CHAPTER 5

THE WHIRLPOOL CENTRALPARK™ REFRIGERATOR: THE DESIGN OF AN ACCESSORY PORT

Some ubicomp product ideas keep reappearing despite unprofitability and unpopularity. For example, take the "smart table." Microsoft's Surface is only the latest in a long line of smart tables promised to revolutionize digital interactions.[1] Yet despite the lasting allure of the idea, none of the proposed tables have generated significant profits or even mass uptake. Another persistent idea, the electronic book, appeared multiple times over ten years[2] until its first notable success with Amazon's Kindle 2. But as of 2010, the Kindle is only moderately successful, and it has required continuing and significant investment from a giant company.

Why did the e-book fail for a decade before mild success? It could have been fundamental technological deficiency: the LCD screens of early e-books had lower resolutions and greater power demands than the E-ink screens of Kindle 2. It may have been sheer bad luck: startups developed the 1998 e-books without Amazon's billion-dollar revenues. The startups' funding may have dried up during the dot-com bubble's collapse in early 2000, causing them to fold before they got sufficient market traction.

Such technical and financial explanations shortchange the importance of the user experience in commercial success and failure. Repeated invention of basically the same product — and repeated subsequent failures — point to continuing, fundamental disconnections between designers' visions and consumers' expectations, goals, and needs.

The Whirlpool centralpark is an example of how one company tried to overcome the repeated failure of the "smart refrigerator" with a user-centered design approach. Their simple technical solution represented a deep shift in design philosophy.

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[1]The IEEE International Workshop on Horizontal Interactive Human-computer System, for example, annually showcases dozens of smart table interfaces.

[2]Rocket's e-Book, Cytales' Cybook, and SoftBook Press' Softbook all launched in 1998. Amazon announced the Kindle 2 exactly ten years later.

5.1 A SHORT HISTORY OF THE SMART FRIDGE

> V Sync Technology [...] said a new household "Internet refrigerator" will be commercialized by late 1999. It already has completed a prototype, and negotiations are now taking place with two home electrical products manufacturers to introduce the Internet refrigerator to the market.
>
> *V Sync press release (1998)*

Introducing computers to kitchens is one of those seemingly obvious technology-led ideas that have appeared with startling regularity since the very beginning of personal computing. The first proposed "kitchen computer" was the 1969 Honeywell H316, but a proliferation of smart fridge prototypes followed the popularity of laptops with LCD displays.[3] It must have seemed like an easy win, from a technical perspective. After all, laptops are flat and use electricity and refrigerators are flat and use electricity. Make some space in the door, run power and data lines, and call it done. What could go wrong?

Lots.

Reviewing the history of the commercial fridge computer (Table 5-1) demonstrates both the idea's tenacity and its lack of commercial success. Not that every generation was identical (the idea was refined at every iteration), but the core principle was the same. The V Sync only promised a computer with the latest hardware (V Sync, 1998), while LG said users could "watch TV, listen to music [...] surf the internet [...] re-stock the refrigerator on-line or check on the latest news and weather—all without leaving the kitchen. And it's great for storing food too" (LG, 2002). Still, those features equated to an Internet-connected general purpose computer attached to a refrigerator. LG could equally have added "type a term paper" and "play video games" to the list of suggested activities.

[3]Weiser (1993) referenced the flatness of refrigerators and their use as an information surface, and Liebowitz et al. (1994) talked about "smart refrigerators." By 1998 there were many "smart fridge" projects.

Table 5-1
Commercial Smart Refrigerator Prototypes

Year introduced	Product
1998	V Sync Internet Refrigerator
1999	Electrolux Screenfridge
2000	Whirlpool and Cisco Internet Home refrigerator with embedded tablet PC
2002	Whirlpool Connected Refrigerator
2003	LG Digital Multimedia Side-By-Side Fridge Freezer with LCD Display
2006	Electrolux Screenfridge, second prototype with the same name (Figure 5-1)
2008	Whirlpool centralpark

Figure 5-1
The 2006 Electrolux Screenfridge. (Courtesy Electrolux)

Despite pilot studies by all of the manufacturers — some involving 50 or more smart fridge prototypes installed in people's homes — only LG's prototype made it to market. And the Digital Multimedia fridge did not make an impact. By 2009 all of the corporate Web pages describing these products[4] had disappeared.

[4]With the exception of press release archives.

5.2 WHY DID THE SMART REFRIGERATORS FAIL?

> Spokesman: New Shimmer is both a floor wax and a dessert topping! Here, I'll spray some on your mop ... and some on your butterscotch pudding.
> Husband: Mmmmm, tastes terrific!
> Wife: And just look at that shine! But will it last?
>
> *"Shimmer commercial,"* Saturday Night Live, *Season 1 (1975–1976), Episode 9*

A complete analysis of why none of the projects was commercially successful requires knowledge of major business decisions at the respective companies and an analysis of the appliance market at the time of introduction, which is outside the scope of this chapter. However, the design and marketing of smart fridges before the Whirlpool centralpark convey a similar story: the value of the very expensive fridge lies in its combination of two different technologies. There was little consideration (or at least explanation) of how the sum of those technologies would provide new benefits to fridge users. As the *Saturday Night Live* skit suggests,

putting two good things together does not necessarily result in a single, *even better* thing. In this case, merging two technologies was relatively easy. Explaining, in terms that make sense to buyers, why they should be merged was hard.

The fridges favored technological unification over the user experience in three ways:

1. They lacked a functional focus. What was the final product going to do that was better than other comparable products?
2. They ignored the different life cycles of consumer electronics and appliances.
3. At their price point, the value of the fridges did not stand up to thorough investigation of their functionality. Price and value are key components of most non-luxury user experiences.

Let's look at each of these factors more closely.

5.2.1 FUNCTIONAL FOCUS

These smart fridges did not communicate how the combined systems might enable household activities better than either system alone. Most people in the target audience probably already had a desktop computer and maybe a laptop. A computer embedded in a refrigerator would have to do something that the existing computers and other kitchen information technologies, such as fridge magnets or notepads, either could not do or did poorly. Software design appears to have been a secondary priority despite being the primary mode of interaction with the fridge computer. Some descriptions emphasized the computer's capabilities as media players. But they did not clarify the advantages of fridge-as-media-player (other than some saved counter space).

Although several designs included "household management" functionality, such as notice boards, the marketing and software design did not emphasize support for everyday household activities such as buying food, cleaning, or coordinating family activities. In other words, the potential benefits of unifying a tablet computer and a refrigerator were not persuasively articulated in terms of what people were already doing around and on refrigerator surfaces. On their own, refrigerators have one of the clearest, most compelling, justifications of all appliances: they keep food fresh. Introducing a general purpose computer undermined the appliance's clarity of purpose without obviously providing useful tools.

5.2.2 LIFE CYCLE

Computers and kitchen appliances have very different life cycles. Refrigerators are replaced once every fifteen years or so.[5] Computer lifetimes are measured in months. Even though they cost about the same when new, refrigerators are

[5]The Association of Home Appliance Manufacturers lists 14 years as the average useful life of a typical refrigerator (AHAM, 1996).

not replaced as frequently as laptops. The patterns of use are much different. Refrigerators disappear into the background and are used in very brief, frequent bursts (a typical one is opened 50 times a day[6]). Their features evolve slowly. Computers are used for more extensive periods, require more maintenance, and evolve much more quickly.

Perhaps manufacturers hoped introducing computers would align refrigerator replacement cycles with those of laptops. Even replacing a refrigerator every five years would triple fridge purchases. However, the purpose of the embedded computers was unclear, which meant that the only clear use for the refrigerator was the traditional one of temperature control. Anyone familiar with personal computers knows that they need to be maintained, occasionally repaired, and quickly replaced. Why complicate repair and maintenance of a stable, familiar, absolutely necessary appliance if there is no corresponding increase in its utility?

5.2.3 PRICE

The retail price of each of these refrigerators was greater than the sum of its parts.[7] Such pricing works for luxury goods, when the value of the product is not based on its functionality. The price of luxury goods, however, depends upon aesthetics, performance, or exclusivity. None of these refrigerators were designed or marketed as luxuries. Instead, their pricing rested solely on claims of a better user experience produced by new functionality. But the marketing communications only obliquely described that imagined experience. I hypothesize that this inadequately justified the price premium relative to buying a separate tablet computer and refrigerator.

5.3 WHIRLPOOL'S CENTRALPARK REFRIGERATOR

Note: Charles L. Jones, Whirlpool VP of Global Consumer Design, provided me with key behind-the-scenes descriptions of the design of centralpark. I was also a consultant to a Whirlpool of Europe prototype kitchen project in 2006.

With this history of questionable investment, why would Whirlpool decide to try to merge a computer with a fridge for a third time?

Because they didn't.

Centralpark (Figure 5-2) is not a refrigerator combined with computers. It is a refrigerator with attachments that use information processing. This is a fundamental difference. It comes from a desire to create a user experience

[6]Parker and Stedman (1992) found 42 fridge door openings per day; Chang and Grot (1979) found a median of 54 per day.

[7]For example, a 2007 LG refrigerator with a built-in 13" LCD television (Model LRSC26980TT) was initially priced at $3000. Functionally and esthetically comparable refrigerators cost more than $500 less, while functionally comparable LCD TVs cost around $300. Thus, LG charged a $200 premium for the combination of the two.

Figure 5-2
Whirlpool's centralpark refrigerator. (Courtesy Whirlpool)

that balances functionality and value while respecting the company's business priorities.

5.3.1 A CHALLENGE FROM LG

The project started in reaction to LG's 2006 announcement of a refrigerator with a built-in LCD television. Whirlpool internal competitive analysis determined that LG's product did not make sense from a consumer perspective because the combination of the TV with the refrigerator was much more expensive than buying a separate kitchen TV and a high-end fridge. Moreover, as Charles L. Jones pointed out, if the TV broke — and televisions tend to be more fragile than refrigerators — it would require expensive repair or stay forever broken, stuck inside the fridge.

Whirlpool felt that consumers would not buy the LG fridge, even though the fridge had gotten good press. Nevertheless, the appliance market is a highly competitive one, and good press is worth pursuing. So when Whirlpool's multidisciplinary Platform Studio (a design group whose work crosses appliance types and brands) suggested a response for the 2008 Consumer Electronics Show, Whirlpool decided to pursue it.

5.3.2 IDEAS FROM CARS AND STEREOS

> We wanted to take advantage of the fact that we didn't make electronics.
>
> *Charles L. Jones*

The designers felt that LG's TV fridge gave them an opportunity to respond with something that was as interesting, but without the TV fridge's problems. Whirlpool had tried computer fridges twice before, and each time, the results were not compelling products. So their response could not simply be another fridge with a computer stuck to it. Moreover, bringing a computer product to market would likely have been prohibitively expensive and time-consuming.

The solution came from a Platform Studio engineer who had worked at Johnson Controls, an automotive component designer and manufacturer. He suggested a simple, open hardware interface for attaching electrical products to the refrigerator. It would bridge the world of "white goods" (appliances) and "brown goods" (consumer electronics). Rather than creating a unified appliance, Whirlpool would provide a physical and electrical connection on a refrigerator and partner with companies with consumer electronic experience who would create modular products that plugged into the connector. This is how automotive companies work with stereo manufacturers, but it is relatively unknown in the appliance industry. For example, KitchenAid, a division of Whirlpool, has sold a mixer with attachments for more than 80 years, but the vast majority of attachments come from within the company.

Once they had identified the core strategy, the team needed resources to pursue it. They were able to get the president of Whirlpool North America interested, and his involvement, according to Jones, was key. Without the sponsorship of an executive at the highest level of the company the project could not access the human and financial resources it required.

5.3.3 RAPID DEVELOPMENT

With resources allocated, the development process went quickly. The first version went from sketch to trade show in under four months.

The technology is deceptively simple (Figure 5-3). It consisted of a mounting point for a couple of screws and a power connector that delivers 14 V DC. The screws hold attachments flush to the fridge door and the electrical connections are designed so that they do not break when the refrigerator is opened and closed dozens of times per day, year after year.

Rather than a hasty hack, the simple connector is actually the culmination of a thorough analysis and design process.

5.3.4 DISTILLATION

> Play nothing sometimes, even if you sit up there all night. Don't just play because you have eighty-eight keys to play.
>
> *Miles Davis' advice to Herbie Hancock (Davis, 1990)*

To reach simplicity, the team had to decide what the product did and what it did not do. According to Jones, they designed "out from the user" rather than starting with the technology. This began with what the team knew from research carried out by Whirlpool's ethnographers and user researchers. Starting from this base, the team brainstormed potential applications. They focused on

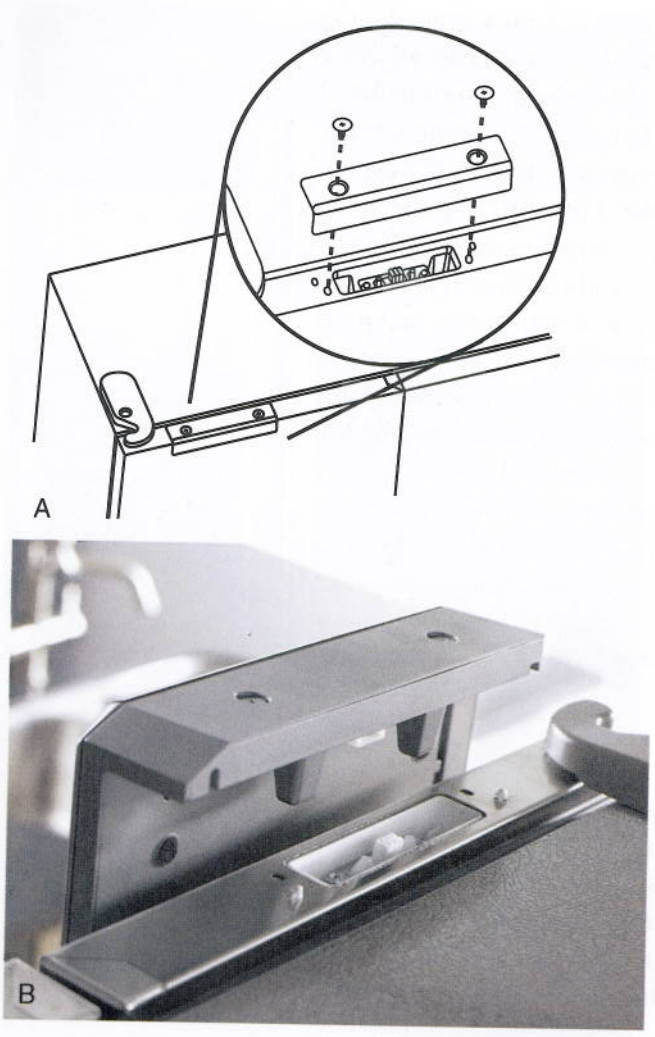

Figure 5-3
Centralpark accessory port showing the blueprint of two basic elements (A) of the system: (B) an electrical connector and mounting points. (Courtesy Whirlpool)

specific kitchen tasks this technology could enable. These included:

- Playing music
- Leaving messages to others in the family
- Watching videos
- Scheduling family activities

They created prototypes that explored design possibilities, and demonstrated their ideas to others in the company and to their potential partners. According to Jones, they eventually began to understand how they could make the technology meaningful and relevant. Simultaneously, they began to identify partner companies with experience developing products that satisfied these needs.

They evaluated which hardware interfaces supported the tasks they envisioned — what Jones called "hooks" into the system — and concluded they only needed to provide power and a secure way to mount a ten-pound device. They could have provided networking or a full computer system,[8] but this created more problems. Adding functionality might make the refrigerator more expensive, put the designers in the position of developing unfamiliar technology, and potentially lock the refrigerator into specific standards that could change much faster than the typical refrigerator replacement cycle. For a company taking its first steps toward creating a new kind of appliance interface, it was already a major step to create an open-ended power connector without explicitly specifying or manufacturing what would connect to it.

5.3.5 PARTNERSHIP

In a sense, the innovation in centralpark is more in its business model than in its modest implantation of power and mounting hardware. The connector opens the company to collaboration as much as it allows specialized devices made and branded by someone else to be considered part of a Whirlpool refrigerator.

[8]As other appliance manufacturers, such as Salton, were already doing.

The business of making attachments has little to do with the connector and more with Whirlpool's acknowledgement that it does not have to own all of the capabilities to create a good product experience. Just as it does not make its own stainless steel and glass, but collaborates with manufacturers with expertise in those fields, it does not have to master the development of information processing-based technology to create a good digital experience.

This business model reflects a shifting organizational understanding of how the design of products made with information processing is not limited to computer manufacturers. It recognizes that ubiquitous computing is now one of the materials in the designer's palette when creating the whole product.

The centralpark refrigerator premiered at the 2008 Consumer Electronics Show with a number of plug-ins (Figure 5-4) and began shipping soon thereafter. By mid-2008, centralpark had won several design awards and Whirlpool had announced a half dozen attachments from as many partners.

5.4 LESSONS FROM THE DESIGN PROCESS

> You can create renderings until you're blue in the face. The minute you build a physical instantiation of [an idea], you get people's hearts and minds behind it.
>
> *Charles L. Jones*

One of the ironies of the centralpark design process is that once again the unpredictability of the world undermined the best intentions. Whirlpool introduced the refrigerator in January of 2008. By December of that year, the United States housing market — one of the largest drivers of new appliance purchases — had collapsed. Housing market troubles smothered any user experience or business strategy success centralpark could have had, and by the 2009 Consumer Electronics Show there was no sign of the refrigerator in Whirlpool's product line.

Nevertheless, it is a successful user experience design. It overcame the problems of earlier and competing attempts to couple refrigerators with computers by staying focused on user needs and creating a technological and business solution to address those needs.

I believe that its success comes from a combination of factors:

- Involvement of top executives. The short timeline of the project and the rapid launch of the product required buy-in at the highest level of the company to free up resources. Without it, the project would have been a conceptual prototype for a trade show, rather than a shipping product.
- Focused functionality. The designers identified common kitchen tasks before they found technologies that could satisfy those tasks, rather than starting with technologies and trying to apply them to the kitchen. This approach let the team

Figure 5-4

Whirlpool centralpark plug-ins: (A) a digital picture frame, (B) an iPod dock, and (C) a glass message board.

concentrate on what they knew to be valuable for customers, to explain the value of their ideas to outsiders, and to find partners with appropriate technological products.

- Cross-disciplinary collaboration. It is the Platform Studio's job to see beyond product lines and brands, so the team included all the people who could design, describe, and prototype the user experience. This was crucial to understanding the constraints of the problem, distilling them to their essence, and explaining them to the specific division who manufactured and marketed the final product.
- Understanding the company's strengths and weaknesses. Jones said that they understood that making consumer electronics was not Whirlpool's strong suit, that they were appliance manufacturers and marketers.
- Rapid, iterative design with physical prototypes. The team did not get the chance to extensively iterate on the design, but once they decided on the core functionality, they developed a series of prototypes, and showed them internally.
- User-centered design. Jones calls Whirlpool's process "designing out from the user," and the centralpark team started with their knowledge of the fieldwork Whirlpool had been doing and the kitchen activities that fieldwork revealed.
- Using information processing as a material. By finding manufacturers who built products that solved specific problems, centralpark's designers were implicitly treating information processing (computation) as one of the design materials from which centralpark is made. They were not creating a computer-fridge hybrid, they were trying to create specific user experiences. Their choice of partners reflects this. The digital picture frame and the glass message board are treated similarly: each has a specific purpose and each attempts to best use the materials of which it is constructed. The message board's glass transmits light from the electric backlight. The picture frame uses information processing and wireless networking to update the photos in the frame.

> Had we not done centralpark and thought through the "apps" for it, we would not have realized this was never about hardware, but it was all about software (the app) and how to deliver that without adding more "hardware."
>
> *Charles L. Jones*

All of these factors came together to create a simple product that was inexpensive for the company to build, yet — in cooperation with other manufacturing partners — created a new set of interaction and business possibilities for an old class of appliances.

It also represents a bridge between industrial and interaction design. The attachments are analogous to software plug-ins or Web page widgets crossed with KitchenAid mixer attachments. Unlike KitchenAid's attachments, however, the interface is open, and Whirlpool encourages its use.[9] It is a small, but significant step. Just as the interfacing of audio components enabled by standard audio and video cable signaled the end of the monolithic stereo console centralpark points to the ability to renew an appliance with attachments.

[9] Although it does not seem to be on the latest models, so who knows.

In the 2010 product season, Whirlpool extended their centralpark experience of modularity to the software their appliances run. They provided different software on different appliances, aiming to match specific audience behaviors and needs with different applications, but explicitly not providing an open-ended computing platform. One high-end Jenn-Air model, for example, used its touchscreen to display an application that visually walks cooks through common tricky recipes, showing an image of what a medium rare roast should look like. This approach retains a high degree of applianceness, but gives their designers flexibility to explore new applications inexpensively. Perhaps someday they will even find an application that justifies incorporating a screen into a refrigerator.