

Early Canadiana on the World Wide Web: Preliminary analysis of usage patterns and user feedback

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Abstract: Early Canadiana Online (ECO) is a full-text, Web-based collection of pre-1900 documents which were published in Canada, or which were published in other countries but written by Canadians or about Canada. This paper reports preliminary findings from two studies of this collection - one involving software monitoring of usage of the collection; the other involving a Web-based user survey. The findings show much enthusiasm for Early Canadiana Online, especially the improved access which it provides to the documents in terms of physical location and time of day. The findings also indicate some enhancements which users would like to see, e.g. inclusion of information about the location of the original material, relevance ranking of retrieved documents, and better ways to print the material.

1. Introduction

Pre-1900 Canadiana¹ material is currently available in the original paper version and microfiche. The Early Canadiana Online (ECO)² project, funded by the Andrew W. Mellon Foundation, is exploring new ways of providing access to these materials. Recently, ECO has made approximately 1,700 titles available on the World Wide Web³, together with an English and French interface for search and retrieval. The research reported here gathers information on patterns of use and user opinions for the prototype World Wide Web versions. The goal of the research is to inform our understanding of how people use Web

¹ Canadiana includes documents (books, periodicals, brochures, etc.) published in Canada as well as documents published in other countries but written by Canadians or about Canada.

² <http://www.nlc-bnc.ca/cihm/ecol/english/default.htm>

³ <http://www.canadiana.org/>

versions of Early Canadiana and to learn how the prototype versions of Early Canadiana can be improved. However, this work is situated within the larger context of the growing corpus of research on digital libraries.

The research involved two data collection methods: (1) software monitoring of use of the Web versions of the texts, and (2) a Web-based survey of users of the Web versions of the texts. First we report the procedures used in the software monitoring, the findings from the preliminary analysis of the data generated, and our plans for further analysis of the log data. Then we report the procedures used in the Web-based user survey, the findings from our preliminary analysis of the users' responses, and discuss what we have learned so far about user reaction to the Early Canadiana Online collection.

2. Software monitoring

Usage of the site has been monitored for both the English and French interface. The analysis presented here is based on the logs from April 1, 1999 until April 9, 1999, a total of nine days. The number of events logged over the period remained consistent at approximately 700 events per day⁴. A notice on the initial page of the site alerted users that site usage was being logged for research purposes.

2.1 Events and sessions

Of the total of 6,287 events, 5,108 or 81% occurred on the English-language version of the website; 1,179 or 19% on the French version. These events took place in the context of 514 individual sessions, where *sessions* are defined by the session ID assigned by the server when a user's program first contacts the site. Of these 514 sessions, 377 were English (73%), and 137 were French (27%).

The average number of events in an English session was 13.5, as compared to 6.1 for French, and 12.2 for the total group. The discrepancy between the two language groups can be accounted for mostly by a small percentage of English sessions that were very long. Whereas the longest session in French was 59 events, in English there were 16 sessions longer than this, and the average length of those sessions was 108.8 events.

⁴The event counts used in this analysis are based on *significant* hits on the site, i.e. those hits that correspond to a single user event. Each user event may trigger many actual hits on the server side, as the client program returns to the server to retrieve any graphical material that the page contains. The first stages of processing the log files involve removing any entries that do not correspond to a significant event and will not contribute anything to the analysis of the logs. These analyses are based on a total significant event count of 6,287 for the period. (The combined logs for this period contain 28,836 entries. Three out of four of these entries represent browser requests for graphical elements and other non-significant events.)

2.2 Types of events

This section looks at events as individual actions, unrelated to any other actions in the log. The next section looks at the same data in the context of *sessions*; and considers them in the context of other events that preceded and followed them.

A total of eight different possible significant events (pages delivered) are recorded in the web server log. The phrase in brackets behind each of these event types indicates how each will be referred to in any subsequent discussion. The types of events are:

- the first page of results for a query (query results);⁵
- subsequent pages of results of a query (additional query results);
- a page selected by title or author browsing (browse);
- a document description, including links to all scanned pages (document retrieval);
- a page of a document, including the scanned image of the page (page view);
- a page of a document at a different resolution from the original (page resizing);
- a page of a document suitable for printing (page print)⁶;
- the help screen for the website (help).

Table 1 shows the breakout of events according to the above categories.

⁵ The first and subsequent pages of each search result, or a browse screen, contains 10 hits.

⁶ When a user retrieves a page for viewing, there is a link at the bottom of the page to a PDF (Portable Document Format) version of the image; it is suggested that this be used for printing the page. In assessing how much printing happened, we can only count how many PDF pages were retrieved, but even this figure will not be completely accurate. Some people may start to download the PDF file and realize that they do not have the necessary software installed to view and print it (Acrobat Reader). Others may download and view the image and decide not to print. Even others may decide to print the GIF (Graphical Image Format) version of the image that appears on the original viewing screen.

Table 1: Breakdown of events by type

Event Type	Percentage of Total Events
Query results	22%
Additional query results	6%
Browse	7%
Document retrieval	10%
Page view	53%
Page resizing	1%
Page print	2%
Help	<1%
Total	102% due to rounding

Over half of the events (53%) corresponded to actual page views. The next most frequent category of event was a query result, at 22% of the total events. Six percent of the events correspond to the retrieval of additional pages of a search result set. Browsing accounted for only 7% of the total events in the log. Of these, 19% were browsing by author, and 81% browsing by title. Only a small number of users went on to resize (1%) or print (2%) a page after viewing it.

We also examined query results by the domain of the search: author, title, publisher, subject, or full text. Full text queries were far and away the most popular, constituting 78% of all queries. This is at least partially attributable to the fact that a full text query is the default on the search form. Subject searches followed next at 14%, followed by title (5%) and author (3%). There was only one search on publisher.

2.3 User sessions

User sessions provide a much richer field to mine. In total, there were 514 sessions over the period logged. Of these, 377 were conducted in English, and 137 in French.⁷ Table 2 contains a tally of those sessions, and what kinds of transactions they contain.

⁷ This is a slight misrepresentation. The logs do not record what language each and every transaction occurred in, but rather in what language the user was working when the session ended. Some users may have switched languages midstream, in which case the whole of their session will be recorded as having occurred in the language they ended with.

Table 2: Percentage of sessions containing each event type

Event type	Percentage of sessions with one or more occurrence of this event type
Query results	82%
Additional query results	21%
Browse	26%
Document retrieval	49%
Page view	55%
Page resizing	7%
Page print	8%
Help	4%

Queries, once again, lead the pack: 82% of all sessions included one or more query results being returned. Twenty-one percent of the sessions included at least one instance of the user requesting an additional page of results from a query.

Forty-nine percent of the sessions included one or more instances of the user retrieving a document description, and 55% included one or more actual page retrievals (note that, in the case of query results, it is possible for the user to go straight to a page that satisfies their query and thus skip the step of looking at the document description page). One last notable aspect of Table 2 is the small percentage of sessions in which the Help pages were used. This might be attributed to the good design and simplicity of the web site, so that users felt no need to consult a help page. On the other hand, they may not have noticed that the help page was there, despite the reasonably prominent placement of the help button on each screen.

An examination of sessions by the first user action of the session showed that queries are the initial strategy for most users (74%). Browsing is the next most popular way to begin (16%). Help is the first user action for only 2% of the user sessions.

2.4 Queries and their results

Also of interest is what action follows a query. Table 3 shows all 1,368 queries in the logs, broken down by the type of action immediately following the query. The data in this table needs to be treated with some caution because it is not possible to be sure that the next event recorded in the web server log is really, from the user's perspective, the next thing that happened. The user might have, for example, pressed the back button and returned to a previous screen, an action which would not be recorded at the server level. Nevertheless, the sequences in this table are suggestive of typical user behaviour.

Table 3: All queries, broken down by the action following the query

Queries followed by:	Percentage
Nothing (end of session) ⁸	14%
Another query	46%
Additional query results	7%
Document retrieval	15%
Page view	14%
Browse	4%
Help	<1%

Nearly half (46%) of all queries in the log were immediately followed by another query. Document retrieval or page views were the next most likely actions, but they both trail a good distance behind the first place, at 15% and 14% respectively. About 14% of the initial queries were the last action taken by the user in the session. This might indicate that they did not find anything useful, but it could equally well be because they had satisfied their curiosity about the site, they ran out of time, their computer crashed, or some other reason that this analysis cannot reveal.

Using the 625 queries that were immediately followed by another query, we can study the changes made between queries to give us some idea of user search strategies. Users can change the search text they are using, the domain/field they are searching, or the boolean operator used for the search. Table 4 shows how these changes break down.

Table 4: Changes made to queries before resubmitting

Change(s) made to:	Percentage
Query string only	62%
Query string and domain	2%
Query string and domain and boolean	<1%
Query string and boolean	7%
Domain	7%
Domain and boolean	2%
Boolean	8%
No change	11%

Two-thirds of the queries that were re-submitted involved a change in the search string itself. These may represent re-phrasing of the original query, or a query on a new topic. The remaining one third are equally divided among strategies of changing one or more of the other parameters.

⁸ This group includes 72 cases where the whole session consisted of just one query.

2.5 Query result sets containing no hits

Table 5 shows the queries broken out by domain, and what percentage of those queries returned no hits.

Table 5: Percentage of each query type returning no hits

Type of query	Percentage of queries returning no hits
Author	70%
Publisher	NA (only 1 search by publisher)
Subject	66%
Text	32%
Title	65%

Full text queries would appear to be the most successful by a substantial margin, with only 32% of them returning no hits, less than half the rate for the other types of queries. However, full text queries also sweep the widest net, and quite possibly return a larger percentage of hits that are not relevant to the user's purpose.

2.6 Discussion of findings from software monitoring data

Web server logs paint, at best, a very incomplete picture of what is actually happening at the user's workstation as they negotiate their way through a site. The logs for the ECO web site, however, because they capture so many aspects of the user's activities, can lead to some useful analyses. The data presented in this paper is only a beginning, based on a short period of logging, but it helps us to see what the main trends are, and points to how we might want to structure further analyses when more data is available. For example, we plan to: (1) conduct more detailed comparisons between the usage of the French and English interfaces; (2) generate a list of most frequently viewed titles; and (3) examine the topics in queries that generated zero hits to identify areas of user interest that are not currently represented in the collection but might be included in the future.

3. Web-based user survey

In developing the questionnaire for this survey, we reviewed research instruments used in other digital library surveys and tried to benefit from the lessons learned in the administration of these earlier surveys. The Early Canadiana questionnaire consists of 27 questions grouped in four sections: (1) questions about the person's use of Pre-1900 Canadiana in general; (2) detailed questions about the person's use of the the Pre-1900 Canadiana item just used in this Web session; (3) general questions about the person's use of computers and the Internet; and (4) demographics. The questionnaire includes both closed- and open-ended questions and was made available in English and in French. Participants in the survey were offered an entry for a draw with a chance to win \$500.00. This incentive to complete the questionnaire was offered because it is known from previous

studies that response rates are extremely low for Web-based surveys on topics of this nature⁹.

3.1 Administration of questionnaire

The initial page of the site provides a link to a notice which gives background information about the study including details regarding the confidentiality of the data. Users can access the questionnaire itself from any page by clicking on an image in the upper right hand corner of the page. At the end of the questionnaire, the user clicks on a button to receive an entry form for the draw. The findings reported here are based on 139 questionnaires completed between April 12, 1999 and April 28, 1999, the first 17 days of the survey.

3.2 Profile of respondents

Seventy percent of the respondents completed the English version of the questionnaire and 30% completed the French version. Fifty-one percent were female, 41% were male, and 8% did not indicate their gender. The group was equally divided by age: 47% were under 46, 47% were 46 or over, and 6% did not answer this question. The majority of respondents (71%) had been using the Internet for over two years. Almost half (46%) of the respondents said that they used the Internet more than 15 hours per week, and almost half (48%) described their knowledge of the Internet as excellent. In addition, the respondents had used a variety of computer applications, as shown in Table 6.

Table 6: Percentage of respondents who had used each computer application

Computer application	% of respondents
Online books or articles	81%
Database software	55%
Internet search tools	94%
Text analysis software	7%
Bibliographic software	18%
Statistical software	22%
None of the above	1%

The largest group of respondents by area of interest was Genealogy (42%), followed by History (21%). Other groups were much smaller, ranging from 1% - 4%. These included Anthropology/Archeology, Canadian Studies, English Literature, French Literature, Law, and Sociology. Seventeen percent wrote in an area of interest that did not appear on our list. However, there were no additional areas of any size in this group.

The majority (58%) of respondents were at home when they answered the questionnaire. Twenty-seven percent were in their offices; 7% were in a computer lab; and 3% were in a library. The remainder did not indicate the location of the computer they were using. The majority of users were relatively close to a university or research library which has Pre-

⁹ See, for example, Columbia University's *Online Book User Survey*.

1900 Canadiana in original paper or microfiche versions. Sixty-four percent indicated that they could travel to such a university or research library in 60 minutes or less; another 17% indicated that it would take more than an hour but less than a day; and 8% indicated it would take more than a day. Nine percent said they did not know, and 2% did not answer the question.

3.3 Findings from quantitative data

Use of Pre-1900 Canadiana in general

One section of the questionnaire focused on the respondent's use of Pre-1900 Canadiana in general. The first question asked users how often they had used Pre-1900 Canadiana (in any version) during the last four weeks. The majority of respondents (71%) indicated that this was their first time. Fifteen percent indicated 2-5 times; 6% indicated 5-10 times; 4% indicated 11-20 times; and 4% indicated more than 20 times. Since such a large percentage of the respondents were using Pre-1900 Canadiana for the first time in four weeks (and perhaps for the first time ever¹⁰), we have examined the responses to some questions in two groups - one group encompassing those who had used the material 2 or more times in the preceding four weeks, and the other group encompassing those who were using the material for the first time in four weeks.

One series of questions asked users to indicate which version (original paper, microfiche, or World Wide Web) they liked the most, which version they liked the least, and which version would be most useful in their work. Table 7 shows the responses to these questions.

Table 7: Preferred version of Pre-1900 Canadiana:

% for those who had used Pre-1900 Canadiana 2 or more times in previous four weeks (N=40)
 (% for those who were using Pre-1900 Canadiana for the first time in four weeks (N=98))

Question	Paper	Microfiche	World Wide Web	No response
Which version do you like the most?	27.5% (8.2%)	7.5% (2.0%)	62.5% (79.6%)	2.5% (10.2%)
Which version do you like the least?	20.0% (15.3%)	55.0% (49.0%)	10.0% (8.2%)	15.0% (27.6%)
Which version would be most useful in your work?	17.5% (3.1%)	2.5% (3.1%)	72.5% (76.5%)	7.5% (17.3%)

For both groups of respondents the majority of users liked the World Wide Web version the most (62.5%; 79.6%), and the majority of respondents indicated that the World Wide Web version would be the most useful in their work (72.5%; 76.5%). About half of the respondents in each group indicated that they liked the microfiche version the least (55.0%;

¹⁰ That some respondents had never used Pre-1900 Canadiana before is confirmed by the responses to another question which asked users to indicate which versions they had used previously. 28.8% indicated they had used the original paper; 20.9% microfiche, and 24.5% World Wide Web. If everyone had used one or more versions previously, the sum of these percentages would equal or exceed 100%.

49.0%). Another question asked how often the person needed to consult the original document, rather than a facsimile, when using Pre-1900 Canadiana. For the group of 40 respondents who had used Pre-1900 Canadiana two or more time in the last four weeks, the responses were- frequently: 17.5%; occasionally: 55.0%; and never: 27.5%. The group of 98 people who were using Pre-1900 Canadiana for the first time in four weeks indicated less need to consult the original document. Their responses were - frequently: 8.2%; occasionally: 29.6%; and never: 59.2%.

Use of a specific Pre-1900 Canadiana item

Another section of the questionnaire focused on the Pre-1900 Canadiana item which the respondent had just used in this session. It asked people how long they spent using the item today, their reason for using it, how they used it, what features they used, if they printed any portion of it, and how satisfied they were with it. If the person had not used an item, they skipped to the next section of the questionnaire. Approximately 15% of the respondents were in this category.

Table 8 shows the responses for how long respondents spent using the item and their reason for using it. Approximately 20% of respondents spent more than 30 minutes using the item. The largest group of respondents were using the item for a personal interest/hobby.

Table 8: Use of a specific Pre-1900 Canadiana - time spent & reason for use

Time spent using item		Reason for using	
0-10 minutes	18.7%	Professional purposes	15.1%
11-20 minutes	25.9%	Curriculum development	0.0%
21-30 minutes	16.5%	Personal interest/hobby	41.7%
31-60 minutes	10.8%	Curiosity	9.4%
More than an hour	9.4%	Research project	7.2%
No response	18.7%	Student assignment	2.9%
		Other	8.6%
		No response	15.1%

In terms of how they used the item, only 4.3% of the respondents read the entire item. Other users read part of the item (26.6%); browsed through the item (21.6%); or looked up something (28.1%). In terms of features used, the largest number of respondents reported using full-text search capabilities (58%), followed by table of contents (27%), index (20%), and footnotes/endnotes (7%). The majority of respondents (57%) did not print any part of the item.

Level of satisfaction with the World Wide Web version of the item they had just used was high: 36.7% were very satisfied and 31.7% were satisfied. Only 1.4% were dissatisfied and 0.7% very dissatisfied. Approximately 8.6% said they weren't sure, and 20.9% did not answer this question.

3.4 Findings from qualitative data

The Preferred Version

The majority of respondents commented on what they liked or disliked about a particular version, i.e., original paper, microfiche, or World Wide Web. Some suggested new functionality to improve the system while others discussed existing features that they found confusing or frustrating. Their comments provided insights into the characteristics and functions that helped them in their research, the features that detracted or limited their use of the system, and why.

As the quantitative data showed, most participants preferred the World Wide Web version. The comments suggest that this is because of its accessibility. Many commented that this version allowed them to access material from their homes at a time that was convenient to them, a feature many applauded.

Can use the WWW from my house, therefore [it's] more convenient when helping my kids with homework.

Although nothing can replace the feel of an original document, it is the ease and access of the internet which is special: available conveniently on our computer at home, a home which is 200 km removed from the significant archives.

Convenience of being able to do research at home at the time you are free to use the internet. Copies are obtainable just by pressing the print button and are available 24 hours a day.

Facilité d'utilisation, disponibilité, liberté de recherche et de consultation.

I live in the country and enjoy being able to look things up from my home as needed. Also, it allows me to look at things at any time.

. . . since I am not in a major city, it can be difficult to access materials.

Some respondents felt it increased their ability to reproduce or copy the item while others appreciated the fact that they could gain access to historical information without handling fragile documents.

Accessibilité plus simple et plus grande. Reproduction plus facile.

Ease and speed of access. Eliminates handling fragile originals. Provides access for many people -- Canadians and others, nationally and internationally -- to materials which may otherwise be totally inaccessible.

Not all respondents preferred the Web version. Some thought the original paper version was best. These participants commented on the importance of the physical attributes of the original paper version and on its authenticity or trustworthiness.

Rien ne peut remplacer le contact physique avec un livre: odeur, texture, facilité de le feuilletter, de passer de la page des matières à une section interne, etc.

C'est plus plaisant de manipuler l'original.

It is authentic. It is exciting to have real copies in one's hands.

One individual simply explained that it was easier to read paper than a computer screen.

Lire sur du papier est plus agréable que lire sur un écran.

On the other hand, some respondents stated they liked the original paper version the least. Fear of damaging the original seemed to be the prime reason for not liking this version. Furthermore, some felt that it took longer to locate information when they used the original paper version and that they could not always copy it.

I would not want to damage it and that in itself slows down the search, plus I don't want others handling it for the same reason.

Unless there is an index, it can take a lot of time.

Il faut le manipuler avec soin. L'accès en est contrôlé, il n'est pas toujours accessible. On ne peut pas le photocopier.

Microfiche was the preferred format for only 5 respondents, and only 1 of these 5 provided any comment on why they liked the microfiche collection over the original paper version or the World Wide Web version.

It appears that www.canadiana.org may not include all CIHM material. Is this true? Also, the microfiche collection allows graduate students to make one photocopy of two pages.

Most respondents liked the microfiche version the least and many elaborated on the limitations and disadvantages of this format. Respondents felt that microfiche was inaccessible, hard to read, resulted in poor reproductions, and that the machines were often difficult to use.

Lecteur souvent complexe à utiliser. Présentation laissant souvent à désirer. Reproduction de qualité aléatoire.

Microfiche is a pain - difficult to read, limited type size.

The Most Useful Version

The majority of respondents identified the Web as the most useful version. Many users who stated they *preferred* original paper version also pointed out that the Web version was often the most *useful* because it provided them with the ability to search quickly, to make copies and to access the material where and when they wanted.

The internet is the most useful because anyone with a computer and access to the web has the ability to do research from their home any time they wish to do research. Most web sites are very informative and list all the important details in one location.

Sometimes originals are too faint to cop[y] and thus need to check that resource [WWW version].

Accessibility. I am a Ph.D. student with an 18 month old son. Need I say more?

Some respondents who found the Web version most useful also stated that they needed to use this version in conjunction with the original paper. The use of the Web version did not eliminate their need to consult the original. Their comments reveal reliance on the original paper version to ensure authenticity or to verify the information.

As stated for access ease, then go to paper for verification and to copy and keep.

Accessibility. However, my work to date makes it clear that this is NEVER sufficient. This data must be verified through one of the other two means.

System Functionality and Content of ECO Collection

The questionnaire also solicited ideas about features that would make the material more useful. Respondents provided a number of suggestions that related to the search engine, the help features and the content of the site. Replies included suggestions to put more material online, to rank the items retrieved from the least likely to contain relevant material to the most likely, to translate the French documents for English readers, to identify where the original material is located and when it was digitized, to provide a listing of documents by date, to give more information about how to search, and to provide a cut and paste feature. Some participants requested features that the system already has.

I didn't notice a "previous page/next page" choice on the screen. This would be useful when you find that the info you want continues to the next, or from the previous, page. If that capability is there, then I need another cup of coffee this morning!

Each screen does contain a forward and next page button, but the buttons appear at the bottom of the page and are not immediately obvious.

In this system each page of an item has been scanned as a separate file. Therefore a user must separately download each page they wish to view or print. Depending on the connection and the computer a person is using, the rendering of a page can seem somewhat time consuming. Some respondents criticized this feature.

Is it possible to view two pages at once? The time spent in recalling each page seems long.

Avoir l'option de le télécharger au complet, et non page par page. . .

It would be enormously useful to have the option to download the entire document as a pdf file, rather than having to visit each page individually. This is a time-consuming process, especially when a text is 2-300 pages long.

Finally, participants wanted the system to identify or highlight the section or phrase that contained the subject or term they were searching for.

When you show the page where the[re] has been a hit on a word or phrase.. display a few lines of the info.

I couldn't immediately see how to pinpoint within the fulltext the phrase I had initially searched.

A couple of respondents stated that they were disabled and that the web provided them with access to information that was otherwise inaccessible.

Since I am not always able to get to a library (univ. or otherwise) due to a back disability, I find the online resources most convenient.

For the most part the respondents were impressed with the site and pleased to gain access to Pre-1900 Canadiana from their homes.

This site is great for finding all kinds of documents. I am also a great fan of Project Gutenberg.

I love this site, for anyone researching their families, it is a wonderful resource. Please leave it up and running and expand. The more people who know about it, the more it will be used, I know. I told the members of the New Brunswick Geneological List that I subscribe to about it this morning and received at least ten replies, everyone loves it!

Wonderful Resource! It makes available to very many people worldwide what was formerly restricted to a few and does it well.

L'idée de ce site est géniale, internet a tendance à être une excellente banque d'information pour les sujets actuels mais il est difficiles [sic] d'y trouver des

documents traitant de notre histoire. Je suis content de voir que du travail est fait pour qu'Internet contienne encore plus d'information pertinente.

3.5 Discussion of the Web-based survey

The findings of the online questionnaire suggest that the Web provides the preferred version for many individuals interested in Pre-1900 Canadiana. Ease of access, ease of copying and increased search capabilities appear to be very important to these users. The Web version, however, does not completely eliminate the need to consult the original paper version as some respondents did not trust the authenticity of the material they found on the Web. Furthermore many respondents who had previously used pre-1900 Canadiana commented on the importance of the physical attributes of the original paper version and the pleasure they gained from using it. The findings also point to possible enhancements to the existing system. Furthermore the ability to download and print the entire document at one time is fairly important to many users.

4. Closing

For both the software monitoring study and the web-based survey, data collection is still in progress. When the data collection is completed, a more detailed analysis will be conducted and a final report of the findings will be published.