

EvrChill™

In my Northwestern Winter Quarter course, Design 407 'Making Things', Professor Herbst and Professor Carr are running a design studio where we make a home good product for a consumer's kitchen or bathroom. After exploring concepts, I landed on what I believe to be a strong business model with potential for use both in and outside of the home. EvrChill™ is an ecosystem of tabletop chilling devices for consumer and commercial use. The first product to be developed, specifically, is a chilled fruit bowl with display worthy design (Figure 1). The majority of the Differentiation by Design analysis will apply to this first product development, though areas identifying strategic growth will speak to the business model at large.



Figure 1. Rendered model for EvrChill™ Fruit Bowl.

I. User-Centered Design Research: Identifying the problem

The benchmark measurement of innovative design is increased product value. Product value is determined by the end user—particularly in the ways which it offers a solution to user problems or meets their needs (Levitt, 3). An emotional connection between people, products and services is at the core of successful design (Lojacono & Zaccai, 79). Therefore, my design research began with observing users in their kitchens and conducting user interviews.

Listening and observing users active in their kitchen was an eye-opening start to identifying problems. Though there were several pain points as users progressed through their activities, nothing compared to the physical and verbal expression of frustration with their food storage situation.

Though the users shared related issues with food storage there, the root of the problem as remained unclear. Through a “5 why’s” framework analysis, I was able to identify a hierarchy of reported issues (Figure 2). The first is *food preservation*, or the necessity to store produce at cool temperatures to extend their shelf life. Second, adults share concern for the appearance or *aesthetic* of their kitchens, resorting to overcrowding of refrigerators and cabinetry. Third, is overcoming general *organization*, as produce comes pre-packaged in plastic bags and containers. The final consideration is food *accessibility*; as depicted in the two photos included in Figure 3, users often store their produce in hard-to-reach places, given issues previously listed, leaving fresh items out of sight and out of mind. Deep insights and task analysis revealed that the root of these related issues is *storage*.



Figure 2. Identifying the Root of the Problem, including photos captured from interviewees.

These problems were particularly difficult for young families. One user shared that her three children “grab a lot of unhealthy snacks, but they would prefer fresh produce” adding that she “would buy more, but it somehow gets wasted leaving the kids to readily grab unhealthy snacks.” Based on this research, I devised a persona named Jenn, who raised her daughter Lucy on a carefully curated diet; due to their increasingly busy schedule, it has been harder for her to maintain Lucy’s healthy eating habits and wishes for an easier way to encourage her to opt for fresh produce as she grows more independent (Figure 3). This use case, in consideration of the root problem, informed my product development question: *How might we encourage healthy eating habits by remedying food storage issues?*

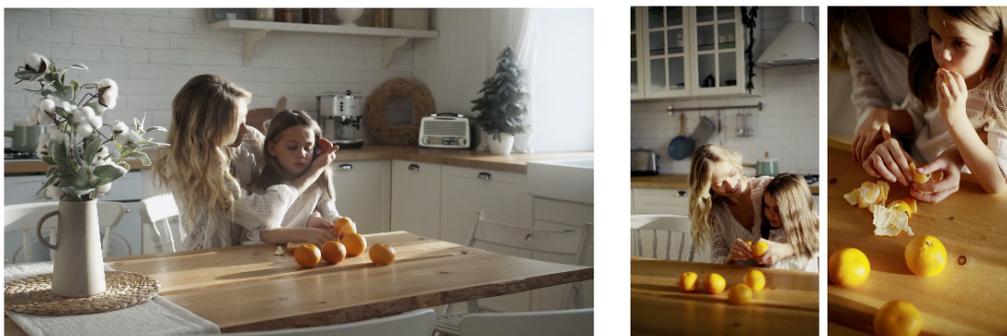


Figure 3. Jenn sharing a healthy snack with her daughter, Lucy.

II. Journey Map the Consumption Chain

As highlighted in the previous section, it is critical in practicing successful design to connect the product to user needs and to understand the entire use case for the product. The ability to find potential for differentiation by design extends beyond the physical use of the product, but through an analysis of the entire user consumption chain from “the moment of customers realization... [until they] decide to dispose of it” (MacMillan & McGrath, 133). Using this methodology, I created a high-level consumption chain analysis of how consumers like my persona Jenn (and Lucy) use storage (Figure 4).

The consumption chain journey drew visual interest to item storage problems by highlighting the complexities with storage before, during, and after product use. Finding design solutions to answer “*How is your product stored?*” (MacMillan & McGrath, 136) streamlines the consumption chain journey itself. By re-conceptualizing the consumption chain after introducing my proposed product, there is an improvement by bypassing the ambiguity of storage, and increasing visibility which will thereby decrease food waste (Figure 5).

Importantly, the methodology of consumption chain mapping is critical as it highlights needs that users are not aware of themselves and therefore could not articulate on their own (MacMillan & McGrath, 145). Though the pain point of food container storage was identified through human-centered design research, no users had previously considered the idea of a cooled, display worthy fruit bowl. Their thinking was limited to the current use of kitchen space and did not draw a valuable commonality between the frequency of use and importance of food storage with their other displayed appliances. This solution space is therefore valuable to the consumer and affords a strategic and sustainable design differentiation (Aaker, 84).

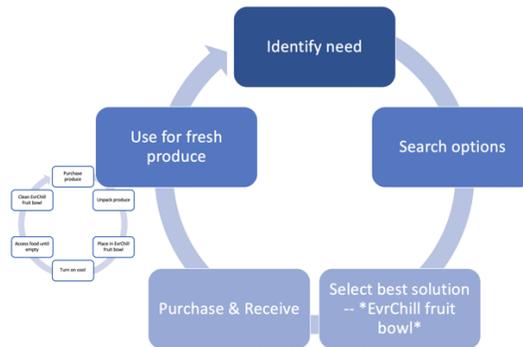
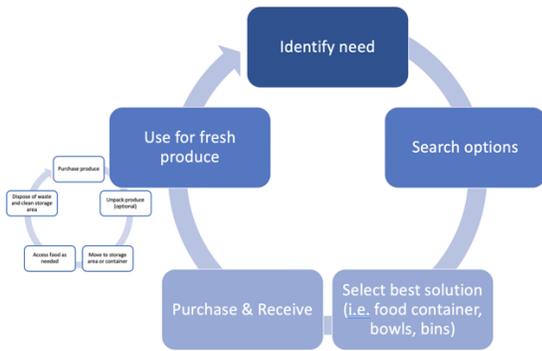


Figure 4. Consumption Chain today.

Figure 5. Envisioned Consumption Chain.

III. Key Stakeholders

Understanding key stakeholders is a valuable tool asset to help conceptualize the scope of the design problem (Lojacono & Zaccai, 77). This includes, but is not limited to, all players involved from the start to the end of the consumption chain journey mapped in the section above. A rigorous stakeholder map can help “diagnose relationships and identify trends” as well as “reveal insights into design opportunities for differentiation” (Brown, Class 2).

There are multiple layers of stakeholders that share an investment or interest in the EvrChill™ fruit bowl, centered around the target users (Figure 6). Each concentric circle offers an opportunity for design differentiation, as it affects the product supply chain at large.

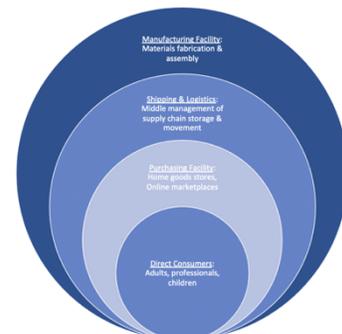


Figure 6. Key Stakeholder Target Map.

As described in later sections, there is an opportunity to differentiate the design of the fruit bowl to appeal to a high, medium, and low-end market. This will ultimately affect how each stakeholder is defined. For example, in the EvrChill™ Fruit Bowl modeled in Figure 1, the main user might be middle income families who can purchase the appliance display at Crate and Barrel. The Bowl can be manufactured out of spun aluminum, and in an effort to reduce overall cost, the heat sink device can be integrated into the design of the bowl instead of purchasing from an external marketplace. Importantly, stakeholder interest will change depending on how the EvrChill™ product line ecosystem evolves. This should be further explored as the EvrChill™ product line develops.

IV. Competitive Landscape

It is important to identify products in the marketplace that compete for your target consumer's interest (Brown, Class 5). This benchmark research provides a comprehensive understanding of what solutions have already been tempted, and thus the ability to assess how your proposal compares.

The majority of my competitive landscape analysis revolved around existing options for produce storage, including scoping materials and use. The food storage products were then analyzed using a 2x2 framework that compared structural size and temperature sustained, to understand critical factors affecting use cycle behavior (Figure 8). This work was helpful to construct a mental model of the product specifications that affect storage space, and to capture niche use differences.

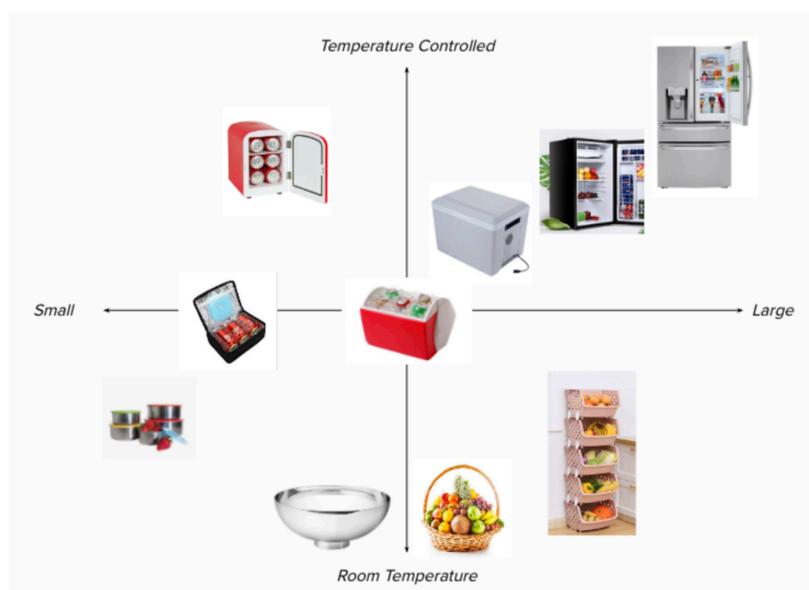


Figure 7. 2x2 Framework comparing size and ambient temperature of competitive products.

V. Opportunities: Knowledge Gaps (Performance)

The competitive landscape not only identifies existing solutions, but also highlights key knowledge gaps: how products fail, and the unmet and unanticipated needs (Brown, Class 5). This ties back to the guiding principle of human-centered design research methods: integrating problem-based solutions for human needs and desires (Burrell, 23). The knowledge gap curated in consideration of existing food storage is ironically obvious from the product name: they only contain food. Existing products offer a sealed environment to isolate desired materials—but they still need to be transferred to different spaces for cooling, a necessary component of food preservation.

VI. Customer Choice Drivers / Unmet (Behavioral) Needs

It is impossible to address the storage issues for produce storage without considering the consumption journey at large. Knowledge gaps identify areas of interest within existing solutions but is also critical to understand the consumer psyche. I believe the user-choice drivers (Brown, Class 2) concerning food storage are, in this case, favorable for my proposed product. First, loss

aversion is carefully balanced (Gourville, 4) based off initial research: users are annoyed by the fresh produce storage options, lack of organization, and food waste and are therefore willing to invest in one solution that would diminish that need. Similarly, there was strong emotional frustration in user interactions with their existing solutions—people will not carry higher value for their existing solutions, even if it requires additional tasks, known as the Endowment Effect (Gourville, 5).

That said, there are tradeoffs to consider. While existing options have a wide range of accessibility, the first product development of the EvrChill™ Fruit Bowl (Figure 1) might bias towards users willing to invest in a higher quality product as captured in my aspirational product mood board (Figure 8). This segments the market (Ghemawat & Rivkin, 16) which is admissible *if* coupled with strong emotional interest. However, the EvrChill™ ecosystem will eventually target a larger user population. Second, the EvrChill™ Fruit Bowl does not cater towards mobility; there is a need for users to have their own product for food transport. Relatedly, it will certainly demand users to consider a new mental model of produce storage, which may take considerable effort.

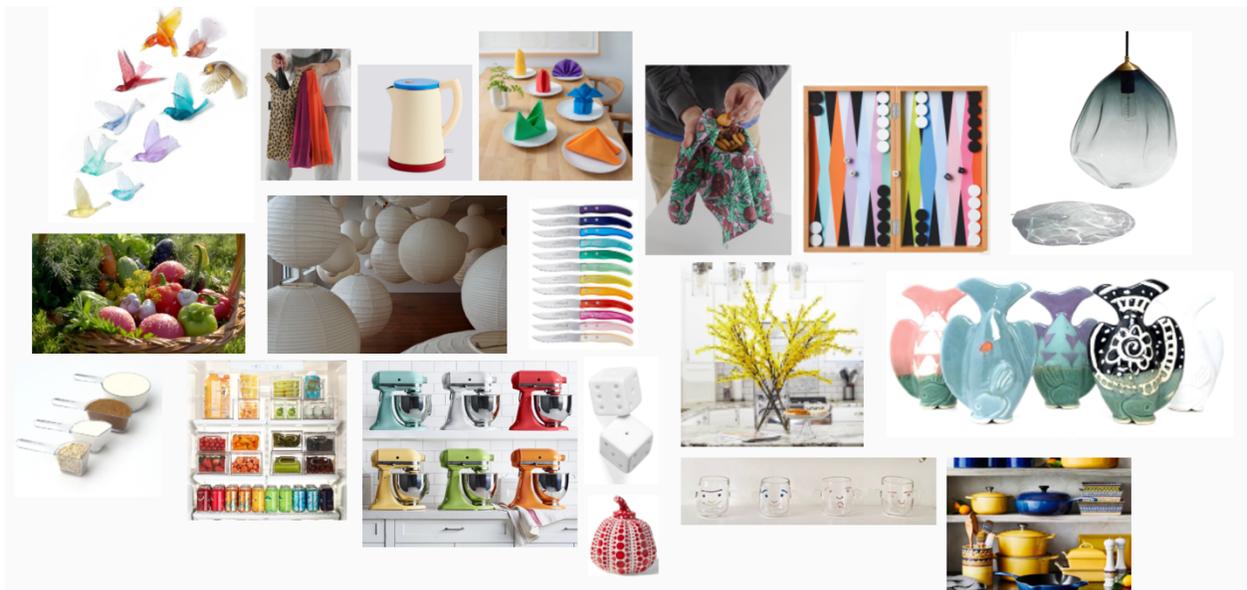


Figure 8. Aspirational Product Mood Board. Highlighting artistic and sculptural elements, as well as kitchen items of remarkable display.

VII. White Space (Differentiation) Opportunities

Obtaining intellectual property (IP) is a critical strategic advantage in the marketplace, as it protects your differentiated product value (Anand & Galetovic, 74; Reitzig, 35). This is especially important for technical and functional innovation. Patent research examines the specifications of existing products and validates proposed product differentiation.

I began researched similar technologies after narrowing my product development on a transparent cooling display. I knew related products to my product included food storage, mini refrigerators, serving trays, and coolers. At this phase, I am most predominantly interested in the heating and cooling capabilities, as that is at the core of my solution space. Despite technological advancements within thermoelectric microsystems, none have patented this technology for use within food storage systems. The closest use of this technology is within food plate and travel mug items, but these also have a docking station and sensors to control the temperature (Clayton, 2013). Other researched designs are much bulkier and complex, usually depending on additional materials to maintain temperatures (Figure 9). Given preliminary identification of a large opportunity space for thermoelectric coolers, I plan to file a provisional patent for the EvrChill™ technology.

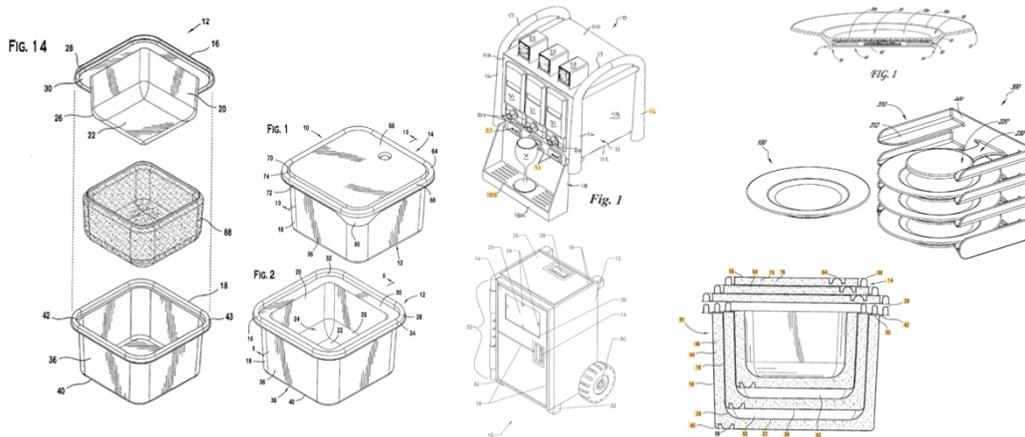


Figure 9. Sketches from patents utilizing microchip (or similar) cooling technologies.

VIII. Differentiation (Value Creation) Opportunities

There is a broad differentiation opportunity by creating a new display-worthy product offering both produce storage and temperature maintenance. Overall product design differentiators can be found (amongst other objectives such as target users) in the product charter and product requirement document (see Appendix).

To start, the EvrChill™ name encompasses key brand identity: the cool temperatures and monumental sculptural element of Mount Everest brought to storage display. Importantly, as alluded to in the stakeholder analysis, the EvrChill™ ecosystem expansion (Figure 10) and related updates to materials and manufacturing will also increase value. In short, the EvrChill™ concept will develop an entire ecosystem of tabletop chilling devices for consumer and commercial use – offering both high, middle, and low-end products targeting a range of markets.

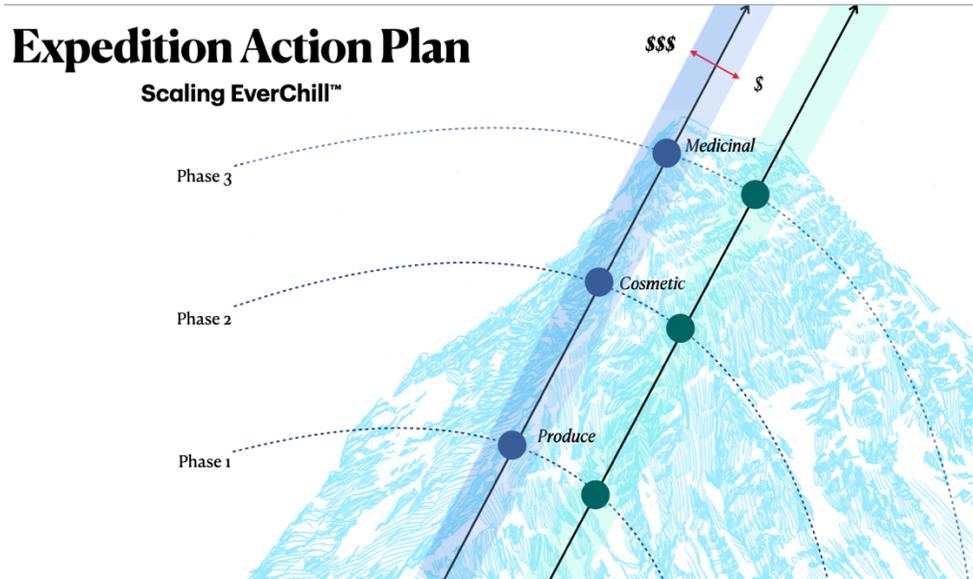


Figure 10. Action plan proposal for three phases EvrChill™ product development. The blue line represents consumer products, and the green represents commercial products, developed simultaneously. The gradient denotes the product expansion line from low-cost to high-cost product. The first phase will develop the EvrChill™ produce-focused product line, including the EvrChill™ ecosystem addressing the middle market development, explored in this paper analysis.

Future analysis should consider the best processing methodology depending on product development (i.e., whether reaction injection molding (RIM) or metal spinning offer greater profit margins). Lastly, EvrChill™ will offer combined service benefits, such as a lifelong quality guarantee (Anand & Galetovic, 74).

IX. Commonality Strategy

It is important to balance commonality with distinctiveness when developing a strategic business plan (Robertson & Ulrich, 21). Through the iterative evolution of problem-solving using design thinking methodologies, my solution grew from a narrow focus on food storage to considering its purpose in the kitchen and within the user's food consumption cycle. As mentioned in the introduction and previous section, EvrChill™ is not just one product but a concept proposal for a line of cool storage products. There will be an option of value differentiated products as well as uses outside of the kitchen which incorporates horizontal

differentiation strategies, as depicted in the business model graph in Figure 10 (Ghemawat & Rivkin, 16). There is new marketplace interest in cooling various beauty and medicinal products, for example. On a corporate scale, food trucks, pastry shops, or pop-up marketplaces often depend on bulky coolers that restrict item display.

X. Competitive Advantages (Differentiation by Design)

The product evolution mentioned in the previous section highlights potential for continual differentiation by design. Brainstorm sketches, consideration for strategic systematic approaches, and additional service benefits (such as lifetime warranty) are other areas that will drive competitive advantage in the marketplace by improving value to the end user. More importantly, beyond function, I believe this product can have a major influence on the social and environmental value of food preservation. It is a worthwhile investment to not only reduce clutter, but also extend the life of your produce and combat food waste. Ultimately, I hope my product will showcase the ability to infuse ornamental display value with human-centered design.

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Appendix

I. *Project Charter*

A display-worthy food storage product designed *with thermoelectric microsystems* to offer cooling and warming temperature settings.

II. *Product Requirements Document (PRD)*

All the requirements of a product or service, written to allow all within the organization to understand what the product or service should do.

- Develop ideations for self-cooling or self-warming containers, that may include existing patent(s)
- Easy on/off switch to activate thermal condition
- Safe to use for food storage *but can also be used for makeup, etc.*
- User group for personal needs may include a wide family audience (adults and professionals, children) that frequent a kitchen
- User group for *commercial needs may include quick service food industry, cosmetologists, aestheticians, astronauts* (growth area)
- Materials should provide insulation and support thermoelectric chip technology
- Materials should be easily cleaned with a simple wiping motion
- Materials should be durable
- Materials should retain temperature selection
- Product should be aesthetically pleasing, perhaps using a unique and customizable material finish to satisfy a wide variety of users
- Display should be worthy to bypass needing hidden storage
- Product *should be offered in a variety of (modular) shapes and sizes to meet different use cases* (growth area)
- Opening and closing of the product should be simple and intuitive
- Product should seal reliably
- Fresh/neutral odor should be considered
- Manufacturing, production, and assembly processes should be feasible with the use of novel technologies but affordable for a competitive market

III. *Mural Workspace*

<https://app.mural.co/t/dsgn4013servicedesign2029/m/dsgn4013servicedesign2029/1612245157716/937b2dbec12b5c332bfd8c14f9e6d08b12b7ced1>

IV. *EvrChill™ Renderings*

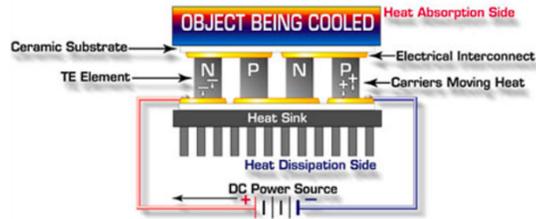
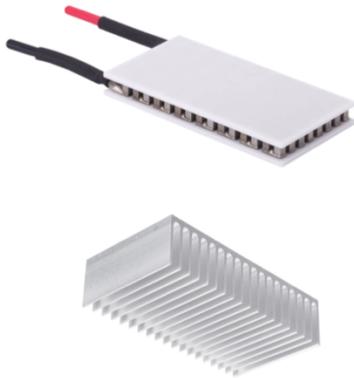


V. *Proposed Materials & Manufacturing Methods // Cost Estimate and Proposed Listing*

PART	PART DESCRIPTION	QUANTITY	CRITICAL DIMENSIONS	MATERIAL
Bowl	Basin with depth for fruit (produce) storage.	1	L 4"H x 9.5"D M 3.5"H x 6.5"D S 2.5"H x 5"D	6061 Aluminum / 18-8 SS
Cover	Lid for bowl cut to match exactly to ensure temperature seal.	1	TBD	Acrylic
Power Supply with DC Support Panel	12V AC / DC power adapter cord.	1	6 ft. Long	
Thermoelectric Cooler	Generate temperature differentials by transferring heat between two electrical junctions.	TBD	TBD	
Heat Sink	Passive heat exchanger to dissipate away, mounted with thermal conductive adhesive tape.	TBD	TBD	6061 Aluminum / 18-8 SS

Proposed cost \$30-\$40 with room for improvement. Proposed market range \$75-\$150.

VI. *Thermochip Technology & Test*



VII. *Brief CMF exportation for User Interviews*

