PRE-PRINT: This is a pre-print version of an accepted manuscript. Please cite the final version at DOI: 10.1177/1077699013514411 (http://dx.doi.org/10.1177/1077699013514411).

Personalized News Portals: Filtering Systems and Increased News Exposure

Michael A. Beam[1]

Washington State University

Gerald M. Kosicki

The Ohio State University

Accepted July 15, 2013 to the journal

Journalism & Mass Communication Quarterly

Abstract

This study investigates the impact of personalized news web portals on selective exposure. Results from analyses of secondary survey data from national random samples of U.S. adults show a positive relationship between personalized news and increased exposure to offline news. Users of personalized news report viewing more sources and categories of news online compared with non-users. Partisan users of personalized news do not report increased partisan news exposure. No difference in preferences for perspective-sharing or challenging news sources is found between personalized news users and non-users. The implications for future research on personalized information systems and selective exposure are discussed.

Keywords

selective exposure, Internet news, public opinion, personalization

[1] michael.beam@wsu.edu, The Edward R. Murrow College of Communication, P.O. Box 642530, Pullman, WA 99164-2530

Personalized News Portals: Filtering Systems and Increased News Exposure

Daily interaction with personalized information systems is rapidly becoming a common reality for Internet users. People who can access the Internet and who are interested in acquiring information are able to access huge amounts of new and old information from traditional and new types of sources. Digital information users have been able to selectively filter information that appeals specifically to them.

Personalized filtering systems allow Internet users to more easily ignore information they find irrelevant. So, while the possibility of individualized information acquisition might be enhanced, collectively shared information by all users may actually narrow in the digital world. Mainstream adoption of new communication systems greatly increases the amount of accessible information and changes the landscape of information options, selection, and exposure for Internet users.[1] This study strives to contribute to our understanding of how the rise of personalized systems impacts news exposure and selectivity.

Information Overload. The revolution in information accessibility presents a new dilemma for Internet newsreaders: how does one make sense of an unmanageable amount of news? "Information overload" is a common concern among communication and information scholars. Information overload occurs when "an individual's efficiency in using information in their work is hampered by the amount of relevant, and potentially useful, information available to them."[2] The amount of relevant information available on the Internet about any news topic has exploded over the last three decades. Particularly worrying is the fact that news information overload can lead to increased uncertainty, poor decision-making and tuning out of subsequent information seeking.[3]

One solution to help Internet users cope with information overload comes in the form of personalization technology. Instead of trying to survey and select from a torrent of information, online newsreaders can take advantage of filtering systems and enter a personalized news environment tailored to their particular preferences. While this technology is a helpful evolution for users struggling to make sense of the information explosion, it poses both challenges and solutions for the democratic notion of a public sphere.

News and Public Opinion. News information believed to be desirable for citizens has been largely diffused through the mass media. Over time, innovation through "information revolutions," or changes in the information landscape, has led to structural changes in public opinion.[4] In the current era, scholars are trying to make sense of the democratic impact of the current transformation from a broadcast and mass media environment into an Internet society.[5]

Some worry that the sea of information made accessible by access to the Internet will decay commonly shared elements of the public sphere. The rise of the Internet has led to a shift in the power of news gatekeeping.[6] The traditional news media environment was largely bounded by traditional journalistic routines of balanced and accurate reporting.[7] News information can now be diffused through a nearly limitless number of channels; so former traditional media gatekeepers can no longer withhold information from the public.[8] Scholars worry that this vastly expanded information environment will lead to the polarization of the public sphere.[9] For example, Sunstein argues a byproduct of personalized filtering technologies that help users cope with the sheer quantity of information will be isolation from diverse news topics and sources.[10] This selective exposure limits the conditions necessary to reach high-quality decisions.

Selective Exposure. Selective exposure research emphasizes that news readers will likely engage in news that is consistent with their own preferences.[11] The primary mechanism of selectively choosing information to attend to and process, cited widely in selective exposure research, comes from Festinger's cognitive dissonance theory.[12] This theory posits people are likely to attend to information that is attitude-consistent rather than attitude-dissonant. Dissonant information increases uncertainty and psychological discomfort, while attitude-consistent information leads to reinforced confidence in pre-existing attitudes. Therefore, people are likely to choose messages that conform to their personal preferences while filtering out inconsistent messages.

Cognitive dissonance theory suggests both approach and avoidance behaviors in communication processes. Empirical evidence has largely focused on selective approach, rather than selective avoidance.[13] Many scholars agree selectively approaching media messages has more influence on information acquisition than selectively avoiding information.[14] This power differential is essential in understanding the effects of having access to an unmanageable number of sources and volume of information.

Brundidge has argued that selectivity leads to increased engagement in civic news and discourse, which in turn leads to increased exposure to both pro- and counter-attitudinal information.[15] Garrett has also found evidence that Internet users engage in news based on selective approach behaviors but do not selectively avoid counter-attitudinal information leading to overall increased information exposure.[16] Taken together, there is a possibility that increased selectivity may facilitate increased exposure to news. The process may come through incidental exposure to counter-attitudinal information, or through reduced cognitive effort required to access information.[17]

Bennett and Iyengar, conversely, argued that an increasing perception of a hostile media helps motivate people to seek other sources and avoid dominant mainstream sources.[18] For example, Iyengar and Hahn found news viewers rated identical news headlines attributed to different sources as less interesting when the news provider was not perceived to share their political perspective.[19] They worried an increasingly polarized media environment might lead to more citizens ill equipped in public discourse and decision-making. In sum, the differential impacts of approach and avoidance mechanisms are still under scholarly debate.

This study will help add empirical evidence to these theoretical questions by focusing on differences between users of personalized information systems that selectively filter news content with users who do not use personalization systems.

Personalized News. Personalized information systems are made possible by the diffusion of digital technology. Economic and technological constraints of mass production in the broadcast and print news media allowed for a single message to be distributed on any given channel to viewers. In digital media, information can be stored in a single database, allowing users to access or be presented different messages based on software algorithms. This allows for mass messages to be cheaply and easily personalized to an individual user.

Research has shown personalizing messages can be more effective at engaging and persuading an audience compared with mass messages.[20] Indeed, effectively personalizing advertisements and messages online has ballooned into a multi-billion dollar industry.[21] Despite a large literature articulating the relationship between the news information environment and the web, little empirical work has focused on personalized news systems.

One of the most pervasive ways to access news online is through a web portal. Indeed, in their explication of web portals Kalyanaraman and Sundar describe a portal as a gate.[22] Portals

provide "a door to access information on the web."[23] In addition to acting as a gateway, portals also "help increase awareness of—and confidence in—other sites."[24] Web portals also allow for users to access personalized links, news stories, and other tailored information. This study will focus specifically on the level of personalization in news web portals.

Most personalized news portal sites, such as *Feedly* and *My Yahoo!*, have high levels of explicit user customization including allowing users to specify sources and categories of news. *Pulse* and *Zite* have similar characteristics and are popular mobile applications.[25] Internet users are likely to interact with personalized and customized news portal sites every day.[26] In a study investigating personalized web portal user psychology, Kalyanaraman and Sundar found a positive relationship between website personalization and attitudes towards the portal site.[27] A multiple mediated model including perceived novelty, community, involvement, interactivity and relevance was empirically supported. Sundar and Marathe found attributes of agency, sense of control, and convenience played a role in users' perceived increase in content quality in personalized and customized news portal websites.[28] In sum, evidence exists that users will more highly regard news found linked from personalized and customized news portals. This study aims to explore news exposure differences between personalized news users and non-users in an externally valid environment.

Hypotheses & Research Questions. The amount of information accessible through a connection to the Internet greatly reduces the authority of traditional gatekeepers by empowering citizens who are using online tools to circumvent gatekeepers entirely. Internet users now have the power to choose to read stories on any number of topics from any number of sources. With access to an overwhelming number of sources online, Internet newsreaders must come up with their own strategies to cope with information overload. Personalized news portals allow users to

manage the topics and sources of news with which they are presented. Automatically filtering relevant information based on a set of user-defined rules provides users access to organized and relevant news. Therefore, we expect personalized news portal users will be more likely to cope with the quantity of news and experience less information overload compared with non-users. That is, users of personalized news portal are expected to be less overwhelmed by the amount of news available online because their news-gathering systems will automatically filter out less relevant news content (H1).

To understand the impact of personalized news portals, it is important to understand basic differences between a representative sample of users and non-users. Research shows that using multiple types of media is a predictor for subsequent news exposure.[29] This intramedia mediation effect would indicate engaging in personalized news portals would be positively related to subsequent news use. However, selective exposure research predicts that users will engage in news that matches their preferences. Unlike the news environment in the pre-Internet era, newsreaders no longer have to expend cognitive resources to assess the value of their news options because their news environment is adapted to them. If users of an online filtering system can access personally relevant news online, they may tune out of other news sources altogether. Therefore, this study tests competing hypotheses concerning quantity of offline media exposure between users and non-users of online personalized portals. That is, we can expect personalized news portals help people engage in the news more easily, which results in additional news use from offline sources (H2a). Or, we can expect personalized news portals help people selectively filter news that matches their preferences and tune out of other more general news channels altogether (H2b).

Additionally, this study investigates how personalized news portal users and non-users

differ in their exposure to news information online. Personalized news portals are built to increase the personal relevance of news sources, topics, and headlines compared with generic news portals. Increased personal relevance should increase the chances of choosing to engage with news content. Selective exposure research predicts that people will engage more often in information that is personally relevant. Therefore, we expect personalized news users will be more likely to report viewing a larger number of online news sources compared with non-users (H3).

Selective exposure research also predicts that users will engage in information that matches their own personal preferences. Research about the impact of choice on news category selection has led to differing results. Some public opinion scholars worry that news filtering will result in people only engaging in news topics in which they are interested, while avoiding others. However, filtering systems should also reduce the amount of effort required to engage in news. This study investigates if personalized news portal users report viewing a different number of online news categories than non-users (RQ1).

Evidence from selective exposure research has shown users are likely to choose to view news from sources that share their perspectives. However, a key question under debate about selective exposure is if people actively avoid information that challenges their perspectives. Personalized news portals allow users to filter their news sources and topics automatically. Lastly, this study examines whether there are systematic differences in preferences for news sources that share or challenge users' perspectives between personalized news portal users and non-users (RQ2).

Method

Two survey data sets collected by the Pew Research Center will test the relationship between using personalized news systems and users' news attitudes and behaviors. Due to the nature of survey data, the analyses cannot determine causality, only correlation. However, these data were chosen because they are part of large representative landline and cell phone random samples of Americans covering topics about online and offline news use, including use of personalized news portals. These public data sets, because of their representative nature and ability to examine behaviors of populations, are well suited to explore the relationships between online personalized news portal use and news attitudes and behaviors.

The Pew Research Center's Internet and American Life Project (PIAL) collected the first nationally representative data set between December 28, 2009 and January 19, 2010. Data were gathered from 2,259 English-speaking adults living in the continental United States including 1,748 landline participants and 580 cell phone participants. The landline response rate is 22% while the cell phone response rate is 20%. Response rates for telephone surveys are in part a function of number of days in the field period. Many surveys are designed to provide snapshots in time, and so the time period is restricted. This limits the use of certain tools that can increase response rates but require longer field periods. This data set is weighted using a two-stage procedure. The full data collection and weighting procedure is provided at the PIAL website.[30]

The Pew Research Center for the People and the Press (PPP) collected the second national data set between June 8, 2010 and June 28, 2010. Data were gathered from 3,006 English-speaking adults living in the continental United States including 2,005 landline participants and 1,001 cell phone participants. The landline response rate is 16.9% while the cell phone response rate is 17.5%. This data set is also weighted using a two-stage procedure. The full data collection and weighting procedure is outlined at the PPP (2010) website.[31]

Measures.

Personalized news portal use. In the PIAL survey, Internet users (N = 1,675) were asked, "Thinking about all the different ways you might get and share news online, please tell me if you ever customize your homepage to include your favorite news sources or topics." Participants answered yes, coded one (N = 466) or no, coded zero (N = 1,208). Participants who answered yes to this question are classified as "personalized news portal users" in the analyses.

In the PPP survey, Internet user participants (N = 2,475) were asked, "How often, if ever, do you get news or news headlines through a customizable web page, such as *iGoogle* or *My Yahoo!*, or through an RSS reader?" Participants who responded, "regularly," "sometimes," or "hardly ever" are coded one (N = 965), as "personalized news portal users" in the analyses, while those who respond "never" are coded zero (N = 1,489).

Information overload. Participants in the PIAL survey were read the statement, "the amount of news and information available from different sources today is overwhelming." They were asked to respond to a four-item Likert-scale coded from one (disagree) to four (agree) (M = 2.91, SD = .86).

Offline news media use. The PPP survey asked participants to report on their news exposure habits. For each type of offline news exposure, participants were asked to respond to four ordinal response options from regularly (coded three) to never (coded zero). Some of the questions in this portion of the survey were only collected from a subset of the participants, those randomly assigned to form one (N = 1,497) or form two (N = 1,502). Form one participants were asked about their *nightly broadcast network news* viewing (M = 1.54, SD = 1.78, N = 1,488), and *cable news network* viewing (M = 1.93, SD = 1.10, N = 1,493) in aggregate. Participants randomly assigned to form two were asked about their viewing of specific cable news channels

including *Fox News* (*M* = 1.36, *SD* = 1.20, *N* = 1,505), *CNN* (*M* = 1.36, *SD* = 1.11, *N* = 1,503), and *MSNBC* (*M* = 1.08, *SD* = 1.06. *N* = 1,499). All PPP participants were asked about their viewing habits for *local network news* (*M* = 2.16, *SD* = 1.04, *N* = 2,992) and a *daily newspaper* (*M* = 1.86, *SD* = 1.16, *N* = 2,995).

Online news sources. Internet user participants in the PIAL survey were asked to report the number of online sources they rely on for news. They were asked, "Thinking about all of the news and information you get online, how many websites, if any, do you routinely rely on for your news and information?" They were given response options of "just one site" (coded one), "two to five" (coded two), "six to ten" (coded three), and "more than ten" (coded four) (*M* = 1.72, *SD* = .88, *N* = 1,576). Participants who responded that they don't rely on any websites regularly for news, a response option not given by the interviewer, were coded zero.

Online news categories. Internet user participants in the PIAL survey were asked to report the categories of news they viewed online. Participants were asked "Thinking about news and information you might get online, do you ever use the Internet to get news or information about…". Participants were then read a list of twelve news content categories including, "developments in your local community; developments in your state; national events; international events; health or medicine; the weather; celebrities or entertainment; arts and culture; business, finance or the economy; science and technology; sports; and traffic." The sum of the number of affirmative responses was computed for an overall number of online news categories (*M* = 6.34, *SD* = 3.25, *N* = 1,664).

Perspective of news. Participants in the PIAL survey were asked to report the type of perspective they preferred in their news. They were asked, "thinking about the different kinds of news available to you, what do you prefer?" Participants were given response options, "getting

news that share your point of view" (coded one) and "getting news from sources that don't have a point of view" (coded zero). Participants randomly assigned to form one (N = 1,109) and form two (N = 1,150) were given slightly different response options for news that differs from their perspective, both coded minus one. Form one participants were given the option, "getting news from sources that challenge your point of view" (M = .06, SD = .72, N = 1,020). Form two participants were given the option, "getting news from sources that differ from your point of view" (M = .22, SD = .64, N = 1,033).

Control Variables.

Demographic variables. Research on digital inequalities has demonstrated that certain people are more likely to have access and skills to use communication technology for specific purposes.[32] Therefore, age, minority race, education, and gender are controlled in the survey analyses. A dummy variable for those who use the Internet (coded one) and those who do not (coded zero) will also be included in RQ1 and RQ2. All other analyses compare Internet users.

Age was measured by asking participants to give their age in years (PIAL M = 45.98, SD = 18, N = 2,212; PPP M = 46.29, SD = 18.12, N = 2,960). Minority race was measured by asking participants to separately answer their race and if they were of Hispanic origin. Non-Hispanic whites were coded zero (PIAL N = 1,564, PPP N = 2,135*),* while others were coded one for the variable *minority* (PIAL N = 664, PPP N = 825). Education was measured with an ordinal scale from low education ("none or grade 1-8") to high education ("post-graduate training") coded from one to seven (PIAL M = 4.36, SD = 1.66, N = 2,243; PPP M = 4.43, SD = 1.63, N = 2,994). Lastly, sex was recorded as either male (PIAL N = 1,103, PPP N = 1,430) or female (PIAL N = 1,156, PPP N = 1,576).

News Attention. Participants' general attention to news was controlled in the PIAL study analyses using a single item asking about participants' frequency of news attention. The ordinal measure was coded from zero to four from no news attention to high news attention (N = 2,247, M = 3.30, SD = .03).

Political variables. Political ideology and party affiliation are also important variables when investigating political news exposure. Those who are strong ideologues and have strong party allegiances are more likely to be polarized in their news readership.[33] Therefore, political ideology and party affiliation will be controlled in the survey analyses.

Both the PPP and PIAL surveys measure political ideology by asking participants, "Describe your political views as." Response categories include "very conservative" (coded one), "conservative" (coded two), "moderate" (coded three), "liberal" (coded four), and "very liberal" (coded five) (PIAL M = 2.82, SD = 1.00, PPP M = 2.79, SD = .97). Both the PPP and PIAL surveys measure political party affiliation by asking participants, "In politics today, do you consider yourself a Republican, Democrat, or Independent?" If the participant reported affiliation with the Republican Party, the control variable *Republican* was coded one (PIAL N = 535, PPP N = 764). If a participant reported affiliation with the Democratic Party, the control variable *Democrat* was coded one (PIAL N = 709, PPP N = 991).

Analysis Plan. The survey data is analyzed using a series of regression models to test H1, RQ1, H2, H3 and RQ2. Personalized news portal use is the independent variable in all models. Models are tested with dependent and control variables included. H1, RQ1, RQ2 and H3 utilize standard OLS regression models to determine the influence of personalized portal news use on the dependent variables. RQ1 is tested with a series of OLS regression models for each offline media source. H2 utilizes ordinal probit regression due to the limited number of response

categories. Appropriate survey weights supplied by the organizations that gathered the original data are utilized in all analyses in order to best approximate a valid population estimate. Analyses were calculated using the SVY tools in STATA, which are appropriate when using complex post-stratification survey weights.

Missing data. In all analyses, listwise deletion is used when data are missing from cases in the variables of interest. The control variable political ideology contains over 5% missing cases in both the PIAL (7.57%) and PPP (6.39%) data. Hot-deck imputation is a good method to impute missing data in this circumstance.[34] Hot-deck imputation randomly matches "donor" participants who match participants with missing data on a variety of other "deck" variables. The donor value is used to impute the missing values. Political ideology was imputed using political party affiliation, age, sex, race, education, employment status, marriage status and parental status as "deck" variables. Imputation was conducted using a hot-deck SPSS macro.[35] After imputing for the missing variable, missing data fell to a level below 5%.

Results

The OLS model results in Table 1 shows the results of modeling personalized news portal use as a predictor of information overload. H1 predicted personalized news portal use would result in being less overwhelmed by the total amount of news. While the results are in the predicted direction, there is no significant difference between personalized news portal users and non-users in describing the amount of news as overwhelming, $b = -.055$, $t(1539) = -0.91$, $p = .36$. This hypothesis is not supported.

Table 2 shows a series of models comparing offline news use between personalized news portal users and non-users to test the competing hypotheses in H2. In nearly all cases, personalized portal news users report significantly more usage of offline media types including

network television news, cable television news, local television news, and newspapers. Personalized news portal users also report viewing *Fox News* and *CNN* cable news channels more than non-users. An increase in *MSNBC* news viewing was marginally significant for personalized news portal users ($p = .06$). In sum, there is evidence that personalized news portal users are viewing more offline news than non-users, so H2a is supported.

To help further understand the relationship between personalized news portal use and offline news habits, the same offline news use models were also tested comparing like-minded partisan news users and non-users to further test H2. Results from Table 3 show that Republican personalized news portal users report significantly more use of offline media types including network television news, cable television news, and local television news. However, Republican personalized news portal users and non-users do not report any difference in offline media types including newspapers, or specific cable news channels *Fox News, CNN*, or *MSNBC*. Results from Table 3 show that Democratic personalized news portal users report significantly more offline media types including cable television news, newspapers, and the cable news channel *CNN*. However, Democratic personalized news portal users and non-users do not report any difference in offline media types including network television news, local television news or the specific cable news channels *Fox News* or *MSNBC*. Together, these results show that personalized news portal users are viewing more general news offline than non-users, but they are not reporting an increase in viewing popular partisan cable news channels *Fox News* or *MSNBC*, indicating additional support for H2a.

Moving from offline to online news viewing, the first column in Table 4 shows models that confirm the H2 prediction that personalized news portal users view more news sources online. The second column in Table 4 shows results for RQ1, indicating personalized news portal

users also view more news categories online compared with non-users. As predicted, personalized news portal users report viewing significantly more sources of news online compared with non-users, $b = .340$, $t(1476) = 6.47$, $p < .001$. Analysis also reveals that personalized news portal users report viewing significantly more categories of news online compared with non-users, $b = 1.61$, $t(1548) = 9.49$, $p < .001$.

Lastly, the exploratory ordinal regression models testing RQ2 in table 5 reveal no differences between personalized news portal users and non-users in their preference for their news source perspectives. Participants were given three different response options representing perspective sharing (coded one), no perspective (coded zero), and differing perspective in their preferred news sources (coded minus one). Form one and form two participants were given slightly different question wording. The affirmative and no-perspective response options were the same in both forms while the last response option used "challenge your point of view" in form one and "differ from your point of view" in form two. Neither wording produced any significant difference in responses between personalized and non-personalized news portal users. The only control variable that had a significant relationship to perspective preference was partisan affiliation with the Republican Party. Republicans were predicted to score significantly higher than those not affiliated with the party, indicating a preference for a more similar perspective.

Discussion

The goal of this study is to contribute to understanding how personalized news portal use impacts news reading, selection, and exposure. Using survey data from random national samples, analyses indicated a positive relationship between personalized news portal use and news acquisition. Personalized news portal users reported viewing both more sources of news and

more categories of news online compared with non-users. In nearly every type of offline media and channel, personalized news portal users reported increased news viewing. However, no differences in attitudes about news information were found.

First, it was expected that accessing personalized news portals would result in users feeling less information overload compared to non-users. This hypothesis was not supported, as there was no difference found between personalized news users and non-users. As mentioned earlier, there is so much news available through the various media outlets online and offline that no one can attend to all the accessible news of the day. The relationship between increased news exposure and personalized news portal use could mean personalized news portal users are more keenly aware of the utter vastness of the accessible news information.

The next set of analyses focused on selective news exposure both offline and online. In all models, the quantity of news exposure was positively related to personalized news use. Despite scholarly worry that more narrow types of news would be viewed when using selective personalized filters, an increase in news sources, channels, and categories was found for personalized news users. Therefore, we can conclude that personalized news users are not narrowing the sources of news (e.g., only *Fox News*) or categories of news (e.g., only sports news) they view. As expected, these findings support previous empirical research demonstrating news users with access to systems that foster selectivity actually increases news exposure.[36]

Personalized news systems allow users to skip the time-consuming step of searching for compelling news stories to view by offering users personally relevant headlines. These results contribute to a growing body of selective exposure research indicating Internet access may foster increased news engagement. If people are equipped with technology that makes it easier to

access news and information in more places and more times, a significant portion of them learn to use it and engage with media.

Much of the scholarly selective exposure debate is centered on people's behaviors as a result of their decreased exposure to diverse perspectives. The findings in this study demonstrate an increase in news category and source exposure, yet it is possible that all of those sources share users' perspective providing them with a skewed perception of the public sphere. This increased polarization is a primary concern for public opinion scholars.

Results indicate users of personalized news report no difference in their personal preferences for news sources sharing or challenging their personal perspectives compared with non-users. The average news viewer seems to favor news that doesn't have a particular biased perspective. News users prefer objective news sources that provide both perspective-sharing and perspective-challenging news. Furthermore, no differences in offline partisan news media were found between partisan affiliated personalized portal users. These same partisans did show an increase in non-partisan offline news outlets.

Taken together, these results indicate personalized information use, made possible by communication technology, may foster positive democratic outcomes through increased engagement with news. The evidence provided in this research supports the notion that our theoretical models of information selection should emphasize the appeal of selective approach over selective avoidance.[37] Conversely, there is no evidence here supporting the popular idea that communication technologies fostering selective exposure will decay the public sphere.[38] When people choose to engage in content, they are often trying to find personally relevant information, but not avoiding information that may challenge their perspective or preferences.

Strengths and Limitations. The goal of this study is to understand how users of personalized news systems in the real world differ from non-users. Most recent research investigating the impact of technology on selective exposure has compared Internet users to non-users. However, little scholarship has focused on the impact of personalized news systems. This study provides a key contribution by building from formative experimental work to provide empirical results about how Americans use personalized news. While survey methods lack the strict control of an experiment, understanding how diverse populations use technologies is important for understanding how technology is actually employed.

Results were empirically tested from secondary representative national cross-sectional survey data. The sample coverage in this data is excellent, as the Pew organizations have fielded the RDD survey to both landline and cellular phones. The response rates for these surveys were around 20%. Response rates have steadily declined in the last two decades due to the proliferation of cellular phones, answering machines, voicemail, and caller ID.[39] However, studies have indicated declining response rates do not indicate systematic nonresponse bias.[40] In fact, Keeter and his colleagues find that lowered response rates in the modern telecommunications era do not indicate any decrease in data quality.[41] The question wording on some measures, for example the binary measurement of online news personalization, could be improved for fine-grained measurement in future studies. A future study may benefit from delineating heavy personalization system users from light users. However, the benefit of utilizing two large-scale externally valid data sets that lead to theoretically consistent conclusions provides a good starting point for this research.

While these results provide a good baseline profile of personalized information system users, causal effects cannot be established. Based on these data, there is no way to establish if

personalized information system users are engaging in more online and offline news as a result of increased personal relevance or if users who are engaged in more online and offline news acquisition are more likely to turn to personalized information systems. Prior shows that a subset of the population interested in the news is likely to engage in increased news attention in a media landscape where news is more easily accessible while others, less interested in news, are likely to tune out.[42] On the other hand, Kalyanaraman and Sundar show that increased personalization leads to increased personal relevance and involvement with information provided by portals.[43] Both of these empirical examples could provide explanations for the order effects in relationship between personalized news use and news acquisition. A reciprocal relationship between news acquisition and personalized news use could be present.

Next, the survey results show a significant increase in personalized news users' online news category exposure, online news source exposure, as well as offline news media type and source exposure. No differences between personalized news users and non-users were reported in their preferences for news source perspective-sharing and perspective-challenging. These findings are notable because they indicate personalized news use is related to increased news acquisition without an increase in perspective-sharing news sources. However, it is not entirely clear that people are fully capable of discerning such perspectives in the abstract, or recognizing them when they see them. For example, research shows that news viewers' reported preferences and actual behaviors could diverge.[44] But within people's ability to recognize this behavior through self-reported data, we were not able to detect significant preferences for perspective sharing.

Future Research. This study indicates a need for more research on the impact of personalized information systems. Scholars in the public opinion and selective exposure

literatures have argued that personalized systems may foster polarization. These results indicate that these fears might be overstated. Future studies should continue to focus on answering the questions raised in this debate as the information environment is unmistakably becoming more diverse and harder to control in systematic ways. People may also not be fully aware of the implications of some of their information habits, and these issues may become more prominent given further technological innovation. This study has demonstrated a link between personalized system use and increased news acquisition. Undeniably, news and public information has gotten more convenient and easier to access compared to the mass communication era. Questions remain about the quality and character of the information that people are finding, or that finds its way to them. Furthermore, this study does not speak to information processing strategies that may or may not be employed after news exposure.

Future studies should continue this work by focusing on establishing a causal relationship between personalized news system usage and increased news category and source exposure. Furthermore, more conclusive results could be found in over-time research studies investigating patterns of changing news reading behaviors. For example, over-time research can help us understand exposure differences in more specific topics such as local news coverage and controversial news issues, which are both central concerns to a well-functioning democracy.

Future research should also focus on content exposure differences between personalized news users and non-users. Political propaganda often begins with a kernel of information that is then interpreted in different ways by friends and critics. This feature of sectors of the information system, especially as communicated through social media, may help explain how people can report hearing the latest information about both their political friends and adversaries. What the information means to a given individual, or a group of individuals with a common viewpoint,

however, is a more complex question that is not so readily answered without more research. The inadvertency thesis indicates increased exposure through personalized systems could lead to increased inadvertent exposure to cross-cutting perspectives.[45] On the other hand, selective filtering technologies may foster decreased exposure to cross-cutting perspectives. This research would be valuable in helping to answer questions about the overall diversity of content exposure when using personalized news systems. Lastly, it is important to continue to conduct research on filtering information systems because the diffusion of personalized communication technologies is pervasive and unstoppable.

Table 1

OLS Regression Model Estimating Level of Being Overwhelmed by the Quantity of News

Variable	*b*	*se(b)*
Personalized News Use	-.055	.060
Sex (F)	.071	.052
Age	.005**	.002
Education	.003	.019
Political Ideology	-.001	.031
Democrat	.046	.069
Republican	.118	.063
News Attention	-.056	.034
Minority	-.005	.071
Constant	2.73***	.194
R^2	.02	
N	1540	

Note. *$p < .05$; **$p < .01$; ***$p < .001$.
Regression coefficients are unstandardized.

Table 2

OLS Regression Models Estimating Frequency of Offline News Viewing

	Network News	Cable News	Local News	Newspapers	Fox News	CNN	MSNBC
Personalized News Use	.435*** (.076)	.333*** (.069)	.227*** (.049)	.142** (.055)	.151* (.077)	.253*** (.077)	.135† (.072)
Sex	.109 (.072)	-.033 (.068)	.119** (.045)	.020 (.051)	.087 (.068)	.053 (.069)	.093 (.066)
Age	.018*** (.002)	.008*** (.002)	.013*** (.001)	.013*** (.002)	.004* (.002)	.007*** (.002)	.007*** (.002)
Education	-.012 (.023)	-.021 (.021)	-.056*** (.015)	.069*** (.016)	-.064* (.023)	.040† (.023)	-.003 (.022)
Political Ideology	-.012 (.054)	-.066 (.043)	-.055* (.028)	.008 (.030)	-.302*** (.038)	.089* (.039)	.023 (.040)
Democrat	.054 (.087)	-.112 (.082)	.022 (.054)	.032 (.061)	-.218* (.082)	.126 (.086)	.208* (.083)
Republican	-.119 (.095)	.105 (.087)	-.021 (.055)	.036 (.065)	.443*** (.091)	-.124 (.087)	-.201* (.080)
Minority	.105 (.088)	.140† (.084)	.072 (.058)	.022 (.063)	.263** (.088)	.256* (.094)	.119 (.089)
Internet User	.051 (.125)	.262* (.127)	.110 (.073)	.365*** (.084)	-.063 (.108)	-.068 (.116)	.132 (.110)
Constant	.574* (.236)	1.59*** (.239)	1.68*** (.161)	.576*** (.169)	2.31*** (.231)	.681** (.236)	.498* (.231)
R^2	.089	.051	.066	.055	.155	.055	.044
N	1372	1374	2756	2758	1387	1384	1382

Note. † < .10; *p < .05; **p < .005; *** p < .001, two-tailed.
Unstandardized regression coefficients are listed with standard errors listed below in parentheses.

Table 3

OLS Regression Models Estimating Frequency of Offline News Viewing from Personalized News Use

	Network News	Cable News	Local News	Newspapers	Fox News	CNN	MSNBC
Republicans	.421**	.628***	.278**	-.086	.267†	.232†	.200
	(.149)	(.123)	(.091)	(.103)	(.142)	(.134)	(.127)
N	395	395	799	804	408	406	406
Democrats	.162	.257*	.131	.274**	.071	.359**	.214
	(.133)	(.123)	(.086)	(.097)	(.129)	(.136)	(.133)
N	453	453	926	925	473	472	471

Note. *$p < .05$; **$p < .005$; *** $p < .001$, two-tailed.
Unstandardized regression coefficients are listed with standard errors listed below in parentheses.

Table 4

OLS Regression Models Estimating Frequency of Online News Viewing

	Number of Online News Sources	Number of Online News Categories
Personalized News Use	.340***	1.61***
	(.053)	(.170)
Sex	-.041	-.128
	(.049)	(.164)
Age	-.014***	-.045***
	(.002)	(.005)
Education	.092***	.597***
	(.017)	(.057)
Political Ideology	-.027	.059
	(.028)	(.094)
Democrat	.020	.436*
	(.063)	(.219)
Republican	-.075	.189
	(.062)	(.196)
News Attention	.244***	.932***
	(.031)	(.096)
Minority	-.003	-.031
	(.069)	(.219)
Constant	1.13***	1.76***
	(.166)	(.570)
R^2	.184	.272
N	1477	1549

Note. *p < .05 **p < .005 *** p < .001, two-tailed.
Unstandardized regression coefficients are listed with standard errors listed below in parentheses.

Table 5

Ordinal Regression Model Estimating Perspective-sharing Preferences of News Sources

	Form 1[1]	Form 2[2]
Personalized News Use	-.037 (.113)	-.039 (.111)
Sex	-.107 (.094)	.075 (.092)
Age	-.002 (.003)	.000 (.003)
Education	-.031 (.030)	-.046 (.034)
Political Ideology	-.041 (.055)	-.062 (.056)
Democrat	.123 (.117)	.067 (.123)
Republican	.272* (.109)	.415*** (.110)
News Attention	-.077 (.061)	.015 (.051)
Minority	.050 (.125)	.197 (.122)
Internet User	-.114 (.137)	-.136 (.159)
N	937	964

Note. *$p < .05$; **$p < .001$, two-tailed.
Unstandardized regression coefficients are listed with standard errors listed below in parentheses.
[1] Lowest response option ”challenge your point of view”
[2] Lowest response option ”differ from your point of view”

[1] See Bruce Bimber, *Information and American Democracy: Technology in the Evolution of Political Power* (NY: Cambridge University, 2003); Markus Prior, *Post-Broadcast Democracy: How Media Choice Increases Inequality in Political Involvement and Polarizes Elections* (Cambridge, UK: Cambridge University, 2007).

[2] David Bawden and Lyn Robinson, "The Dark Side of Information: Overload, Anxiety and Other Paradoxes and Pathologies," *Journal of Information Science* 35 (2, 2008): 180-191, 182.

[3] Linda Aldoory and Mark A. Van Dyke, "The Roles of Perceived "Shared" Involvement and Information Overload in Understanding How Audiences Make Meaning of News About Bioterrorism," *Journalism & Mass Communication Quarterly* 83 (2, 2006): 346-361.

[4] Bimber, *Information and American Democracy.*

[5] Bimber, *Information and American Democracy;* Cass R. Sunstein, *Republic.com 2.0* (Princeton: Princeton, 2007); Paul DiMaggio, Eszter Hargittai, W. Russell Neuman, and John P. Robinson, "Social Implications of the Internet," *Annual Review of Social Science* 27 (August, 2001): 307-336; Prior, *Post-Broadcast Democracy*; Yochai Benkler, *The Wealth of Networks: How Social Production Transforms Markets and Freedom* (New Haven: Yale University, 2006); Jennifer Brundidge, "Toward a Theory of Citizen Interface with Political Discussion and News in the Contemporary Public Sphere," *International Journal of Communication* 4 (2010): 1056-1078.

[6] Ivan B. Dylko, Michael A. Beam, Kristen D. Landreville, and Nicholas G. Geidner, "Filtering 2008 Presidental Election News on YouTube by Elites and Nonelites: Examination of the Democratizing Potential of the Internet," *New Media and Society* 14 (5, 2012): 832-849; Karine Barzilai-Nahon, "Toward a Theory of Network Gatekeeping: A Framework for Exploring Information Control," *Journal of the American Society for Information Science and Technology* 59 (9, 2008): 1493-1512; Eszter Hargittai, "Open Portals or Closed Gates? Channeling Content on the World Wide Web," *Poetics* 27 (4, 2000): 233-253; Axel Bruns, *Gatewatching: Collaborative Online News Production* (NY: P. Lang, 2005).

[7] Pamela J. Shoemaker, *Gatekeeping* (Newbury Park, CA: Sage, 1991).

[8] Bruce A. Williams and Michael X. Delli-Carpini, "Unchained Reaction: The Collapse of Media Gatekeeping and the Clinton-Lewinsky Scandal," *Journalism* 1 (1, 2000): 61-85.

[9] Sunstein, *Republic.com 2.0*; Prior, *Post-Broadcast Democracy*; Natalie Jomini Stroud, *Niche News: The Politics of News Choice* (NY: Oxford University, 2011).

[10] Sunstein, *Republic.com 2.0*

[11] See David O. Sears and Jonathan L. Freedman, "Selective Exposure to Information: A Critical Review," *Public Opinion Quarterly* 31 (2, 1967): 194–213; Dieter Frey, "Recent

Research on Selective Exposure to Information," in vol. 19 of *Advances in Experimental Social Psychology*, ed. Leonard Berkowitz (NY: Academic Press, 1986): 41-80; Paul D. Sweeny and Kathy L. Gruber, "Selective Exposure: Voter Information Preferences in the Watergate Affair," *Journal of Personality and Social Psychology* 46 (6, 1984): 1208-1221; R. Kelly Garrett, "Politically Motivated Reinforcement Seeking: Reframing the Selective Exposure Debate," *Journal of Communication* 59 (4, 2009): 676-699; R. Kelly Garrett, "Echo Chambers Online? Politically Motivated Selective Exposure Among Internet News Users," *Journal of Computer Mediated Communication* 14 (2, 2009): 265-285; Silvia Knobloch-Westerwick and Jingbo Meng, "Looking the Other Way: Selective Exposure to Attitude-Consistent and Counterattitudinal Political Information," *Communication Research* 36 (3, 2009): 426-448; Shanto Iyengar and Kyu S. Hahn, "Red Media, Blue Media: Evidence of Ideological Selectivity in Media Use," *Journal of Communication* 59 (1, 2009): 19-39; Stroud, *Niche News*.

[12] See Leon Festinger, *A Theory of Cognitive Dissonance* (Stanford, CA: Stanford University, 1957); Leon Festinger, *Conflict, Decision, and Dissonance* (Stanford, CA: Stanford University, 1964).

[13] John L. Cotton, "Cognitive Dissonance in Selective Exposure," in *Selective Exposure To Communication,* ed. Dolf Zillmann and Jennings Bryant (Hillsdale, NJ: Routledge, 1985), 11-34.

[14] Sears and Freedman, "Selective Exposure to Information;" Garrett, "Echo Chambers Online?," Jennifer Brundidge, "Encountering 'Difference' in the Contemporary Public Sphere: The Contribution of the Internet to the Heterogeneity of Political Discussion Networks," *Journal of Communication* 60 (4, 2010): 680-700.

[15] Brundidge, "Encountering 'Difference' in the Contemporary Public Sphere."

[16] Garrett, "Politically Motivated Reinforcement Seeking;" Garrett, "Echo Chambers Online?"

[17] Brundidge, "Encountering 'Difference' in the Contemporary Public Sphere;" Magdalena E. Wojcieszak, and Diana C. Mutz, "Online Groups and Political Discourse: Do Online Discussion Spaces Facilitate Exposure to Political Disagreement?," *Journal of Communication* 59 (1, 2009): 40-56; Bimber, *Information and American Democracy.*

[18] W. Lance Bennett and Shanto Iyengar, "A New Era of Minimal Effects? The Changing Foundations of Political Communication," *Journal of Communication*, 58 (4, 2008): 707-731.

[19] For example, Iyenger and Hahn, "Red Media, Blue Media."

[20] Barbara K. Rimer and Matthew W. Kreuter, "Advancing Tailored Health Communication: A Persuasion and Message Effects Perspective," *Journal of Communication* 56 (S1, 2006): S184–S201; Anthony J. Roberto, Janice L. Krieger and Michael A. Beam, "Enhancing Web-Based Prevention Messages for Hispanics Using Targeting and Tailoring," *Journal of Health Communication* 14 (6, 2009): 525-540.

[21] Douglas MacMillan, "Google's Display-Ad Sales Should Top $1 Billion," *Bloomberg Businessweek,* Last modified February 8, 2010, http://www.businessweek.com/technology/content/feb2010/tc2010027_356976.htm; Eli Pariser, *The Filter Bubble: What the Internet is Hiding from You*. (NY: Penguin, 2011).

[22] Sriram Kalyanaraman and Shyam S. Sundar, "Portrait of the Portal as a Metaphor: Explicating Web Portals for Communication Research," *Journalism and Mass Communication Quarterly* 85 (2, 2008): 239–256.

[23] Kalyanaraman and Sundar, "Portrait of the Portal as a Metaphor," 248.

[24] Kalyanaraman and Sundar, "Portrait of the Portal as a Metaphor," 248.

[25] See Shyam S. Sundar and Sampada S. Marathe, "Personalization versus Customization: The Importance of Agency, Privacy, and Power Usage," *Human Communication Research* 36 (3, 2010): 298-322.

[26] Pariser, "The Filter Bubble."

[27] Sriram Kalyanaraman and Shyam S. Sundar, "The Psychological Appeal of Personalized Content in Web Portals: Does Customization Affect Attitudes and Behavior?," *Journal of Communication* 56 (1, 2006): 110-132.

[28] Sundar and Marathe, "Personalization versus Customization."

[29] For example, R. Lance Holbert, "Intramedia Mediation: The Cumulative and Complementary Effects of News Media Use," *Political Communication* 22 (4, 2005): 447-461.

[30] "January 2010 – Online News," Pew Internet and American Life Project, accessed Feb. 10, 2011, http://pewinternet.com/Shared-Content/Data-Sets/2010/January-2010--Online-News.aspx

[31] "June 2010 Media Consumption Survey," Pew Research Center for the People & the Press, accessed Feb. 10, 2011, http://people-press.org/category/datasets/2010/?download=20018243

[32] DiMaggio et al., "Social Implications of the Internet."

[33] For example, Iyengar and Hahn, "Red Media, Blue Media."

[34] Philip L. Roth, "Missing Data: A Conceptual Review for Applied Psychologists," *Personnel Psychology* 47 (3, 1994): 537-560.

[35] For full details, see Teresa A. Myers, "Goodbye, Listwise Deletion: Presenting Hot Deck Imputation as an Easy and Effective Tool for Handling Missing Data," *Communication Methods and Measures* 5 (4, 2011): 297-310.

[36] Garrett, "Echo Chambers Online?"

[37] Cotton, "Cognitive Dissonance in Selective Exposure;" Garrett, "Echo Chambers Online?"

[38] See Sunstein, *Republic.com 2.0*

[39] Richard Curtin, Stanley Presser, and Eleanor Singer, "Changes in Telephone Survey Nonresponse Over the Past Quarter Century," *Public Opinion Quarterly* 69 (1, 2005): 87–98;

[40] Curtin, Presser, and Singer, "Changes in Telephone Survey Nonresponse Over the Past Quarter Century;" Scott Keeter, Courtney Kennedy, Michael Dimock, Jonathan Best, and Peyton Craighill, "Gauging the Impact of Growing Nonresponse on Estimates from a National RDD Telephone Survey," *Public Opinion Quarterly* 70 (5, 2006): 759–779.

[41] Keeter et al., "Gauging the Impact of Growing Nonresponse on Estimates from a National RDD Telephone Survey."

[42] Prior, *Post-Broadcast Democracy*

[43] Kalyanaraman and Sundar, "The Psychological Appeal of Personalized Content in Web Portals."

[44] David Tewksbury, "What Do Americans Really Want to Know? Tracking the Behavior of News Readers on the Internet," *Journal of Communication* 53 (4, 2003): 694-710.

[45] Brundidge, "Encountering 'Difference' in the Contemporary Public Sphere."