A Carrier's Perspective on Creating a Mobile Multimedia Service

Looking at cell-phone connectivity from the other side of the screen.

Carriers sit at the center of the complex intercompany ecosystems that bring mobile products and services to the consumer mass market. In fact, to a large extent, carriers create, shape, and coordinate these systems. Carriers provide the large monetary investments needed to begin development and are responsible for creating and maintaining the long-term customer relationships that sustain products once they are launched. This article describes the creation of Sprint PCS Vision Multimedia Services launched in August 2004 from the view of the design team within the carrier. This view provides insight into how business and research constraints play out to influence the design of mass market services.

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Illustration by Lisa Haney

Designing for the Consumer Mass Market

Carriers seek to design and develop mobile products and services that are successful in the marketplace. Success follows only if the product solves customer problems or fulfills unmet needs. Furthermore, carriers only invest in products and services that operate on a scale large enough to recover the cost of investment and return a profit. The carrier's initial investments include:

- Product Development: Network and infrastructure built out on a nationwide scale. Usually measured in billions of dollars.
- Customer Acquisition: The cost of advertising, direct sales, payments to third-party resellers, and phone subsidies that reduce costs for the consumer. Usually measured in hundreds of millions of dollars.
- Customer Retention: The cost of customer care and ongoing product maintenance. Usually measured in hundreds of millions of dollars.

Within a carrier, mobile product and service designers are constantly reminded of these investments, and must act to ensure that products perform as expected for both consumers and business owners.

Technological and cultural change are the only "constants" in the work of mobile product and service designers. For example, in 1997, the only services that Sprint PCS provided were standard voice calling and voice mail. The most revolutionary product features were Sprint's digital network and the marketing offers that included "first incoming minute free" and "no contracts."

In the intervening years, much has changed in the wireless telephony realm. Customers can now browse the Internet, take pictures and video, send text messages, access email, download games, ring tones and screen savers, or watch live TV through their cell phones. In the U.S., Sprint tends to lead in advanced data service adoption, with more than seven million customers using wireless data services [5].

Creating the Ecosystem

Most mobile products and services rely on four key components to be successful, including:

- A business (billing) model that gels with the service's natural usage patterns;
- Devices that deliver new features that meet customer needs;
- Device-level applications that leverage the new features; and
- Content designed for consumption within mobile usage scenarios.

When we began work on the mobile streaming media service we had little or no information regarding device or content specifics. Thus, we focused initially on the business model and corresponding application design.

Research Constraints

At Sprint, we conduct customer research to reduce the risk of product failure. However, our ability to conduct research is often constrained by the novel nature of the product offerings that we pursue. In this case, we began high-level design activities for Sprint PCS Vision Multimedia Services nearly three years prior to the launch of the product. At that time there were no competitive products to benchmark against. DVD players or portable handheld TVs existed, but the market for portable DVDs was small and didn't reflect the usage patterns or product consumption process of mobile phone customers.

We also faced many of the issues identified by the Nokia team [2]. For example, mobile product consumption is characterized by infrequent and opportunistic use within an environment that doesn't often afford ethnographic observation. For example, the ability for a teenager to hide a mobile phone under a pillow makes sending text messages in bed at 2:00 A.M. a viable option.

Sprint's Marketing Vision

Today, there are two consumer screens: the television and the PC. Sprint's marketing vision was to create a third screen that consumers would integrate into their daily lives. This new screen needed to entertain and inform, and it needed to have an associated "cool" factor to support mass-market advertising.

We quickly recognized that the quality of the video stream would make or break the product's ability to entertain and inform. Before development began, we worked with our Technology, Research, and Development team to prototype the quality of the service in the lab. We did this to understand how the wireless data network parameters might influence the perception of streaming video quality within a mobile data network. Specifically, we varied frame rate and data network speed to isolate the minimum values that led to an acceptable customer experience for each type of content (such as Anima-

tion vs. Live Action). The results of these studies are presented in detail in [3].

The Business Model

Understanding the business model was critical to our success. Customers would purchase content on a per-event basis or license content through a monthly recurring charge. The user interface also had to support branding elements from the third-party content partners (such as the word mark CNN).

Technically, the service had to leverage Sprint's existing content vending infrastructure for payment and distribution. Reusing the existing infrastructure allowed Sprint to speed up development, reuse existing content licensing models, and leverage interface concepts established in our existing product set.

Figure 1. Final service design.

User Interface Design

We set out to create a user interface concept for mobile streaming media that would fit the business model and support content discovery and rendering. Initially, we investigated multiple interface approaches with different navigational schemes. We employed various informal and formal design techniques, including McGrew's Parallel Design Process Based on a Genetic Algorithm, to generate these concepts [4].

Some designs used a standard list view while others used side scroll navigation to access the content categories. We investigated category structures and the implications of nesting content within folders. We also needed to account for both real-time video streams and prerecorded clips. Above all, we needed to make sure that customers could get a sense of the video experience quickly, without a lot of cumbersome exploration.

Through the design and evaluation process, we decided that content providers would be assigned channel numbers (see Figure 1). By leveraging the concept of channel numbers, we were able to connect the novel mobile media service to the television experience that customers already understand.

We also leveraged prior learning to avoid mobile usability pitfalls. For example, we once released a version of our mobile browsing service that supported content navigation through a set of user interface tabs. Tab paradigms are well known and used frequently on wired Web sites. However, the tab design did not map well into a mobile phone where there are two soft keys, a four-way rocker key, and a select key. We experienced latency problems from multiple image files (including the images for the tabs). Due to poor performance, this version of the browsing service was quickly removed from production and replaced. In sum, our past experience allowed us to eliminate the idea of a tabbed user interface early in the design process, and we avoided using images unless they were absolutely necessary.

In our final design, the application parses an XML file to construct the user interface. This XML document is called the Media Channel Descriptor (MCD). The MCD allows Sprint to easily change the nomenclature and content tree within the user interface. For example, if CNN and FOX merged and desired to present their content side-by-side, we could easily adapt our mobile user interface presentation. The interface itself is based on a split screen grid.

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The channels that the user has purchased are displayed on top and the channels available for purchase are displayed underneath. The two grid spaces are separated by non-selectable information headers. Icons distinguish between the different media types and folders are used to depict hierarchies.

Design Validation

We conducted a traditional usability test to validate our design, which scored in the top 10th percentile and exceeded the participants' expectations regarding ease of use. Note, that as a carrier, we have augmented our usability testing program to leverage our unique position within the telecom industry. For example, the User Research and Metrics team at Sprint has norm-referenced our usability scale to other telecommunications products.

identifies some of the partner corporations within the streaming multimedia ecosystem that Sprint created. Both Sprint and the partnering organizations benefit from the cross-brand promotion enabled by these types of collaborations.

Research Opportunities

To create a profitable product, carriers must be able to anticipate the future or at least be very confident in their investments. Some carriers have made poor decisions (for example, those that bet on TDMA technology) causing them to replace a bad technology choice at great expense.

To improve the odds, carriers must deliver services that meet real customer needs through a user interface that delivers an acceptable experience. However, current customer experience research methodologies are limited in the mobile domain.

Figure 2. Advertising represents the ecosystem the carrier creates.

In addition to lab testing, we conducted market trials with early JAVA (J2ME) implementations of the streaming service to assess market acceptance. These applications pushed the limits of device memory and processor speed. In some cases the video stream could only produce frame rates of one or two frames per second. To our surprise, customers were willing to use these applications even though performance was sub-optimal.

Service Launch

On August 13, 2004, Sprint announced the launch of Sprint PCS Vision Multimedia Services, a service that offers streaming video and audio content available in the U.S. The Sprint PCS Vision Multimedia Phone MM-A700 by Samsung was the first CDMA device in the U.S. to deliver streaming audio and video content from familiar sources such as CNN, NBC Universal, FOX Sports, The Weather Channel, E! Entertainment, mFlix, Twentieth Century Fox, AccuWeather and 1KTV. In addition, on Nov. 10th, 2004, Sprint announced the Sprint PCS Vision Multimedia Phone MM-7400 manufactured by Sanyo.

The banner advertisement shown in Figure 2

For example, methods that make corporate desktop software successful are likely to provide underwhelming results when applied to the mobile products and services market. As described previously, some of the key challenges to research include the unpredictable mobile environment, unavailable or prototypical technology, and the pressing need to create interface designs early in the development process.

Many ethnographic techniques fail to overcome the infrequent usage profile for wireless services. Carriers report that voice usage averages about 600 minutes per month. Accordingly, during the course of an average month a typical user places about 20 minutes of voice calls per day. Wireless data services are used even more sporadically, making ethnographic observation difficult.

Research Informs Design

At Sprint, we have developed research programs that align and integrate traditional design and usability techniques with large-scale field surveys. These methods are well detailed in [1] and are summarized here.

We use large-scale surveys to understand the cus-

tomer experience throughout the product life cycle. For example, with the launch of Sprint PCS Vision Multimedia Services we will measure product usability and satisfaction through an extensive tracking program. Surveys will be conducted at two months, four months, and 10 months from first product use.

We use our field surveys to drive design and to prioritize new functions. We are also able to link survey results back to lab data quantitatively such that we can now model and predict the customer's real-world experience based on lab results.

Even with a robust field evaluation and lab testing program, driving design based on data is still difficult due to development timelines. For example, second-generation design iterations began for Sprint PCS Vision Multimedia Services prior to its public launch.

Conclusion

Wireless carriers faces a unique set of design and research challenges. This article demonstrates how carriers successfully design novel services 18 to 36 months prior to market launch. Keys to carrier success include leveraging prior knowledge about existing products and services, traditional in-lab usability testing and large-scale field research. The challenge remains to adapt ethnographic methods that are highly effective in other domains to the mobile realm. C

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