is assumed that these prices are conservative and that lower costs can be obtained after identifying suppliers of choice and notifying them directly in order to qualify volume pricing.



The insert which represents the material cutout to accommodate and organize the individual components requires tooling charges and other non-recurring engineering fees associated with the final design by the target supplier. This insert component and associated costs are shown below. An alternate Insert-B is also shown that represents a reduced cost version due to a shortened height and less overall material. This Insert-B represents a reduced costs version to be discussed by the team.

The external package houses the insert and purchased components. This part requires tooling charges associated with the manufacturing of this molded component. Charges and per piece costs are itemized in the table below. Cost reductions can be realized by quoting the design to other suppliers within the U.S. as well as abroad in lower cost areas. This effort would require additional research and work in order to qualify target suppliers. The costs and tooling charges represented here are per a U.S. mold supplier.

Assembly Costs were evaluated using minimum wage per hour costs for the local economy and the target rate to assembly one unit. This rate was discussed by the team considering the proposed design to date, physical elements and how many units could be assembled per hour. The cost per unit as well as sub-component parts cost and quoted tooling charges are outlined in Table 1 in the DFM appendix.

Recommended Process

The CC is primarily a packaging product development. All of the physical elements are purchased. Cost reductions may be marginal when considering the eye care components. The external package costs are high for initial tooling for the original design and approximately 35% less for the half-size version. The process in the chapter as outlined in the flow chart above was followed where applicable. Fixed and Variable costs too were evaluated and discussed in detail. It is obvious that this packaging product and resultant purchased components comprises 65% of the material cost and greater if volume pricing is not realized.

Key Learning

This chapter highlighted the cost structure associated with purchased and manufactured parts, as well as associated fixed and variable costs. Subsequently, the cost impacts could be more easily recognized and reduction efforts more meaningful concerning total cost impact. The CC product type (packaging) itemized how the purchased components contributed to almost the full cost of the CC as expected. Product variation will have similar cost structures while modifying the external package size and material mass will change the cost by a marginal amount. Overall, this packaging product development effort highlighted the minimal cost reduction possible in such a development effort.

The fact that the purchased components make-up a large % of the final product also adds risks associated with realizing said volumes based on the product design and overall appeal. The product and package design can be introduced in phases without incurring the full cost of volume products that may not be fulfilled. The wholesale costs or better based on further research and quoting, provides a market entry option without incurring the full cost of purchased components in early product release. Wholesale estimates can be found in Table 2 in the DFM appendix.

The wholesale total unit cost reflects what can be expected, conservatively, during early product release. When volumes begin to increase and outcome of product success improves then purchasing power can yield improved material cost and greater profitability captured. This product type and DfM process outline magnifies this option to market entry and initial incurred costs.

Economic Analysis

Team Process

Continuing with our efforts for the NPD of the Contact Caddy, we setup and utilized the Hammer economical model to evaluate the business/financial case for going to market and how sensitive it was to variance in development costs. The input Data can be found in Tables 1 & 2 of the Economic Analysis Appendix.

In developing the model the following were our reasoning: The prediction can only hold valid for a period of 3 years, as discount rate may change, as well as competitors may be entering the market with like or enhanced products that may require the company to launch a new product. Also there is the possibility of technology advancement or change of customer needs to where laser eye care becomes the norm and contacts are no longer used.

In relation to each item we derived our dollar values and estimates from team experience and research, as two team members are professional in the product development discipline, one person had previous work experience in manufacturing, and a fourth is currently working in marketing.

Development: Based on time we spent on project multiplied by average pay of engineer. We also considered a higher cost to account for input from an industrial designer. Testing: As the panel of experts we found the proposed dollar amount reflect standard testing cost based on the complexity of the product manufacturing. Tooling: we applied the same reasoning as to testing, with a confirmation from one of team member work experience. Market Introduction: was based on estimates for initial web development and search engine optimization. We decided to have the web as our base market place for contact caddy. We have decided not to approach distribution channels and retail store as more financial resources would be required, without necessarily increasing our revenue. Further analysis could be done to compare the impact on NPV of investing in other marketing approaches, but was beyond our scope. Ongoing market, maintenance cost: It was more challenging to determine the cost for ongoing marketing as under normal assumptions the cost would be fixed, however due to possible market changes, A more drastic change would be needed to accommodate for example a new site to advertise Caddy on, or enhancement in web related technologies, which would result in added personal time as well as recreation and refinement of web related marketing material. Unit Sales: was based on the dollar amount customers (from survey results) are willing to pay. As well as average sales price for like product organizers. Unit Price: obtained from DFM, which encapsulate quotes from vendors, suppliers. unit production cost was derived from the DFM, which was based on quotes from actual vendors, and current market cost to assemble and ship products. Table 3 through table 6, illustrate our sensitivity analysis.

Recommended Process

1- Build a base case Financial Model.
2- Perform sensitivity analysis.
3- Use sensitivity to understand project trade-off.
4- Consider the influence of the qualitative factors.

We obtained our results following steps 1 through 3. However, we faced difficulty as to step -4. We didn't define a hypothetical work scenario, such as been a startup, or part of an establish NPD company. Therefore, we didn't take qualitative factors into consideration.

Key Learning

- Overall, the model is not highly sensitive to changes in the value of the parameters except unit product price. Although an increasing unit product price increases the NPV with a given unit sales and development cost, increasing development cost with a given unit product price hardly affects the NPV. Increased product performance may require additional product cost.
- Optimistic (lowest devlp., unit prod. cost and highest unit price and sales) : $4.9M
- Pessimistic (highest devlp., unit prod. cost and lowest unit price and sales) : $923K
- Limitations – market performance can't be measured, it was a decision on our end to focus on the Internet channel. Due to the fact of the lower marketing cost associated as opposed to market through retail. The advantage since our Contact Caddy is a new product to the market is to test the market with a lower marketing budget, as opposed to investing a larger marketing budget to target retail channels, which can be an option based on the results of the internet marketing efforts in a later stage.

Conclusion

The new product development process recommended in the textbook was used as a guideline for development of the Contact Caddy. The bulk of our efforts were employed in developing a caddy that would be useful to contact lens wearers by understanding customer needs fully through customer statements and surveys, conversion of those needs into target specs, and comparison of concepts to those resulting needs. Upon finalization of the selected concept, the team focused on business aspects of the product: how could this be manufactured and at what cost, and does the introduction and development of this product make sense on a financial level. The final result was a product that makes sense financially, is manufacturable, has opportunities to expand the product line, and meets the needs of an unmet market segment.

While not every recommended process was useful or employed by this team, the guiding concepts were quite useful. We found as a team that having large chunks of time together as a team aided the communication and development process, that documenting decisions and methods helped when revisiting decisions later in development, and that no single process or approach is applicable at every stage in development. Informal processes worked best for creative situations, while formalized processes helped keep our decisions and selection objective, in line with customer needs, and reviewable. All in all, the development of this product went smoothly and the overall processes would be recommended for further development activities.

Product Planning Appendix

The following were potential market needs:

1. A windshield cover that goes on the outside of the windshield to protect the window from ice and snow buildup. The driver can simply remove it without having to scrape ice and snow off – keeping them warmer and allowing them to drive fairly quickly without a lot of effort.
2. A spoon that can have a set mass/volume with a leveling top so that measurements can be precise.
3. A modification to existing contact lens inserters/removers. Currently they are on long posts, if they could be slid onto the finger, so the action of inserting contacts is more like people are used to using their fingers, then it would be more comfortable for people and provide the sanitation advantages.
4. Pacifier sanitizer (see above)
5. Modification of an existing product. Many workers have to wear id badges to gain access to their work place and also to show that they belong here. The standard badge clips are metal and a little sharp and tend to leave marks on clothing and belts and if you don't wear a belt, can dig into the skin a bit. So a change to the clip to make it more clothing and skin friendly.
6. A caddy that holds all of the gears in one place that you need to change your contacts: contact solution, container, glasses, inserter, etc. This may or may not include a travel kit as part of the concept.
7. Sticky notes of a different orientation so that they do not get bent or fall out of books.
8. A combination of two existing products: contact lens case and inserter. Provides convenience.

Mission Statement – Contact Caddy

Product description:

- Organizes contacts and other eye care accessories for home and travel use

Benefit Proposition:

- Convenient storage method for home and travel use.
- Consolidates all eye care needs in one location

Key Business Goals:

- Targeting new market segment
- Can be developed within a 10 week period
- Keep costs to a minimum by leveraging existing components

Markets:

- Primary: any wearer of contacts (who currently use organizers or not)
- Secondary: frequent travelers who wear contacts
- Primary: retail/online
- Secondary: eye care providers (glasses shops, etc.)

Assumptions and Constraints:

- Compatible with standardized contact/eye care accessories
- Limited to eye care related goods

Stakeholders:

- Contact lens users
- Supply chain, distributors, retailers
- Manufacturing
- Investors

Customer Needs Appendix

Group	Question	Common Statements (rolled-up)	Customer Statement	Interpretated Need
Design and Aesthetics	What overall look, package features, etc. would be your preference regarding possible purchase?	Style and color makes it useful for either women or men	Carrier style and color accommodates both men and women	Contact caddy is aesthetically appealing to both the sexes
		Cute and convenient	Carrier is attractive	
		"Great idea and fun color"		
	What do you like or dislike about the liquid solutions regarding storage and ease of use?	"[I like that it was] color coded so you can put different solutions in each"	Containers are visually or physically different so they can easily be identified	Contact caddy provides a means to help people uniquely identify solution containers
Storage	What eye care products do you use and would like to see in the organizer?	"It has everything you need"	Carrier accommodates a contact lens container, solution, saline, tweezers, mirror, and glasses holder	Contact caddy stores and organizes eye care items such as contact lens case, solutions, tweezers, mirror and glasses
			Carrier includes/has room for multi-purpose cleaner and saline rinse bottles	
		"Also love the mirror inside"	Carrier has a mirror	Contact caddy provides a mirror
		"I especially like the part of the case to store your glasses (with a protective cloth), so all my eye needs can be kept together"	Carrier has a method of storing glasses	Contact caddy provides safe space for storage of glasses and related glass/lens cleaning wipes
		"The contact case is fine and labled L & R, but make sure you close it very tight (I didn't once and the liquid poured from one, but it was absorbed by the foam inside so it never made it outside the travel case, leaving my purse dry)"	Contact cases clearly indicate left and right.	Contact caddy contains lens cases that are clearly marked 'L' - left and 'R' - right to differentiate contacts accordingly during storage
		"What a handy idea...I wear disposable contacts so I put an extra pair of contacts in my Contact Companion lens case, along with my solution in one bottle and my rinse saline solution in the other bottle"	Carrier accommodates wearers of disposable contacts with room for multiple pairs.	Contact caddy provides space for disposable contacts with room for multiple pairs
			Carrier accommodates multiple pairs of contacts	
		"The tweezers are easy to use and I am paranoid about infection"	Carrier includes tweezers or a place for tweezers	Contact caddy can accommodate tweezers
		"The tweezers allow you to remove the contacts from the case without contaminating your solution"		

Safety	What eye care products do you use and would like to see in the organizer?	"I especially like the part of the case to store your glasses (with a protective cloth), so all my eye needs can be kept together"	Glasses are stored safely and protected from damage	Contact caddy protects glasses from damage when stored
	What do you like or dislike about the liquid solutions regarding storage and ease of use?	"It is a pain to pack all the little bottles, etc. and keep them all together"	Carrier provides a way to keep all bottles together that contact wearers use Spilled liquids are contained in the carrier	Contact caddy keeps the bottles secured and prevents them from leaking in to other compartments
		"I've never had any problems with the solution leaking out of the bottles in my contact companion, which is great considering I've always had to pack my big solution bottle in a zip lock bag or something, because it always leaks out"	Carrier secures liquid containers to prevent leakage	
		My only complaint is that the case I received did not have the nice foam lining I was expecting - It had a flimsy plastic tray that popped out whenever I removed the solution bottles. I threw out the plastic tray and now everything rolls around loosely in the case, and the contact solution bottles leak if held upside down"		
		"If you are like me and use a lot of solution (disinfect case, new solution every night) then you might need more solution than can fit in the 2 travel bottles"	Travel solution containers hold enough fluid for the duration of the travel. Travel solution containers hold more fluid than current products	Contact caddy's containers hold enough fuild for the entire duration of the travel and store more fluid than existing products' containers
	What general requirements would a contact kit or organizer have to provide?	"Sometimes the contact case is a bit hard to get out, but I use the tweezers to help out with that"	Contact lens cases close tightly and easily	Contact caddy holds the lenses and the rest contents securedly
		"The case, tweezers, and bottles stay in place"	Contents stay in their proper places	
		"Very hard to get the pieces out"	It is easy to remove articles from the carrier	Contact caddy provides an easy access to remove articles

Cost and Durability	What general requirements would a contact kit or organizer have to provide?	"Must be a good value for the money"	Good value and affordable	Contact caddy is affordable, durable and made of high quality materials
		"Durable, convenient. Everything is convenient and handy!"	Carrier is durable	
		"The case, tweezers, and bottles stay in place"	Carrier is made of high quality materials	

Interpreted Need	Need No.	Category
CC (Contact Caddy) can accommodate standard contact care items	1	Storage
CC organizes items conveniently and together in a common platform	2	Convenience
CC organizes items in a way that can provide for home, work or extended travel use	3	Convenience
CC accommodates extended daily use in a convenient travel size	4	Convenience
CC accommodates standard package sizes for multiple replacement uses	5	Functional
CC is functional regarding organization and use	6	Functional
CC accommodates standard solution 12 oz. bottle	7	Functional
CC accommodates smaller size bottle for extended or travel use	8	Functional
CC provides a single organizing solution set	9	Functional
CC safely secures the eye care items from damage	10	Durability
Liquid containers prevent spilling/leaking when oriented in all directions	11	Functional
CC is portable	12	Convenience
CC is compact in size	13	Storage
CC is appealing enough to put on bathroom sink or out in open	14	Aesthetics
CC is cost affordable	15	Price
Liquid Items compartments prevent leakage to other compartments	16	Functional
CC does not scratch easily	17	Aesthetics
CC is easy to clean	18	Convenience
CC can fit under sink or in drawer	19	Storage
CC is easily accessible	20	Convenience

Product Specifications Appendix

Metrics

Metric No.	Need Nos.	Metric	Importance	Units
1	1,2,6,9	X individual compartments for home use	1	numbers
2	1,2,6,9	Y individual compartments for travel use	1	numbers
3	3.4,7,20	Compartment size to store multi purpose solution - Home section	1	L x B x W
4	3.4,20	Compartment size to store saline solution - Home section	1	L x B x W
5	3.4,20	Compartment size to store contact case - Home section	1	L x B x W
6	3.4,20	Compartment size to store eye drop bottle - Home section	3	L x B x W
7	3.4,20	Compartment size to store glasses - Home section	3	L x B x W
8	3.4,20	Compartment size to store contact spares - Home section	3	L x B x W
9	3.4,20	Compartment size to store wipes/cloth - Home section	3	L x B x W
10	4,8,20	Compartment size to store multi purpose solution - Travel section	1	L x B x W
11	4,8,20	Compartment size to store saline solution - Travel section	1	L x B x W
12	4,20	Compartment size to store contact case - Travel section	1	L x B x W
13	4,8,20	Compartment size to store eye drop bottle - Travel section	3	L x B x W
14	4,20	Compartment size to store glasses - Travel section	3	L x B x W
15	4,5,20	Compartment size to store contact spares - Travel section	3	L x B x W
16	4,5,20	Compartment size to store wipes/cloth - Travel section	3	L x B x W
17	6,9,13,19	Caddy Size	2	L x B x W
18	11	Solution containers should be oriented such that no leaks take place	2	Degrees
19	16	Maximum Voiume of liquid to be absorbed by the compartment material	2	Oz
20	14	CC is appealing enough to put on bathroom sink or out in open	5	Subj
21	17	Maximum force required to scratch the caddy outer surface	5	Low, Med, High
22	15	Cost of Contact caddy	4	US$
23	10	Maximum force the contact caddy could withstand without damage	2	Low, Med, High
24	8,12,13	Travel Caddy Size	2	L x B x W
25	10	Maximum force the travel caddy could withstand without damage	2	Low, Med, High
26	6,12	Weight of travel caddy	2	Pounds
27	18	CC is easily cleanable	5	Subj

		NEEDS																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
METRICS	1	x	x				x			x											
	2	x	x				x			x											
	3			x	x			x													x
	4			x	x																x
	5			x	x																x
	6			x	x																x
	7			x	x																x
	8			x	x																x
	9			x	x																x
	10				x				x												x
	11				x				x												x
	12				x																x
	13				x				x												x
	14				x																x
	15				x	x															x
	16				x	x															x
	17						x			x				x						x	
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	19																x				
	20														x						
	21																	x			
	22															x					
	23										x										
	24								x				x	x							
	25										x										
	26						x						x								
	27																		x		

Competitive Benchmarking

No	Need	Imp	H1	H2	H3	T1	T2	T3
1	CC (Contact Caddy) can accommodate standard contact care items	1	x	xx	x	xxx	xxx	xxx
2	CC organizes items conveniently and together in a common platform	1	x	xx	x	xx	xx	xx
3	CC organizes items in a way that can provide for home, work or extended travel use	1,3	x	x	x	x	x	x
4	CC accommodates extended daily use in a convenient travel size	1,3	x	x	x	xxx	xxx	xxx
5	CC accommodates standard package sizes for multiple replacement uses	3	x	x	x	x	x	x
6	CC is functional regarding organization and use	1,2	xx	xx	xx	xx	xx	xx
7	CC accommodates standard solution 12 oz. bottle	1	x	xx	x	x	x	x
8	CC accommodates smaller size bottle for extended or travel use	2,3	xxx	xxx	xxx	xxx	xxx	xxx
9	CC provides a single organizing solution set	1,2	x	x	x	xx	xx	xx
10	CC safely secures the eye care items from damage	2	x	x	x	xx	xx	xx
11	Liquid containers prevent spilling/leaking when oriented in all directions	2	x	x	x	xx	xx	xx
12	CC is portable	2	x	x	x	xxx	xxx	xxx
13	CC is compact in size	2	xx	xx	xx	xxx	xxx	xxx
14	CC is appealing enough to put on bathroom sink or out in open	4,5	xx	xxx	xx	x	x	x
15	CC is cost affordable	3	xx	xx	xx	xxx	x	xx
16	Liquid Items compartments prevent leakage to other compartments	2	x	xxx	xxx	x	x	x
17	CC does not scratch easily	5	xxx	x	x	xx	xx	xx
18	CC is easy to clean	5	xx	x	xx	xx	xx	xx
19	CC can fit under sink or in drawer	2	xxx	xxx	xxx	xxx	xxx	xxx
20	CC is easily accessible	1,3	xx	xx	xx	xx	xx	xx

Metric No.	Need Nos.	Imp	Units	condiment caddy	wooden modular tray	cosmetic organizer	ReNu Multi Trav Kit	Visol "Sight contact lens Travel Kit	Contact Companion
1	1,2,6,9	1	numbers	4	4	6	n/a	N/A	N/A
2	1,2,6,9	1	numbers	0	0	0			
3	3.4,7,20	1	L x B x W	3x3x4.5"	3.25x11x1.5	4.5x2x4.25	n/a	n/a	N/A
4	3.4,20	1	L x B x W	3x3x4.5"	3.25x3.5x1.5	4.5x2x4.25	n/a	n/a	N/A
5	3.4,20	1	L x B x W	3x3x4.5"	3.25x3.5x1.5	4.5x2x4.25	n/a	n/a	N/A
6	3.4,20	3	L x B x W	9x3.5x4.5"	3.25x3.5x1.5	3.25x2x4.25	n/a	n/a	N/A
7	3.4,20	3	L x B x W	n/a	n/a	3.25x2x4.25	n/a	n/a	N/A
8	3.4,20	3	L x B x W	n/a	n/a	3.25x2x4.25	n/a	n/a	N/A
9	3.4,20	3	L x B x W	n/a	n/a		n/a	n/a	N/A
10	4.8,20	1	L x B x W	n/a	n/a				
11	4,8,20	1	L x B x W	n/a	n/a				
12	4,20	1	L x B x W	n/a	n/a				
13	4,8,20	3	L x B x W	n/a	n/a				
14	4,20	3	L x B x W	n/a	n/a				
15	4,5,20	3	L x B x W	n/a	n/a				
16	4,5,20	3	L x B x W	n/a	n/a				
17	6,9,13,19	2	L x B x W	9.5x6.5x4.5	7.25x11x1.5	8.25x6.25x4.25			
18	11	2	Degrees	vertical	vertical	vertical	vertical	None	horizontal
19	16	2	Oz	none	small amt	0	N/A	N/A	N/A
20	14	5	Subj	yes	yes	yes	No	yes	yes
21	17	5	low, med, high	high	low	med			
22	15	4	US$	11.99	11	13	3.49	22.95	14.99
23	10	2	low, med, high	high	low	med			
24	8,12,13	2	L x B x W	n/a	n/a	n/a	6*5*3,	4.36x1.11x3	3.1 x 0.9 x 3.1
25	10	2	low, med, high	n/a	n/a	n/a	N/A	N/A	N/A
26	6,12	2	Pounds	n/a	n/a	n/a	1.3	4.36oz	4oz
27	18	5	Subj	yes	no	yes	yes	yes	yes

Target Specs

Metric No.	Need Nos.	Metric	Importance	Units	Ideal Value
1	1,2,6,9	X individual compartments for home use	1	numbers	6
2	1,2,6,9	Y individual compartments for travel use	1	numbers	Universal fit
3	3,4,7,20	Compartment size to store multi purpose solution - Home section	1	L x B x W	3.25" x 3.25"
4	3,4,20	Compartment size to store saline solution - Home section	1	L x B x W	3.25" x 3.25"
5	3,4,20	Compartment size to store contact case - Home section	1	L x B x W	3" x 4.25"
6	3,4,20	Compartment size to store eye drop bottle - Home section	3	L x B x W	
7	3,4,20	Compartment size to store glasses - Home section	3	L x B x W	6.25" x 4.25"
8	3,4,20	Compartment size to store contact spares - Home section	3	L x B x W	2.75" x 3.25"
9	3,4,20	Compartment size to store wipes/cloth - Home section	3	L x B x W	
10	4,8,20	Compartment size to store multi purpose solution - Travel section	1	L x B x W	2.5" x 7.5"
11	4,8,20	Compartment size to store saline solution - Travel section	1	L x B x W	
12	4,20	Compartment size to store contact case - Travel section	1	L x B x W	
13	4,8,20	Compartment size to store eye drop bottle - Travel section	3	L x B x W	
14	4,20	Compartment size to store glasses - Travel section	3	L x B x W	
15	4,5,20	Compartment size to store contact spares - Travel section	3	L x B x W	
16	4,5,20	Compartment size to store wipes/cloth - Travel section	3	L x B x W	
17	6,9,13,19	Caddy Size	2	L x B x W	12.375" x 7.875" (L x B) 1.5" - 4.5" (W)
18	11	Solution containers should be oriented such that no leaks take place	2	Degrees	90 degrees
19	16	Maximum Voiume of liquid to be absorbed by the compartment material	2	Oz	Moderate Amount
20	14	CC is appealing enough to put on bathroom sink or out in open	5	Subj	Yes
21	17	Maximum force required to scratch the caddy outer surface	5	Low, Med, High	High
22	15	Cost of Contact caddy	4	US$	$10
23	10	Maximum force the contact caddy could withstand without damage	2	Low, Med, High	High
24	8,12,13	Travel Caddy Size	2	L x B x W	Universal fit
25	10	Maximum force the travel caddy could withstand without damage	2	Low, Med, High	N/A
26	6,12	Weight of travel caddy	2	Pounds	N/A
27	18	CC is easily cleanable	5	Subj	Yes

Concept Generation Appendix

Concept Ideas

- A home kit that is similar to home product organizers (that sits on the counter or in a drawer with multiple compartments) with either:
    - A travel kit open and attached to it
    - A travel kit closed and slid into a compartment
- A shelf-like carrier that hangs on a wall
- One with a hook that hangs on the back of a door
- One with suction cups that allows it to attach to a bathroom or dresser mirror
- One that sits on a countertop or under the sink that has layers (shelves, drawers, etc vertically stacked on top of one another)
- Sits on a counter top or in a drawer in a single layer

Concept Selection Appendix

Concept Screening Matrix

Selection Criteria	*Combo Open/ Drawer*	*Baseline*	*Spice rack/ carousel*	*Open Shelves*	*3-drawer Horiz.*	*Top Load Basket*
Storage - Comprehensive; all in one place	0	0	0	0	0	0
Convenience - Accessibility, portability, cleanable	-	0	+	-	-	+
Functional - How/what stored, form, Size	+	0	-	0	0	+
Durable	-	0	0	-	-	0
Aesthetics - looks nice (material)	+	0	+	0	+	+
Price	-	0	-	-	-	-
Sum +'s	2	0	2	0	1	3
Sum 0's	1	6	2	3	2	2
Sum -'s	3	0	2	3	3	1
Net Score	-1	0	0	-3	-2	2
Rank	4	3	2	6	5	1
Continue?	N	Y	Y	N	N	Y

Concept Scoring Matrix

		Carousel				Baseline		Top Load			
		Single		Dual				With Lid		Without Lid	
Selection Criteria	*Weight*	*Score*	*Weighted Score*	*Score*	*Weighted Score*	*Score*	*Weighted Score*	*Score*	*Weighted Score*	*Score*	*Weighted Score*
Convenience - Accessibility, portability, clean- ability	32.5%	3	0.975	3	0.975	9	2.925	3	0.975	9	2.925
Functional - How/what stored, form, Size	27.5%	3	0.825	9	2.475	3	0.825	3	0.825	9	2.475
Durable	6.0%	1	0.06	1	0.06	3	0.18	3	0.18	3	0.18
Aesthetics - looks nice (material)	20.0%	3	0.6	9	1.8	3	0.6	9	1.8	3	0.6
Price	14.0%	3	0.42	1	0.14	9	1.26	3	0.42	3	0.42
Total Weighted Score			2.88		5.45		5.79		4.2		6.6
Continue?			N		Y		Y		N		Y

Selected Product Concept Prototype

Concept Testing Appendix

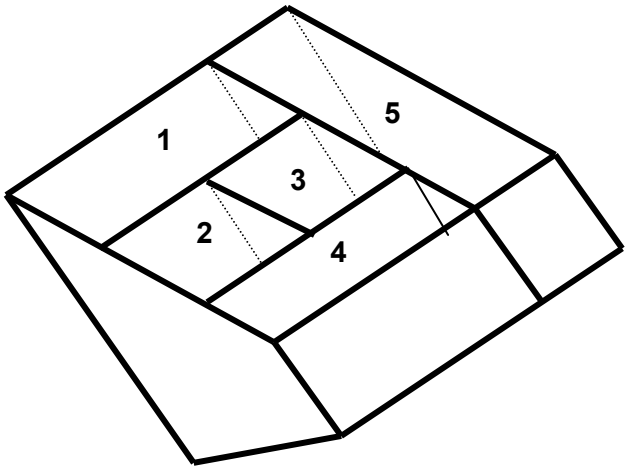
Concept Test Survey – Contact Caddy

Do you wear contact lenses? _____

Do you carry contact care accessories with you regularly? _____

Following is a description of a new contact lens caddy:

The caddy is a compact organizer for storing contacts and other eye care accessories at home. The caddy could be conveniently placed on a bathroom counter top. The caddy contains individual compartments to store the accessories in an organized and distinct manner. The caddy contains a separate compartment to store a travel kit.



1 – Solution bottle(s)

2 – Lenses, Eye drops

3 – Spares, wipes

4 – Eye glasses

5 – Travel kit

If the product were prices according to your expectations, how likely would you be to purchase the caddy?

___	___	___	___	___
I would Definitely not Purchase	I would probably not purchase	I might or might not purchase	I would probably purchase	I would definitely purchase

If not likely, why?

_____

How much would you pay for it? _____

Can you make any suggestions for improving the product concept?

_____

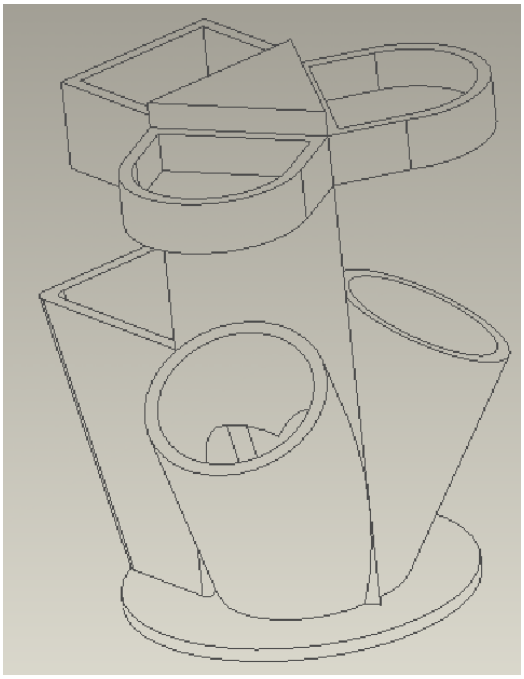
Concept Test Survey – Carousel

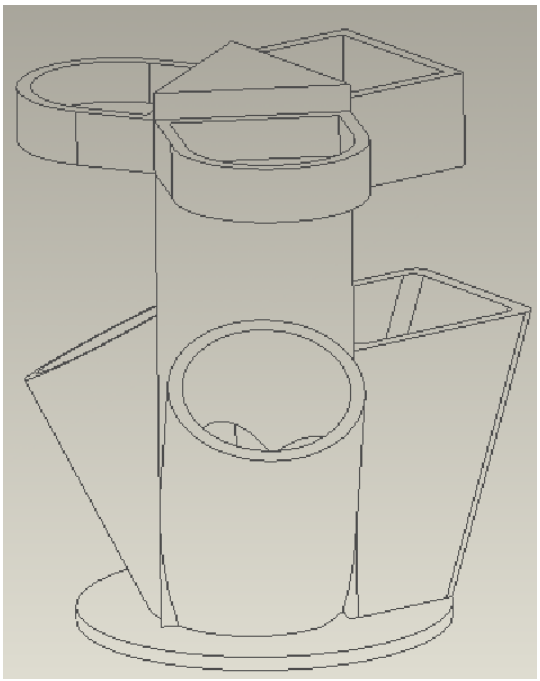
Do you wear contact lenses? _____

Do you carry contact care accessories with you regularly? _____

Following is a description of a new contact lens caddy:

The caddy is a compact organizer for storing contacts and other eye care accessories at home. This spice-rack like caddy could be conveniently placed and looks appealing on a bathroom counter top. The caddy contains two layers of compartments arranged in a circular fashion and the caddy could be easily rotated to reach the needed accessory. The caddy contains a separate compartment to store a travel kit. The accessories include contact lenses, solution bottles, eye drops, spares, wipes, eye glasses and travel kit.





If the product were prices according to your expectations, how likely would you be to purchase the caddy?

___	___	___	___	___
I would Definitely not Purchase	I would probably not purchase	I might or might not purchase	I would probably purchase	I would definitely purchase

If not likely, why?

_____

How much would you pay for it? _____

Can you make any suggestions for improving the product concept?

_____

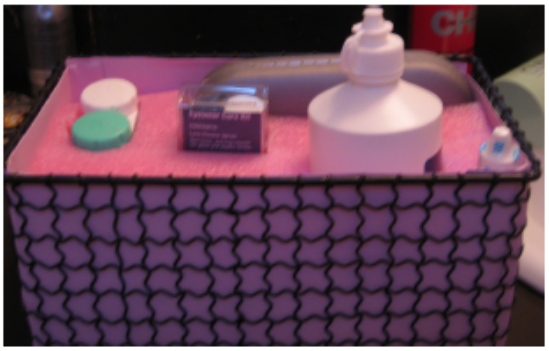
Concept Test Survey – Top-Load without lid

Do you wear contact lenses? _____

Do you carry contact care accessories with you regularly? _____

Following is a description of a new contact lens caddy:

The caddy is a compact organizer for storing contacts and other eye care accessories at home. This counter-top or drawer organizer is accompanied with a foam-like insert that keeps stored items secure during storage or on the move. The caddy comes with a daily travel kit for people wanting eye care accessories during work or play; as well as 1ea. contact lens case, solution bottle, wetting drops and eye-glass cleaning kit. Additional compartments accommodate your own spare contacts, wipes and eye glasses (case).



If the product were prices according to your expectations, how likely would you be to purchase the caddy?

___	___	___	___	___
I would Definitely not Purchase	I would probably not purchase	I might or might not purchase	I would probably purchase	I would definitely purchase

If not likely, why?

_____

How much would you pay for it? _____

Can you make any suggestions for improving the product concept?

_____

_____

Concept Testing Matrix

Concept	Price Ranges ($)	Definitely Not Purchase	Probably Not Purchase	Might/Might Not Purchase	Probably Purchase	Definitely Purchase	Remarks
Baseline	15,35,15-20,5-6,12-15,10,10,20, 15, 10, 12-18, 6	x,x	x,x,x,x,x	x,x,x	x,x,x,x,x		
Carousel	8,35,15-20,15-20,10-15,20, 10,15,20,15,10,20, 15, 15-20	x,x,x,x	x,x,x	x,x,x,x	x,x,x,x	x,x	Compact, lids for ease of cleaning, swivel or not swivel options, color options, compartment demarcation
Top-Load	23,5,15-20,15-20,15-20,10-15,10-15,5,10,20, 20-25, 50, 8	x	x	x,x,x,x,x	x,x,x,x	x,x,x	Compact, different foam color options, different packaging options, handle for portability

Market Size and Sales Estimation for selected concept (Top-Load)

Terms used & Formula	
Market	Contact Lens wearers in North America
Q=NxAxP	
Q	Quantity expected to be sold
N	# of potential customers
A	Fraction of N who are aware of the product
P	Probability that the product is purchased if aware =Cdefinitely x Fdefinitely + Cprobably x Fprobably
C definitely	Calibration Constant
C probably	Calibration Constant
F definitely	Fraction of respondents indicating they would *definitely purchase*
F probably	Fraction of respondents indicating they would *probably purchase*

Term	Values	Remarks
N	36,000,000	# of contact lens wearers in North America - 2003 data - Likely to be higher now.
A	0.2	Advertise & sell primarily online - 1999 data - # of internet users are much higher now, but not will be aware of the product - So, an average of 20% is taken
C definitely	0.4	Constant
C probably	0.2	Constant
F definitely	0.21	Respondents that said definitely purchase / Total Respondents = 3 / 14
F probably	0.29	Respondents that said probably purchase / Total Respondents = 4 / 14
P	0.142857143	Cdefinitely x Fdefinitely + Cprobably x Fprobably
Q	1028571.429	Q=NxAxP
Q	**1.03**	**1.03 million units**

Industrial Design Appendix

Assessment Category	Performance Rating	Explanation of Rating
1-Quality of the User Interface	High	Inserting the different components need to be easy as well as constant over the life of the contact caddy.
2-Emotional Appeal	High	An elegant looking basket, insert and colors that appeals to majority of customers M/F.
3-Ability to Maintain and Repair the Product	Low	Since an Integral/commodity product, and under normal use and operation, the maintenance and repair is not needed.
4-Appropriate Use of Resources	High	basket and insert needs be of acceptable quality.
5-Product Differentiation	Medium	Unique appeal for contact users with Caddy Logo.

DFM Appendix

Table 1

Physical Elements	*Purchased Materials Cost*			*Labor*		*Total unit Variable Costs*		*Tooling and NRE$*	*Tooling lifetime (k units)*	*Total Unit Fixed Cost*	*Total Cost*
	Retail	Wholesale	*Projected*	rate(mins)	Cost	Wholesale	*Projected*				
Insert		*$2.00*	*$2.00*	0.083	$0.012	$2.01	*$2.01*	$700	500,000	$0.00	*$2.01*
External Pkg-A		$3.30	$3.30	0.083	$0.012	$3.31	*$3.31*	35,000	500,000	$0.07	*$3.38*
Feet Standoff (4ea.)	$0.60	$0.20	$0.15	0.167	$0.023	$0.22	*$0.17*				*$0.17*
Daily Travel Kit	$7.50	$4.00	$3.00	0.083	$0.012	$4.01	*$3.01*				*$3.01*
Wetting Drops	$5.10	$4.00	$3.00	0.083	$0.012	$4.01	*$3.01*				*$3.01*
Contact Case (custom)	$7.50	$1.25	$0.90	0.083	$0.012	$1.26	*$0.91*				*$0.91*
12 oz. MP Solution	$5.00	$3.75	$3.00	0.083	$0.012	$3.76	*$3.01*				*$3.01*
EyeGlass Case (custom)	$5.25	$2.75	$1.80	0.083	$0.012	$2.76	*$1.81*				*$1.81*
Handling & Packaging		$0.40	$0.33	0.167	$0.023	$0.42	*$0.36*				*$0.36*
Total Direct Cost		$21.65	$17.48	0.915	$0.128	$21.77	$17.61	$35,700		$0.07	$17.68
Overhead Charges			$1.38		$0.102						$1.48
											$19.16

Table 2

		Original		Redesigned	
Variable Cost		Wholesale	Volume	Wholesale	Volume
Materials	Eye care purchased parts	$16.03	$11.93	$16.03	$11.93
Materials	Insert	$2.00	$2.01	$1.10	$1.11
Materials	External Package	$3.30	$3.31	$2.25	$2.26
Materials	Processing and packaging	$0.42	$0.36	$0.42	$0.36
Fixed Cost					
Insert Tooling	$700 per tool & 500k units/tool	$0.001	$0.001	$0.001	$0.001
Mold Tooling	$(35k / 24k) per tool & 500k units/tool	$0.07	$0.07	$0.050	$0.050
Total Direct Cost		$21.82	$17.68	$19.851	$15.71
Overhead Charges		$0.00	$1.48	$0.000	$1.48
Total Unit Cost		$21.82	$19.16	$19.85	$17.19

Economic Analysis Appendix

Table 1 Hammer Econ Model

Item	Start Quarter	Finish Quarter	Cost Range	
Development	1	1	{**15,000**,$30,000}	
Testing	2	4	$3,300	
Tooling	2	3	$35,700	
Market Intro	3	3	$5000	
Ongoing Mkt/Maint Cost	4	12	$2,000	
Units Sales	4	12	{50,000,**80,000**,125,000}	
Unit Price	4	12	{$25,$30}	
Unit Production Cost	4	12	{$18.72, **$21.82**}	
Discount Rate	1	12	8%	Resulted NPV: 1.536M

Table 2 Model snapshot

Period	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Development	-15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Testing	0	-0.33	-0.33	-0.33	0	0	0	0	0	0	0	0	0	0	0	0
Tooling and Ramp-Up Costs	0	-17.85	-17.85	0	0	0	0	0	0	0	0	0	0	0	0	0
Market Introduction	0	0	-5	0	0	0	0	0	0	0	0	0	0	0	0	0
Ongoing Mkt./Maint. Costs	0	0	0	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Production Cost	0	0	0	-936	-936	-936	-936	-936	-936	-936	-936	-936	-936	-936	-936	-936
Product Revenues (wholesal	0	0	0	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
Unit Sales	0	0	0	50000	50000	50000	50000	50000	50000	50000	50000	50000	50000	50000	50000	50000
Unit Price	0	0	0	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Unit Production Cost	0	0	0	-0.01872	-0.01872	-0.01872	-0.0187	-0.01872	-0.0187	-0.0187	-0.0187	-0.0187	-0.0187	-0.0187	-0.0187	-0.0187
Period Cash Flow	-15	-18	-23	562	562	562	562	562	562	562	562	562	562	562	562	562
PV Time Period 0	-14	-16	-18	413	382	354	328	304	281	260	241	223	207	191	177	164
Cumul. Disc. Cash Flow	-14	-29	-48	365	747	1102	1430	1733	2014	2275	2516	2739	2945	3137	3314	3478

PROJECT NPV $ 3,478

Base NPV	Changes from Base NPV	
	% of NPV	$ change
1,167	198.0%	2311

MODEL VALUES

	first	last	base burn rate	adjusted burn rate	%Δ from base value	$Δ from base value
Development	1	1	-15	-15	0.0%	0
Testing	2	4	-0.330	0	0.0%	0
Tooling and Ramp-Up Costs	2	3	-17.850	-18	0.0%	0
Market Introduction	3	3	-5.000	-5	0.0%	0
Ongoing Mkt./Maint. Costs	4	16	-2.000	-2	0.0%	0
Unit Sales	4	16	50000	50000	0.0%	0
Unit Price	4	16	0.030	0.030	0.0%	0.00
Unit Production Cost	4	16	-0.01872	-0.019	0.0%	0.00
Discount Rate (per time period)	8.00%					

Set input values in shaded cells.

Table 3 Internal Factors – Development cost

Development Cost	Unit Sales	Product Price	Project NPV	% Change from Base NPV
$15K	50K	$25	$937K	-39.0%
$30K	50K	$25	$923K	-39.9%
$15K	125K	$25	$2.43M	58.4%
$30K	125K	$25	$2.42M	57.5%

Table 4 External Factors – Product Price

Unit Sales	Development Cost	Product Price	Project NPV	% Change from Base NPV
50K	**$15K**	**$25**	**$937K**	**-39.0%**
50K	**$15K**	**$30**	**$2.5M**	**63.1%**

Unit Sales	Development Cost	Product Price	Project NPV	% Change from Base NPV
50K	**$30K**	**$25**	**$923K**	**-39.9%**
50K	**$30K**	**$30**	**$2.49M**	**62.2%**

* where Unit Production Cost = $21.82 and Baseline NPV = $1.536M

Table-5: External Factors – Unit Sales

Unit Sales	Development Cost	Product Price	Project NPV	% Change from Base NPV
50K	$15K	$25	$937K	-39.0%
80K	$15K	$25	$1.53M	0.0%
125K	$15K	$25	$2.43M	58.4%
Unit Sales	Development Cost	Product Price	Project NPV	% Change from Base NPV
50K	$30K	$25	$923K	-39.9%
80K	$30K	$25	$1.52M	-0.9%
125K	$30K	$25	$2.41M	57.5%

Table 6: Sensitivity Analysis

Factor	Relative Impact	Comments
Development cost	Low	For a given unit sales and product price, increase in development cost hardly affects the NPV.
Product price	High	For a given unit sales and development cost, increase in product price measurably increases the NPV.
Unit Sales	Medium	For a given development cost and product price, increase in unit sales relatively affects the NPV to some extent.