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Student Preferences for Mobile App Usage

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Overview

The future of learning is mobile, whether it is a simple delivery technology or something that enables a new method of instruction not yet possible. This is the future that many of us see. Less clear, however, are the steps necessary for getting us there, given the options for how best to deliver mobile learning applications to students.

The development of mobile applications generally falls into two categories: those designed to be device-neutral and delivered via a smartphone browser, and native apps developed for a specific mobile platform such as iOS or Android. A reasonably defensible technical argument can be made for moving in either direction, which is why an additional point of view is needed. The intent here is not to pronounce either as better than the other. Each has its merits. Rather, the intent is to identify those areas where one approach might better enable the desired functionality.

In the debate over "native versus neutral," what do students prefer? Is a student's preference for a mobile learning application related to the nature of the information provided or the activity performed? This research bulletin examines a study conducted by Purdue University regarding student mobile preferences. The study provides insights into how students prefer to consume information on their mobile devices, ranging from broad categories to coursework-specific areas of interest. Additionally, a brief case study of Purdue's own mobile development activities illustrates one example for how this information can be practically applied. The information detailed in this research bulletin is intended to help inform future mobile application development efforts, as well as establish expectations for companies with which institutions do business.

Highlights

A survey of student mobile application use was developed and distributed during the fall 2011 semester at Purdue University. The survey consisted of 32 questions broken into three sections: demographic information, general mobile application usage, and educational mobile application usage. The survey was tested by a small group of students to evaluate the instructions and language used with each question. For this survey, it was particularly important that the respondents had a clear understanding of the difference between native mobile apps and browser-based apps. Anecdotal feedback from the students who tested the survey suggested confusion around the term "mobile web app." Initial student responses indicated that the term "app" would typically refer only to a native app. For example, one student asked, "What does this [mobile web app] mean? Like you have to get the app first through the browser? Or the app takes you to the website?" For this reason the survey consistently referred to accessing information using either a "mobile app" or a "smartphone browser."

The demographic section of the survey collected information related to age, sex, ethnicity, and year in school. This section also included the type of smartphone (Android, iOS, BlackBerry, Windows, Symbian, etc.) the student owned. Those who did not own a smartphone were rerouted to three questions related to plans to purchase a smartphone or tablet device.

The general mobile application usage section explored specific items related to how students use the apps on their smartphone: the number of apps downloaded, amount of time and money spent, and their overall experience level using a smartphone (from novice to expert). Additionally, students were given 12 categories of mobile applications and asked to indicate whether they had a preference for a mobile app or a browser-based app for that category. The categories included a broad range of topics including games, social networking, news, entertainment, and education. The list of categories was derived from the overlapping categories in the Apple App Store and Android Marketplace.

The educational mobile application usage section collected information about student preferences specifically related to coursework. Students were presented with 18 specific tasks, for which they could indicated a preference for mobile app or browser app. These tasks provided a representative list of actions that a student might typically perform, including accessing a course schedule, reviewing course announcements, sharing documents with other students, taking course notes, searching for course resources, and finding the answer to a question during lecture.

Results

Distributed in September and October of 2011, the survey was made available to all 39,000 Purdue University students. Survey invitations soliciting participation from students who own smartphones were made via announcements within student-centric communication channels such as the student information system and campus computer labs. A total of 1,566 students responded to the survey—a 4% response rate.

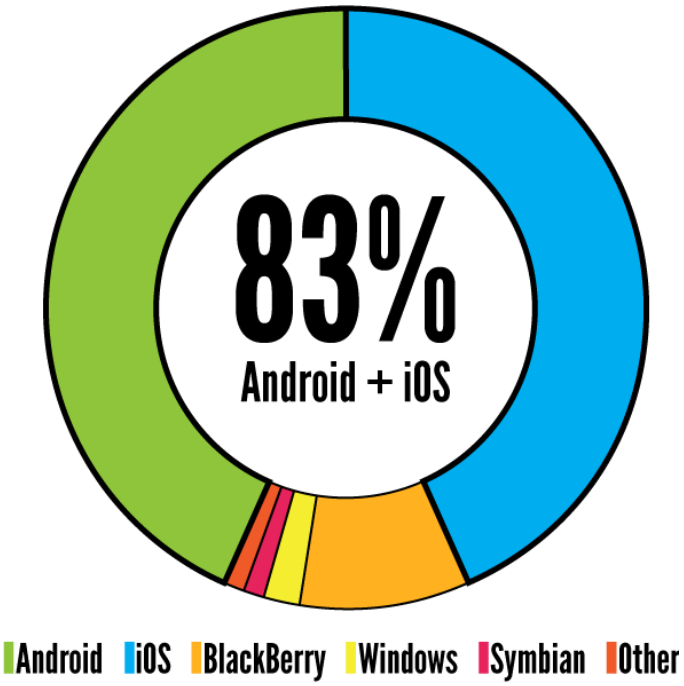
The survey received responses from a diverse group of students. In general demographics, 38% of respondents were female, compared to 42% of all enrolled undergraduate students at the university. Respondent student levels were also comparable to university enrollment, with freshmen representing the largest proportion of respondents (31%).

Findings

Android and iPhone Dominate Device Ownership

Student device ownership was largely focused on two smartphone platforms, Android and iPhone, which together represented 83% of the survey responses—Android (43%) slightly edged iPhone (40%). It is important to note that while iPhone represents a specific device, Android represents many different devices and manufacturers. The survey did not explore specific devices or version numbers. Figure 1 shows the percentage of response by platform.

Figure 1. Student Device Ownership



Students who currently own smartphones favor the Android and iPhone platforms, and this preference continues when comparing smartphones that students plan to purchase in the next six months. Of those planning a future purchase, nearly half (49%) plan to buy an iPhone and a third plan to buy an Android smartphone. The next most commonly owned device identified was BlackBerry, representing 9% of the responses. Among students who own a BlackBerry, 59% plan to purchase a new smartphone in the next six months, and only 8% plan to buy another BlackBerry.

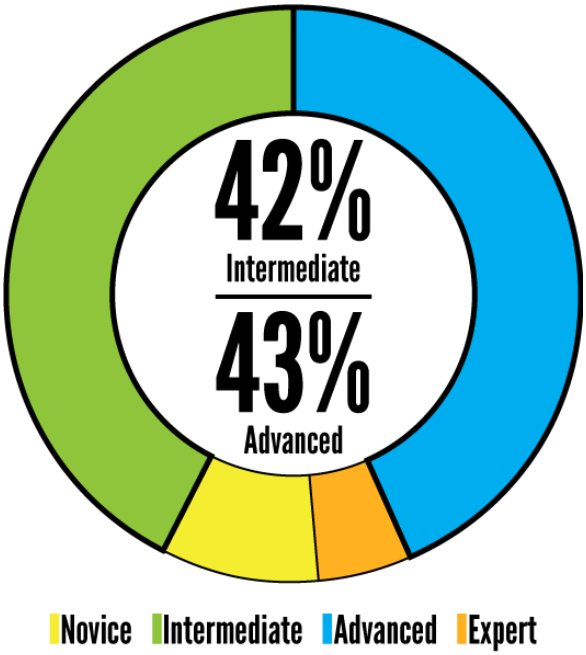
Students See Themselves as Skilled Smartphone Users

Students were asked to characterize their level of smartphone usage based on a common set of descriptions. The following descriptions were based on length of ownership and characteristics that describe the level of usage.

- **Novice:** I have only been using a smartphone for less than six months and only have a few apps installed. I use my smartphone for calls, texting, and e-mail.
- **Intermediate:** I have been using a smartphone for more than six months. I occasionally download apps when I have a need or when my friends recommend something new.
- **Advanced:** I have been using a smartphone for two years and have installed and used a variety of different apps. I often install many of the same type of app to evaluate differences and make recommendations to my friends about the best apps.
- **Expert:** I have developed my own mobile apps.

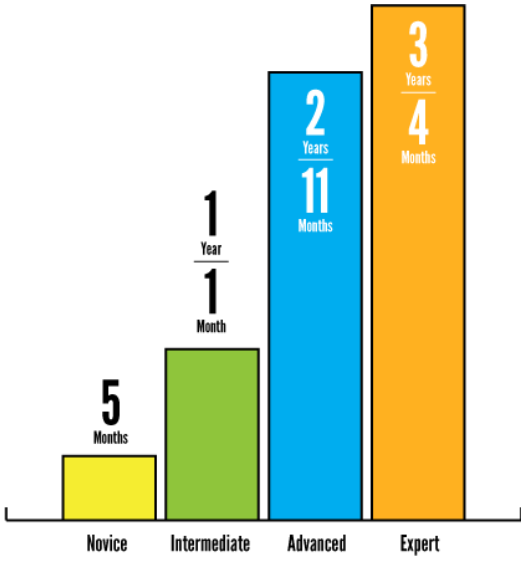
When asked to categorize their level of experience with smartphone usage, 85% of students identified themselves as either intermediate or advanced users (see Figure 2).

Figure 2. Level of Smartphone Usage



The student's level of experience is also positively correlated with length of ownership (see Figure 3). When comparing phone ownership with year in school, we found that freshmen have owned a smartphone for an average of nearly two years (1 year and 10 months). However, almost one-third of freshmen (32%) had purchased their smartphones within the previous three months, suggesting that a significant number of incoming students' purchases of smartphones coincide with the start of fall classes.

Figure 3. Average Length of Ownership, by Level

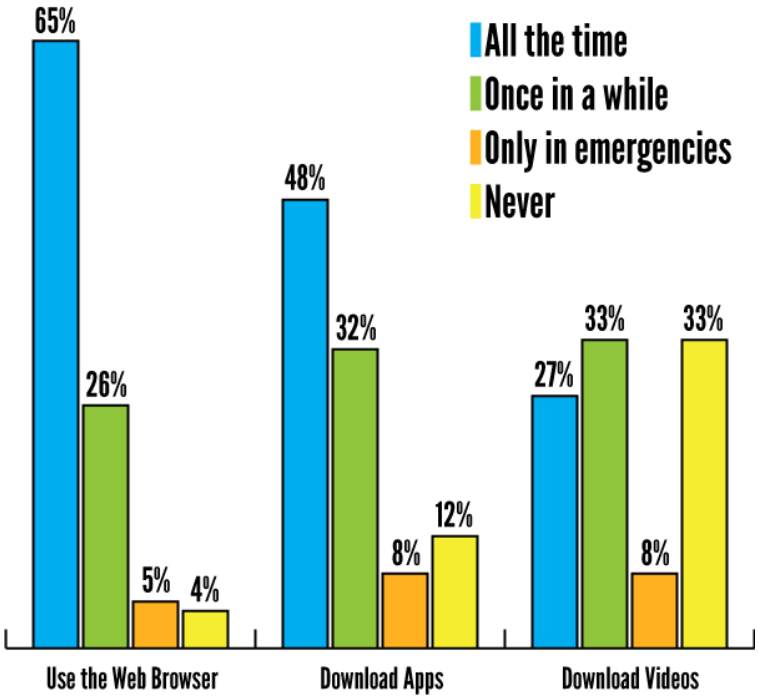


For Mobile Usage, Connectivity Matters

Mobile devices can typically connect through Wi-Fi or cell networks, and understanding how students consume mobile bandwidth is important to watch as major carriers move away from unlimited data plans and the cost of bandwidth increases. Further exploration is needed to identify the total cost of ownership (mobile app price + bandwidth) for mobile app usage.

This survey used three common tasks as a method to characterize data usage: web browsing, downloading apps, and downloading videos. Figure 4 provides some insight into how smartphone connectivity through cellular networks impacts student consumption of data for these tasks. The majority (65%) use a web browser all the time. However, that number comes down slightly for downloading mobile apps, which could be because some mobile apps, due to their size, can be downloaded only via Wi-Fi. Access to Wi-Fi also impacts consumption of video via smartphone; one-third of students indicated that they would never download a video when not connected to Wi-Fi.

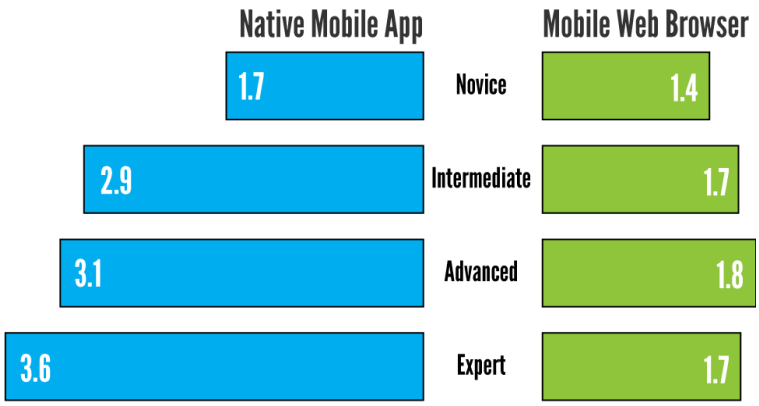
Figure 4. Mobile Activities over Cell Networks



Students Prefer Native Apps for Most Mobile Activities

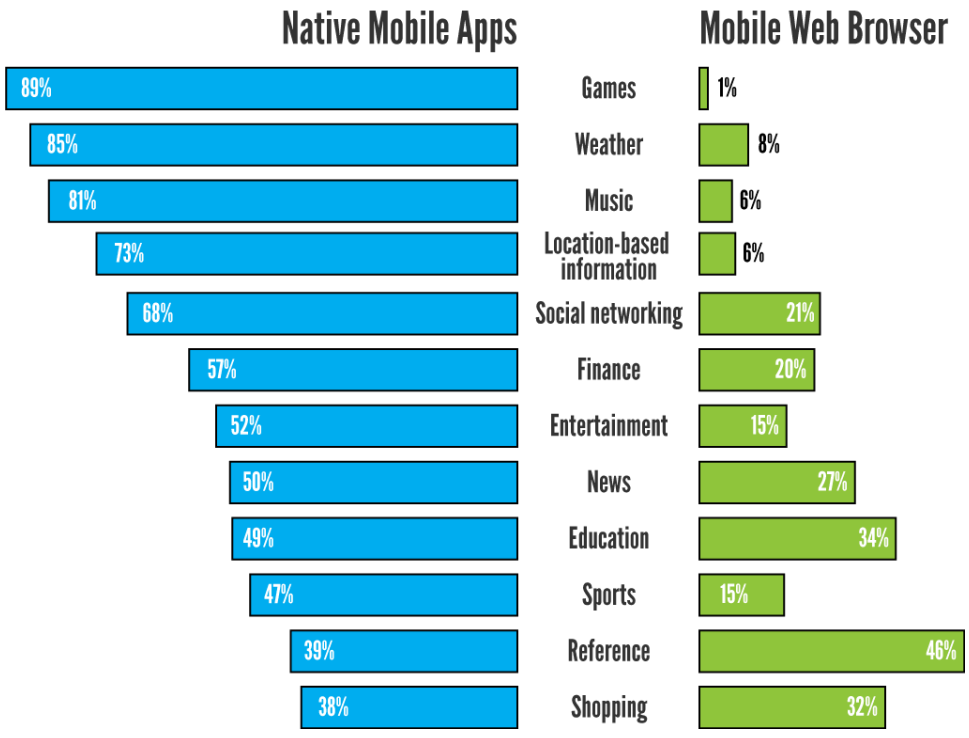
The survey asked students to report the relative amounts of time they spent using mobile apps versus using a smartphone browser. Figure 5 indicates how the average daily use times compare when separating by level of smartphone user. Overall, students reported spending more time using mobile apps, and as students become more advanced in their use of smartphones, the gap widens—the amount of time spent using mobile apps increases, while the amount of time spent using a smartphone browser remains relatively consistent.

Figure 5. Hours of Student Daily Smartphone Use



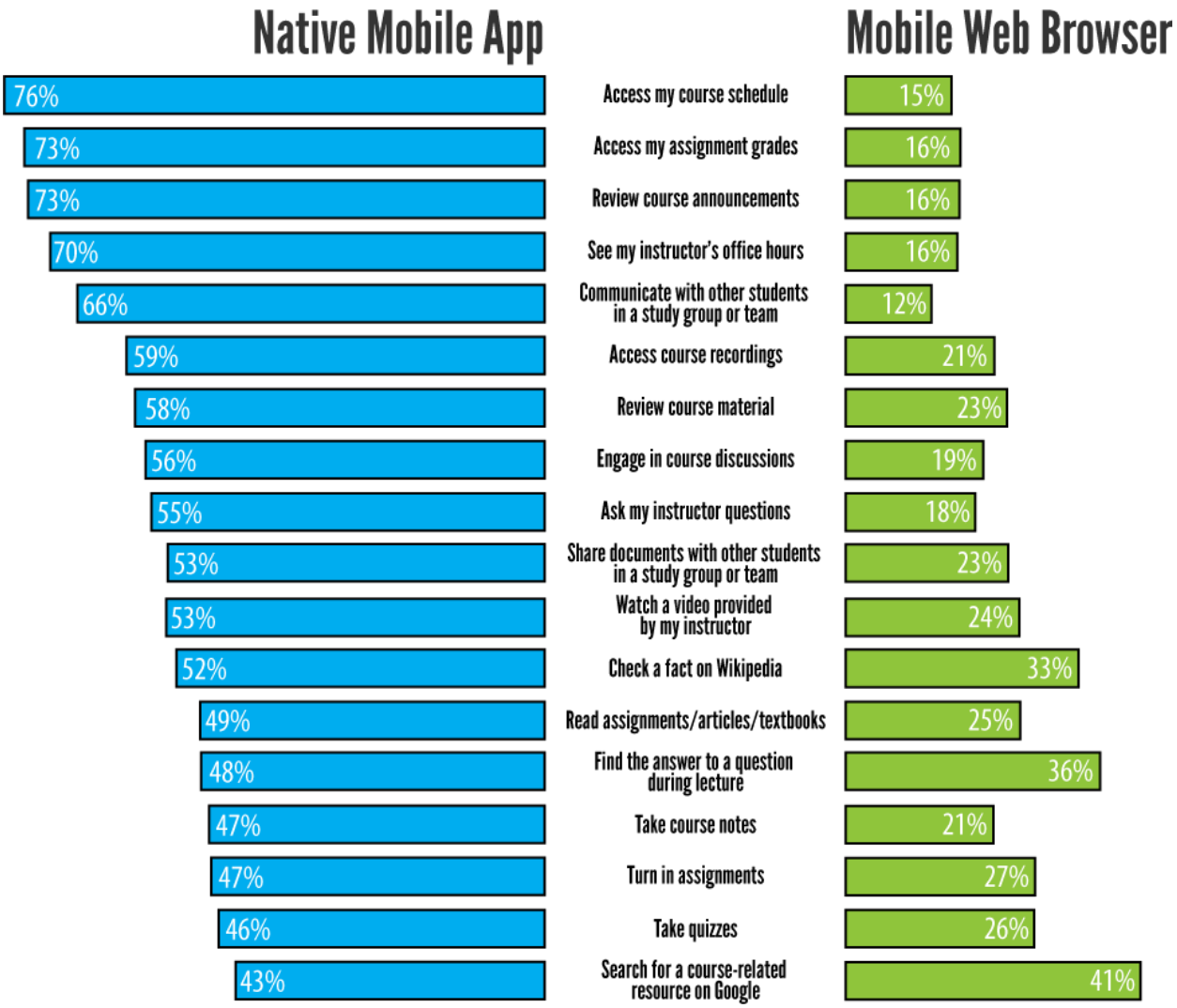
For a list of 12 categories of mobile functionality, students indicated their preference for "mobile app," "mobile web browser," "no preference," or "don't engage in this category of activity." The list of categories was derived by comparing common categories of apps in various popular stores and marketplaces across different mobile platforms. Figure 6 illustrates how students' preferences split between mobile apps and smartphone browsers. In 11 of the 12 categories, students preferred mobile apps. The widest gaps were for games (89% to 1%), music (81% to 6%), and weather (85% to 8%). The closest area of preference was in shopping (38% to 32%). Students indicated a preference for using a smartphone browser in only one area, reference, but only slightly (46% to 39%).

Figure 6. Student Preference for Mobile Access by Functional Category



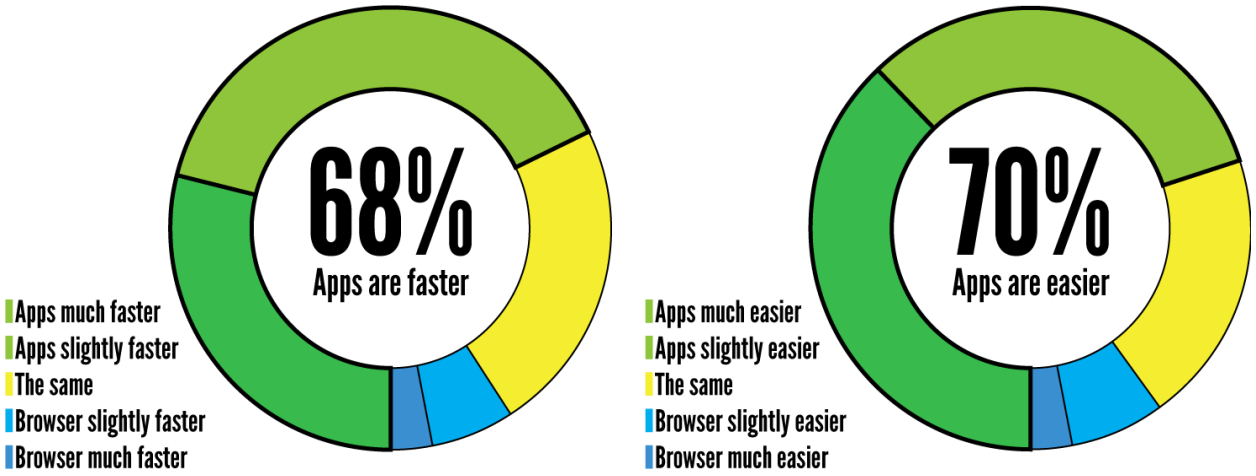
The survey also explored 18 specific tasks that students might perform with a smartphone as part of typical coursework. Figure 7 shows how student preferences split on how to accomplish each task. In all 18 categories, students preferred mobile apps. The closest relationship was related to searching for course-related resources. This comparison is similar to the responses provided when exploring the more general categories of apps described above.

Figure 7. Student Preference for Mobile Access by Course-Related Task



The survey asked students to evaluate the ease of use and speed of accessing information on their smartphones. The largest percentage of students indicated that mobile apps are both faster (68%) and easier to use (70%) when compared to accessing information via the browser (see Figure 8).

Figure 8. Speed vs. Ease of Use



Case Study: Studio

In 2009, Purdue University began the Studio initiative to develop new learning technologies designed to capitalize on the expanding use of mobile technologies by students. The approach was directly focused on partnering with faculty to create a new generation of technologies that didn't exist in the market and that could be designed to improve student success. Each project reexamined some aspect of the learning experience—collaboration in and out of the classroom, video-based assignments, and, most recently, the course e-text. For each project, mobility was a central aspect. As we progressed through each project, it became increasingly important to better understand how students prefer to use their mobile devices, leading to the study described in this bulletin.

The development of this technology used a strategy popular among start-up companies called the Minimum Viable Product, or MVP. The MVP is a product in which only the core functionality required to accomplish the project's goals are developed and deployed. In practice, this means that long-term goals are sacrificed in favor of immediate customer feedback that can help drive future development of the tool. It also makes it possible to invest in multiple and diverse projects, conducting experiments over a broader range of instructional challenges.

The Studio Projects

Engagement is a key aspect of any student's academic success. Activities such as discussing coursework outside class and working with other students on projects are correlated with academic performance. Increasingly, students have been turning to mobile and social tools for enabling this discussion.[1] Because students come to these tools on their own, they are left to

find creative ways to bridge the divide between their personal learning environments and the one provided by an institution.

To facilitate student collaboration, Purdue developed a series of mobile tools for use inside and outside the classroom. These mobile learning applications were designed to take advantage of the connections and devices most common to students:

- *Hotseat*: A collaborative micro-discussion tool that allows students to provide near-real-time feedback during class by posting messages using their Facebook or Twitter accounts, sending text messages, or logging in to the Hotseat Android, iOS, or web application.
- *Mixable*: A learning application that builds connections by blending a student's course enrollment information with his friend network in Facebook. Mixable enables students to build and share their personal learning environments by using the tools with which they are already familiar—Facebook, Twitter, and Dropbox. This system is presented as Facebook, web, and mobile apps for Android and iOS.
- *DoubleTake*: A mobile video platform that enables students to capture video with a smartphone and share that video with other students and instructors within minutes. Student-captured video can also be automatically submitted for course assignments and peer evaluation.
- *Jetpack*: An Android, iOS, and web application that offers an alternative to texts, course packs, and class handouts. Jetpack enables instructors to build mobile-ready learning content from a variety of media and resources. In addition to traditional readings, Jetpack delivers video, audio, popular document formats, student self-assessments, and HTML5 applications. All are kept up-to-date wirelessly and delivered to the student's smartphone, tablet, or laptop.

Through the development of these tools, much has been learned about how to approach developing mobile technology and its implementation within the classroom. In addition to providing students and instructors with new functionality, mobile applications can form a new underlying infrastructure for assessment. Each tool collects and stores analytics for each user. These data can be combined with grade book data to measure mobile application use in relation to specific assignments or overall course performance, making it possible to measure impact on specific learning outcomes.

Technology Issues Related to the Study

When development of the first studio project began in 2009, the university took the position of developing exclusively for the web and not pursuing native apps. This is a popular approach to mobile development. The report *Mobile IT in Higher Education, 2011* noted that only 24% of institutions take a mobile-web-only strategy.[2] The browser on most smartphones was capable of delivering the functionality needed at the time, and it would enable the application to operate on the widest number of devices while using the technical skills that already existed within the institution.

As the first application, Hotseat, went into usage in the classroom, we almost immediately observed that the students didn't intuitively make the connection that the tool could be used from their smartphone. This was investigated a bit further by interviewing the faculty and

gathering feedback from teaching assistants. We discovered that a simple prompt from the instructor was enough to initiate further adoption. An additional explanation that the web application could be accessed via the browser on their smartphone was necessary because many students instinctively checked the App Store and found no corresponding app available.

Performance of the web app was also slow. The nature of Hotseat was such that students needed almost immediate access to the backchannel conversation. This near-real-time discussion was difficult to enable reliably using a web browser.

As we moved forward with new projects that had more complex functionality, such as Mixable and DoubleTake, it was clear that the necessary functionality could only be provided through a native mobile app. Specific functionality such as access to the device camera and the ability to manipulate video and upload files were either impossible or too difficult to use through the browser.

As a result of these projects, we adjusted our approach to include native mobile apps as a central aspect of each Studio project. The study detailed above was conducted to help drive decisions on where efforts should be focused. The move to native apps was a complex one, requiring the expansion of new competencies within the development team, as well as seeking ways to expedite the approach.

Native Development

The move to native development brought with it a series of experiments, missteps, and lessons learned. Methods that worked well in experiments didn't work well in production. And things that seemed too good to be true turned out to be just that.

There are two general approaches (with much variation) to developing a native app: native development, and mobile development frameworks, such as PhoneGap and Appcelerator Titanium. Native development is using the native language of the platform to program the app. In the case of iOS, this is Objective C, and for Android, it is Java. In contrast, mobile development frameworks enable developers to build native applications using a common toolset that is typically based on common web development languages such as HTML5, JavaScript, and CSS3. Frameworks also support more than one mobile platform, whereas native development is focused on developing for one platform at a time.

For Studio projects, we experimented with the frameworks by developing proof-of-concept apps. The experiments yielded positive outcomes, prompting us to put Appcelerator's Titanium framework immediately into practice to build native apps for our next two projects. Four native apps—two iPhone and two Android—were completed, available on their respective devices, and used actively with classes.

Unfortunately, this proved to be the wrong approach for mobile apps that would be used broadly. As expected, developers were able to learn how to develop using the mobile frameworks. However, a lack of effective debugging tools, even those provided with paid support, caused development to take longer than expected and resulted in a high level of frustration. The frameworks did allow us to develop for two platforms, but due to differences between them, heavy modification was needed to operate successfully on both platforms. Lastly, the overall performance of the apps was lacking. Bugs in the framework translated into bugs in our apps, causing slow speeds and frequent crashes for unknown reasons.

The frameworks aren't without merit. From this experience, it is possible to develop prototypes, proof of concepts, or very simple apps quickly. However, native development tools are quickly catching up in this regard. Apple's Storyboarding feature available in the iOS 5 SDK can enable this same type of speed-to-market approach.

The greatest regret was that with the time spent learning the frameworks, development staff could have been developing the capacity to program natively. This competency has since been developed within the group.

What It Means to Higher Education

As Tim Berners-Lee commented on a public W3C mailing list, "If I can't give power to [web] apps, then the web app platform cannot compete with native apps." In many ways, this statement describes the technical differentiation between native and web-based functionality. However, it also describes the difference in each user's experience. On the surface, it almost seems unfair to directly compare what is technically one mobile app (the browser) versus an entire catalog of mobile apps. But the mobile browser is more than just a mobile app. It is a virtually unrestricted platform from which any type of information can be delivered. A fairer way to describe this is as a comparison of native mobile apps versus the web as a whole.

The comparisons in this study were intended to explore how students use their smartphones. Many of us who own smartphones have our own biases about the best ways to consume information and the best apps to achieve a desired goal. Understanding students' preferences informs how an institution can move beyond providing mobile access to services. This understanding might also influence the creation of new services that will help students be more successful. As institutions seek to provide mobile services to students, these findings provide insights into best practices for content delivery in a mobile environment.

Discoveries made through this survey in many ways supported what has been observed in the classroom. There is a strong preference, in almost every way, for using native mobile apps. It could be that Apple's marketing campaigns have made the mobile app top-of-mind, and the user experiences of native apps being faster and easier have only solidified this idea. Even though a web app might provide the same information and experience, it is still not an "app" that is downloaded and installed from the App Store or Android Market.

The greatest challenge in observing smartphone use is the rate of technological change. Even during the brief period when we collected responses, new devices were being launched. However, as this study found, students are largely coalescing around a small number of platforms. This study also focused on smartphone owners in particular—the numbers reported don't include those who might own devices like tablets or the iPod touch that share the same catalogue of apps and access to the web. This means that development efforts can be focused on as few as two platforms and capture a large portion of smartphone owners.

It is clear that students who own smartphones have owned them for some time—the vast majority for a year or more. Further, they spend hours each day consuming everything that smartphones have to offer. This level of usage presents a great opportunity for institutions to deliver new services and technologies—not by creating a new destination but by claiming a virtual footprint in a place where students are already spending considerable time.

Key Questions to Ask

- How are your mobile initiatives impacting teaching, learning, and student success? It is important to design mobile initiatives to capture the information that makes it possible to assess impact and effectiveness from the beginning. Further, assessment on the intersection of various initiatives on student success needs to be conducted to ensure that positive gains are being made.
- What is the mobile profile of your students? What devices (smartphones and tablets) do they own? Examining wireless network logs may provide some insights on the numbers and types of devices being used. Participating in the annual ECAR student study is also an effective way to gather information about student mobile habits.
- Can your institution promote the use of mobile technology in the classroom by supporting bring-your-own-device methods? As the number of students owning mobile technologies continues to rise, these methods become a viable option for virtually any institution.
- How are institutions' mobile initiatives advancing learning technology? Is the mobile initiative the same content on a smaller screen, or have students and faculty been enabled to do something not previously possible?
- How are institutions developing the technical competencies necessary to support future mobile initiatives? Proactively developing mobile development skills in IT staff can help support this technology as the market continues to evolve. No technology can replace having access to talent.

Where to Learn More

- Degusta, Michael. "Are Smart Phones Spreading Faster than Any Technology in Human History?" *Technology Review*, May 9, 2012. http://www.technologyreview.com/business/40321/.
- "Smartphones Account for Half of all Mobile Phones, Dominate New Phone Purchases in the US." Nielson Wire blog, March 29, 2012. http://blog.nielsen.com/nielsenwire/online_mobile/smartphones-account-for-half-of-all-mobile-phones-dominate-new-phone-purchases-in-the-us.
- "The State of Mobile Apps." Nielson Wire blog, June 1, 2010. http://blog.nielsen.com/nielsenwire/online_mobile/the-state-of-mobile-apps/.

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Notes

1. Alberto F. Cabrera, Amaury Nora, Jennifer L. Crissman, Patrick T. Terenzini, Elena M. Bernal, and Ernest T. Pascarella, "Collaborative Learning: Its Impact on College Students' Development and Diversity," *Journal of College Student Development* 43, no. 1 (2002): 20–34; George D. Kuh, "The Other Curriculum: Out-of-Class Experiences Associated with Student Learning and Personal Development," *The Journal of Higher Education* 66, no. 2 (1995): 123–155; and George D. Kuh, "What We're Learning about Student Engagement from NSSE," *Change* 35 (2003): 24–32.
2. Gregory Dobbin, with Pam Arroway, Eden Dahlstrom, and Mark C. Sheehan, *Mobile IT in Higher Education, 2011* (Research Report), Boulder, CO: EDUCAUSE Center for Applied Research, December 2011, available from http://www.educause.edu/ecar.