

# The ubiquity of mobile devices in universities – usage and expectations

Whether you look at multiplatform publishing from the perspective of publishers, content creators or technology providers, it becomes abundantly clear that the shifting patterns of media consumption are not a challenge to be taken lightly. Based on a survey of librarians, research administrators and researchers across the globe, we found interesting insights regarding the adoption and usage of mobile devices. The input from these survey respondents was used to build applications that fulfil research workflow needs and solve challenges encountered in the search for information. What can a mobile platform offer that fits search and discovery habits on the go? This article discusses a number of options available such as push notifications, task-specific apps and other tools that take advantage of mobile technology.



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Over the past two decades, the scientific community has experienced a seismic shift in content consumption as a result of the information age. Sifting through hard copies of journals has given way to the capability to search through millions of articles at once, and the process of transporting large data sets has become as simple as the click of a mouse. This has given researchers access to a wealth of information at their fingertips that several decades ago might have seemed impossible.

Mobile devices now permeate all aspects of personal and professional life across borders, industries and socio-economic standing, and it is clear that content consumption is facing another significant evolution. The Pew Internet Project's May 2011 survey found that 35% of adults in the US own a smartphone, with 87% of those users accessing e-mail or the internet on their device and 25% using it as a main source of internet access.<sup>1</sup> Smartphone ownership is similar in Western Europe, and though less than 20 percent of mobile users in Asia Pacific own smartphones, nearly half of Asian consumers intend to buy a smartphone in 2011.<sup>2</sup> Globally, smartphone sales represent 26% of the mobile market, with global mobile data revenues expected to surpass \$300 billion for the first time in 2011, according to a recent report from Chetan Sharma Consulting. Chetan predicted that the total number of mobile subscriptions will

exceed 6 billion by the end of 2011, noting that it took 20 years to reach the first 1 billion, while the jump from 5 billion to 6 billion will only take about 15 months.<sup>3</sup> Whether you look at multiplatform publishing from the perspective of publishers, content creators or technology providers, it becomes abundantly clear that the shifting patterns of media consumption are not a challenge to be taken lightly.

To gauge the interests and expectations of the scientific community in regards to mobile usage and applications, Elsevier conducted extensive surveys and discussions over a period of two years.

## Survey background

Between July 2009 and June 2011, Elsevier undertook a series of online surveys and discussions in its three 'Innovation Explorer' communities on topics related to mobile. Innovation Explorers is Elsevier's online community consisting of approximately 600 librarians, researchers and research administrators (RAs) around the globe who provide feedback on its products through surveys, polls, interviews and relevant discussion topics. The researcher community includes more than 300 scientific researchers from over 60 countries whose fields of study range from physics to environmental

science; the librarian community includes 150 librarians from 31 countries who work in a variety of settings, from universities to private corporations; and the research administrator community includes 150 research administrators and managers from 21 countries who work in a variety of settings, from universities to private corporations. The results revealed interesting insights into the adoption and use of mobile devices. The general spread of feedback is illustrated in Table 1.

**Mobile habits and personality**

In assessing the devices currently owned by librarians, researchers and research administrators, all three communities proved similarly ‘tech savvy’: ownership rates for established devices such as desktop computers, laptops and MP3 players were

similar across the three communities. However, when it came to more recently released technology such as e-readers and other popular devices like the Apple iTouch and iPad, librarians proved to be the early adopters.

For librarians, researchers and research administrators, smartphones competed with laptops as the most sought-after purchase in 2010. Indicating a preference towards portability, laptop purchases outpaced desktop purchases across all three communities: librarians (20 percent vs. 15 percent), researchers (31 percent vs. 22 percent) and RAs (30 percent vs. 13 percent). Despite common assumptions that younger generations are more tech savvy, in a breakdown by age there were few differences in mainstream technology purchases among the under-35 and over-35 age segments. (See Table 2.)

Topic	Title	Activity Type	Community	Number of Responses
Trends	Mobile devices in the scientific workflow	Survey	Researcher	67
Knowledge discovery	Research on the go	Survey	Researcher and Librarian	136
Trends	Your mobile pulse	Survey	All communities	238
Trends	If your mobile apps could talk	Discussion	All communities	100
Trends	Your mobile usage	Survey	All communities	216
Trends	The next big thing in mobile	Discussion	All communities	58
Sharing impact	Your impact on Elsevier: a better mobile phone app	Discussion	All communities	117

Table 1. General breakdown of respondents

From the list below, tell us what technology devices you currently own? (N=224)						
By community				By age		
	Librarian n=86	Researcher n=108	Research Administrator n=30		Under 35 n=81	Over 35 n=142
Desktop computer	80%	79%	80%	Desktop computer	67%	87%
Laptop computer	77%	82%	87%	Laptop computer	81%	80%
Wireless router	67%	55%	73%	Wireless router	48%	70%
MP3 Player	55%	59%	63%	MP3 Player	63%	55%
Smartphone (e.g. Blackberry, iPhone)	41%	31%	37%	Smartphone (e.g. Blackberry, iPhone)	31%	38%
Web cam	37%	55%	43%	Web cam	58%	39%
Video camera	29%	45%	43%	Video camera	40%	39%
GPS device	27%	25%	23%	GPS device	19%	29%
Gaming device (e.g. Playstation, Xbox)	26%	21%	23%	Gaming device (e.g. Playstation, Xbox)	15%	28%
Kindle or other e-reader	19%	4%	7%	Kindle or other e-reader	4%	13%
Netbook computer	19%	13%	10%	Netbook computer	10%	17%
iTouch	16%	5%	13%	iTouch	10%	11%
Blu-Ray player	12%	4%	10%	Blu-Ray player	2%	11%

Table 2.

Participants expressed the personal and professional opportunities that abound with the advancement of technology such as rapid access to information, communication and social connectivity, portability, tools and efficiency. One researcher summed it up by saying "... my workflow is MUCH more efficient and synchronized with the aid of technology. I can pull a huge number of papers, sync them to my phone, and read them on the bus home. Or I can make my laptop read them to me while I'm doing other things..."

**General usage**

Similar to global trends, more than one out of four Innovation Explorers members owns a smartphone, and seven out of ten own a phone with some form of internet capabilities. The majority of smartphone owners initially purchased the devices for personal use, yet applicability for work provides additional justification. While 60 percent use their smartphones every day, or almost every day for work, 95 percent of respondents use them daily for personal reasons. Table 3 shows the types of mobile in use by different respondents.

Among the reasons cited for purchasing a smartphone over another mobile device are: access to and accountability for e-mail and critical documents especially when travelling, greater functionality with fewer devices and the availability of useful and abundant apps.

**Workplace usage**

Despite logistical barriers, nearly two thirds of members download mobile applications for work

What make and model of mobile phone are you currently using?			
	Librarian	Researcher	RAs
iPhone	8%	9%	14%
Blackberry	6%	6%	11%
Droid	3%	1%	0%
Symbian	2%	4%	4%
Other 'smartphone'	5%	7%	4%
<b>Subtotal Smartphone users</b>	<b>24%</b>	<b>27%</b>	<b>33%</b>
Phone w/internet	42%	45%	43%
<b>Subtotal Internet capability</b>	<b>66%</b>	<b>72%</b>	<b>76%</b>
Phone w/o internet	28%	25%	18%
I do not own a mobile phone	8%	3%	7%

Table 3.

activities. The common 'professional' apps currently available serve various functions:

- work productivity – project management (time/expenses), barcode scanners
- document production – Microsoft Office Suite, dictionaries, dictation, YouSendIt
- reminders and alerts – weather, flight status, financial and stock notifications
- document search and access – PDF reader, e-readers, Google
- converters and calculators – unit conversion
- social/professional networks – LinkedIn, Twitter
- content – BMJ Differentials, Epocrates, Evernote, Keynote, Scopus, WorldCat.

On-the-go applications come in handy for reading articles, communicating with others, collaborating and, to a lesser extent, searching for articles. One third of respondents expressed a desire for a mobile app to record experimental findings, analyze data sets and prepare group presentations for meetings. Table 4 shows the ways in which respondents thought work-related activities could be positively enhanced by an appropriate mobile solution.

Mobile content consumers remain a minority – only 30 percent of researchers who own a smartphone or an e-reader use their device to read online journal articles. However, the ability to browse shorter content appears to be more commonly

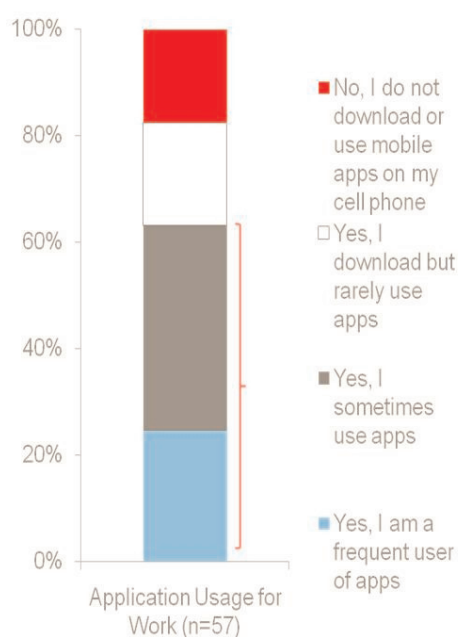


Figure 1. Application usage for work (n = 57)

	Work-related activities you feel could be positively enhanced by an appropriate mobile solution. (Check all that apply)			Work-related activity could be most positively enhanced by an appropriate mobile solution? (Choose one)		
	Librarian n=63	Researcher n=119	Admin n=26	Librarian n=62	Researcher n=119	Admin n=26
Communication: email, scheduling appointments, Facebook etc	89%	75%	92%	35%	35%	35%
Searching for an article	<b>92%</b>	<b>71%</b>	65%	<b>27%</b>	<b>26%</b>	8%
Collaborating with colleagues	84%	69%	<b>81%</b>	18%	9%	<b>23%</b>
Reading an article	81%	54%	58%	13%	10%	4%
Preparing presentations for group meetings	65%	34%	54%	3%	2%	4%
Searching for funding/grants	54%	35%	62%	2%	3%	0%
Writing a publication	46%	31%	23%	2%	4%	8%
Analyzing data sets	33%	34%	27%	0%	7%	4%
Recording experimental findings	29%	36%	19%	0%	2%	4%
Applying for funding/grants	35%	25%	46%	0%	0%	0%
Annotate/comment on data sets	35%	27%	19%	0%	1%	0%
Managing funding/grants	22%	21%	<b>35%</b>	0%	1%	<b>12%</b>

Table 4.

desired, and mobile access to abstract databases is appealing as a quick and easy way to search for information. Members indicated that they would find mobile access to an abstract database most useful because it would provide convenient, quick access and serve as a valuable reference tool.

Members want a quick and easy way to access information, such as abstracts, without having to use their PC. Researchers also want the convenience of being able to read short summaries or even full articles as a way to take advantage of 'down time' during transit.

Further, the ability to quickly look up information on a mobile device could serve as a valuable reference tool. One US researcher remarked that looking up an abstract by author is useful in recalling the content of the article and its results.

### Perception of mobile

When asked which work activity would be 'most' enhanced, article search came out on top for researchers and librarians (see Table 4). Researchers and librarians see the appeal of better article-search apps, with a majority feeling that searching for an article could be positively enhanced by an appropriate mobile solution.

While researchers and librarians valued the opportunity to search for content and read articles on the go, RAs saw the most potential in

collaborating with colleagues and applying for/managing funding/grants. Mobile technology presents the potential for a radical shift in how RAs work, as typical RA activities (searching for funding and grants) do not appear to be conducted remotely today ... but could be.

Those under 35 are more interested than their 'senior' colleagues in finding mobile solutions for professional activities, as a greater number of younger Innovation Explorer members expressed interest in work-related apps (see Table 5). For example, of those under 35, 33 percent revealed interest in mobile apps that would assist in writing publications, while only 20 percent of those members over 35 felt the same; and roughly 40 percent under 35 expressed interest in apps that enable annotating, commenting or performing analysis on data sets or recording experimental findings, compared to 25 percent or less of those over 35.

### The limitations of mobile

While nearly 20 percent of respondents did not see any negative consequences to technology, others noted concern that technology advancements come with a cost, including: the stress from being 'on call' 24/7, addictive behaviour, a shift in priorities away from family time, exercise, etc., technology threats such as viruses, spam, repair costs, phishing and the expense of cable and ISP fees. For example, one Canadian librarian noted

	Activities not currently supported by mobile devices but would be interested in a mobile solution	
	Under 35 N=85	Over 35 N=123
Searching for an article	35%	26%
Reading an article	28%	20%
Searching for funding/grants	27%	24%
Applying for funding/grants	22%	22%
Managing funding/grants	26%	24%
Writing a publication	33%	20%
Analyzing data sets	38%	25%
Annotate/comment on data sets	40%	22%
Recording experimental findings	40%	24%
Communication: email, scheduling appointments, Facebook, etc.	22%	21%
Collaborating with colleagues	26%	24%
Preparing presentations for group meetings	40%	28%

Table 5.

between a laptop and iPod Touch, it was difficult to get very far away from work, and a researcher within the US noted that it prevented down time with the family.

However, not all work tasks are suitable for mobile access. Members referred to a variety of limitations of mobile access for work-related activities. For one, it is cost prohibitive – for those who do not have mobile internet reimbursed by an institution or employer, the data access charges can be very expensive. Others find the eye strain of a small screen limiting, or express a personal preference to read articles in hard copy. Further, it can be difficult to complete some activities on a mobile device. One US researcher noted that it takes too long to create bibliographic entries (e.g., by adding it to CiteUlike or Refworks), while others found reading a long article on a smartphone too cumbersome.

**Embracing mobile functionality**

The survey queried whether members saw potential in using commonly available multimedia features in mobile devices in their workflow. The answers revealed that researchers are most interested in tools that leverage features that many phones already have such as cameras, sound and online access:

- camera (72 percent): field researchers in particular say that camera phones are a ‘quick and dirty’ way to document their work outside

of the lab. Other members also felt a camera would be useful during conferences

- sound (60 percent): many survey respondents, 34 percent, indicated that they would find it useful in their workflow to record sound, particularly for memo taking. Members were also interested in listening to podcasts or music on their mobile devices
- online connection (59 percent): accessing e-mail was the number one use of online connections. Other uses include searching for information, uploading images, assessing articles or checking on RSS feeds
- texting (52 percent): some researchers find texting to be a useful way to collaborate with colleagues and provide status updates, as well as keep in touch with the lab
- note-taking (42 percent): note-taking on a mobile device could be helpful to researchers during briefings or conferences, which some already do on their stylus. A few also use it for creating reminders
- large display (40 percent): many researchers would prefer large displays for reading articles, PowerPoint presentations and graphs or to enlarge images
- offline connection (32 percent): approximately one third of respondents saw value in the ability to access e-mails, articles and other downloaded content offline. Offline access could be particularly useful for reading articles while on a flight. Other uses include note-taking or setting up reminders

- GPS (30 percent): researchers who travel for their work found GPS more useful, such as healthcare workers. Popular uses included finding meeting locations or mapping out a route ahead of time for an experiment.

### Current applications and the future of mobile science

What can a mobile platform offer that provides a meaningful user experience and fits people's search and discovery habits on the go? One approach is to take advantage of the iPhone's functionality by creating push notifications to alert users when an article receives a new citation. For other platforms, it might mean task-specific applications such as an author search app for users seeking fellow researchers at conventions.

Elsevier used the input from these surveys to build mobile applications that aim to solve challenges that researchers encounter in their workflow and search for information. The applications for its SciVerse ScienceDirect and SciVerse Scopus databases for the iPhone, iPad, Android and BlackBerry allow users to conduct activities such as searching for citations, finding and downloading articles.

In a follow-up discussion with the community in Spring 2011, Elsevier asked for feedback on the mobile apps it developed based on member input. In general, there was positive feedback towards the concept of using mobile apps in research. Even many who do not currently use a smartphone remarked on the future potential of incorporating mobile into researcher workflow, and several librarians noted the importance due to the number of students using mobile devices. One member noted, "I'm thrilled whenever another mobile app comes out — we see students using their phones to do research pretty frequently now, so the more we can offer them, the better tools we can give them."

### Conclusion

Not surprisingly, most survey participants want fewer, more sophisticated devices. And while mobile users within the scientific community look to benefit from the enhanced productivity and

opportunities for greater professional and personal connectivity, there is concern about the stress of being accessible 24/7. Mobile users are seeking better applications tied to their work and more options when it comes to searching for and reading articles. In the future, image and sound documentation as well as easy access to articles are of significant interest to researchers.

Currently, a number of limitations still exist to conducting research on the go. However, the development of mobile apps for research is still in its infancy, and it is evident by our increasingly mobile-focused society that as software and devices advance, scientific research will transition to mobile just as rapidly as it evolved to internet.

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