Journal of Library and Information Studies 16:1 (June 2018) pp.1-21
doi: 10.6182/jlis.201806_16(1).001

How Do University Students Receive, Read, Find, Share, and Store News? A Survey Study on Mobile News Behavior

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Abstract

Mobile news research has primarily focused on mobile information needs as well as mobile news information searching behavior. In this study, we investigated an array of mobile news activities (receiving, reading, finding, sharing, and storing news) and cross-examined differential patterns and habits associated with these activities. One hundred and eleven undergraduate and graduate students in the US responded to a screener survey, and 63 subsequently participated in an online survey and reported in detail their mobile news consumption habits. Our results showed that participants' behavioral patterns for receiving, reading, and finding news differed from their sharing and storing activities. Not only are there significantly higher frequencies in receiving, reading, and finding news, but participants rated themselves as less proficient and satisfied regarding their ability to store and share news. This study's findings, including students' own comments on their limited ability in news keeping as well as such a functionality being overlooked by mobile app developers, will advance our knowledge of university students' mobile news information behavior and provide potentially meaningful design recommendations for mobile news applications.

Keywords: Mobile News Information Behavior; News; Information Behavior; Smartphones; University Students

1. Introduction

Mobile devices and smartphones have become a routine part of everyday life. According to a report by The Telecommunication Development Sector, a United Nations' specialized agency for Information and Communications Technology, mobile-cellular telephone subscriptions penetrated an estimated 98.7% of the world population in 2017 (International Telecommunication Union, 2017). The data from the June 2017 Ericsson Mobility Report shows a total mobile subscription of 7.6 billion in Quarter 1, with 5.2 billion subscribers worldwide. Additionally, smartphones accounted for 80% of all mobile phones sold in the first quarter of 2017 (Ericsson, 2017). Meanwhile, authors of a 2016 EDUCAUSE report noted that, "from 2015 to 2016, smartphone ownership [by undergraduate students] increased from 92% to 96%; in other words, half of the students who did not own a smartphone in 2015 now do" (Brooks, 2016, p. 9). Mobile is considered the first truly personalized mass medium as well as the 7th mass medium following print, recordings, cinema, radio, television, and the Internet (Ahonen, 2013). In the realm of news consumption, numerous reports have revealed that younger users frequently rely upon news apps on their smartphones or social media tools as their primary news information sources (Pew Research Center, 2016). Meanwhile,

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Lu and Holcomb (2016) discovered a notable increase in mobile news readers and a continuing shift to mobile devices among online news consumers. Mobile access to news resources has therefore fundamentally transformed the news media landscape. In addition, the relationship between users and news has evolved into not only a personalized and ubiquitous one, but also a participatory, socially-engaging, and socially-driven activity due to users' ability to share, review, and comment on news articles (O'Brien, Freund, & Westman, 2014; Pew Research Center, 2010; Struckmann & Karnowski, 2016).

Even though processing news via mobile devices has become a routine activity, mobile news behavior research has focused on investigating particular aspects of news information behavior instead of examining a stream of activities such as receiving, reading, finding, sharing, and storing news. This particular study attempts to fill this gap by exploring the full array of news consumption activities in the mobile environment. Our research not only advances the field's knowledge of the full spectrum of news processing activities, but also contributes to the potential improvement for the design of mobile tools that will support all these activities.

2. Literature Review

With the emergence and advancement of mobile technology, scholars have developed a body of empirical research on users' mobile information behavior. In this literature review, we focus on three key research areas: mobile information needs, mobile news information behavior, and information activities suggested by Information Behavior (IB) and Personal Information Management (PIM) research.

2.1 Mobile information needs

Over the years, researchers have identified a variety of mobile users' information needs using different labels and variations in grouping. Through multiple rounds of literature searches using keywords such as "mobile or mobile devices," "information needs," and "information behavior or behaviour" to search on a variety of scholarly databases including EBSCO Academic Search Complete, SCOPUS, and ACM Digital Library, we found 43 research articles related to mobile information behavior. Of these research papers, 11 studies specifically investigated mobile information needs. By analyzing and comparing these eleven research studies, we identified 22 common types of mobile information needs (Amin, Townsend, Ossenbruggen, & Hardman, 2009; Chen & Qi, 2010; Cherubini, Oliveira, Hiltunen, & Oliver, 2011; Church, Cherubini, & Oliver, 2014; Church & Smyth, 2009; Dearman, Kellar, & Truong, 2008; Heimonen, 2009; Hinze, Chang, & Nichols, 2010; Karlson et al., 2010; Komaki, Hara, & Nishio, 2012; Sohn, Griswood, & Holland, 2008). As shown in Figure 1, the most commonly reported information needs (10 out of 11 studies) were "location and directions," "shopping/product services," and "travel." The second most common types (9 out of 11 studies) included "points of interest" and "weather." Scholars identified "sports or news" in seven studies.

Among these research studies, Church et al. (2014) specifically examined the categorization of mobile information needs. One of the main purposes of this large-scale snippet-based diary

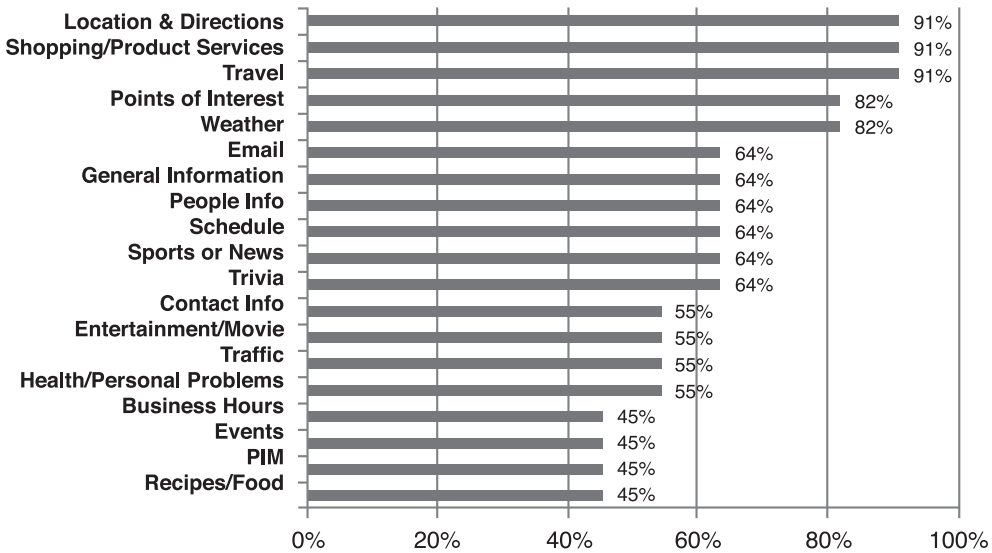

Figure 1. Common Categories of Mobile Information Needs Based on Eleven Prior Research Studies

study was to establish a taxonomy of mobile information needs. More than 100 participants recorded their daily information needs using their mobile phones over a three-month study period. Based on their results, Church et al. reconfigured the "trivia and pop culture" category developed by Dearman et al. (2008) by specifying a "news" subcategory and renaming the category as "news and trivia." Their examples for mobile news item included "the most important news of the day," "general news," "main news of the world" (p. 10:15). Meanwhile, a study by Heimonen (2009) suggested that mobile information needs that are recurring included "looking up the latest news updates online every morning" (p. 6). Heimonen further classifies these activities as "habitual and functional," and notes that people relied on accessing news, weather, or locational information everyday either as a habit or as a repeated functional need.

2.2 Mobile news environment and news consumption behavior

Research work focusing on mobile news often starts with the assertion that mobile phones have overtaken the media market and changed the media ecology (e.g., Li, 2014; O'Brien et al., 2014; Struckmann & Karnowski, 2016). As observed by Li (2014), "news information is now delivered on mobile phones on a daily basis, and people access news information easily through mobile phone applications" (p. 298). Li further states that, "the media landscape is changing rapidly due to mobile phones working as a functional channel to deliver news information" (p. 298). Struckmann and Karnowski (2016) also highlighted the impact of mobile devices on news media ecology: "This fast and widespread diffusion of smartphones, tablets and the likes is influencing news media consumption...being able

to bring news consumption into 'niches in time and space'" (p. 309). Similarly, Shim, You, Lee, and Go (2015) have argued that "the rapid growth of mobile phones has not only altered the way in which people consume news...it has also changed the landscape of news media content" (p. 109).

Nevertheless, several studies have revealed that even though mobile devices could serve as a primary platform for younger users, traditional media (television and print newspapers) have remained the most highly used news media of the majority of the population (Chan, 2015; Van Damme, Courtois, Verbrugge, & De Marez, 2015). In a two-phase study investigating how mobile users consume news, Van Damme et al. (2015) discovered that, "on the one hand, the majority of news consumers dominantly relies on traditional media outlets to stay informed, only to supplement with online mobile services in specific circumstances. Even then, there is at least a tendency to stick to trusted brand materials. On the other hand, these mobile news outlets/products do seem to increasingly infiltrate the daily lives of mobile audiences who were previously disengaged with news" (p. 197). Chan's (2015) results also suggested that, "adding new mobile devices does not necessarily displace existing media channels, but tend to add to the amount of overall news consumption" (p. 189).

With regard to specific news consumption behaviors, a number of studies reported when and how news is processed, different news consumption styles, and the suitability of various news types on mobile devices. For example, Hoffman and Fang (2014) discovered that online users spent more time during the middle of weekdays and on Sundays consuming news and politics related information than other days, and spent "an average of 10 minutes on each news page" (p. 441). Additionally, their findings revealed that the most frequently visited category was national/regional news followed by international news, while the least frequently visited was campaign sites. Shim et al. (2015) explored the suitability of political and entertainment news accessed on a mobile device and discovered that mobile news consumption of both news types were significantly associated with information seeking motivation and accessibility. They further found that "information seeking" and "accessibility" correlated with mobile news use and social news use. Shim et al. concluded that, "though our analyses showed that mobile users' news consumption is still habitual in somewhat aspects, we do not necessarily negate the possibility of civic engagement that mobile technology offers, when considering our findings indicated that the mobile news consumers think upon the political featured news as an important news type as soft news, and mobile news readers accessed the political news via social media platform" (p. 22).

In exploring types of news consumers, Van Damme et al. (2015) developed a typology for news consumption: "omnivores (those who combine digital and traditional news platforms), traditionals (those who consult news on national TV and radio), and the serendips (neologism for 'serendipitous users,' those who tend to consume news less frequently)" (p. 200). The authors found, contrary to results of other studies, that, "the majority of news consulted on a mobile device is consumed at home, in the morning (by the omnivores) or in the evening (by the traditionals)" (p. 210).

In a 2006 study, Diddi and LaRose investigated the internet's role in college students' news consumption. After examining the survey responses of over 300 undergraduate students from a midwestern university in the U.S., they discovered that as the first Internet generation, college students were, "more likely to use the Internet for news and read more news magazines" than non-college students (p. 205). The authors further found that when facing an increased number of news outlets, college students acted more as "news grazers" who checked news periodically without a fixed news consumption time.

2.3 Information activities suggested by IB and PIM research

It is worth noting that even though research studies on mobile information behavior have mainly focused on seeking and accessing information, Information Behavior (IB) and Personal Information Management (PIM) research provides insights into a range of information processing activities. Several researchers examined information process from the point of view of the entire cycle of activities. For instance, Thivant (2005) used an "information activities" framework for his research. Adams and Blandford (2005) and Du (2014) cultivated the notion of "information journey" during their investigations. While Thivant's diagram outlined an activity stream of information need, information seeking, information use, information management, and information production, Du's research study positioned those activities as a path beginning with information need and progressing to information seeking, information judgments, information use, and, finally, information sharing and collaboration.

Meanwhile, PIM research has identified three essential activities that individuals perform when managing their own information: (1) finding/re-finding activities; (2) meta-level activities; and (3) keeping activities (Jones, 2007; Jones & Teevan, 2007). Meta-level activities include organizing information, while keeping activities refer to "the way people keep information in a physical or virtual location for a certain period of time for personal or organizational use" (Koh, Oh, Agarwal, & Belkin, 2015, p. 3). It has been noted that while people extensively organize and keep information in their personal devices, how people organize or keep their own information remains under-researched (Koh et al., 2015; Whittaker, 2011).

In summary, although there is a rich body of scholarly work on mobile news consumption behaviors, seldom has any study focused exclusively on the activities a user takes when interacting with news via a mobile phone. These activities might include, but are not limited to, receiving, reading, finding, sharing, and storing news. Additionally, further investigations into the intensity of mobile news users' engagement during these news processing stages are rare. The present study attempts to fill this gap by examining various news processing activities that mobile users carry out as they consume news. It is our belief that mobile news information behavior cannot be fully understood without investigating the individual activities that comprise mobile news processing. Not only the accessing and reading activities are valuable to report, but also sharing, organizing, and keeping activities are equally important to investigate. By comparing users' self-reported behavioral patterns of receiving, finding, reading, sharing, and storing news, we

can outline the common and unique characteristics of each activity. In this study, when we asked participants to describe their mobile news behavior, we specifically limited mobile devices to "smartphones."

3. Research Questions

This survey research investigates the following four research questions:

RQ1. To what extent do various mobile news processing activities (receiving, reading, finding, sharing, and storing news) differ in terms of their frequency, the types of primary media used, and the types of mobile apps used?

RQ2. To what extent do participants' self-rated proficiency scores differ with regard to receiving, reading, finding, sharing, and storing news?

RQ3. To what extent do participants' self-rated satisfaction scores differ with regard to receiving, reading, finding, sharing, and storing news?

RQ4. In participants' perception, how well does mobile technology facilitate various news processing activities (receiving, reading, finding, sharing, and storing news)?

4. Method

4.1 Research design

In this study, a survey instrument was developed to gather information relevant to our research questions. The survey contained questions concerning demographic information, participants' mobile phone usage, and their mobile news consumption behavior. The background information section of the survey included questions on gender, age, ethnicity, nationality, academic status, and major. We also inquired about the types of news that the respondents followed (e.g., world news, US news, specific country news, political news, financial news, sports news, and entertainment news). Next, the respondents answered questions about the model and length of use of their primary smartphones (i.e., how long they owned the smartphone). Following that, a question regarding the primary media that participants use to receive, read, find, share, or store publically available news-related information was posed. Subsequently, participants were asked for the reasons that they use mobile devices as their primary media to access and process news information, with answer options of "portability," "convenience," "accessibility," and "sharable." The next set of questions was related to participants' news processing behavior, including the mobile apps they use to receive, read, find, share, or store publically available news-related information and the frequency that participants received, read, found, shared, or stored publically available news-related information through their smartphones in the past 30 days. Finally the respondents were asked to rate their proficiency and satisfaction with using their smartphone to receive, read, find, share, or store publically available news-related information on a five point scale.

The survey was distributed to university students in the US to explore their mobile news processing behavior. To recruit participants, advertisements that included the link to the online survey were posted on "call for participation"

type websites and social media sites including Craigslist, Facebook, and Twitter. In addition, researchers' personal networks were used. The target population was undergraduate and graduate university students in the U.S., and a purposive sampling method was used. Criteria for qualified participants included (1) they used their smartphones to receive, read, find, share, or store publicly available news-related information; and (2) they were undergraduate or graduate students enrolled in a university or four year college in the United States.

Data collection occurred between July 22 and August 5, 2016 (Round 1) and September 21 and October 2, 2016 (Round 2). Utilizing two collection periods allowed us to collect data during the summer time when university students may have more leisure and flexible time and also during a regular semester which could reflect students who are on a normal academic schedule.

Prior to our formal survey, a pilot test of the survey instrument was performed with two participants. Following that, a screener survey was conducted to recruit potential participants. The screener helped to filter unqualified participants, i.e., participants whose academic affiliations indicated that they were not from a university or four-year college degree program, or who responded that they did not use their smartphones to process news were not contacted to participate in the survey. A total of 111 students responded to the screener. Qualified respondents were then contacted to complete the formal survey.

4.2 Participants' demographic background

All of the 111 screener survey respondents (of which 28.8% were male and 71.2% were female) indicated that they owned a smartphone and that they used their phone for news information processing. These respondents consisted of 31 graduate students (27.9%) and 80 undergraduate students (72.1%) from 56 different institutions in the United States. Ninety-two (82.9%) were American students and 19 (17.1%) were international students studying in the United States.

Ultimately, 63 participants completed the formal survey. Of these respondents, almost three quarters were female and one quarter were male. Additionally, more than 75% of the participants were younger than 25 years of age. In terms of ethnicity, the top groups were White/Caucasian, Asian, and Hispanic/Latino. Survey respondents were from 31 different higher education institutions in the United States including Berklee College of Music, Drexel University, Emerson College, Georgia Institute of Technology, Harvard University, Penn State University, Northeastern University, Portland State University, University of Washington, and William James College. Nearly 70% were undergraduates and 30% were graduate students. More than 80% were American students and 19% were international students. Students' fields of study were rather evenly distributed across the science, social science, and arts and humanities fields. Note that several participants had multiple majors, and therefore the total count for major exceeded the total number of participants. For detailed demographic information about the formal survey respondents, see Table 1.

Table 1. Formal Survey Respondents' Demographic Information

Demographics		*n*	%
Gender	Male	16	25.4
	Female	47	74.6
Age group	Under 20	13	20.6
	20-24	36	57.1
	25-29	7	11.1
	30-40	6	9.5
	41-50	1	1.6
Ethnicity	American Indian	1	1.6
	Asian	19	30.2
	Black/African American	6	9.5
	Hispanic/Latino	9	14.3
	White/Caucasian	28	44.4
Class	Undergraduate	44	69.8
	Graduate	19	30.2
Major	Social Science	25	36.8
	Science	19	27.9
	Arts & Humanities	18	26.5
	Engineering	5	7.4
	Undeclared	1	1.5

5. Results

5.1 Participants' use of mobile phones

On average, respondents had been using smartphones for 4.83 years, ranging from one year to eleven years. Participants' primary smartphones included different models of iPhones (76.2%) and Samsung Galaxy (12.7%), in addition to other phone brands (11.1%). Fifty-eight (92.1%) reported that they typically followed *US news*, 47 (74.6%) followed *world news*, 43 (68.3%) *entertainment news*, 42 (66.7%) *political news*, 26 (41.3%) *public health news*, 19 (30.2%) *specific country related news*, 20 (31.7%) *sports news*, 15 (23.8%) *financial news*, 2 (3.2%) *local news*, and 13 (20.6%) followed *other news* which included *music news*, *gaming news*, *interior news*, *crime news*, and *technology news*.

Demographic attributes appeared to have some impact on the type of news that participants followed. Table 2 displays those attributes that had significant differences in the types of news followed. A significantly higher proportion

Table 2. Demographic Differences in Types of News Followed

	American vs. International	Age group	Ethnicity
US news	χ^2 (1, N = 63) = 5.91, p = .02		
Specific country news	χ^2 (1, N = 63) = 14.15, p = .00		χ^2 (4, N = 63) = 11.62, p = .02
Political news	χ^2 (1, N = 63) = 4.17, p = .04		χ^2 (4, N = 63) = 9.78, p = .04
Finance news	χ^2 (1, N = 63) = 5.61, p = .02		χ^2 (4, N = 63) = 10.75, p = .03
Entertainment news		χ^2 (4, N = 63) = 9.75, p = .045	

of the American students followed *US news* and *political news* than international students. Meanwhile, a significantly higher proportion of international students followed *specific country news* and *finance news* than American students. A significantly higher proportion of younger participants followed *entertainment news* than older respondents. Significant differences were also found among different ethnic groups who followed *specific country news, political news*, and *finance news*.

When asked to indicate their reasons for using a mobile device as their primary news processing device, 84.1% of respondents selected the following survey response: "I always carry my smart-phone and have it handy when I need it" (i.e., *portability*). The second most frequently selected reason was *accessibility* (81.0%), represented by the following survey option: "It is very easy for me to use my phone to access news information." Nearly half of the respondents selected the options corresponding to *shareability* (47.6%) and *convenience* (46.0%), which respectively referred to "it is very easy for me to use my phone to share news information with my friends/family and community members," and "compared to other devices, my phone is the most convenient tool to process news information." Thus, *portability* and *accessibility* were the two main reasons that students used mobile devices to process news.

5.2 Frequency of mobile news processing

Most survey participants reported receiving (68.3%), reading (73.0%), and finding (65.1%) news *daily* in the last 30 days. However, the majority of respondents shared news either *monthly* (33.4%) or *weekly* (30.1%). In other words, participants shared news less frequently than receiving, reading, or finding news. With regard to storing news, the highest proportion of people (41.3%) reported that they *never* stored news information. Among those who did store news stories, most stored news *monthly* (25.4%), which was the least frequently practiced activity among all activities. Based solely on these frequencies, storing and sharing news appeared to have different usage patterns than receiving, reading, and finding news. There were statistically

significant differences among the frequencies of different mobile news processing activities (χ^2 (12, N = 63) = 152.52, p = .00). Figure 2 displays the percentage of people receiving, reading, finding, sharing, and storing news in varied frequencies (daily, weekly, monthly, never).

5.3 Types of media used

When receiving and reading news, more than 75% of participants used *mobile devices* as their primary media and less than 20% utilized *desktops/laptops*. With regard to finding and sharing news, about 70% of participants primarily employed *mobile devices* to find and share news, while 23-27% of participants used *desktops/laptops*, an indicator that most participants used *mobile devices* to receive, read, find, and share news. However, a similar number of participants reported employing *mobile devices* (39.7%) and *desktops/laptops* (38.1%) as their primary news storage devices.

About 10% of participants relied on traditional media, such as *TV* (6.3%) and *radio* (3.2%) to receive news. While few respondents reported using any media to receive (1.6%), read (0%), or find news (0%), a higher number of participants stated that they did not use any media to store news (19.1%) or share news (6.3%). Significant differences were found among types of primary media used for different news processing activities (χ^2 (12, N = 63) = 57.37, p = .00). Figure 3 illustrates the percentage of participants receiving, reading, finding, sharing, and storing news using various media (mobile devices, desktops/laptops, TV, print newspaper/magazine, radio, N/A).

5.4 Types of mobile apps used

Participants heavily relied on *social media apps* (e.g., Facebook or Twitter) to receive (46.0%), read (54.0%), find (49.2%), and share (69.8%) news. *News apps* (such as *CNN*) were the second most frequently used applications for

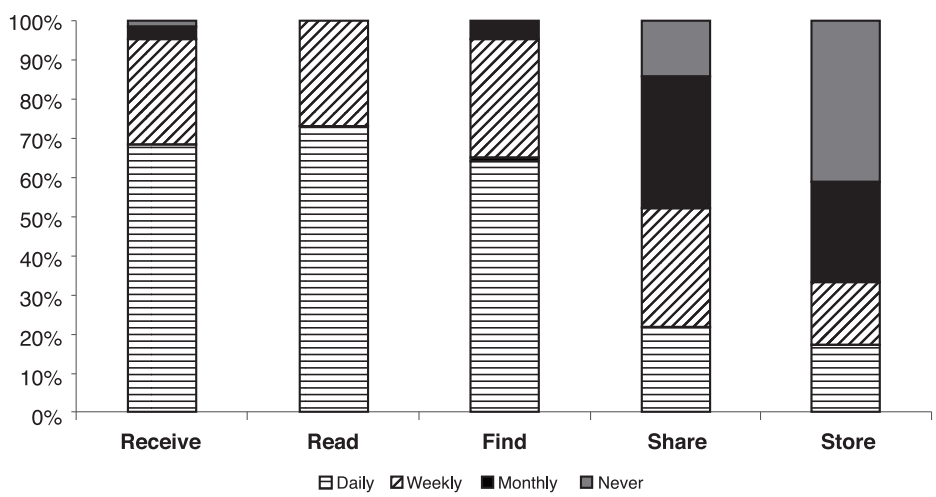

Figure 2. Frequency of Receiving, Reading, Finding, Sharing, and Storing News

receiving (30.2%) and reading (22.2%) news. In contrast, *Search engine specialized news apps* (e.g., Yahoo News) were the second most frequently used apps (20.6%) for finding news. For sharing news, *instant or text messaging apps* (11.1%) were the second most used type of apps. Nearly 8% of participants did not use any mobile apps to share news. In addition, many participants did not use any mobile apps to store news information (44.4%). When they did, *social media apps* (30.2%) and *news apps* (14%) were used more than other types of apps. It is worth noting that in contrast to other activities, almost half of the participants did not use any apps for storing news. Significant differences were found in the types of apps used for receiving, reading, finding, sharing, and storing news (χ^2 (20, N = 63) = 113.17, p = .00). Figure 4 shows the percentage of participants receiving, reading, finding, sharing, and storing news using various mobile apps (social media apps, news apps, search engine specialized news apps, aggregator apps, instant or text messaging apps).

5.5 Proficiency of processing news

Participants were asked to rate their own proficiency level of using smartphones to receive, read, find, share, and store news on a 5-point Likert scale, with 5 as highly proficient. On average, participants gave a rating of above 4.5 (on a five-point scale) for *receiving* (M = 4.71), *reading* (M = 4.60), and *finding* (M = 4.73) news. For *sharing*, the average proficiency rating was lower than 4.5 (M = 4.22); and for *storing*, the average was below 4 (M = 3.92), which was the lowest among the five activities. A Kruskal-Wallis test revealed statistically significant differences in self-rated proficiency across various activities (H (4, N = 63) = 30.71, p = .00). Figure 5 presents the confidence intervals and respondents' average proficiency ratings in receiving, reading, finding, sharing, and storing news.

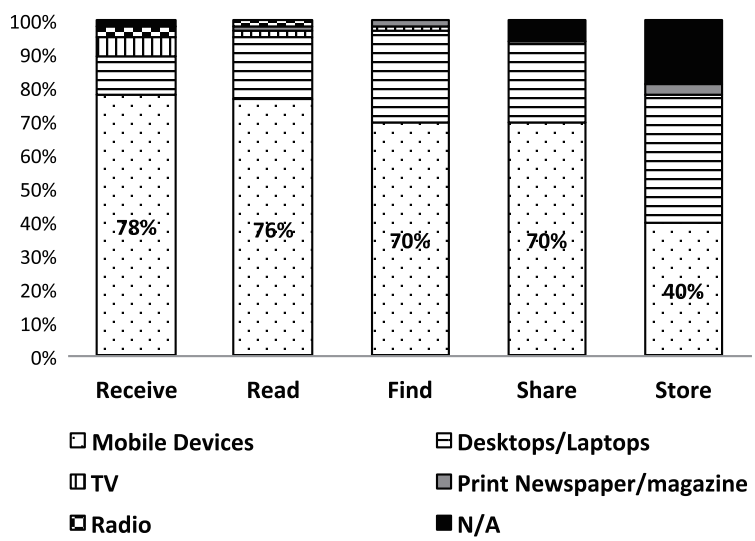

Figure 3. Primary Media Used to Receive, Read, Find, Share, and Store News

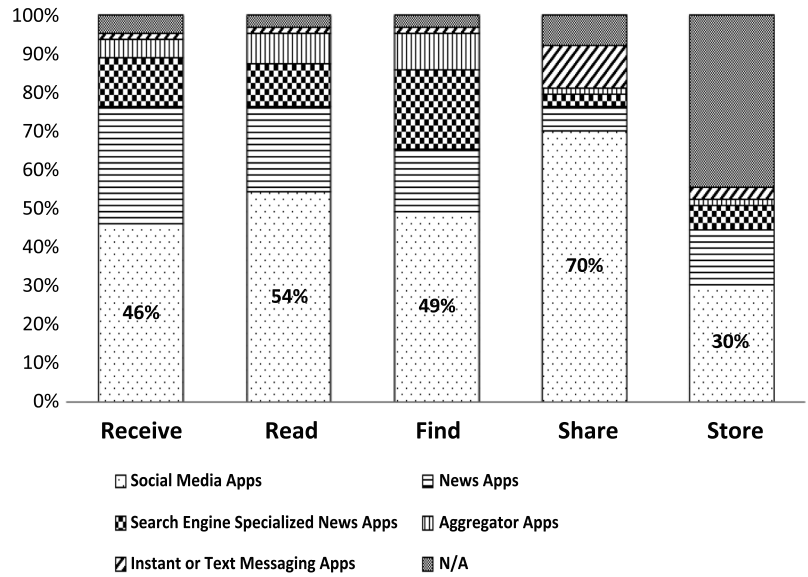

Figure 4. Types of Mobile Apps Used to Receive, Read, Find, Share, and Store News

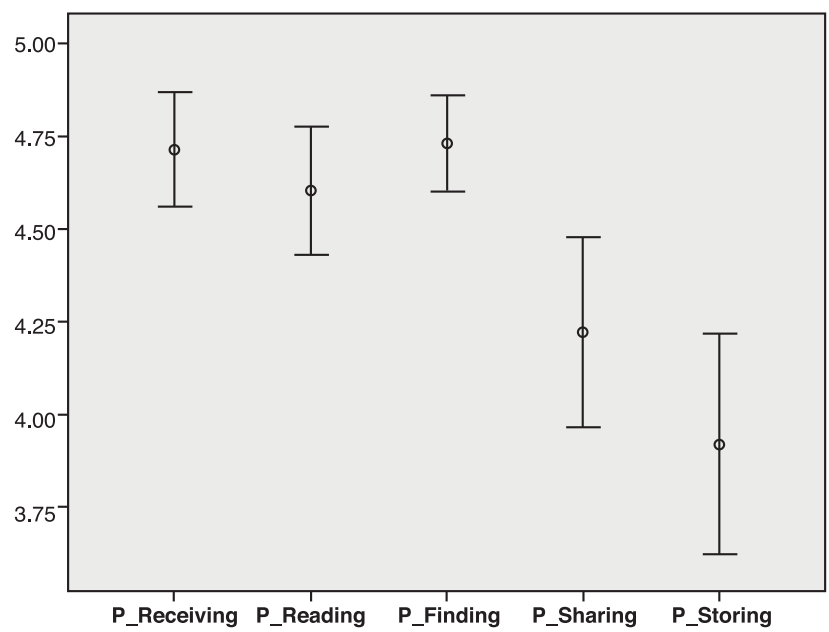

Figure 5. Confidence Intervals and Average Ratings of Proficiency in Receiving, Reading, Finding, Sharing, and Storing News

To further analyze differences among specific activities, we conducted a series of Wilcoxon Signed Ranks tests. The results revealed that the proficiency ratings of *sharing* were significantly lower than the proficiency ratings of *receiving* (z = -3.79, p = .00), *reading* (z = -2.65, p = .01), and *finding* (z = -3.89, p = .00) news. Moreover, the proficiency ratings of *storing* were significantly lower than proficiency ratings of *receiving* (z = -4.73, p = .00), *reading* (z = -3.99, p = .00), *finding* (z = -4.70, p = .00), and *sharing* (z = -2.31, p = .02) news.

5.6 Satisfaction of processing news

When asked to rate their satisfaction in using their mobile phones to process news on a five-point scale, the averages were lower than 4.5 for all five activities. The average for *receiving* (M = 4.37), *reading* (M = 4.35), *finding* (M = 4.32), and *sharing* (M = 4.14) news was above 4, while *storing* was rated lower than 3.5 (M = 3.46). Statistically significant differences were found in satisfaction ratings across various activities (χ^2 (4, N = 63) = 33.05, p = .00). A series of Wilcoxon Signed Ranks tests revealed that satisfaction ratings of *sharing* were significantly lower than satisfaction ratings of *receiving* (z = -2.25, p = .03), *reading* (z = -2.08, p = .04), but significantly higher than *storing* (z = -4.01, p = .00). The satisfaction ratings of *storing* were found to be significantly lower than the satisfaction ratings of *receiving* (z = -4.67, p = .00), *reading* (z = -4.52, p = .00), *finding* (z = -4.65, p = .00), and *sharing* (z = -4.01, p = .00). Figure 6 displays the confidence interval and the average satisfaction ratings in *receiving*, *reading*, *finding*, *sharing*, and *storing* news.

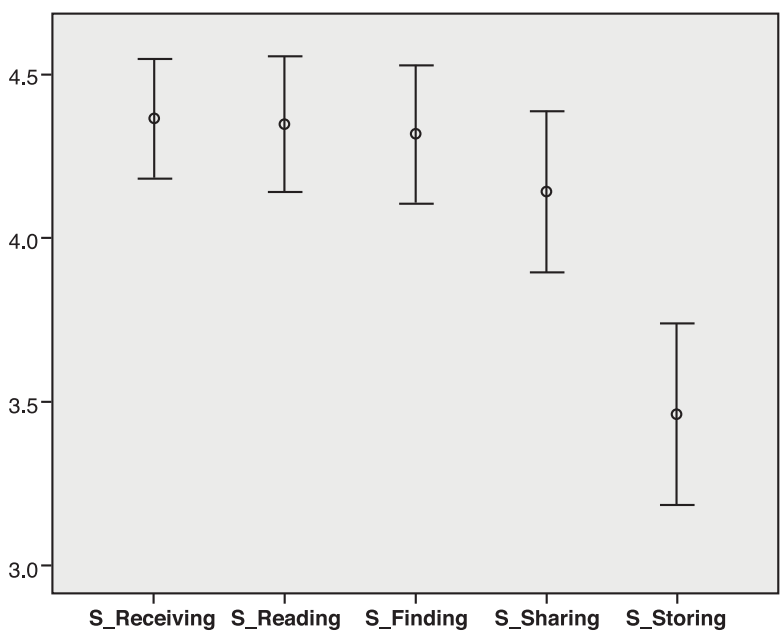

Figure 6. Confidence Intervals and Average Ratings of Satisfaction in Receiving, Reading, Finding, Sharing, and Storing News

A series of Kruskal-Wallis tests were conducted to examine the differences among various demographic variables, including gender, age, ethnicity, nationality, academic status, and more. Here only those groups that had significant differences are reported. Significant differences were found among ethnic groups in their satisfaction ratings for *reading* (H (4, N = 63) = 9.57, p = .048), *finding* (H (4, N = 63) = 9.67, p = .046), *sharing* (H (4, N = 63) = 10.59, p = .03), and *storing* news (H (4, N = 63) = 10.61, p = .03). In the case of *reading*, *finding*, and *storing* news, Hispanic participants had the highest satisfaction. Multiethnic participants had the highest satisfaction when *sharing* news. For *reading*, *finding*, *sharing*, and *storing* news, Asian participants had the lowest satisfaction.

5.7 Participants' comments on mobile news processing

At the end of the survey, participants responded to an open-ended question about their experiences with mobile news. Of the 63 participants, 19 participants (eight graduate and eleven undergraduate students) provided comments. Six respondents noted the convenience of accessing news via mobile phones, with one respondent (P40) stating that, "it is handy and easy using my phone to receive and read publicly news-related information, because it is easy to read up on such during my commutes to and from work. Mobile application[s] are capable of downloading all the daily news and one can read them offline." Participant 6 (P6) affirmed this point, stating that, "with technological advancements on smartphones, it has become much easier to access news-related information."

Multiple participants commented on the impact of social media on mobile news delivery. For instance, one participant (P39) pointed out that "social media motivates it's [sic] viewers to see news. For example, Facebook shows things that are 'trending', snapchat has 'discover' where I often look at the articles from Food Network to CNN to People. I get sent articles from a family member via flipboard sent to my email which seems like is a way to receive news that is more related to my interests." Another respondent (P37) claimed that social media, coupled with mobile devices, make mobile news an unavoidable and immersive part of people's daily lives: "Mobile Devices and Social Media Accounts are flooded with news information (at least mine), so there is no way to avoid news while also using those devices. Whereas television you can change the channel."

In contrast, several respondents emphasized the technical constraints of accessing news information on a mobile device. Two participants (P38 and P56) complained about the small display screen, with P56 noting that, "Sometimes it is a little difficult to read on the smartphone simply because the text is so small and I have poor eyesight." Another respondent (P58) indicated a preference for using his or her computer because it is easier to control news feeds: "I prefer using my computer for two reasons. First, it's just easier. Second, I don't know how to block ads and trackers on my phone like I do on my computer. I'm more comfortable in every sense on my computer." Another respondent (P18) spoke of the design and usability of mobile versions of news sites, noting that, media versions of sites to access news can either be well executed or annoying: "When sites are not designed well, I

am more likely to skip reading the story from those sites." Participants also discussed a habit of expanding their interaction with news from mobile to other devices or media, as commented by one participant (P15): "I am likely to find more information when I could not find enough information from my news app. So, I expand my search through labtop [sic] and social media."

There were also multiple comments about participants' lack of knowledge, familiarity, or comfort with the storing function on their mobile phones. One respondent (P27) pointed out that "I don't know what it means to 'store' news; I get a lot of my news through theSkimm, an email newsletter. I typically read it on my phone, but I didn't know how to qualify that as an app." Another respondent (P13) commented that, "I'm not familiar with quick ways to store such articles on my phone- though space would be an issue. I'd probably share more articles but sometimes the icons for sharing (for Facebook or Twitter for example) don't seem to work on my phone." And a third (P2) echoed that: "it is easy to access and explore news, but it is hard to store and categorize them with a smartphone. Sometimes I use the sharing function instead of storing news on social media apps so I later can find them easily by the shared time." A fourth respondent (P53) stated, "I don't feel like I store very many news articles. I will definitely read and share, but consume and 'toss away', aka not save it anywhere." Not every respondent expressed concerns with storing news on a mobile phone. For example, P48 argued that using a phone's storage feature proved more useful than retaining a pile of newspaper clippings: "I like to keep newspapers for reference sometimes, so it's more convenient to save articles I've found online through my phone instead of having a clutter of papers."

6. Discussion

Results of the study have revealed interesting behavior patterns of university students in their mobile news consumption. With regard to RQ1, significant differences were found between reported frequencies of various activities. It is worth noting that in general participants seldom or never stored news, whereas the majority of participants were heavy users when it came to receiving, reading, and finding news. In terms of sharing news, participants were light users, with the majority sharing news either monthly or weekly. This finding suggests that university students relied on their mobile devices to consume news rather than to transfer or archive news.

There were also significant differences in the types of primary media and apps used for different activities. Participants mainly relied on mobile devices for receiving, reading, finding, and sharing news, whereas for storing news, their preferred media were desktops/laptops in addition to mobile devices. In terms of the types of apps used, many reported that they did not store news in any apps while social media apps were heavily used for receiving, reading, finding, and especially sharing news.

With regard to participants' self-rated proficiency and satisfaction scores (RQ2 and RQ3), consistent patterns emerged. Participants' proficiency and satisfaction ratings in storing and sharing were the lowest or second lowest among the five activities. This statistic further reveals a large gap in the design of mobile news tools

in supporting activities such as storing or sharing news.

Consistent with our other findings, qualitative comments from participants (RQ4) suggest that processes for storing and sharing news were less streamlined and more difficult than receiving, reading, and finding news. Although mobile news sharing capabilities were limited, there were almost no mobile features that supported organizing or storing news. Participants pointed out that they used their desktops/laptops to extend their searches of news stories or to keep news if their mobile searches or news consumption did not lead to fruitful results. It is interesting that some participants used the "sharing" function for the purpose of "storing" and "organizing" since they could use the share timestamps as a way to organize and re-find news later. It is also interesting that participants expressed mixed feelings about their capabilities to keep and categorize news. One respondent indicated that she never permanently "save[d]" news anywhere. She would just consume and then simply "toss away" the news. As counter-evidence, another participant appreciated having mobile news storing capabilities which are much better than the clutter caused by old newspaper clipping.

The most intriguing finding of this study is that archiving/storing news has been the weakest point both in terms of the participants' own ability and with regard to the mobile devices' functionality. Using PIM terminology, the "keeping activities" component of mobile news processing was rather ignored by mobile device designers and thus continues to be perceived as problematic and challenging by mobile users. This could be partly due to the diminished temporal value of news, which may have prevented further development of mobile users' skills in this area as well as focused advancement of functionality and technological solutions concerning the archiving, organizing, and storing news through mobile phones. While using services such as cloud storage to enable news archiving could be an effective solution, smoother transition between mobile devices and cloud services must be implemented to ensure the extended usage of such a solution.

It was also surprising that our survey results revealed that the process of sharing news was not as streamlined as other activities. University students are avid users of social media tools and when they share news, they inherit the same mental model of shareability notion and sharing functionality of social media tools for any news app. The fact that the news apps students used to receive, find, and read news do not possess a highly functional sharing capability might have reduced the frequency of sharing news or using these apps to share news. It could become a cause of concern if younger mobile users (e.g., university students) turn from mobile news apps to social media tools as their primary news sources. To be competitive, news apps are in dire need for enhancing their functionality and usability for sharing, organizing, and storing news.

Even though this research study produced unique discoveries concerning the mobile news processing activities of university students, its design is limited by its relatively small sample size and non-randomized sampling. Although the results of the study are insightful and informative, they would not be generalizable. Future research could investigate whether the pattern of sharing and storing news on mobile phones being less

regularly practiced than receiving, reading and finding news is common to other user populations such as pre-college young adults or senior citizens. It would also be interesting to explore whether such a pattern remains true in a desktop or laptop computer setting. More broadly, we could investigate whether the mobile news activity patterns observed in this study could be expanded to describe information activities in other settings beyond the consumption of news information.

7. Conclusion

This research study used an online survey to examine how undergraduate and graduate students in the U.S. receive, read, find, share, and store news via their smartphones. Our findings show that receiving, reading, and finding news via mobile phone is part of most participants' daily activities. However, news resources were less frequently shared and even more rarely stored on smartphones. In addition, most participants rated themselves as very proficient in receiving, reading, and finding news, while less proficient in sharing news, and even less capable in storing news. In a similar vein, participants were very satisfied in using their smartphones to receive, read, and find news, but they were less satisfied in using their smartphones to share news, and least satisfied in using their smartphones to store news. Figure 7 outlines mobile usage patterns associated with the five activities of processing news, with both "sharing" and "storing" displaying opposite patterns from "receiving," "reading" and "finding." The fact that sharing and keeping activities were downplayed by mobile news app vendors, coupled with mobile users' need to improvise for news sharing and storing, presents a gap as well as an opportunity to create a meaningful, functionally fitting, and user-friendly solution to support streamlined news processing activities of sharing, keeping (organizing and archiving/storing), and re-finding.

This research study enriches our understanding of smartphone users' news information behavior. It also makes a unique contribution to the field by investigating not only mobile news searching behavior (which has been well-investigated in

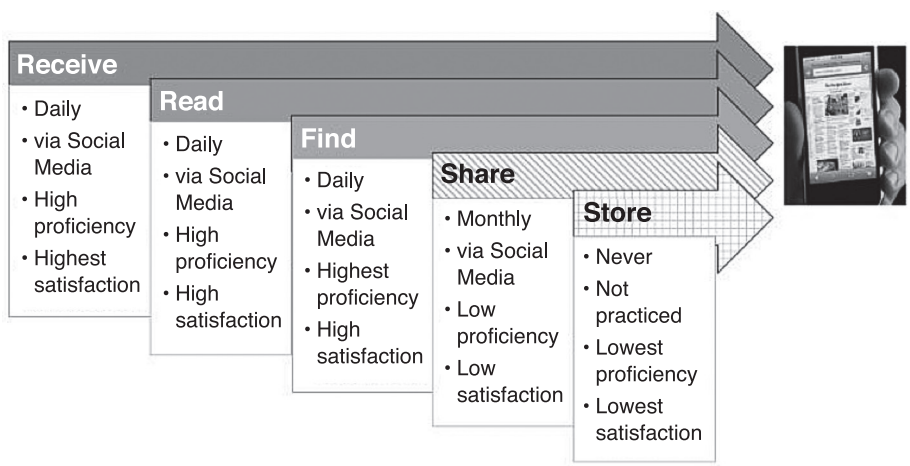

Figure 7. Usage Pattern of Receiving, Reading, Finding, Sharing, and Storing News

existing research) but also by examining, and comparatively analyzing, a stream of mobile news activities. Since mobile news information behavior constitutes part of our routine information behavior, establishing a thorough understanding of such behavior is valuable not only in terms of advancing our knowledge on this phenomenon but also because of the practical design directions that the research provides for mobile news tools.

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(Received: 2017/10/9; Accepted: 2017/11/27)

圖書資訊學刊　第16卷第1期　（2018.6）　頁1-21
doi: 10.6182/jlis.201806_16(1).001

美國大學生如何接收、閱讀、查找、分享與儲存新聞？行動新聞資訊行為調查研究

How Do University Students Receive, Read, Find, Share, and Store News? A Survey Study on Mobile News Behavior

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摘　要

行動新聞研究主要關注行動資訊需求，以及行動新聞資訊搜尋行為。本研究調查一系列行動新聞活動（接收、閱讀、查找、分享和儲存新聞），並交叉檢查與這些活動相關之差異模式和習慣。111名美國大學生和研究生參與篩選調查，其中63名參與後續線上調查並詳細回報他們的行動新聞消費習慣。研究結果顯示，參與者的接收、閱讀和查找新聞的行為模式與其分享和儲存新聞的模式不同。參與者接收、閱讀和查找新聞的頻率非常高，但認為自己對儲存和分享新聞的能力不夠熟練和滿意。研究結果（包括學生自己對新聞保存能力有限的評論以及行動應用程式開發人員忽視新聞儲存的功能）將增進對大學生行動新聞資訊行為的了解，並為行動新聞提供潛在且具意義之設計建議應用。

關鍵字：手機新聞資訊行為、新聞、資訊行為、智慧型手機、大學生

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註：本中文摘要由作者提供。
以APA格式引用本文：Oh, K. E., & Tang, R. (2018). How do university students receive, read, find, share, and store news? A survey study on mobile news behavior. *Journal of Library and Information Studies, 16*(1), 01-21. doi: 10.6182/jlis.201806_16(1).001
以Chicago格式引用本文：Kyong Eun Oh and Rong Tang. “How do university students receive, read, find, share, and store news? A survey study on mobile news behavior.” *Journal of Library and Information Studies* 16, no. 1 (2018): 01-21. doi: 10.6182/jlis.201806_16(1).001