

The Role of User Profiles for News Filtering

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Abstract

Most online news sources are electronic versions of “ink-on-paper” newspapers. These are versions that have been filtered, from the mass of news produced each day, by an editorial board with a given community profile in mind. As readers, we choose the filter rather than choose the stories. New technology, however, provides the potential for personalized versions to be filtered automatically from this mass of news on the basis of user profiles.

People read the news for many reasons: to find out “what's going on”, to be knowledgeable members of a community, and because the activity itself is pleasurable. Given this, we ask the question, “How much filtering is acceptable to readers?”

In this study, an evaluation of user preference for personal editions vs. community editions of online news was performed. A personalized edition of a local newspaper was created for each subject based on an elliptical model that combined the user profile and community profile as represented by the full edition of the local newspaper. The amount of emphasis given the user profile and the community profile was varied to test the subjects' reactions to different amounts of personalized filtering. The task was simply, “read the news”, rather than any subject specific information retrieval task. The results indicate that users prefer the coarse-grained community filters to fine-grained personalized filters.

Introduction

News, within the scope of this project (Burkowski, Watters, & Shepherd 1994; Shepherd, Watters, & Burkowski, 1995a, 1995b; Watters, Shepherd & Burkowski, 1998) is information about recent events of general interest, especially as reported by newspapers, magazines, radio, or television. Electronic news is the presentation of such news delivered over switched, high-bandwidth communications networks. This presents the opportunity to actually provide interactive, multimedia (text, photos, video, and audio), personalized news selection.

News of current events is endlessly different, but with a short shelf life with respect to its immediacy. The amount of raw or source data from which stories are selected is enormous and much of it is later archived. Although the bandwidth to deliver electronic news to large numbers of people is certainly an issue today, it is predicted (Negroponte, 1996) that by the year 2020, these networks will, "...pour bits galore into your home." The problem will not be bandwidth, rather it will be selecting the right news stories from the enormous flood of information.

Most people read the newspaper, watch televised newscasts, and/or listen to radio newscasts to gain the public knowledge (Schudson, 1995) necessary to participate within their local, national, and global communities. However, while the quantity of news has increased, the time available to view this news has not (van Cuilenburg, 1987). As such, news seeking behavior satisfies different task requirements at different times. For instance, people read the weekday paper and the weekend paper differently (Bogart, 1992).

The deployment of electronic news represents a major shift in the infrastructure, logistics, and ethos of the traditional news (newspaper, television, and radio) delivery services. In contrast to the current model of broadcasting news by the delivery of a discrete product (a paper or a newscast), electronic news has the potential for narrowcast delivery of interactive electronic items of various media integrated into a single multimedia presentation.

In designing electronic news systems, we must understand what people expect to gain from “getting the news”. Two behavioral theories that have been applied to news reading are *uses and gratification* and *play* or *ludenic* (Dozier and Rice, 1984).

The *uses and gratification* theoretical perspective is based on the assumption that the reader has some underlying goal, outside the reading itself, that reading the news satisfies. That is, “... an assumption that media use, including news reading, serves some ulterior purpose external to the communication behavior itself.” (Dozier and Rice, 1984) As an example, a reader may read the paper specifically to check the performance of the stock market. This perspective implies that optimal content and form can be determined once the particular goal is known. So we could expect that a profile of user interest could be used to predict and select items for individual readers based on his or her information goal(s).

Task analysis of user interfaces and information systems is generally based on the theory of uses and gratification. That is, the user has some goal or task that can be satisfied by using the system and the evaluation of the system measures the degree to which that goal has been achieved. Success in “getting the news” is a very vague concept and seldom do any *a priori* queries exist against which results can be measured. Task analysis and profile

definition may not be appropriate to behavior that is not specifically goal oriented and that has a large social component. News reading/gathering is more than a task of getting information; it is a task for which the “getting” is part of the reward. Based on research done presenting news using videotex, largely menu based and textual, Dozier and Rice (1984) found that the, “Economic viability ... may depend on an appreciation of the play inherent in newspaper reading.”

The *ludenic*¹ or *play* theory of news reading was introduced by Stephenson (1967). This theory asserts that, “... the process of news reading is intrinsically pleasurable, and that intrinsic pleasure is at the root of a mature, orderly, and highly ritualized form of news reading as well as a more casual, spontaneous, and unstructured form of news reading.” (Dozier and Rice, 1984).

Several ludenic behavioral characteristics are consistent with news reading behavior; individual path selection, apperception, and habitualness. Individuals read the paper differently. They select different items to read, read articles in different orders, and read different amounts of items selected in the paper. Each individual generates a unique path through the news items. Furthermore, humans apply their capability for apperception to news reading. That is, readers perceive only those aspects of a complex situation that fit within their current interests and/or understanding. Readers will only read the first part of a news article if that article fits within their current interests and/or understanding and will stop reading that article when it no longer fits within their framework. This is consistent

¹ We use Stephenson’s original term, *ludenic*, throughout this paper although one could argue that the correct term should be *ludic*.

with the findings of Paterson and Tinker (1946) in which they describe the task of reading headlines as one of “skimming”. Thirdly, news reading behavior has been characterized by Stone and Wetherington (1979) as an habitual activity that, “... accompanies daily rituals and is typically performed in the same place at the same time; indeed late deliveries lead to cancellations.” This “habitualness” extends even to where newspaper readers expect to find certain elements, such as the comics, of the paper. Consistent packaging makes the paper’s content seem familiar and comfortable (Bogart, 1992).

The ludenic or play theory of news reading implies that the news presentation metaphor must assist the users by making it easy to browse, easy to skim or to read in depth, by providing a comfortable sameness, and by making the process itself an enjoyable part of the day. News reading, particularly recreational news reading, relies on browsing as an information seeking behavior. Chang and Rice (1993) provide a relevant review of browsing characteristics in information seeking contexts. “What ludenic newsreaders require is an *edited* product, shaped narrowly enough in form and content to permit convergent selective processes to occur *through* protocols that are pleasurable ends in themselves.” (Dozier and Rice, 1984) Although electronic news sources must accommodate both goal oriented and ludenic uses, reading the news is primarily a social activity and users need access to a presentation mode that allows them to select items of interest and to enjoy the process.

The remainder of this paper presents the research carried out in this project. The following section discusses aspects of the form and content of the newspaper genre addressed in this research. This is followed by a description of various news filtering projects. The hypotheses and an overview of this research is followed by a description of the model used to blend the personal profile and the community profile. This research is

unique in that it addresses the effect of various amounts of filtering. The experimental design, results, and discussions follow the overall research description.

Role of Genre in Presentation Model for Electronic News

Other work (Watters & Shepherd, 1997; Shepherd & Watters, 1998), discusses the importance of genre in electronic media, where genre is minimally concerned with expectations related to both *form* and *content*. News is an excellent example of a print genre that has been replicated successfully in digital form and is open to evolution based on opportunities of interaction, multimedia, and personalization. In this paper we examine the role of *content expectations* on the satisfaction of users reading the news electronically.

Form

An earlier study (Watters, Shepherd, Chiasson, & Manchester, 1996), examined the effect of form on the satisfaction of readers of electronic newspapers. In that study we found there was a strong preference for the newspaper or broadsheet metaphor for reading electronic news over a document style browser. The broadsheet metaphor is a newspaper layout of text and photographs, possibly supplemented with television video, integrated into a coherent presentation. While there is some concern over the acceptability of the newspaper in electronic versus paper form (Pack, 1993), the electronic form appears to be inevitable, although the newspaper metaphor may be only the initial interface as the paradigm continues to evolve (Ashton and Cruickshank, 1993).

News reading/gathering is more than the task of getting information; it is a task for which the “getting” is part of the reward as described earlier by the *ludenic* or *play* theory of

news reading. This is reflected in a preferred form of the electronic newspaper, which supports user path selection and apperception.

There are a number of reasons for the newspaper metaphor being the preferred form by the readers. Newspapers follow a well-recognized format and functionality that is well known to large numbers of users. Readers understand the sectional organization, e.g., national news, sports, entertainment, and have expectations with respect to the contents of such sections. The newspaper format provides excellent scan and browse spaces containing both headings and partial stories so that linking to more data is often not necessary. The juxtaposition of items, particularly with the integration of photos and video clips, makes an interesting and varied information space for the reader. Furthermore, advertisements are an accepted part of the metaphor rather than an add-on feature. Watters et al. (1996), have shown that users prefer the newspaper metaphor over the single document metaphor for the task of “reading the news.” The reasons stated for this preference seem to support the ludenic theory of news reading. Users found that in viewing the electronic version of the newspaper metaphor, it was easier to select their own paths through the news and the multiple news item per page made it easier to read parts of a story and then to shift attention to a different story (apperception).

Content

In this study we examine the content attribute of electronic news delivery since the electronic version offers new opportunities of content definition based on filters. Readers can specify constraints and parameters that can be used to select information on an ongoing and *individual basis*.

Fishwrap (Chesnais, Mucko and Sheena, 1995) is an electronic newspaper system available at MIT that has adopted the browser metaphor. It is a fully integrated system in that the Fishwrap server provides text, graphics, photographs, and video. It is a hypertext system with links among various news items and it also attempts to personalize the user's edition through individual user profiles, although it is careful to maintain a community section of items that are common for all readers.

The Newspace project (Bender, Lie, Orwant, Teodosio, and Abramson, 1991) and the *Krakatoa Chronicle* project (Kamba, Bharat and Albers, 1995) include personalized editions along with the integration of multiple media types in a newspaper metaphor. Researchers at GMD-IPSI have developed the Individualized Electronic Newspaper (IEN) using HyperNeWS, a newspaper and mailtool metaphor (Haake, Huser and Reichenberger, 1994), as part of the larger issue of active publications, i.e., publications that have programs attached to them to allow the publications to act on its environment. The IEN is an individualized publication, composed on demand for the reader and then delivered electronically. They found that having an electronic document created expectations of functionality such as cut and paste, annotation capabilities, previous article/next article, etc.

Filtering

Electronic news systems are available that work over switched, high bandwidth communication networks, thus making it possible to deliver personalized "editions" of the news. Systems, like *entrypoint*², and *Crayon*³ retrieve data from selected sites in the

²<http://www.entrypoint.com>

background. These delivery systems retrieve data from one or more designated sites, like *The Wall Street Journal* or *The New York Times*, and present the data in an HTML format. However, both Crayon and entrypoint are based on very coarse-grained profiles. For example, the reader may choose the business section from the Wall Street Journal and the Arts section from the *New York Times*. The creation of fine-grained personalized editions, where individual stories are chosen from a variety of sites, is very difficult.

Personalized filters remove data from a data stream that do not satisfy the criteria of a personal profile. Foltz and Dumais (1992) present a relevant summary of personalized filtering techniques. There is the fear that a very narrowly defined user profile will defeat the content function of news by filtering out all news except that identified by the profile. The reader will be exposed to no new items of potential interest and the reader may not receive the information necessary to participate fully as a citizen in the local, national, and international community (Asp, 1981). In order to counter this, Fishwrap (Chesnais et al., 1995; Bender, 1994/95) has a community “front page” where readers add articles they think are important for the community at large. These articles are ranked by the number of people who actually access the article. In the *Krakatoa Chronicle* system (Kamba et al., 1995) each article is assigned both a personal weight (i.e., a weight computed for each reader based on the reader’s profile) and a community weight which is the average of all the personal weights for that article. When creating “today’s newspaper”, the personal weights and community weights are combined to determine if an article will be included in the newspaper. Ohkubo, Koyayashi and Nakagawa (1993) took a different approach in allowing

³ <http://www.crayon.net>

the user to do the filtering directly rather than through a program and a profile. In this system, the user selects from an initial presentation of the headlines of a diverse sampling of news reports (of various media). Once the reader selects a news item, other reports on similar topics are also presented. If there are not enough reports, the available space is filled with randomly selected headlines.

In this paper we examine the satisfaction quality of the content provided by these fine grained personalized editions for the general readership, i.e., where the task is to “read the news” rather than to retrieve specific information. Allen (1990) attempted to develop user models for reading news and found that the “task” involved makes it very difficult to do. He found that it was virtually impossible to predict what items a reader will read in today’s news based on a history of the items a reader has read over the previous few days. In a preliminary study associated with The Electronic News Delivery Project, McGillivray (1995) developed an adaptive user model for reading news, based on Rich’s (1983) stereotypes. These stereotypes are based on a set of weighted attribute-value pairs that are gradually updated as the system is used. He found that the model required a large amount of input before it began to give consistent results and with too much input the model broke down.

Hypotheses

The predicted hypotheses of this study are:

H1 Users will prefer community filtering to a blend of community and personal filtering .

H2 The personal blend filtering will leave out articles of interest.

H3 Ignoring overall preference for filtering (H1), the less the influence of personal filtering the more users will like it.

Hypothesis 1 and 2 follow from the previous discussion. Hypothesis 3 also follows from that discussion in that as the influence of the personal filter diminishes (from 100% to 25%) the number of articles of interest filtered out over and above the community filtering will also diminish. Thus users' dissatisfaction with the exclusivity of the personal filtering should also diminish.

Research Description

A volunteer group of graduate and undergraduate students from computer science and the School of Business Administration at Dalhousie University participated in the study. Electronic versions of the local paper, *The Chronicle-Herald*, was used for this research. The version composed of all news items was called the community newspaper. Figure 1 shows the community version of the "provincial section". Upon arrival, each student filled out a personal interest form, from which a user profile was generated. Individualized editions of this community paper were then created, where the items included in the

personal edition satisfied varying degrees of closeness to the profile of the individual.

Figure 2 shows a personalized version of the “provincial section”. After the subjects “read the news” using their individualized editions, they were asked to “read the news” using the community newspaper. All subjects were run on the same day.

It is important to note that the order of the blended personal filtered newspaper versus the full community newspaper was not controlled for. This was done because, in this experiment, the articles selected by any filtering were a subset of the full community newspaper. If the full community newspaper were presented first then subjects would have seen all of the articles their profile was going to select plus all the remaining articles. Since the underlying purpose of personal profile filtering is to reduce the number of articles one has to look through while not missing articles of interest, it makes more sense to present the subset before the set. With this order of presentation, subjects can determine whether they prefer the filtered version of the newspaper or the full community newspaper by the set of articles selected by the community profile that did not appear in the subset selected by the blended personal profile. Finally there was only one instance of community filtering (*The Chronicle-Herald* that day). Therefore, the effect of different community filterings was not tested and a symmetrical experimental design is not warranted.

[Insert Figure 1 about here.]

[Insert Figure 2 about here.]

Mathematical Models for Blending

Retrieval Model

As the purpose of this research was to evaluate user preference for a mix of news selected by a user profile and by a community profile, a retrieval model was required that would accommodate multiple reference points, e.g., the user profile and the community profile.

The ellipsoidal model (Chavarria, Garza and Korfhage, 1982) was selected for this research, with the community profile and the user profile as the two foci of the ellipse defined mathematically as:

$$\text{distance}(n_i, c) + \text{distance}(n_i, u) \leq t$$

where n_i is a news item, c is the focus representing the community profile, u is the focus representing the user profile, and t is a threshold value that defines the contour boundary of the set of news items to be retrieved. The cosine similarity measure was the metric used to measure the closeness (distance) of a profile and a news item, thus the ellipse was defined as:

$$\text{cosine}(n_i, c) + \text{cosine}(n_i, u) \geq t$$

It should be noted that c , the focus representing the community profile, is the centroid of the set of news items available. Therefore, the resulting ellipsoidal retrieval space is demonstrated as the shaded area in Figure 3.

[Insert Figure 3 about here]

This research required that different weights be assigned to the two foci and this was accommodated within the ellipsoidal model as:

$$\text{weight} * \text{cosine}(n_i, c) + (1 - \text{weight}) * \text{cosine}(n_i, u) \geq t$$

where weight was {0, 0.25, 0.50, 0.75}. When the weight was set at 0, the community profile was not a factor and only news items sufficiently close to the user profile were retrieved. When the weight was set at 0.50, equal weight was given to both the community profile and the user profile.

The ellipsoidal model is appropriate for this research because it retrieves those news items within the elliptical area, i.e., those items that satisfy both the user and community profiles to some extent. The disjunctive, conjunctive, and Cassini oval models (Korfhage, 1997; Myaeng & Korfhage, 1990) also accommodate multiple reference points. However, the disjunctive model was not appropriate for this research since it is not restrictive enough and it would retrieve any news item that satisfied either the user or community profile. The conjunctive model was too restrictive as it would retrieve only those news items that satisfied both of the profiles. The Cassini Oval model permits the retrieval of items that satisfy both profiles to some extent. This model was rejected for if the foci are very far apart, the middle part of the lemniscate or peanut shape oval becomes thinner until the shape degenerates into two separate areas around the two foci and the news items retrieved are centred at either focus.

The Data Set

The data consisted of news items supplied by *The Chronicle-Herald* and appearing in the newspaper on that day. On the day of the user study, there were 219 news items. Each item was in SGML markup format and many had associated photographs. Not counting the SGML tags, there were 96,405 word occurrences. After removing stop words (van Rijsbergen, 1997), there were 50,458 word occurrences and 11,887 different words. After applying Porter's stemming algorithm (Porter, 1980; Lazarinis, 1997), there were 8508 different word stems to make up the vectors representing the news stories.

Therefore, each news item was represented by a vector of 8508 word stems. For each word stem for each news item, the inverse document term frequency weight (Salton & McGill, 1983) was used to indicate the importance of that stem to that news item within the overall set of news items.

Profile Generation

Community Profile

In this research, the community consisted of the reading audience of *The Chronicle-Herald*. *The Chronicle-Herald* is the major daily newspaper in the Province of Nova Scotia, which has a population of approximately one million people. A few hundred thousand copies of the paper are sold every day. Therefore, the set of news items appearing in *The Chronicle-Herald* and used as the data set in this research was defined to be the set of news items satisfying the community profile.

The centroid of this set of news items was calculated to represent the community profile focus of the ellipsoidal model. The centroid of this community profile consisted of a vector of word stems of those terms remaining after applying the stop list to the terms in all of the news items. The weight assigned to each stem in this vector was the number of times that stem occurred over all of the news items.

User Profiles

The user profiles were represented as vectors of weighted word stems. In the preliminary data collection part of this study, each user was asked to complete a questionnaire. Each subject was shown a hierarchical subject classification (Appendix A) created specifically for *The Chronicle-Herald* (Toms, 1997). Each subject indicated his or her interest in each subcategory by assigning a weight of 0, 1 or 2, where 2 indicated high interest and 0 no interest. Each subject was asked to enter a maximum of five more specific keywords in any subcategory with a nonzero weight. These keywords were then stemmed in the same manner as terms from the news items. These stems were assigned the weights the subject had associated with those subcategories to create a vector of weighted word stems. The weights associated with each word stem of a term entered by the user was either 1 or 2.

The average length of these user profile vectors was 181.35 weighted word stems. Those subjects from the School of Business Administration had an average of 205.30 stems while the subjects from the Faculty of Computer Science had an average of 133.47.

Retrieval

Retrieval of news items was effected within the ellipsoidal model as discussed above. However, two problems had to be addressed, normalizing the effects of differences in vector lengths representing the community and the user profiles and determining a suitable retrieval threshold.

Normalization

As the community profile vector was derived from the news item vectors, these vectors consisted of the same set of word stems with appropriate weights. However, it was possible that these stems might not be represented in a user profile vector and that stems in a user profile might not be represented in the community and news item vectors. In this case, the word stem was added to the appropriate vector with a weight of 0.

The cosine similarity measure was used to calculate the “distance” of a news item from the user profile and from the community profile. However, the cosine measure is sensitive to the number of nonzero weights in the vector. Thus, resulting distance values may be quite different for different subjects based on the number of keywords the subjects had incorporated into their individual profiles. The measure is also sensitive to the number of matching word stems in the two vectors. Therefore, because the news item vectors were all incorporated into the community profiles, one might expect a news item to have more stems in common with the community profile than with a user profile and , thus, the community profile would unduly influence the overall ellipsoidal distance measure. Therefore, the resulting similarity measures between the news item and the user profile and between the news item and the community profile were both normalized to the range of 0

and 1. The highest cosine similarity value calculated was assigned the value of 1 and the lowest nonzero similarity value was assigned the value of 0 and all other values were scaled appropriately.

Retrieval Threshold

As the ellipsoidal model assigns similarity values to all news items and permits the ranking of these news items by these values, a threshold value was required to determine at what point not to include a news item in the personalized newspaper. A lower threshold value increased the area of the ellipse while a higher threshold decreased the area. During trial runs prior to the user study, it was found that a threshold of 0.4 retrieved very few news items while a threshold of 0.25 retrieved the majority of the news items available. After several trial runs, the threshold was set at 0.33.

Experimental Design

A volunteer sample of graduate and undergraduate business school and computer science students participated in the study. Prior to the experiment each subject filled out a personal interest form from which a personal profile was generated. This interest form was based on a hierarchical classification, developed manually, of the contents of *The Chronicle-Herald* appearing over a period of time (Toms, 1997). This was Part A of the study and the complete personal interest form is in Appendix A. The experiment itself was divided into two parts, B1 and B2. In Part B1, the subjects were randomly slotted into one of four blends of community/personal filtering as detailed in Table 1. After reading the news produced by the personal and community profile blend, the subjects filled out a questionnaire covering

their satisfaction with the news stories they had to choose from when “reading the news” (described below).

Table 1. Community/Personal Blends

Condition	Weight of Personal Profile	Weight of Community Profile
A1	25%	75%
A2	50%	50%
A3	75%	25%
A4	100%	0%

Part B2 began immediately after completing the Part B1 questionnaire. In Part B2, the subjects were asked to again read the news, only this time there was no personal filtering and the entire set of news items was presented to the user. This constitutes the community newspaper as defined by the newspaper editors. After reading this edition, the subjects again filled out a questionnaire covering their satisfaction with the news stories they had to choose from when “reading the news”.

Recall that the order of the blended personal filtered newspaper versus the full community newspaper was not controlled for. This was done because, in this experiment, the articles selected by any filtering were a subset of the full community newspaper. With this order of presentation, subjects can determine whether they prefer the filtered version of the newspaper or the full community newspaper by the set of articles selected by the community profile that did not appear in the subset selected by the blended personal profile.

Questionnaires

The questionnaire at the end of Part B1 consisted of six Likert-type attitude scales from 1 to 5. The questionnaire at the completion of Part B1 is in Appendix B. Each subject could have a total score from 6 to 30. The questionnaire at the end of Part B2 (Appendix C) consisted of the same six Likert-type attitude scales (with the same total score range of 6 to 30). In addition, after Part B the following seventh question was asked:

Which method would you like to use for reading the news again? Select one:

1 = the first method

2 = the second method

Subjects also reported demographic information (gender, age, current level of education, computer usage, and frequency of reading a newspaper). In addition, subjects were asked the following two questions:

Did you read The Chronicle-Herald today before this evaluation session?

Did you read any newspaper today before this evaluation session?

In addition, we asked subjects to give us written comments. These questionnaires are in Appendix B.

Finally, we ran a pilot study on five users. We talked to them at length about the experimental procedure and the scales. Although no changes were indicated, we did not use this pilot data in the results.

Results

Sixty-nine subjects participated in the study. The subjects were randomly assigned to the conditions in Part B1. The subject distribution was as follows:

- 18 subjects had the condition A1, weight of personal profile 25% and weight of community profile 75%
- 14 subjects had the condition A2, weight of personal profile 50% and weight of community profile 50%
- 17 subjects had the condition A3, weight of personal profile 75% and weight of community profile 25%
- 20 subjects had the condition A4, weight of personal profile 100% and weight of community profile 0%

Table 2 shows the percentage distributions for the biographical questions.

Table 2. Biographical Data by Percentage

Gender	Male 58%	Female 42%	
Age	Below 21 years 20%	Between 21-26 years 51%	Over 26 years 29%
Education	Undergrad 3 years 9%	Undergrad 4 years 28%	Grad 63%
Computer Usage	Once a week 1%	Everyday a little 55%	Everyday a lot 44%
Read news	Never 1%	Sometimes 73%	Everyday 26%
Read Herald today	No 91%	Yes 9%	
Read a paper today	No 74%	Yes 26%	

H1 Users will prefer community filtering to a blend of community and personal filtering .

Hypothesis 1 was tested by analyzing the data for the seventh question following Part B2; which method did they prefer for reading the news. Recall that Hypothesis 1 posed that users will be more satisfied with only the community filtering. The mean was 1.78 and

the standard deviation was .42. In other words, 78% of the subjects preferred the community only filtering. A two tailed Z test of true proportions (Freund, 1973) yielded a value of $Z=4.69$ which has a $p<0.001$. Thus the first predicted hypothesis was upheld.

H2 The personal blend filtering will leave out articles of interest.

Hypothesis 2 was tested qualitatively (Cassell & Symon, 1994; Eisner, 1998). Unfortunately, there is ample evidence (Rosenthal & Rosnow, 1969) that asking subjects a direct question like, “Did you find that the first method left out articles of interest?” is too leading. In other words, such an approach would bias the results in favor of our predicted hypothesis. Instead we chose a qualitative research approach for the second hypothesis. If our prediction (that the personal blend conditions leave out articles of interest) is true, then subjects’ open ended comments should reveal their reasons for preferring the community only filter. We received many open ended comments. Some examples are:

- *“... by having a restricted newspaper, I feel like I am missing something.”*
- *“There were stories that were interesting, but that I would have never thought of when making up my keyword lists.”*
- *“One of the nicest features of a typical newspaper is the unexpected.”*
- *“Although the concept of a newspaper that caters to individual tastes seems good, I find it quite scary.”*

However there were 22% of the subjects who preferred the influence of the personal filter.

Some of their comments were:

- *“Both sessions seemed to have some articles that interested me, but Session B had so many it was tedious to get through.”*
- *“I enjoyed the first session better ... I liked the fact that the paper was tailored to my interests.”*
- *“I quite enjoyed reading the abbreviated newspaper on-line.”*

Recall that 78% of the subjects preferred the community only filtering (the second treatment). The number of comments for the community-only filtering paralleled this 78 to 22 split. Thus, based on qualitative evidence, predicted hypothesis 2 was confirmed.

H3 Ignoring overall preference for filtering (H1), the less the influence of personal filtering the more users will like it.

Hypothesis 3 (there would be less dissatisfaction with the blend treatment as the influence of the personal filter diminished) was tested by analyzing the data from the six questions following Part B1. In order for the six item scale to be an acceptable measure of user satisfaction, it must have reliability and validity. Reliability can be assessed from the Cronbach alpha statistic - a measure based on the average inter item correlation of all the scale items. The inter-item correlation matrix is presented in Table 3.

Table 3. Inter-item Correlation Matrix for Part B1 Questionnaire

Item	1	2	3	4	5	6
1						
2	.52*					
3	.60*	.55*				
4	.35*	.30*	.41*			
5	.26**	.38*	.23 ^{ns}	.12 ^{ns}		
6	.27**	.39*	.37*	.28**	.13 ^{ns}	

* significant at $p < .01$

** significant at $p < .05$

ns not significant ($p > .05$)

The Cronbach α was .76. This is an acceptable reliability (Nunnally, 1978; Gatewood & Feild, 1998). Validity was estimated via content validity. An inspection of the six items by two disinterested researchers as well as the authors led to a consensus that the items tapped user satisfaction with the treatment condition in B1. Furthermore, in the pilot test as well as the experiment, no subjects questioned the point of the scale. This points to face validity. Therefore the authors are confident that each subject's total scale score can be used as a criterion for a one way analysis of variance (ANOVA) comparing the four blend conditions in Part B1. The calculated $F_{3,65}=1.90$ was not significant at the .05 level. Thus there was no difference in subject preference between the four conditions. Predicted Hypothesis 3 was not confirmed. In other words, no matter what blend of

personal/community filtering the subjects experienced, their preference for that filtering was about the same. For example, if a subject had seen the 50/50 blend his or her satisfaction with that blend was about the same as a subject who had seen the 25/75 blend. In other words, no blend was preferred over any other blend.

To further investigate this we looked at the six-item questionnaire from Part B2. Paralleling the approach taken for the scale in B1, we noted the same evidence of content and face validity. Regarding reliability, Table 4 shows the inter-item correlation matrix.

Table 4. Inter-item Correlation Matrix for Part B2 Questionnaire

Item	1	2	3	4	5	6
1						
2	.56*					
3	.59*	.67*				
4	.18^{ns}	.42*	.37*			
5	.35*	.37*	.50*	.16^{ns}		
6	.35*	.58*	.56*	.19^{ns}	.29**	

*** significant at $p < .01$**

**** significant at $p < .05$**

ns not significant, $p > .05$

The Cronbach α was .81. Again this indicates the questionnaire is a robust enough criterion for a one-way ANOVA comparing the four blend conditions in Part B1 with their

preferences after experiencing Part B2. The calculated $F_{3,65}=2.46$ and was not significant at the .05 level. Thus there was no difference in subject preference for the community profile no matter what blend of personal profile they had experienced. For example, if a subject had seen the 50/50 blend in Part B1, his or her satisfaction with the community only version (Part B2) was about the same (high) as another subject who had seen the 25/75 blend in Part B1. In other words, there was no impact of blend condition on preference for the community only version.

Finally we used an analysis of covariance (ANCOVA) to see if any of the biographical items influenced the results. Of the 21 ANCOVAs (7 biographical items by the three criteria), only 1 was significant (newspaper reading habits was a significant covariate for preference for community profile no matter what personal profile blend was experienced. $F_{7,61}=2.73$ $p<.02$) With an alpha level of .05 we would expect one in twenty tests to be significant due to Type I error. Given that and the uninterpretable cell mean differences (in the 75% personal profile group the 6 subjects who read the newspaper everyday had a lower preference for the community profile newspaper), we conclude that there are no *post hoc* covariates which explain the results. In other words, these results are not explained by gender, age, education, computer usage, or reading habits. The ANOVA results stand as an unmoderated test of the hypotheses.

Finally, we correlated the number of articles that subjects had presented to them with their overall rating of preference to provide for a check on whether our profile filter was inadvertently introducing a confounding to the experimental design. The correlation coefficient was $-.106$, which is not significant ($p = .05$ if $r > .195$). Therefore the personal filter did not restrict the number of articles chosen in a way that was related to the preference

for B1 or B2. On the day of the study, there were 219 articles in the newspaper. The mean of the number of articles in the personalized editions was 89.43 with a standard deviation of 22.15.

Thus, predicted Hypotheses 1 and 2 were confirmed but predicted Hypothesis 3 was not confirmed.

Discussion and Conclusion

This study gives strong evidence that users prefer no filtering beyond what the community newspaper editor does. Even the non-confirmation of Hypothesis 3 can be seen as adding strength to this conclusion. Furthermore, the subject's preference for community-only filtering was not influenced by any of the four blends of personal filtering they experienced.

Recall that the result of the blend of the personal and community profiles was presented first to all subjects. This blend condition used a subset of articles from the community profile condition that should have been satisfactory to the user without missing any other articles that might have been of interest. Thus, it could be inferred that the subjects' dissatisfaction with the filtered newspaper was due to the articles the filter left out (the remainder of the articles in the set was the only difference between the B1 and the B2 conditions). This was true even when the influence of the personal profile was only one third as strong as the community profile. Thus, even small influences of personal profile filtering beyond the community profile filter are not preferred by the subjects.

Newspapers are a well recognized genre, where users have well defined expectations as to both form and content. In this paper we examined the effect of content on the satisfaction of the reader with the experience of “reading the news”. In particular we examined whether readers would prefer individualized papers based on personal profiles or whether the content defined by an external “editor” is preferred.

McQuail (1992) identifies several dimensions for evaluating the quality of media contents; factualness, accuracy, completeness, and readability. Currently, we adjust our personal requirements on these dimensions by choosing different packagers (newspapers, television, or radio channels), each of which presents a set of news items for our consumption. How much do we want to control these dimensions in a new composite mass media by replacing editors and editorial boards with personalized search agents? The potential for truly personalized news introduces questions that have to be asked with respect to breadth and coverage, bias, similarity and sameness of individual items from different sources and reliability of news coverage.

In this paper we have asked whether the required breadth and depth of news coverage is better served, from the reader's perspective, with individual rather than common news editions? When both form and content are determined by personalized news agents driven by individual profiles we remove the context provided by competing deliverers of news: different newspapers, television, and radio channels, etc. Individual newspaper, television, and radio sources gain a reputation for bias and reliability. For example, we have a perception that a report in certain newspapers may be more or less credible than one from another source. Newspapers, television and radio stations often generate an impression of

political balance or imbalance that the consumer uses to weigh or filter information coming from that source.

The selection of items can now be driven by individual queries and personal profiles rather than third-party editors. The question becomes not can we do fine grain filtering, but how much if any of it contributes to the satisfaction of “reading the news”. Automatic feedback (Golofchinsky, 1997) and adaptive user models may result in more and more tightly constrained user profiles that accurately reflect the immediate interests and interest levels of a given user but no longer provide adequate coverage of real-world events. Such news coverage may be self-fulfilling and become more narrow rather than maintaining the breadth required to satisfy news coverage criteria of density, breadth and depth (Asp, 1981).

From this study we make two interesting observations. First, users do not, in fact, want fine-grained filtering of news. This is consistent with research (Allen, 1990) that indicates that it is impossible to predict what people want to read from either watching them read previous editions or from knowing them well. Too finely filtered news removes the serendipitous and collateral news items that make reading the news a pleasurable activity. Second, we believe, although we did not directly test it, that users do use coarse grained filters of the news by choosing the editorial policy and perceived accuracy and bias of the newspaper or newspaper sections that they read. Increasing the level of filtering beyond this does not increase user satisfaction with the selection of items. Future research might test whether this effect holds up across other instances of community filtering (i.e., with other newspapers besides *The Chronicle-Herald*).

Acknowledgments

We would like to thank the Natural Sciences and Engineering Research Council of Canada for grants that were used to support this research. We would also like to thank Mr. Theo Chiasson and The Halifax Herald Limited for making news items from *The Chronicle-Herald* available for this research.

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Appendix A

Classification Scheme for the News Items

The following is the classification scheme for news items develop for *The Chronicle-Herald Limited* (Toms, 1997). There are seven major categories and a total of forty-six sub-categories.

News	Business	Sports
<ul style="list-style-type: none"> • Metro 	<ul style="list-style-type: none"> • Regional 	<ul style="list-style-type: none"> • Baseball
<ul style="list-style-type: none"> • Provincial 	<ul style="list-style-type: none"> • National 	<ul style="list-style-type: none"> • Basketball
<ul style="list-style-type: none"> • National 	<ul style="list-style-type: none"> • International 	<ul style="list-style-type: none"> • Cycling
<ul style="list-style-type: none"> • International 	<ul style="list-style-type: none"> • Economy 	<ul style="list-style-type: none"> • Football
Opinions	<ul style="list-style-type: none"> • Personal \$\$\$ 	<ul style="list-style-type: none"> • Golf/Tennis
<ul style="list-style-type: none"> • Editorials 	<ul style="list-style-type: none"> • Stock Market 	<ul style="list-style-type: none"> • Hockey
<ul style="list-style-type: none"> • Letters 	<ul style="list-style-type: none"> • Business 	<ul style="list-style-type: none"> • Soccer/Rugby
<ul style="list-style-type: none"> • Commentary 	<ul style="list-style-type: none"> • Calendar 	<ul style="list-style-type: none"> • Swimming
	<ul style="list-style-type: none"> • Workplace 	<ul style="list-style-type: none"> • Track/Field
		<ul style="list-style-type: none"> • Other
		<ul style="list-style-type: none"> • Olympics

Entertainment

- Art and Museum
- Dance
- Movies
- Music
- TV and Radio
- Theater
- Reading

Life and Learning

- Motor Vehicle
- Education
- Food
- Health
- Homes/Gardens
- Spirituality
- Social Events
- Travel
- Volunteer

Sci-Tech

- Computing
- Environment
- Science
- Technology

Appendix B

Questionnaire after Viewing Filtered Results (Part B1)

The following is the questionnaire the subjects completed after viewing the filtered version of the newspaper. The questionnaire was completed on-line.

- The stories I just read were all interesting.
- The stories fit my area of interest.
- I liked the selection of stories I just received.
- I would like to use this method of reading the news again.
- There were too many stories which I was not interested in.
- The stories presented satisfied my interest in general news

The response to each question was on a Likert-type scale as follows:

- 1 = strongly disagree
- 2 = disagree
- 3 = neither agree nor disagree
- 4 = agree
- 5 = strongly agree

Appendix C

Questionnaire after Viewing Full Newspaper (Part B2)

The questionnaire was identical to the questionnaire described in Appendix B, with the additional three questions:

- Which method would you like to use for reading the news again? Select one:

1 = the first method

2 = the second method

- Did you read *The Chronicle-Herald* today before this evaluation session?
- Did you read any newspaper today before this evaluation session?

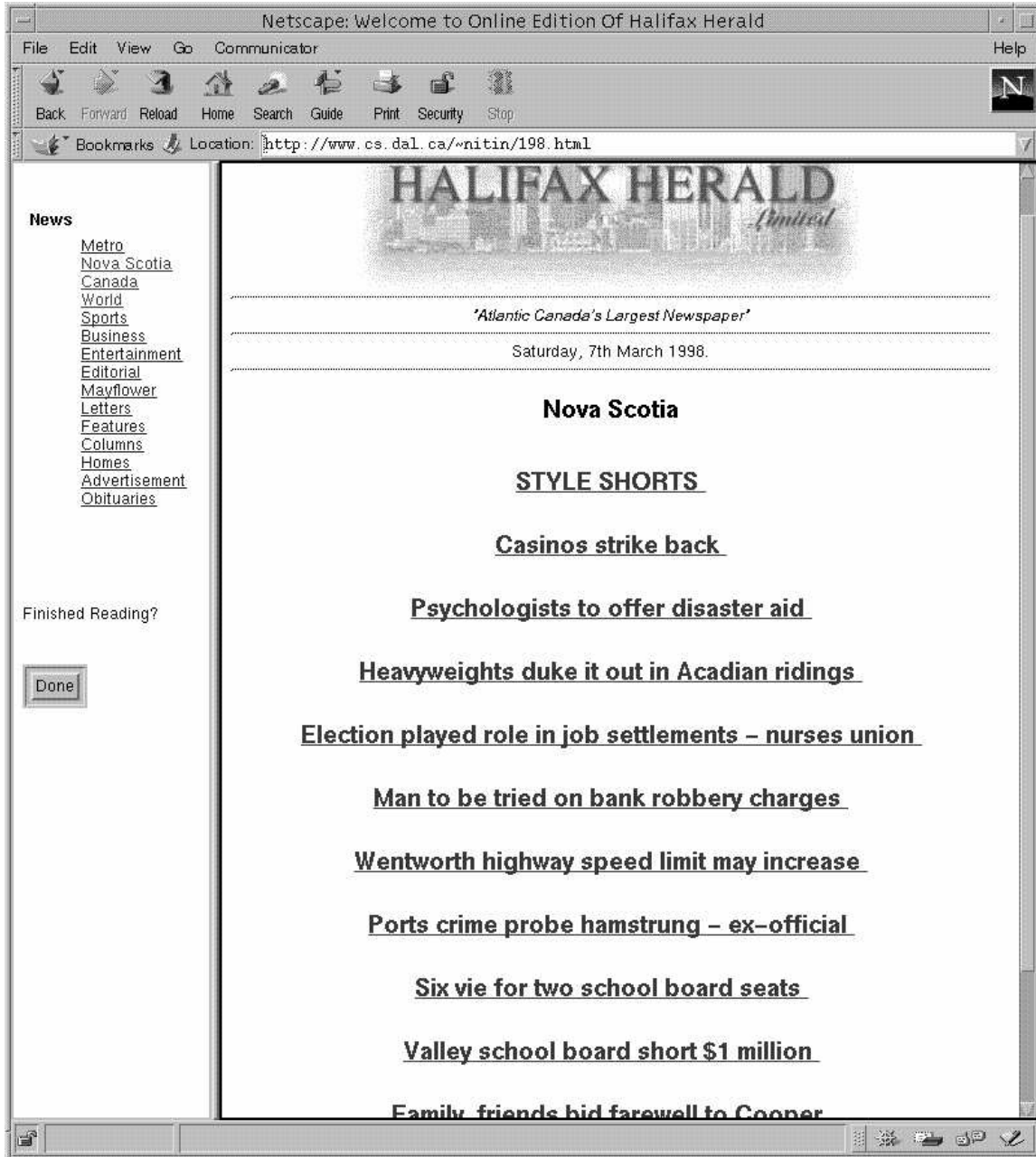


Figure 1. Provincial section of newspaper.

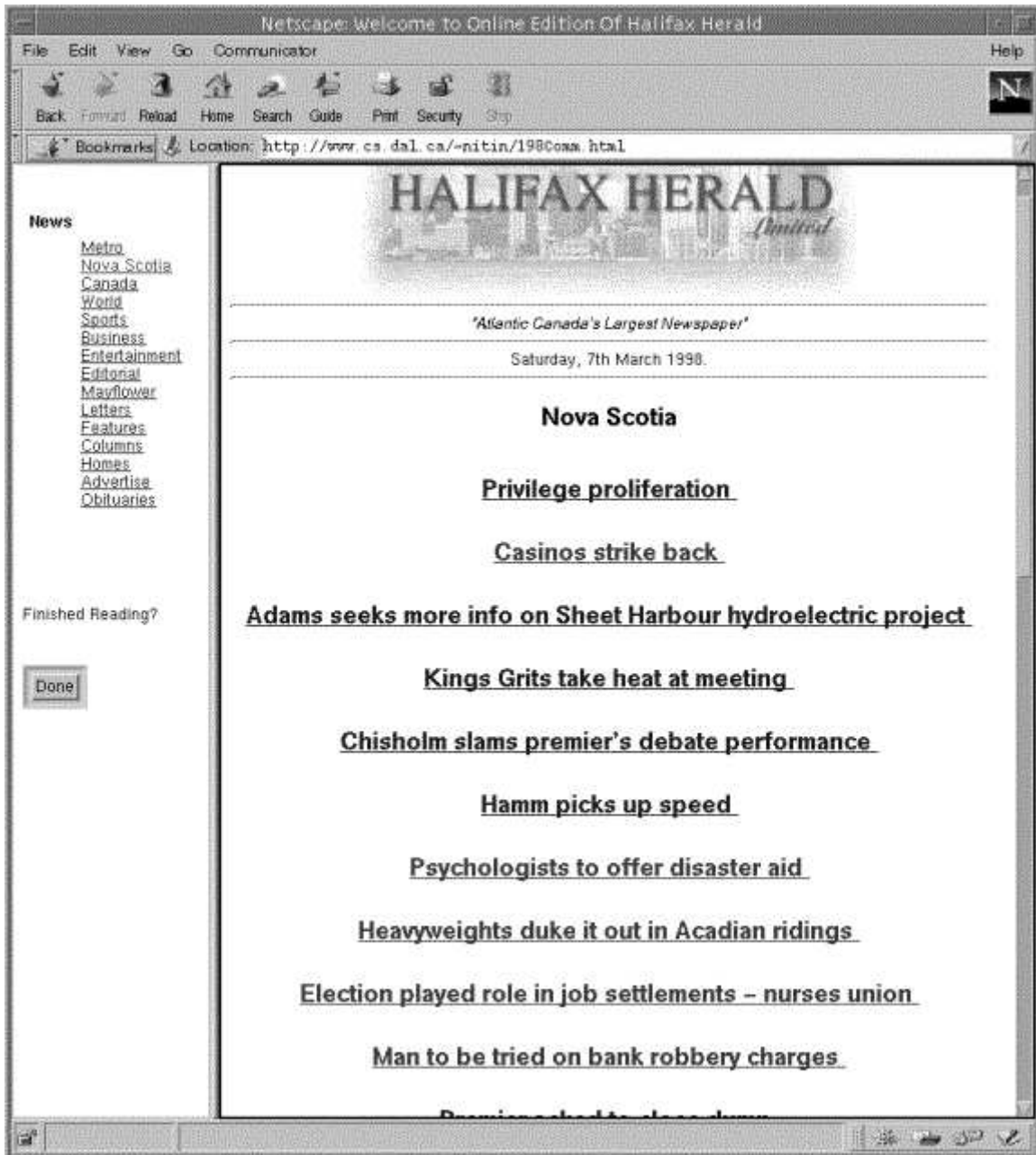


Figure 2. Personalized version of provincial section of newspaper.

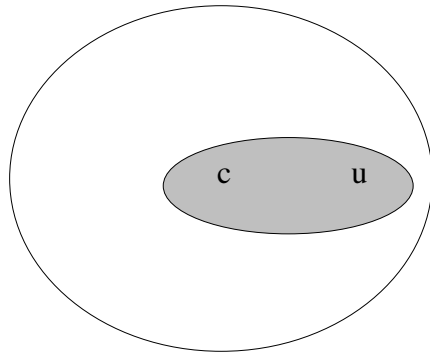


Figure 3. Ellipsoidal retrieval space