

## Lessons From Reading E-News for Browsing the Web: The Roles of Genre and Task

Michael Shepherd , Carolyn Watters, Raj Kaushik  
Web Information Filtering Lab  
Faculty of Computer Science  
Dalhousie University  
Halifax, Nova Scotia, Canada B3H 1W5  
Phone: 902-494-3686 Fax: 902-492-1517  
{shepherd, waters, kaushik} @cs.dal.ca

### Abstract

An appreciation of the roles of *genre* and *task* is important in understanding how people browse the Web. Genre is characterized by content and form and is intimately linked to the task at hand. In moving from ink-on-paper to E-News, The Electronic News Delivery Project examined both user interfaces and personalized filtering for electronic newspapers. Time-and-again, research results from user studies supported the importance of both genre and task in interface design and the effectiveness of personalized filtering of electronic news. The results also indicated that, given the same task, the link between the genre and task was essentially the same for both ink-on-paper and electronic news.

In this paper, we present the results of a recent study on the effectiveness of predicting interesting Web pages based on the content of previously visited pages. Preliminary results suggest that there is a great similarity between reading electronic news and browsing the Web with regards to the roles of genre and task. The results suggest that there are lessons to be learned in the design of Web sites and filtering mechanism from the previous research on electronic news.

### 1. Introduction

Literary or rhetorical genre are sets of recurring forms that allow us to find similarity over a wide range of differences [23], and often characterized by the tuple, <form, content>. For instance, the detective novel is a particular genre and we are able to recognize novels as member of that genre, even though the novels themselves may be very different. A genre also provides us with a set of expectations with respect to structure and content [12]. We expect, for example, newspapers to carry reviews of plays and movies but not the text of the entire play and not the movie itself.

As Yates and Orlikowski [34] have shown in their study of the evolution of the business letter of the late 19th century into the electronic mail of today, genres evolve over time in response to institutional changes and social pressures. In some cases, the changes to an existing genre are so extensive that they lead to the emergence of a new genre. One of

the triggers for the emergence of variants of existing genres or of new genres is the introduction of a new communications medium [35].

The introduction of the Web as a new communications medium has triggered both the emergence of variants of existing genres and the introduction of new genres, or cybergenres [26]. For instance, the newspaper has migrated to the Web and has evolved into e-news, integrating video news with the traditional text and pictures. The genre for theses and dissertations [13] has evolved on the Web to include video and audio streams as well as links to supporting materials. Examples of new genres that have emerged on the Web include the home page and FAQs [8] as well as games, brochures and catalogues [26].

While genre is historically characterized by the tuple, <form, content>, the concept of a digital genre extends the concept of the literary or rhetorical genre by incorporating the notion of functionality, <form, content, functionality> [26], where functionality includes user interactions and processing. Instant linking, multimodal displays of video and audio along with the text, applets, database accesses and other processing capabilities add a new dimension to information available electronically.

There is a strong link between task and genre in that the “affordance” [19] provided by the genre has to lend itself to successful completion of the task. If it does not, then either the genre will evolve to support the task at hand or a new genre will emerge. In our research on electronic news, the genre of the ink-on-paper newspaper has shown remarkable resiliency in its migration to the Web and subsequent evolution on the Web, suggesting that it is well suited to the task of reading the news. In addition, preliminary research results from user studies support the importance of genre and task with respect to filtering the Web [27]. More importantly, these preliminary results suggest that there is a great similarity between reading electronic news and browsing the Web with regards to the roles of genre and task.

Section 2 of this paper discusses different behavioral theories for reading the news and places these theories in the context of browsing and, in particular, Web browsing. Section 3 discusses research results that support these theories for reading electronic news and Section 4 summarizes a recent user study of Web browsing and draws parallels with the research of reading electronic news. Section 5 summarizes this paper and presents some areas for future research for genre and task in Web browsing.

## **2. Behavioral Theories for Browsing**

There have been a number of excellent reviews of the literature on browsing. While there does not seem to be agreement on the number or definition of different types of browsing, there does seem to be agreement that there is a spectrum of browsing types with two endpoints that we will call intentional search and random browsing. Marchionini [18] found three general types of browsing in this spectrum: directed browsing when there is an explicit information need, semi-directed browsing when the information need is less well defined and browsing is less systematic, and undirected browsing when there is no

real goal and the user is “surfing”. Choo [6, 7] suggests an integrated model of browsing and searching, within a model with these two endpoints. Chang and Rice [5] found that browsing has many dimensions to it and that the degree of browsing (i.e., the position between the endpoints) differs, depending on both the specificity of the task and the state of the knowledge of the user with respect to the information need.

In all of the above models, the impact of browsing is driven by the task and the current state of knowledge of the user. We generally separate tasks into goal-oriented and interest-oriented. It has been shown [16, 22] that users prefer browsing strategies when they are looking for “information about” or general information and that users prefer a keyword search strategy when they are looking for specific information. Watters, et al. [32] have shown that, given a choice of browsing or search tools, the user will select the tool to best accomplish the task at hand. On the Web users usually combine strategies of short keyword searches, menu selections, and clicking on hypertext links found in documents to find information of interest.

In designing electronic news systems or Web information systems, we must first understand why people are accessing these systems, i.e., what do they expect to get from the experience. Most people read the newspaper, watch televised newscasts, and/or listen to radio newscasts to gain the public knowledge necessary to participate within their local, national, and global communities [28]. However, while the quantity of news has increased, the time available to view this news has not [9]. Furthermore, news seeking behavior satisfies different task requirements at different times even for the same person. For instance, many people read the weekday paper and the weekend paper differently [3].

Similarly, people access the Web to gain the information necessary to participate within their local, national, and global communities. Those communities may be work, study or leisure related. In a study by Hunter [15], students at Boston College were found to use the Web for browsing (35%), entertainment (30%), and academic research (26%). As such, Web access behavior satisfies different task requirements at different times.

In the rest of this section, we discuss two behavioral theories that have been applied to the end points of the browsing spectrum for reading the news, *uses and gratification* theory and the *play* or *ludic* theory [11]. We then show the applicability of these theories to Web browsing behavior. These two theories should not be viewed as a simple dichotomy, where the uses and gratification reading of the newspaper is browsing with intentional search and the ludic or play reading is random browsing. Rather, they should be viewed as two ends of the spectrum of reading the news.

## **2.1 Uses and Gratification Theory**

The *uses and gratification* theory is based on the assumption that the reader has some underlying goal, outside the content itself, that reading satisfies. Such news reading is an example of extrinsically motivated behavior in that there is some reward to be gained by engaging in the activity [10]. As applied to news reading it is “... an assumption that media use, including news reading, serves some ulterior purpose external to the

communication behavior itself.” [11] 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. Uses and gratification theory obviously applies to news reading and Web access when there is an articulated information need that must be met. In such a scenario, the Web acts as an information retrieval system and responds to either a direct query or to a search agent representing a user profile.

## **2.2 Play or Ludic Theory**

Task analysis and profile definition may not be appropriate, however, to behavior that is not specifically goal oriented and that has a large social component. News reading, for example, is often more than just 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 [11] found that the, “Economic viability ... may depend on an appreciation of the play inherent in newspaper reading.”

The *ludic* or *play* theory of news reading was introduced by Stephenson [29]. Such news reading is an example of intrinsically motivated behavior [10] in that the activity appears to be spontaneously initiated by the person in pursuit of no other goal than the activity itself. The person engages in the activity for its enjoyment value. The ludic 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.” [11] Ludic browsing behavior is characterized by individual path selection, apperception, and habitualness.

Ludic behavioral characteristics are found in both news reading and Web browsing activities. Individual users select different items to read, read items in different orders, and read different amounts of items selected, i.e., each individual generates a unique path through the information. Individual path selection is somewhat constrained by pre-authored links from a given Web page. Users have, however, been shown to prefer having a map of the Web site available to help them navigate [27] and to permit them to break away from the pre-authored paths.

People apply apperception to both news reading and Web browsing. 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 or Web page if that article fits within their current interests and/or understanding and will stop reading when it no longer fits within their framework. This is consistent with the findings of

Paterson and Tinker [20] in which they describe the task of reading headlines as one of “skimming” and with Huberman’s “law of surfing” on the Web [14]. The “law of surfing” is based on the assumption that users make a decision to traverse a link to the next page only as long as the value of the current page exceeds some threshold. The evidence [14] seems to support this assumption. This supports apperception as a characteristic of reading both news and Web pages. Users will stop following links when the page they are at is no longer of interest, is beyond their ability to understand it, or does not fit into their current framework. Users will stop reading a document (news article or Web page) when the content ceases to fit within their current interests and/or understanding.

Thirdly, both news reading and Web browsing behavior fits into patterns of habitualness for many people. News reading behavior has been characterized by Stone and Wetherington [33] 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 [3]. Consistent packaging of Web pages, using genre (home page, catalogue, etc.) and style guidelines also provides a level of comfort for readers. People tend to browse from the same place, at the same time, using the same browser and same search engine, and expect consistency of functionality.

The ludic or play theory of news reading has implications for the presentation metaphor, in that it 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. “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.” [11] Although electronic news sources must accommodate both goal oriented and ludic uses, where reading the news is primarily a social activity users need a presentation mode that allows them to select items of interest and *to enjoy the process*.

The ludic or play theory applied to Web browsing also has implications for the presentation metaphor in that it 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. If the parallel holds, then what ludenic Web browsers 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.” Although the Web must accommodate both goal oriented and ludic uses, undirected browsing of the Web 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*.

### 3. Genre and Task for Electronic News

In this section, we show from research of the Electronic News Project [30] the importance of the newspaper genre, both form and content, in supporting the task of “reading the news”, in its evolution into electronic news.

#### 3.1 Form

Watters, et al. [31], examined the effect of form on the satisfaction of readers of electronic newspapers. In that study, the only task that the participants were given was simply to, “read the news”. The participants viewed the news in both newspaper broadsheet form (figure 1) and in a document style browser that presented the news in a hierarchical manner, i.e., sections-headlines-stories. Both presentation forms included newspaper photographs. The tests were designed to determine if the subjects preferred one presentation form over the other.



Figure 1. Newspaper broadsheet format.

Ninety-one participants viewed the news in both metaphors. The order in which they viewed the two metaphors was determined randomly. Of the 91 participants, 82 preferred the newspaper broadsheet format and no significant relationship was found between the order in which the participant viewed the systems and the participants preferred metaphor.

In addition to the quantitative data collected, users were asked for written comments on why they preferred one metaphor over the other. The 9 participants who preferred the document browser metaphor did so because it seemed easier and faster to find individual stories. The participants liked being able to go directly to a section of interest and see the headlines of all the stories in that section at a single glance and select from that list. Those participants who preferred the newspaper metaphor appeared to like the juxtaposition of multiple stories on a page, allowing them to scan and browse.

The results of this study indicated that the task of simply “reading the news” is ludic in nature and the electronic version of the newspaper broadsheet is the preferred genre form for this task. Those participants who preferred the hierarchical document presentation form appeared to be more interested in looking for particular types of news stories and their approach appeared to be more uses and gratification in nature and the hierarchical form was better suited to their needs. In other words, there appears to be a tight coupling between the genre form and the task.

### **3.2 Content**

Allen [1] 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 either watching them read previous editions or from knowing them well.

Two different studies associated with The Electronic News Delivery Project [30] have supported Allen’s findings. In the larger study, a full user study with 69 participants was performed to evaluate user preference for personal editions vs. community editions of online news [25]. 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. Seventy-eight percent of the participants preferred the coarse-grained community filters to fine-grained personalized filters, i.e., they preferred no filtering over any level of filtering.

From these studies it can be concluded that users do not, in fact, want fine-grained filtering of news when the task is simply “reading the news”. Too finely filtered news removes the serendipitous and collateral connections that make reading the news a pleasurable activity.

In a further study, neural networks were trained as user profiles and evaluated with respect to their capabilities as filters of news [17]. In this instance, a pilot study indicated that the results of the neural net filters are not acceptable when the task is simply to “read the news”, but may be acceptable when the task is to satisfy an articulated information need.

These studies show that the electronic newspaper genre, both form and content, is well suited to supporting news reading when the task is more ludic, i.e., users do not want fine-grained filtering when the task is simply to read the news.

The newspaper is a well recognized genre, where users have well defined expectations as to both form and content. In these studies we examined the effect of form and content on the satisfaction of the reader with the experience of “reading the news” electronically and found that there is a tight coupling between the genre and the nature of the task.

#### **4. Genre and Task for Web Browsing**

In this section, we argue that what we have learned about the co-dependence of task and genre for news reading applies as well to Web browsing behaviour, which can also be goal oriented or more ludic in its approach.

Studies [17, 27] have shown that Web users, particularly when browsing, are not very good at articulating keywords that express their interests and typically enter as few as possible. This characteristic is even more noticeable when the task itself is vague. We have not found, on the other hand, that users have any difficulty in expressing whether a page was interesting or not.

#### **Predicting Interest based on Content**

In this recent study, we applied a Web filtering algorithm that uses adaptive learning to build a user profile [27] to predict Web pages a user may want to link to, based on past preferences. The task was ludic in nature, i.e., there is no articulated information need and the user was allowed to simply browse the Web site. The system is designed to act as a personalized, on-demand information delivery assistant for people who are browsing rather than searching for specific information. This means that the person has not articulated a strategy or even a query but will recognize when enough information has been found or their interest wanes.

The system accepts a root URL as input, then downloads that page and all links from that page recursively for a given number of levels, rates these pages against the user profile, and presents the results in a hierarchical directory presentation for the user (Figure 2). The colour codes indicate the relative ranking assigned by the system, but this information was not given to the user.



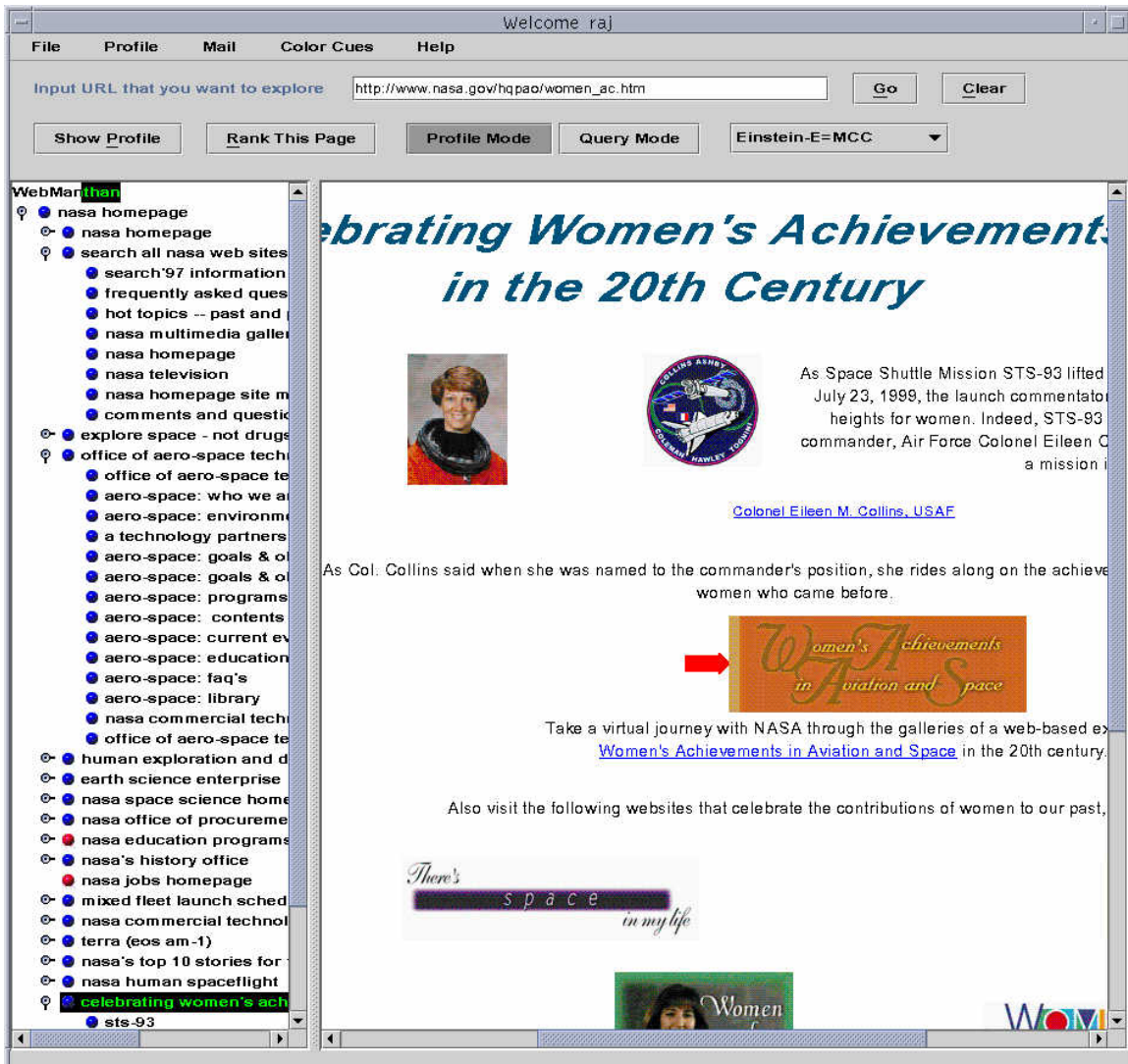


Figure 2. Web page with hierarchical directory.

The system uses adaptive user profiles, with feedback, to provide information to inform the browsing process for the user. The user's interest profile is based on keywords extracted from Web documents designated as interesting by the user in a direct manner. This is based on the observation that although most users have a hard time describing exactly their search interests, they, nonetheless, recognize interesting Web pages when they see them. We then use a learning algorithm to combine and aggregate user feedback based on the work of Baclace [2].

Each interest profile is represented by a set of term-weight pairs, similar to Baclace's agent [2]. A term-weight is an attribute-value pair, where the attribute is the keyword and the value is its interest weight [0,1], where 0 is of no interest to the user and 1 is of significant interest to the user. The user profile begins with an empty set of term-weights

and adapts automatically through user feedback. If a term extracted from the page is already present in the profile, a new weight for that term is calculated based on the Hebbian Learning Model. If this is a new term, it is defined with an initial weight based on the rating of that page and added to the profile.

A term-weight pair is triggered whenever a term in the user profile also appears in a document evaluated by the user. The term-weight pairs both compete and cooperate in making accurate predictions of the user's actual interest in a given document. The set of term-weights is private to the given user's profile. Each time a user ranks a Web page, a network of keywords from the document activates the corresponding term-weights in the user profile for revision.

Iterative adjustments of the weight values of the term-weights provides for continual changes in the system performance. The learning rate of the term-weights can be adjusted, from 0 (not learning) to 1 (very rapid learning). In the browsing model we want the term-weights to learn continuously and quickly but with some memory and so the learning rate was set at 0.5, a moderate learning rate. The Hebbian Learning rule causes the term-weight for any keyword occurring in both the document and the profile to be strengthened when both are active at the same time.

Using a URL as the root page, the system follows the links outward for  $n$  levels, rating each retrieved page against the user profile. It calculates an overall rating value, called the relevancy index value,  $[0,1]$ , for each page. The relevancy index value, RI, is computed as the sum of the weights of all of the keywords co-occurring in the profile and the document, normalized by the number of keywords in the document. The page rating algorithm compares keywords in the document with the keywords in the user profile and so building the profile is a critical component. When there are more keywords in the user profile, there is a higher chance that a keyword will be common to both a given document and the user profile. The value of this relevancy information is used to determine the colour coding associate with that document within an hierarchical directory view of all of the pages below the root URL (Figure 2).

An evaluation study was conducted to see if the approach using profiles based on term-weights derived from the content of Web pages provided useful navigational support for browsing on the Web. Users were asked to use the system five times and complete a questionnaire at the end of each session. Two metrics are considered: how *effective* was the system in recommending relevant (interesting) pages, and what was the *correlation* of the system and user rating of pages.

The measure of *effectiveness* chosen was a relatively simple one measuring the agreement of ratings on those pages selected by the users. Effectiveness is the proportion of the pages rated by the user for which the user and system ratings concur, i.e., the number of pages rated high by both the user and system plus the number of pages rated low by both the user and the system, divided by the total number of pages rated by the user. Note that the system rated all pages while the user was asked to rate at most 20 pages.

Our hypothesis is that effectiveness should increase as the profile is refined. We were also interested in knowing how long a learning period would be required for profile refinement to increase effectiveness. A measure of *correlation* was used as a summary of the effectiveness and distrust indices combined, to measure how closely the system mimicked the performance of the user in individual ratings for pages rated by both.

There were 24 participants in the study. The participants were given the general task to “browse a Web site for pages of interest to you”. In the study, the participants were asked to rate the retrieved pages after each of five sessions. There were then two sets of rating data for each session: the data generated by the system, and the user’s input on relevance of the pages. We then compared the system and user ratings of the pages. After the fifth session each participant filled out an additional questionnaire.

Most participants found that understanding the hierarchical relationship of the pages within the site provided a look-ahead function and that this was important in planning a navigation strategy. On average, effectiveness, a measure of the ability of the system to predict ratings consistent with the user ratings (high or low), was 64% (Figure 3) but the effectiveness did not differ significantly from session to session at the 0.05 level of significance. From this we can see that the adjustments in the profile had no effect on the effectiveness of the system when used for browsing.



**Figure 3. Effectives by session.**

The correlation coefficients for system and user preferences were calculated for each participant over the five sessions (Table 1). A one-way analysis of variance test using all five correlations indicated that there is no significant difference observed among the five sessions. This means that the system and the user have significant agreement on their

ratings in each and every session. But the level of agreement does not change from session to session.

**Table 1. Correlation of user and system preferences for each session.**

Session	1	2	3	4	5
Correlation Coefficient	0.30	0.28	0.35	0.26	0.26

One of our hypotheses was that the correlation would improve the longer the user used the system and the profile increased in size and weights adjusted. In fact, no specific pattern was found in the behavior of the correlation coefficient when plotted against the number of sessions. Rather, the *behavior was found to be idiosyncratic and personal*.

The results of this user study indicate that there were no improvements found in the performance of the system in predicting which pages a user would find interesting while browsing based on the content of the documents that the users rated in previous sessions. The keyword content of documents preferred by a user in one browsing session were not shown to be good indicators of documents that will be preferred in a future browsing session. Each session was an independent event as far as the system rating and user rating correlation was concerned. The Hebbian learning model, at least with learning rate set at 0.5, was not effective in providing changes in the profile that improved performance.

The effectiveness of the system was 64%. From this we conclude that for the purposes of browsing, the system did mimic the user's behavior to some degree, but it did not improve as the user used the system. It is interesting to note that at 64%, the system is in the low end of effectiveness of systems designed to use interest profiles based on page content where the task is more narrowly defined by a topic of interest [21].

These studies support our argument that browsing effectiveness is very much affected by the purpose of the activity. Where the task is ludic, the user does not benefit from algorithms that try to predict interest based on previous interests.

## **5. Lessons from News Reading for Web browsing**

Genre has been shown to play a role on the Web [8, 26]. The readers' expectations of <form, content, and functionality> are determined largely by recognition of the genre of a given site and this recognition drives the seeking pattern both for goal oriented information searches and for browsing activities.

The relationship of genre and task is clear, where digital genre has three components <form, content, functionality>. The genre helps the reader identify quickly the type of form, content and functionality that the user can expect from a given Web site. The genre form can support the task or get in its way. The newspaper form supports skimming and

browsing through news articles but not the selection of particular bits of information. The genre of a Web page can be used to support browsing or specific information retrieval tasks. If the task is to find information then the genre of the Web site becomes an important factor in the user's confidence to find the necessary information and/or perform necessary processing to generate the necessary information.

Research into the predictive value of content analysis for browsing related to news reading has indicated that we can not predict, on past behavior, which news items a person is likely to choose. The study, reported in this paper, on Web browsing indicates that the serendipitous factor that drives ludic behavior in news reading may also be dominant in Web browsing behavior. Just as with the selection of items for news reading, the selection of Web pages based on an adaptive user profile of extracted keywords, weighted by the user feedback from previously viewed documents, is not helpful to the user.

This inability to recommend a path when the goal is not well articulated is well known. For instance, the following conversation between the Cheshire Cat and Alice [4] was recently brought to my attention<sup>1</sup>,

'Would you tell me, please, which way I ought to go from here?'  
'That depends a good deal on where you want to get to,' said the Cat.  
'I don't much care where --' said Alice.  
'Then it doesn't matter which way you go,' said the Cat.  
'-- so long as I get *somewhere*,' Alice added as an explanation.  
'Oh, you're sure to do that,' said the Cat, 'if you only walk long enough.'

We suggest that a shift away from content to the characteristics of genre [24] and user task may be more effective at predicting or presenting choices for users on the Web. That is, the profile should be built on user *use characteristics* and *genre characteristics* rather than document content or user keyword characteristics. Characteristics such as categorization of content, genre of documents preferred, document visit patterns, link topologies, and community use patterns, may be used to profile use characteristics for use in recommending pages in subsequent browsing sessions by the user.

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<sup>1</sup> Thanks to Arnon Amir, who credits Freddy Bruckstein for bringing it to his attention.

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