Mobile User Experience Issues and the Mobile Ecosystem

Full Report

THE MAP

As with nearly any high-tech commercial endeavor, the development and delivery of mobile services is accomplished through the interaction of several entities forming an industry ecosystem. In the United States, the ecosystem is dominated by five major carriers. This carrier-centric model has emerged in part because carriers own the network "pipelines" through which content and services are delivered. Like their predecessors the telecommunications companies did for many years, mobile carriers not only operate the networks, but they also retain control over the design and development of phone handsets, applications, and content through proprietary agreements. The carrier-dominated ecosystem also exists because of the fragmentation caused by multiple technological interdependencies among development platforms, operating systems, and network standards. However, mobile is a rapidly evolving area, and new models promise to emerge.

Understanding the mobile ecosystem is obviously important for those companies operating within it, and with time and experience people working in the industry come to understand at least those interdependencies that affect their work. But with the increasing ubiquity of mobile information exchange, there is growing interest on the part of thinkers outside of industry about the way mobile communication is experienced. Our research group falls into this category, and as part of our background work we felt it was important to understand the industry factors affecting the mobile user experience in order to be able to ground any recommendations that might arise from our inquiry. After a fairly exhaustive search of both academic and industry sources, we were unable to find a cohesive representation of the mobile ecosystem. The closest work seemed to be in value chain analysis, but even then the representations were limited to just the factors of interest around a specific outcome.

The knowledge map *Mobile User Experience Issues and the Mobile Ecosystem* is the result of our efforts to create the missing representation. This map will inform our continued research efforts by providing a basic understanding of the mobile ecosystem, framed in terms of user experience issues rather than revenue models. It is also a beginning. Because of the wide swath of user experience issues in the mobile realm and the complexity of the interdependencies that affect and are affected by them, this map has been intentionally limited to top-level paths and synopses of user pain points so that the larger picture is the focus. Each user experience area identified and each path of interdependency is rich with opportunities to explore and express narrower and deeper relationships.

Knowledge maps are a topic that has been explored extensively by Robert Horn. Among the benefits of mapping he has identified, the following are important in this application:

- Showing the logical and visual structure of relationships.

- Keeping the big picture from being obscured by the details.

- Allowing more rapid analysis of the subject matter.

- Helping to structure the flow of complex discussions.

- Increasing appreciation for the complexity of the issues.

Outside of our research efforts, we hope that the map will be useful to others who are exploring the mobile user experience by collecting the threads explored in the literature into a local vocabulary. At a time when the mobile user experience landscape is exploding well beyond the boundaries of voice and text and into internet and multimedia capabilities, understanding the way that humans experience the technology is crucial. The time when users are willing to put up with bad experiences on their mobile devices is rapidly coming to a close – and for early adopters, it is already over. Designers and developers will no longer be able to just throw out ideas to see what sticks, and the complexity of the mobile ecosystem will continue to present challenges. Successful products will be developed out of an understanding of what user goals need to be met, where there is room for innovation and change, and how user delight can be fostered. This map and the representations it may parent can help designers to identify those places.

POSTER TEXT: USER EXPERIENCE ISSUES

Plan cost

Billing schemes can be difficult for users to decode. When per KB or subscription data costs are added to already confusing plans, users may hesitate to sign up for additional mobile services, or hesitate to use data services for fear of high monthly bills.

Two year contracts and financial incentives making it cheaper to call people served by the same carrier causes users to feel locked in and/or manipulated by the carrier.

Multimedia services are expensive, so users have high expectations for them.

Network quality

Users differentiate between carriers in part based on perceived network quality. If they experience dropped calls they may be concerned that data transfers will be disrupted. This will be of particular concern if they are paying per KB.

Video requires a higher level of bandwidth not yet available to mainstream US customers or offered only at premium prices. In many cases video is slow to display or play.

Phone choice

Especially when purchasing more expensive phones, users want to optimize phone features such as storage/memory, form factor, and battery life. However, users often can't use the phone they prefer with the service they prefer (or are contractually bound to).

The display format and quality of rich media varies widely across devices.

Standards are changing rapidly, deterring users from purchasing expensive handsets that will quickly become obsolete.

User interfaces

User interfaces are not designed collaboratively among carriers, application developers, content providers, and phone manufacturers. The interactions, interfaces, and conceptual models can be different for each item the user comes in contact with, creating a steep learning curve.

Content and Application UI: The amount and layout of content from different providers is not always consistent across all categories of content. Applications generally do not behave in a consistent manner. Different screens may have different information structures and learning patterns, creating more cognitive work for the user.

Phone UI: Input controls are inconsistent from phone to phone, making it difficult to design an experience that will work across all phones. Screen displays vary significantly (width, depth, and resolution), requiring multiple versions of screen layout and visual elements for any application. The same application or site may look and behave very differently from phone to phone.

Content access

Carriers determine which content is available to subscribers through partnerships with content providers. This increases information efficiency, but it also means users need to consider which content partners a carrier has deals with in order to determine which will serve them best.

Most carriers do not allow users to browse the world wide web on their phone easily. Marketing and sales information promising "the Internet on your phone" is misleading. Users are disappointed and frustrated at paying a premium when the service does not match their expectations.

If a phone is WAP-enabled (wireless access protocol, allowing the user to access the World Wide Web through a browser), per KB data fees may be charged on top of subscription costs or additional data service charges.

Applications

Agreements between carriers and application providers determine which applications are offered on which phone, limiting user choice.

Applications are often bundled, or aggregated, into branded products such as Yahoo Go, including applications such as search, IM, maps, email, etc.

Third party applications may not be compatible with other applications on the phone (such as contacts), causing user frustration.

DISCUSSION: ECOSYSTEM INFLUENCES

Most of us in the United States carry phones that we have purchased through our carrier (Cingular, Verizon, Sprint, T-Mobile, or Nextel) along with a service plan that includes a certain number of minutes that we can use voice services. We generally sign up for two-year contracts so that we don't have to pay full price for the phone. When we are choosing a phone, we weigh available features against the cost of the phone itself. At the same time many of us are beginning to consider adding data plans so that we can access web content and send multimedia messages, which is again an additional cost we must consider. The phone we choose also depends on our need for these capabilities. When we move beyond free or inexpensive phones to more robust models, we become less forgiving of bad interfaces, and concerns about our daily experience navigating all of these services we will have access to begin weighing more heavily on our decision-making process.

This scenario is a familiar one for mobile phone consumers. The fact that users are faced with such complexity and a high potential for frustration even *before* they begin using mobile data services is worthy of attention, as it is becoming less acceptable as mobile technology becomes more ubiquitous. This moment I've described, when a user is purchasing a new plan and phone, is a crucial point in the fierce competition for user loyalty. Many carriers are beginning to realize that user interface design is a commercial imperative: "Both mobile operators and manufacturers see a well-designed and emotive user interface as a way to differentiate their otherwise 'me too' products from competitors." (Williams p. 36)

In the mobile sphere, the notion of the user interface is an interesting one. Because of mobile's relative newness as well as the multiplicity of players in the game, there is no one interface paradigm that has emerged for mobile screens. This situation is akin to the early days of the web, when links were often embedded within the narrative text of given page, and any site structure was expressed in list form. It wasn't until there was a significant proliferation of pages on the web that conventions such as listing structural links on the left side came into being. Currently, mobile navigation structures are emerging, at the same time that they are grappling with existing user mental models around the online experience. Because the mobile screen experience is so much smaller, the web paradigm does not work in the same way. Also unlike the internet, there is no standard technology for these interfaces, nor can developers count on similarity among phone inputs.

Application developers face significant challenges in the mobile environment, grappling with the constraints imposed by operating systems and development platforms:
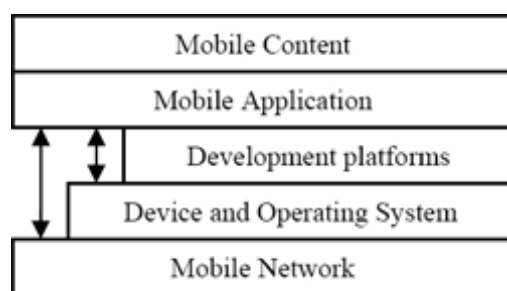
Mobile Content and Application Development Interdependencies (Tarnacha et. al.)

"An important source of these [development] challenges is the technical interdependencies across the mobile value chain that a functional application must contend with. That is to say that typically a mobile application is restricted to a particular combination of development platform, operating system, device and network, depending on the functionality-providing resources used at every level." (Tarnacha et. al., p. 590)

Phone manufacturers are also part of the dependency chain, since in terms the particular structure of individual phone inputs changes the way that an application interface must operate.

Carriers are the arbiters of these restrictions for a number of reasons. First and foremost, because they control the network technology on which the phones must operate, they have influence over this part of the ecosystem. Only phone manufacturers who have entered into business agreements with the carrier are able to submit their products to be encoded to operate on the network. This relationship in turn presents the design environment for application and content developers, both in terms of interface and technology. In this way carriers can control revenue streams. Carriers are also in competition with other carriers, so they have a vested interest in pushing their brand in all aspects of the user experience. Because of their brand ties, they also have an interest in ensuring quality controls over applications served on their phones, so they manage certification processes that application developers must follow and pass. The web gets even more complex when the carrier hires an agent company to handle these or other operations. Mobile virtual network operators, mobile virtual network enablers, and aggregators all represent another layer in the mobile ecosystem. The end result is that interface design is a fragmented activity. Even though carriers *could* leave interface design up to the application developers, they actively leverage their ownership over the network to control both design (for the reasons stated above) and product availability. On the developers' side, it is simply not cost-effective to build for multiple combinations of platform factors, so they choose to enter into agreements with carriers for select phones.

It's not hard to see how user interface design and user experience considerations are challenging in this ecosystem. The interface presented to the user is the result of a combination of the work of phone designers, application developers, and content developers. A developer team may be designing from a functionality stance, but a carrier design team will want to focus on directing users to revenue-generating features such as multimedia messaging or content downloads. A phone manufacturer's design team will have different objectives still, perhaps focusing on making the most likely task easily accessible regardless of its revenue-generating potential (Williams p. 36-37)

FUTURES

Because the mobile environment is relatively new and growing rapidly, changes that are currently on the horizon may create new relationships or areas of inquiry for the mobile user experience ecosystem map.

Wi-Fi enabled phones and VOIP

The potential of wi-fi enabled phones threatens carrier controls on content revenue streams. In the current model, the mobile internet is not really the free internet. Though access to

internet content via URLs is possible, the mobile internet we see on phones today is really more of an intranet:

> "Mobile Internet actually refers to two types of data networks: intranet as well as true Internet. First, all mobile operators provide their own proprietary data services, which typically entail services such as ringtones, IM, games, news services, e-mail, and other applications. We may perceive such service offerings as large intranets (a.k.a. the 'walled garden'), as only the particular operator's customers may access these services." (van Gorp p. 4)

The majority of carriers provide browsing capabilities as well, but they discourage use by adding high data charges for access to the subscription fee which already covered the data services in their walled gardens. Phones must be WAP (wireless application protocol) enabled in order to access the internet, and carriers often bury these settings along with any browser capabilities in the menu hierarchy. If phones in the future can operate on wi-fi networks just as laptop computers do, however, carriers no longer have control over the "pipeline" and life will be very different. Apple's iPhone is the harbinger of this change, and while it still operates on cellular networks for voice applications, it or another phone could very well be configured to use VOIP (voice over IP) technology for voice functions in cities with fairly ubiquitous wi-fi coverage.

Open frameworks for application development

Open source software and other efforts at reducing friction in the mobile development environment may gradually bring new ways of developing applications to the forefront. Using open UI software such as Mobile-Linux, J2ME, Symbian, and Flash Lite as well as participation in new "hardware agnostic" software development activities will give application developers more control over core UI development (Williams p. 37). The greatest effect will most likely be in removing a major barrier to developing applications for multiple platforms and phones, freeing application developers from single-carrier agreements and bringing high-demand applications to more users.

One example of an open, "hardware agnostic" framework is Tegic's recently announced SmartScreens, an open mobile software application framework that provides an integrating background for application development. Tegic's goal with this product is to eases the development load while remaining highly customizable:

> "Companies can leverage the SmartScreens software application framework to bring exciting new wirelessly connected devices, content, and services to market faster,

without developing essential components themselves in a form and function of their own choosing." (Tegic SmartScreens website)

Co-design

A reality of the mobile ecosystem is that applications that might resolve user needs or provide truly innovative experiences are not developed due to development complexity. In a world where use beyond voice and text messaging is limited to a relative few early adopters, there has not been a large effort toward really outstanding interface design. However, the explosion of multimedia feature use in the US is starting, and we have as a predictor of what is to come the Asian market. There are some significant differences between the Asian and American mobile ecosystems, not the least of which is that network operators in Asian countries are much more willing to resell airtime to virtual network operators, who then market their own brand and user experience. In Asian countries the competition for user loyalty is intense, and user interface is emerging as "a commercial imperative: Both mobile operators and [phone] manufacturers see a well-designed and emotive user interface as a way to differentiate their otherwise 'me too' products from competitors." (Williams p. 36)

Additional deterioration of the major carrier model is occurring as virtual operators sidestep major phone manufacturers in favor of working with low brand-equity manufacturers, who are willing to accept a greater degree of control and customization requests from the operator. The burden of design exists in a different weight balance, and provides an opening for a more collaborative design model. This "co-design" model is emerging to address the need for "killer" interfaces in the tough Asian market, and a new set of design methods is emerging. The continued fragmentation of the US market, as well as an equal need to differentiate the user experience, may well look to co-design as a rational next step. By relinquishing a small amount of control and working in the bigger picture of meeting user needs and providing them with delightful product interactions, US carriers may find that co-design carries them forward.

FURTHER EXPLORATIONS

- **Gathering user perceptions of problems:** Who do they blame? This information could inform future iterations of the map, or be juxtaposed against the relationships that have been outlined based on literature review and industry knowledge. Data might be gathered by interviewing customer service managers at carrier call centers in addition to users.

- **Going deeper:** There are many areas of the poster than could be expanded upon and expressed as branches or overlays. Each of the user experience issue areas could benefit from further detail in mapping out interdependencies among players, especially the already complex *Applications* section.

- **Developing better visual representations:** This iteration of the map is a simple boxes-and-arrows visualization of a complex set of relationships, drafted by a researcher with no graphic design background. A researcher with information visualization and/or graphic design skills could express greater visual granularity while maintaining clarity and composition.

  o Some relationships are not one-to-one, and some interactions actually exist on more than one level. Paths between entities could be represented with more variety as to the *nature* of the relationships.

  o User pain points are buried in narrative text; some visual treatment with color or other differentiation could make them pop out more.

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