Perceived Usefulness of Online Educational Museum Resources by Teachers

by

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Abstract

This research project is a qualitative study that explores the online user experiences of teachers in relation to online educational museum resources. Using Davis' Technology Acceptance Model (TAM) as a theoretical framework, I interviewed four teachers to discuss what factors contributed to their perceived usefulness of online resources. The teachers raised 15 different topics, categorized into 4 web usability themes: features and functionality, readability, findability and relevance. The findings suggest that by addressing the specific web-based needs of teachers, web developers and content providers can increase the perceived usefulness of their online resources.

Keywords: technology acceptance model (TAM), perceived usefulness, teachers, online educational resources, museums

Introduction

The International Council of Museums (ICOM) defines a museum as "a non-profit, permanent institution in the service of society and its development, open to the public, which acquires, conserves, researches, communicates and exhibits the tangible and intangible heritage of humanity and its environment for the purposes of education, study and enjoyment" (ICOM, 2007, Museum definition, para. 3). As described by ICOM, every museum has a mandate to share and communicate our collective heritage with the public and one of the key ways to meet this mandate is through education programs. Understanding how museums can better deliver resources to educators is the motivation for this research project. Through a qualitative research study, this paper aims to gain insight into what teachers find useful about online educational museum resources, with the results contributing to the development of more effective digital resources in the future.

About Online Educational Museum Resources

There are over 2 400 museums in Canada (Canadian Heritage, 2008) with vast collections and subject areas, ranging from fine arts to living histories to dinosaurs. The Canadian Museum Association (2010, homepage, para. 4) recognizes the following as museums:

- Exhibition places such as art galleries and science and interpretation centers;
- Institutions with plant and animal collections and displays, such as botanical gardens, biodomes, zoos, aquariums and insectariums;
- Cultural establishments that facilitate the preservation, continuation and management of tangible and intangible living heritage resources, such as keeping houses and heritage centers;

- Natural, archaeological, ethnographic and historical monuments and sites.

They can be found in small towns and large metropolises, and can be completely volunteer-operated or have hundreds of staff members. While there is immense diversity in the museum sector, a common goal for all organizations is to connect with the public, including teachers and students.

Museums have a long history of engaging teachers and students through traditional on-site programs, such as field trips, programs and workshops. While on-site programs are successful and critical to a museum's operation, there is a growing need, however, for museums to increase their educational reach beyond the physical exhibition space. With increasing access to the internet and greater bandwidth availability, museums have more capability in today's environment to connect with teachers and students in their classrooms through online resources. As an example of the growing trend towards web-based education programs there are now several museums that offer distance education programs through interactive video conferencing technology, which is dependent on high-speed network access. Sumption (2001) described interactive video conferencing as "…unlike current electronic field trips, video conferencing can utilize synchronous affordance technologies to connect students and teachers to the real museum's staff and exhibits, in real time" (p. 7). In 2010, the Glenbow Museum had 50 199 students who participated in school programs, of which 2 366 of those students participated in school programs remotely, including their distance education program delivered via interactive videoconferencing (Glenbow Museum, 2010). Likewise in 2010, the Cleveland Museum of Natural History recorded 48 487 students who experienced on-site programs and 11 921 students through a similar video conferencing education program (Cleveland Museum of Natural History, 2010). Such numbers indicate that traditional on-site educational programs makes up the greater

part of student engagement with museum content. However, museum experiences are not limited to the physical space and clearly, opportunities exist within the current museum landscape to grow the number of students engaged online. Museums need to be able to share their expertise, collections, and stories through the Internet to remain relevant in a future dominated by advanced electronic communications.

The development of online resources has exploded over the last 20 years as Internet access and technology have become a mainstream in society. As an indication of the growing importance of online educational museum resources in Canada, Canadian Heritage (a federal government department) launched the Virtual Museum of Canada, www.virturalmuseum.ca, in 2001. Currently, this portal has more than 750 virtual exhibits contributed by institutions all across Canada (Virtual Museum of Canada, 2011). The number of resources will undoubtedly continue to grow as the Internet becomes more integrated with every aspect of Canadian life, including the education system.

Why Study Online Educational Museum Resources? A Personal Perspective

As a web developer working in the heritage sector, developing online educational resources is a core function of my work. This research project will directly impact the way I work and the resources I develop in the future, and will hopefully assist other developers as well. Teachers are an important user group to understand for web professionals, especially those in content rich sectors such as museums. While traditionally museums provide experiences on-site and with objects or artifacts, there is also the intangible elements such as the stories, the knowledge base and the forum to discuss ideas. Looking towards the future these core museum products require strong communication channels, such as the Internet, rather than physical spaces. We must make better use of current technologies, trends in education, and online user

behaviour research to meet the needs of our audiences, thus making museums relevant and meaningful to future generations.

But how do we improve online educational museum resources in a practical way? One method is to talk to the users. User evaluations and feedback are critical to building future projects, allowing us to constantly grow and change with our audiences. Access to quality user data, however, is not readily available to the typical resource developer in a museum. Many of the resources available in a workplace do not include rich data that describes detailed individual experiences with educational resources in a systematic and formal manner. There are many reasons for this lack of quality user evaluations, including insufficient funds, time, and in-house expertise. The most tangible evaluation of web usage for most organizations is to analyze web statistics. Much of the web analytic information that is typically available is strictly numerical (described in more detailed later in this paper) and while it is useful, this type of information flattens and summarizes the online activity of all the users. There is little differentiation of users and their specific needs. These numbers don't explain the current challenges teachers face in the classroom, how they use web resources, or why they use certain resources over others.

My personal goal for this project is to gain a deeper understanding of what is useful to teachers. What are their needs and how can online educational resources address them? This work is important because an increased awareness and engagement of teachers with online educational resources could translate into more traffic to virtual exhibitions sites, more productive use of the websites, and a better use of developer resources. Rather than creating what we *think* teachers want, we could create what they *do* want. Ideally, online educational museum resources would be used often by teachers and students, and would provide valuable experiences whether or not they are at the museum physically. It is not always possible for

teachers to bring students to the museum and it is certainly not possible for museums to display all the objects in their collection in an exhibition. Access to museum content, however, no longer needs to be limited by geography, opening hours, or conservation concerns.

Problem Statement

This research project will attempt to understand and evaluate the content of online educational museum resources from the teachers perspective. By understanding the qualities of online educational resources that contribute to the perceived usefulness of the website, museums can develop better resources and which in turn, can lead to greater adoption of online resources. Major questions for this project include:

- What qualities of an educational website do teachers find useful? Why?
- What factors contribute to a website's perceived usefulness? Why?

Literature Review

Theoretical Framework

The theoretical framework for this research project is Davis' Technology Acceptance Model (TAM) and more specifically, the concept of the perceived usefulness of a technology. Davis (1989) wrote that the concept of perceived usefulness is a significant factor that causes a person to use a technology or not. Davis defines perceived usefulness as the tendency for people "to use or not use an application to the extent they believe it will help them perform their job better " (p.320). -Multiple studies have shown that TAM is successful in explaining intention to use information systems and web-based technologies (c.f. Lederer, Maupin, Sena and Zhuang, 2000; Mathieson, 1991; Moon and Kim, 2001). Studies have researched TAM as it applies to general website usage (c.f. Castañeda, Muñoz-Leiva & Luque, 2007; Lederer et al., 2000; Wangpipatwong, Chutimaskul & Papasratorn, 2008) and learning environments (c.f. Gao, 2005;

Martinez-Torres, M. R., Toral Marin, S.L., Garcia, F. B., Vazquez, S. G., Oliva, M. A., & Torres, T.A., 2008; Selim, 2003). Few studies, however, have focused on museum-specific resources and their use by teachers. By examining the usage of online educational museum resources through the lens of TAM, we can gain a better understanding of what aspects contribute to a teacher's perceived usefulness of that website. In turn, by addressing specific factors of perceived usefulness, web developers, such as myself, can potentially increase the acceptance level of a critical user group.

A review of the existing literature for this research project will focus on three main themes: 1) web use and usability, 2) the current landscape of online educational museum resources and their use by teachers, and 3) research that tests the Technology Acceptance Model (TAM) for website usage.

Web Use and Usability

As the Internet becomes a mainstream communication tool in society there is an increased desire to engage users more effectively with online content. In fact, Industry Canada held public consultations in 2010 to develop a national digital economy strategy, which would promote the use of new technologies in all sectors of the economy (Government of Canada, 2011). The strategy (to be released late 2011) will be center on five issues: 1) Capacity to innovate using digital technologies, 2) Building a world-class digital infrastructure, 3) Growth of the information technology and communications industry, 4) Digital media: Improving Canada's Digital content advantage and finally, 5) Building digital skills for tomorrow (Government of Canada, 2011). A national strategy is recognition of how valuable the web is and why it is important for all sectors, including museums, to be actively engaged with its development.

Meaningful user engagement and greater understanding of how online resources can be used more effectively, can be informed by the growing research in the web usability field.

What is web usability? Usability.gov defined usability as, "…how well users can learn and use a product to achieve their goals and how satisfied they are with that process" (Usability.gov, 2011, Usability Basics, para. 1). This can be applied to any product - a car, a telephone, and a website. The goal of web usability is to make websites more efficient for users, easier to learn and more satisfying to users (Usability.gov, 2011). Nielsen (2003) and Usability.gov (2011) stated that the five most common metrics for web usability are:

- Effectiveness: A user's ability to successfully use a website to find information and accomplish tasks.
- Efficiency: A user's ability to quickly accomplish tasks with ease and without frustration.
- Satisfaction: How much a user enjoys using the website.
- Error frequency and severity: How often do users make errors while using the system, how serious are these errors, and how do users recover from these errors?
- Memorability: If a user has used the system before, can he or she remember enough to use it effectively the next time or does the user have to start over again learning everything?

There have been numerous studies about web usability and online user behaviours in many sectors, including the medical field (c.f. Becker, 2004; Curtis & Shershneva, 2004; Eysenbach & Köhler, 2002), e-commerce (c.f. Egger, 2001; Roy, Dewit and Aubert, 2001; Venkatesh, Ramesh & Massey, 2003) and education (c.f. Kay, Knaak and Petrarca, 2009; MacGregor and Lou, 2006; Zaharias and Poylymenakou, 2009), to name a few.

Online Museum Teacher Resources

A 2004 survey showed that 87% of U.S. art museums had online educational resources available through their websites (Varisco & Cates, 2005). The majority of large museums in North America will have education departments and teacher resources available online, including one or more school programs, online exhibitions and curriculum-based student and teacher resources. As well, there is research to show that teachers are using online museum resources to engage with museum content. A website audience behaviour study by Kravchyna and Hastings (2002) shows that 62% of teachers surveyed used museum websites for research purposes. Teachers use museum websites for research proposes more than scholars (44%), students (44%), general visitors (37%) and even museums staff (60%). This statistic indicates that teachers are an important and active web audience for museums to reach and engage with.

A 2007 study by Paquin and Barfurth is particularly interesting as it focuses on Canadian teachers and the potential learning outcomes of online museum resources. Paquin and Barfurth (2007) conducted a study on the use of virtual museum websites by francophone teachers in Canada. With 43% of their sample reporting that they used virtual museum websites, the researchers agreed there was a growing trend of teachers using online museum resources. However, Paquin and Barfurth (2007) reported that only 21.5% of the francophone teachers surveyed said they had done any preparation prior to having their students search the Internet as part of a learning activity. When asked if they conducted follow up activities, 78.5% said no. Lee, Groves and Stephens (as cited in Paquin and Barfurth, 2007, p. 163) have found that preparation and follow-up are essential processes for students to learn new concepts. The study results are disappointing as they show that teachers are not maximizing the opportunities and benefits that virtual museums provide. Virtual museums or online educational museum resources can help facilitate the learning processes of topics before and after a museum visit or a classroom

discussion. Paquin and Barfurth's study is evidence there remains a gap between the awareness of resources available and teachers' use of material for preparation and follow up as part of their activities. Their study recommends that museums should do a better job of making teachers aware of the full range of resources available (Paquin & Barfurth, 2007).

A compelling and concrete reason to improving awareness of available online educational resources is that these websites have been proven to be a benefit. A study by Prosser and Eddisford (2004) showed that online museum resources were a benefit to students as well as teachers. In addition, they found that virtual museums provided users with unique learning opportunities that would not be typically available in a more traditional physical museum space, "ICT (information and communication technology) is capable of facilitating value-added learning interactions that are not possible in the physical museum" (Prosser & Eddisford, 2004, p. 294). Prosser and Eddisford also found that virtual museums enhanced the learning of artifacts. They wrote,

> Student S has combined both his real and virtual experience of the xylophone to synthesis his understanding and draw conclusions about real objects that he hasn't seen. The virtual learning experience seems to have increased his ability to conceptualise the real world. (Prosser & Eddisford, 2004, p. 294)

The literature confirms that online educational museum resources are widely available and provide an enormous amount of benefit to students and teachers. There exists, however, a gap between awareness of the resources and their use by teachers in classrooms. While there is a general awareness of existing museum resources, dedicated educational resources appear to be

under utilized. How can we, as resource developers, understand what factors contribute to their perceived usefulness and therefore greater adoption of the resources?

Application of the Technology Acceptance Model (TAM)

There are two key variables in Davis' Technology Acceptance Model (TAM): perceived usefulness and the perceived ease of use. The goal of this study is to learn more about how online resources can better meet the needs of teachers and help them do their job more effectively through the lens of TAM's perceived usefulness variable. The user's perception that a technology can enhance their job performance is the very definition of Davis' perceived usefulness: "A system high in perceived usefulness, in turn, is one for which a user believes in the existence of a positive use-performance relationship" (Davis, 1989, p. 320).

This study does not explore the ease of use variable in relation to web usage. As Davis (1989) found that, "…usefulness was significantly more strongly linked to usage than was ease of use" (p. 333). A study by Castañeda, Muñoz-Leiva and Luque (2007) confirms the strength of the perceived usefulness variable to predict website usage. They found that, "perceived usefulness was the most important determinant of the intention to visit, regardless of the user's level of experience" (Castañeda et al., 2007, p. 393). The study showed that ease of use was a given minimum requirement to allow users to evaluate its usefulness. "Ease of use is a necessary but not sufficient condition for the acceptance and use of a free-content website" (Castañeda et al., 2007, p. 393).

TAM and perceived usefulness have also been applied in an e-learning context. A study completed by Gao (2005) found that, "TAM can be a valuable tool in the evaluation and selection of hypermedia-based educational products such as a course companion website" (p.

245). This study tested several hypotheses related to TAM and educational websites. Among its major findings were support for the following hypotheses (Gao, 2005, p. 243):

- Perceived usefulness is positively related to attitude toward using
- Perceived usefulness is positively related to intention to use
- Attitude toward using is positively related to intention to use
- Intention of use is positively related to actual use

Following the results from Gao's study, we can infer that by addressing perceived usefulness of an online resource, we will also have an impact on the actual use of said resources.

Methodology

This research project is an exploratory study focused on how teachers use online educational museum resources, specifically the Glenbow Museum's online exhibition website titled *Niitsitapiisini: Our Way of Life* (www.glenbow.org/blackfoot), referred to in this paper as the Blackfoot website. The Blackfoot website was selected as a common discussion point for all interviewees as a way to focus the investigation about online user experiences with educational resources. Through qualitative research methods this project hopes to identify patterns of technology use and provide insight into how teachers determine if a resource is useful or not.

About Niitsitapiisini: Our Way of Life

Niitsitapiisini: Our Way of Life is an online exhibition and educational resource launched in 2006 by the Glenbow Museum in Calgary (Glenbow Museum, 2006). The website shares the history and culture of the Blackfoot-speaking people of the northwestern plains of North America, an area including present-day Alberta, Saskatchewan and Montana (Glenbow Museum, 2006). The website is a companion piece, developed in support of the permanent gallery at the

museum, also called *Niitsitapiisini: Our Way of Life.* As described on the Virtual Museum of Canada portal, the website invites users to

> Take an interactive journey into the rich heritage of the Niisitapi, known as the Blackfoot Tribe. This exhibit provides a comprehensive glimpse into the Blackfoot way of life; how they lived with their families, the environment and their neighbours. Additionally, learn how these relationships are important to the Blackfoot Tribe to this very day. (Virtual Museum of Canada, 2009, Niitsitapiisini: Our Way of Life, para. 1)

The Blackfoot website is multilingual, available in English, French and Niitsi'powahsini (Blackfoot). The Blackfoot website is also available in multiple web formats, viewable through a Flash player or through standard HTML webpages. The Flash and HTML versions display identical content (text, graphics, photos, audio and video elements) in the same narrative structure. The website aims to provide accessible and equal user experiences regardless of the language or technology selected, that is, any information found in one language or technology format can be found in the other versions. In addition to the online exhibition, the Blackfoot website includes a secondary area entitled *Teacher Toolkit*, which is a resource section for teachers. This section is only available in English and French, and only in the HTML format. The *Teacher Toolkit* includes general background information about Blackfoot culture and provides learning resources that can be used in the classroom.

A Qualitative Approach

This research project will attempt to capture the descriptive opinions and experiences of a select group of teachers. To help answer the question of how teachers use online educational

museum resources, a qualitative research approach was selected over a quantitative one. Hoepfl (1997) writes, "Where quantitative researchers seek causal determination, prediction, and generalization of findings, qualitative researchers seek instead illumination, understanding, and extrapolation to similar situations" (p. 48). This project seeks to obtain and explore the rich descriptive data of individual teacher experiences with the Blackfoot website and other online educational resources.

Currently, there exists a gap in the literature for qualitative studies in the area of Davis' TAM as it applies to website usage and there is an even greater gap in the specific context of online educational museum resources. Often website usage studies are quantitative research projects with defined variables and measures, using tools such as surveys, numerical response scales and statistical procedures (c.f. Lederer et al., 2000, Paquin and Barfurth, 2007, and Castañeda et al., 2007). Results from quantitative studies represents statistically valid information that can be extrapolated to an entire user group, yet they fail to capture the rich details and nuances of a user's personal experience. This qualitative study attempts to explore the details found in data obtained from descriptive online user experiences.

One of the reasons there are so many quantitative studies on web usages is that websites generate an immense amount of data, known as clickstream data, which can be quickly obtained, processed and manipulated. Clickstream data can include statistics such as the number of online visitors, the amount of time users spend on a webpage, the number of pages viewed, and the most visited pages, geographic location of users. All of these statistics can be measured for a specific period of time. As such, readily available clickstream data means that quantitative studies about website technologies tend to be more common than qualitative ones. Clickstream data, however, does not always generate an accurate or detailed portrait of user experiences.

Sen, Dacin and Pattichis (2006) write that there are inherent drawbacks with clickstream data, such as incomplete data, large data size and general messiness in the data.

There are many advantages of a qualitative research approach for this project. Through open-ended questions and dialogue, a qualitative approach will allow participants to express their opinions, experiences and views in their own words. Participants will be able to discuss and explore topics, often limited by a quantitative study in which a small set of anticipated responses are structured in advance. The data will be detailed as primary data, or "information directly from the people or situation under study" (Creswell, 2009, p.183). This primary data is valuable for gaining a richer understanding of the individual teacher's online experience.

The data collected will be a description of the subjective measures of web usability such as why teachers like or dislike certain resources available to them, and how they determine what resources are useful. As described by Usability.gov (2011), subjective measures of web usability are users' self reported satisfaction and comfort ratings as opposed to performance measures, which are linked to tasks success, time and errors. Subjective measures can be best captured by open-ended questions because it allows participants to discuss what is important to them based on their own experiences and in their own words.

Purposefully Selected Sample of Teachers

Teachers interviewed for this study were purposefully selected. Singleton and Straits (2005) defined purposeful sampling as when "... the investigator relies on his or her expert judgement to select units that are 'representative' or 'typical' of the population" (p.133). Using a purposeful sample is a dominant sampling technique in qualitative projects and involves selecting participants because they are information-rich cases (Hoepfl, 1997). As Patton (2002)

wrote, “Information-rich cases are those from which one can learn a great deal about issues of central importance to the purpose of the inquiry, thus the term purposeful sampling” (p. 230).

For this study, I used my pre-existing professional contacts within the Glenbow Museum to obtain a purposeful sampling of teachers. I worked collaboratively with various staff members in the education and curatorial departments to identify possible methods for recruiting three to five participants who met the selection criteria. The inclusion criteria for participants were as follows:

- Teach the subject of social studies. It was important to interview teachers who were knowledgeable about the subject and had first hand teaching experiences to share. The participants should be able to provide detailed feedback about the use or potential use of this resource in their classroom or as part of their preparation, and about how it compares to other related resources they are aware of. As well, museums typically develop educational websites for specific subject areas and grade levels. The Blackfoot website was developed specifically for elementary social studies students and teachers (Glenbow Museum, 2006).

- Active/currently teaching. It was necessary to use participants who are actively teaching in the school system to gain insights into current teaching needs. Active teachers have the most recent experience using educational resources and have interactions with students who use the latest technologies.

- Have knowledge of the Blackfoot website prior to the interview. For the study to have rich data, the participants had to be able to describe their experiences with the website. Without any experience or knowledge of the website, it would have been difficult for the participants to answer any specific questions about its features or functionalities.

Invitations to participate in the research project were sent through an intermediary (i.e. the museum staff members). Invitation emails were sent to a selected group of teachers based on the recommendations of the museum staff and their existing teacher contact list. The email contained details of the study, an information sheet (see Appendix A), an informed consent agreement (see Appendix B), and information on how to get in contact with the researcher. Interested participants made the initial contact to the researcher and provided informed consent to participate in the study. The number of teachers who were sent the initial invitation was left to the museum staff's discretion, although the staff were aware that the goal of the study was to interview between three to five teachers. In total, four teachers were interviewed for this study. All participants were volunteers and were not compensated in any way.

Perspectives And Ethical Issues For A Practitioner-Researcher

In terms of the researcher's role, it was necessary to be aware of any biases I may have brought to the interview as the primary researcher. Mehra (2002) wrote that a qualitative researcher's bias is crucial to the development of knowledge, and that "qualitative research paradigm believes that the researcher is an important part of the process. The researcher can't separate himself or herself from the topic/people he or she is studying, it is in the interaction between the researcher and researched that the knowledge is created." While the researcher's biases and experiences shape our knowledge, it is important to be aware that researcher biases may affect interactions with participants and the data analysis. In an effort to be as transparent as possible and to acknowledge researcher biases, all participants were informed of my professional background as a web developer in the museum sector before the interviews began. I provided a description of my involvement in the development of the Blackfoot website and my work history with the museum. The Blackfoot website was chosen for this research project in part because I

was familiar with the project and the museum's approach to its development but did not lead the content or technical development. It was based on my prior experience with the Blackfoot website that lead me to think that it would be a good project to explore in detail, in the hopes that it will lead to insights that could be applied to the development of future projects.

For the purpose of this study, I considered myself a practitioner-researcher. A practitioner-researcher was defined by Robson (2002) as "someone who holds down a job in some particular area and is, at the same time, involved in carrying out systematic enquiry which is relevant to the job" (p. 534). This research project, inspired by my professional work as a web developer, was an academic investigation into my own practice. As Zeni (2001) wrote, "In practitioner research, insiders study their own professional practice and frame their own questions with an immediate goal to assess, develop, or improve their practice" (para. 24) Indeed, one of the goals of this study was to improve my professional practice and I anticipated this project would directly impact how I work on future projects. Not only was my professional practice the impetus for this project, it has been the grounding stage for carrying out this study in a practical way. My existing contacts within the museum facilitated the logistics of gaining the necessary permissions and recruiting participants.

There are some ethical issues to be considered in a practitioner research study. How might the study impact my professional relationship with the museum if the results were negative? What would be the consequences of this study? Would there be an impact on what I would include in the final paper? Burgess (1989) wrote that practitioner-researchers may be tempted to hold back or "not to tell all" of their research (as cited by Thomas & Denton, 2006, p.3). It is important for researchers to be aware of such ethical issues. Thomas and Denton (2006) and Zeni (2001) suggested and provided an "ethical checklist" for practitioner-researchers

in education and technology as a way to acknowledge such ethical issues. It is equally important, however, to keep in mind that it is our bias as qualitative researchers that contribute to the framing and organization of the findings, and adds meaning to the data (Brown, 1996, p. 16 as cited by Mehra, 2002).

Method of Data Collection

Semi-structured telephone interviews were conducted with the selected teachers. A list of closed and open-ended questions was developed before any of the interviews took place. The teachers were interviewed with open-ended questions to encourage dialogue and discussion about the Blackfoot website and other online educational resources. Open-ended questions allow for individual variations in responses (Hoepfl, 1997), which enrich the data being collected. All of the participants were asked the entire list of questions and at the end, were given the opportunity to ask their own questions. A semi-structured interview format was chosen to allow the participants and myself the opportunity to ask unplanned questions that may arise throughout the interview. While the interviews were guided and focused through the list of questions, the format allowed me to clarify an element, further develop a topic and/or explore a new topic inspired by the teachers' feedback.

The pre-developed questions were organized into six categories (see Appendix C for the complete list of interview questions):

- General demographic
- Museum knowledge
- Technology usage
- Perceived usefulness of online resources

- Specific use of the Blackfoot website
- Questions from the participants

While other methods of communication were considered, including instant messaging, Skype, and e-mail, I chose to conduct the interviews over the telephone because the technology is reliable, easy to use and convenient. All interviews were recorded using the audio software program Garage Band Version 4.1.2. Each interview was approximately 30 minutes in length. Each audio file was exported in its entirety without any editing (i.e. content was not added, removed or rearranged) as an individual MP3 file. All interviews were then transcribed.

Method of Analysis

This study uses the grounded theory procedures for data analysis. Grounded theory, as first proposed by Glaser and Strauss in 1967, refers to theory generated from firsthand observations, as opposed to theory testing (Singleton and Straits, 2005). The analysis of the data collected is based on the following tasks: organizing data and identifying patterns, developing ideas, and finally, drawing and verifying conclusions (Singleton and Straits, 2005).

The first step in organizing the data after the four interviews were completed and transcribed was to conduct an initial review of the transcripts to obtain a general sense of the data collected and to determine if more interviews were required. After this initial review, I decided there was enough data to work with and stopped recruiting additional participants for the study. Already, at the early stage of the data analysis, there appeared to be several common threads running between the interviews.

Next, each transcript was put through a coding process whereby the transcript texts were broken into small segments according to specific topics described by the teachers, a process called open coding. As described by Corbin and Strauss (1990), coding data is a fundamental

analytic process in a grounded theory approach and is a technique to process the data. They stated that "In open coding, events/actions/interactions are compared with others for similarities and differences. They are also given conceptual labels. In this way, conceptually similar events/actions/interactions are grouped together to form categories and subcategories" (p. 12). These topic codes emerged from the data and were not pre-determined before the interviews. The topics were directly based on the keywords the teachers used to describe their experiences. For example, all the teachers were asked "What do you think makes a bad online resource?" Teacher 3 responded with "For children, I think a lot of text. Heavy text" (personal communication, March 29, 2011). This sentence was coded as *too much text*. Teacher 1 responded by saying "Dead links are super frustrating" (personal communication, March 22, 2011), which was coded as *broken links.* The term *broken links* is a more commonly used and widely understood term in web development than the exact words "*dead links."*

The initial coding process resulted in approximately 30 different codes. Some of the codes were then eliminated from the list because they were not directly related to the use of web resources. For example, when Teacher 1 was asked if there was anything missing from the museum's corporate website, the conversation lead to the topic of field trips. She said, "The field trip isn't a 'oh we're going on a field trip.' The field trip is like a classroom that's not in our school today" (personal communication, March 22, 2011). Through the coding process this was labelled *field trips* but this code was later dropped from the list as it did not relate to web usage.

Reviewing and grouping similar topics together into broader categories further refined the list of codes. For example, Teacher 3 said, "It's layered information. So what I mean by that is, that you can skitter across the top of something and gain a kind of understanding. But with this new technology it allows you to go deeper and deeper if that's a point of interest" (personal

communication, March 29, 2011). Initially this segment was codes as *layered content* based on the keywords the teacher used. As well, in the interview with Teacher 1, she said, "The thing that I would add is 'bite-size' information you can build on so the kid is able to get this piece of information." This was initially coded as *bite-size information.* Both *layered content* and *bite-size information* are specific aspects of the broader category, *Information architecture (IA),* which again, is an established term in the web development industry to describe how content is organized within a website. *Information architecture (IA)* was the topic code used in the final coding matrix (see Appendix D), not the initial codes of *layered content* and *bite-size information.*

Transcripts were reviewed and coded again, adjusting for the final list of topic codes that emerged from the data. The process of grouping similar topics together resulted in 18 final topic codes.

Finally, there was an attempt to identify patterns in the data. As Corbin and Strauss (1990) wrote, "To maintain consistency in data collection, the investigator should watch for indications of all important concepts in every observation – ones carried over from previous analyses as well as ones that emerge in the situation… Finding patterns or regularities help to give order to the data and assist with integration" (p. 9-10). To indentify repeating themes across all interviews, the topic codes were tabulated in an Excel spreadsheet. The occurrence of each topic was then tracked. See Appendix D for the interview code matrix.

Review Of Data For Credibility

It is important to ensure accuracy of the transcripts and that the subsequent coding is a fair representation of the data collected. This speaks to the trustworthiness of the study and in particular, the credibility of the data. When it comes to the practitioner research approach, as

used in this study, there are compelling arguments to consider when discussing trustworthiness. Rooney (2005) stated, “Neopositivists and antipositivists may argue that because complete objectivity is impossible, it is the insider researcher's biases and assumptions that threaten validity or `trustworthiness'” (p. 15). Rooney (2005) raised several questions of the practitioner-researcher concept as it relates to the collection and analysis of data (p. 6):

- Will the researcher's relationships with subjects have a negative impact on the subject's behaviour such that they behave in a way that they would not normally?
- Will the researcher's tacit knowledge lead them to misinterpret data or make false assumptions?
- Will the researcher's insider knowledge lead them to make assumptions and miss potentially important information?
- Will the researcher's politics, loyalties, or hidden agendas lead to misrepresentations?
- Will the researcher's moral/political/cultural standpoints lead them to subconsciously distort data?

While these are important questions, there are ways to address these concerns in a qualitative study. Hoepfl (1997) stated that credibility is a criterion for readers to judge the trustworthiness of a qualitative study and that the credibility of the data can be enhanced through triangulation methods. More specifically, the use of external researchers or peer debriefers to review the data and analysis is a type of triangulation that addresses some of the trustworthiness issues in practitioner research raised by Rooney (Hoepfl, 1997, Creswell, 2009). In addition to enhancing the credibility of the data and the researcher’s analysis, the process of using peer debriefers also assisted in a greater understanding of the data. More than simply confirming or dismissing early analysis, the use of peer debriefers helped me process the information,

deconstruct the interviews, and increased my understanding of the emerging themes. As Golafshani (2003) writes, "To improve the analysis and understanding of construction of others, triangulation is a step taken by researchers to involve several investigators or peer researchers' interpretation of the data at different time or location." (p. 604).

Each of the audio recordings and the coded transcripts were reviewed by an independent researcher (or peer debriefer) who was not associated with the project. I used two cohorts from my graduate program as peer debriefers. Each person reviewed two interviews. Neither of the peer debriefers worked in web development or in the culture and heritage sector. They were asked to review the accuracy of the transcripts as it compares to the audio recording and the initial topic codes I assigned to transcript segments. Their feedback was incorporated into the second round of coding, which resulted in the final list of topic codes used in the matrix.

Findings

Following the coding process, the data was grouped together according to similar themes and was analyzed for any common patterns or trends across the four interviews. The data has been presented here in two main sections. Firstly, there is a background profile of the teachers based on their answers to the questions about general demographics, museum knowledge and technology usage. Secondly, there is a section about factors of perceived usefulness of web resources, which contain the descriptions of the teachers' online user experiences.

After briefly discussing their backgrounds, the majority of the interviews focused on obtaining their personal experiences using online educational resources, including the Blackfoot website. Major themes that emerged from the teachers' descriptions were found to centre around four main categories that contribute to their perceived usefulness of web resources. The major themes were: features and functionality, readability, findability and relevance.

Background Profiles of Teachers: General Demographics, Museum Knowledge and Technology Usage

The four teachers interviewed for this project all taught at the elementary school level (K-6), and all had more than 10 years of experience. Teacher 1 had 11 years of experience, Teacher 2 and Teacher 3 both had 23 years of experience, and Teacher 4 had 15 years of teaching experience.

All four of the teachers were familiar with the Glenbow Museum prior to participating in the study. At various points in their teaching careers each teacher had visited the museum on a school field trip and/or taken part in a museum school program. Teacher 1 had visited the museum 9 times, Teacher 2 visited 28 times, Teacher 3 visited 3 times, and Teacher 4 visited the museum 10 times.

All four of the teachers said they used online resources in their classrooms or for lesson preparation. Two teachers said "everyday" (Teacher 1, personal communication, March 22, 2011 and Teacher 2, personal communication, March 25, 2011) and the other two said "all the time" (Teacher 3, personal communication, March 29, 2011 and Teacher 4, personal communication, March 31, 2011) when asked how often they used online resources. This implied that online resources are an important and likely daily aspect of their teaching practices, and suggested a high level of experience using and searching for online educational resources in general.

Factors of Perceived Usefulness of Web Resources

To gain insight into what teachers perceived as useful online educational resources, they were asked what they thought made a good or bad online resource. Their responses and

descriptions of how they used resources, and what their experiences were with the Blackfoot website and other websites, are presented in four major categories:

- Features and functionality – Features are the content elements viewable on the website. Functionality is what the website can do technically and how users can interact with it.
- Readability – How easy is it to understand the content?
- Findability – How easy is it to find the information that you are looking for?
- Relevance – Does the content match your needs? Is there a meaningful connection?

Features and functionality

Many of the topics discussed by the teachers could be grouped together under the broader theme of *features and functionality*. This category represents the type of teacher descriptions that reference the content and/or the technical aspects of the website, that is, what they could see and actions they could perform. These are qualities that had an impact (negative or positive) on their perception of how useful a website is. The following topics were mentioned in at least one of the interviews conducted:

- Audiovisual content
- Manipulatives, interactives and use of SMART boards
- Replication of traditional paper-based worksheets

Audiovisual content.

Teacher comments were coded as the *audiovisual content* topic when they mentioned the use of audio, video, graphics, or photos as enhancing a web experience for students or for themselves. All four teachers mentioned the need for audio equivalents of text displayed on the screen. For example, Teacher 1 stated,

> It would be really nice if there were audio of all of your text. You're really doing this research with Grade 1 students. Grade 1 students will use this as well and they don't read so well. The visuals are brilliant with them but to be able to have the native voice is fabulous. There is a lot of text. If you're not a reader, you're stuck. Teacher 1 (personal communication, March 22, 2011)

Audio resources were mentioned as a critical tool for students who are learning to read but also, for older students where literacy remains a challenge. The teachers described the use of audio as an essential tool for meeting basic content comprehension requirements:

> And the use of technology right now is assisting us in the areas where kids can't read but they still need to know the information of the content of each subject…. Of course they get resource help and we try to catch them up in the reading but in the meantime, we don't want them to lose any of the information from other subjects. We can't evaluate them on the fact that they can't read. We can only evaluate them on "do they understand the content of each subject?" So we have to find a way around that and audio is always a way around that. Teacher 4 (personal communication, March 31, 2011)

Also, many of teachers considered classroom technologies, specifically SMART boards, when talking about working with websites in the classroom. They felt that current technologies were excellent tools to share audiovisual web content with students:

> I just think that one improvement could be more audio so that the children could actually go and visit and listen to it. Especially now with the SMART Board in the classroom, set up in the centre with the beautiful sound that comes from a SMART Board, hooked up to a USB …it's phenomenal… and I could see teaching the kids how to use the website. You know "click on these things and explore." And I think it would just be incredible. Teacher 2 (personal communication, March 25, 2011)

Teachers also referred to media rich websites, such as Google Maps, Google Images and YouTube, as tools that they used in their teaching. These descriptions were coded as the *Audiovisual Content* topic as well. Teacher 2 provided an example of how media rich websites were used:

> For instance, we did a study of community. So I was looking for futuristic cities and I was looking for designs of buildings. So I would Google that, find images, find examples of famous cities in our world….We plotted all of our homes on the community Google map, my community map. Where they [the students] could plot where everyone lived so they could see where everyone lives, and in which community. And I think that's a very engaging way to get ideas across. Teacher 2 (personal communication, March 25, 2011)

Interactives, manipulatives and use of SMART boards.

When teachers described the interactive aspects of websites and the technical tools available, these descriptions were coded as *Interactives, manipulatives and use of SMART boards.* Three of the four teachers mentioned using online activities, such as games, quizzes,

interactives and manipulatives, in their classroom. These are content elements that required students to interact with the website beyond basic navigation activities (i.e. going from one webpage to another). Teacher 4 discussed interactives in the classroom:

> Interactive sites for the kids is one of the things we use a lot, especially in math where it's manipulatives and we have the SMART Board to move things around… Just reinforce their online learning through using some kind of game or activity. Teacher 4 (personal communication, March 31, 2011)

Another teacher discussed the use of SMART Board technology in the classroom as a tool to display web resources and engage students with the interactive nature of websites:

> I have a SMART Board and it's a lovely SMART Board and it goes up and down, down to the level of a 5 year old. So we can use that for display purposes and showing how we could use information. Teaching it with a SMART Board where all the children can see. Instead of me just being the person that's using the computer and telling them what it is. So having them involved in the search. Teacher 2 (personal communication, March 25, 2011)

Replication of worksheets.

Two teachers mentioned web resources that had electronic versions of tradition paper-based worksheets a feature they disliked. In response to the question, "What are some things that trigger the reaction – this is not going to work?" Teacher 2 answered, "Well things that are too

gimmicky. That gets away from the content. And things that have activities that are basically worksheets replicated in a digital format" (personal communication, March 25, 2011).

When Teacher 1 was asked for an example of a bad online resource, she responded with:

> If you want a really bad site, it's www.can-do.com. And what it is… it's a worksheet online and that's what makes a really bad website where it's just exactly the same as a book with worksheets, lots of text and worksheets. And you know what? Just hand the kid a book. There's nothing there that pushes their thinking. Teacher 1 (personal communication, March 22, 2011)

Readability

There were three topic codes that emerged from the data that could be categorized as readability qualities. In web development, readability refers to how easy the content is for users to understand. Beyond the reading grade level of text, web readability can include (but not limited to) factors such as the use of white space, text font and sizes, use of images/graphics, and the number of words on a page. The teachers discussed three elements that affected their ability or the student's ability to read the content: content available in French, non-kid friendly language, and too much text.

Content available in French.

Teacher 4 is an elementary teacher in the French language school system and referred to the search for French resources as an ongoing challenge. In response to the question "How do you find resources?" Teacher 4 answered,

> It's hard sometimes. It's really hard, especially in French…. I usually try to go to other

> school websites or tap into my sources. I have a sister that teachers in Ontario and have family in Quebec and so we try to tap into our resources that are over there instead of reinventing. But often times that's what we end up doing. We end up going to Google and typing in what we're looking for but it takes a long time to find some good resources. Once we've got them we bookmark them for the kids. Teacher 4 (personal communication, March 31, 2011)

Non-kid friendly language.

Teacher 4 found that appropriate reading levels were factors that negatively impacted the perceived usefulness of a website:

> Language base is probably where we get stuck the most, like vocabulary and non-kid friendly. Or even for us, there are some sites that are over my head. They are written by scientists. So I think language friendly sites are much easier. Teacher 4 (personal communication, March 31, 2011)

Too much text.

Three of the four teachers mentioned the amount of text on a webpage as being a factor that contributed to their perceived usefulness of a website. In response to the question "What do you think makes a bad online resource?" Teacher 3 answered, "For children, I think a lot of text, heavy text." Similarly, Teacher 1 described a useful website as "…you're not hitting a ton of text" (personal communication, March 22, 2011).

When discussing the amount of text on a webpage, two teachers mentioned that the

challenges go beyond basic literacy abilities. Extensive text may not suit particular subjects, such as First Nations culture, where there is a strong oral tradition. Teacher 3 said, "This site is really text based, text heavy. I know there are some audio stories and stuff but a First Nations natural point of entry would not be necessarily through text, right?" (personal communication, March 29, 2011).

Also, text heavy websites were seen as missed opportunities to engage students on a different learning modality beyond reading books. Teacher 3 said, "So when I think about what engages children and the way that they learn and access information, having different ways of accessing the information, aside from text, is really important." (personal communication, March 29, 2011).

Findability

How do teachers search and find online educational resources? Once they have located resources, how easy is it for them to find the information they want within the website? There were four topics that emerged from the data that were related to the findability of online resources and information. The topics in the findability category were: difficult to find, specific teacher areas, information architecture (IA), and sharing with other teachers.

Difficult to find.

While interviewing Teacher 4, she discussed the ongoing challenge teachers have in finding information on the Internet.

> That is our struggle as teachers too – is finding information. How do people store it or how do they make it friendly enough for us so that we're not searching for hours to be able to find this information? Teacher 4 (personal communication, March 31, 2011)

She was able to locate the Blackfoot website on the Glenbow Museum's corporate website because her museum contact directed her, but she wondered how she could locate it on her own:

> If I was just to go on the website, where would I find this information?... So I found it hidden well and that's one of the things she (the museum contact) said to let you know about. I didn't know it was there and I always go to "Teacher" and so I wouldn't have know where to go find that information" Teacher 4 (personal communication, March 31, 2011).

Specific teacher areas.

The Blackfoot website is located under the *Online Exhibitions* section of the Glenbow Musuem's corporate website. Currently, the museum does not use the term "teacher" as a navigation item, which is another challenge discussed by Teacher 4 as it is an area she specifically seeks:

> Yeah, like the second we go into Google or anything like that or anyone's website we go straight to "Teacher" (as a navigation item) and see if there's any information. And so I would put, even under your teacher section… right there I would put a link that says "online information you can use in your classroom" or "resources" or "online resources for teachers" or something like that because that's the only section we usually go look. Teacher 4 (personal communication, March 31, 2011).

Information architecture (IA)

Information architecture (IA) in the web development sector is a broad term that can be used to describe how and why information is organized. The Information Architecture Institute (2008) defines IA as "the art and science of organizing and labeling web sites, intranets, online communities and software to support usability and findability" (para. 4). In the context of this study, comments were coded as an *information architecture(IA)* topic code when the teachers referenced how the organization and/or display of information on a website affected their experience. As Teacher 3 describes below, the size and the location of the information throughout the website is critical to a student's learning.

> Instead of huge text chunks, there are little bits of texts. I think the way our understanding of children, the way they are developing literacy skills, it's different than you and I. Where we start at the beginning of the book and finish at the end of the book, children take little bits. Their eyes go all over the place. It's not a linear experience anymore. So little bits of information in a multitude of areas, I think, is critical…. And it's layered information. So what I mean by that is that you can skitter across the top of something and gain a kind of understanding. But with this new technology it allows you to go deeper and deeper if that's a point of interest. Teacher 3 (personal communication, March 29, 2011)

Information architecture pertains to the organization of all information types, not only text based content. Teacher 1 discussed how a content summary is an element she looks for in online educational resources. She describes a summary as being communicated by the combination of images, graphics, and text to give users an overview of the content.

> But it doesn't also have to be "this is the summary." The way it's graphically laid out too, also is a summary and just the way the text is laid out, you kind of get this is the kind of thing that it's going to be. So it's not just in words, its words and images tied together that creates the summary. Teacher 1 (personal communication, March 22, 2011)

Sharing with other teachers.

Throughout the interviews two teachers mentioned the topic of sharing useful web resources with their colleagues. This led to discussions about how teachers find and share websites with each other. Teacher 4 discussed how there are networks across the school board to facilitate the sharing of web resources.

> The CBE [Calgary Board of Education] also has a resource, an online resource centre that we tap into through our e-library. There's a whole part on there just on websites and so we often go on there.... On what we call D2L, Desire to Learn, and it's accessible to all CBE staff and that's where we go to post. If I translate something or we find something great, I'll send it to the head coordinator and they put it in the Grade 4 shelf or the general shelf depending on who it's good for. And then we go search on there. If there's something we're searching for we always go on there first to see if someone else found it. Teacher 4 (personal communication, March 31, 2011)

Teacher 1 also discussed how sharing web resources with colleagues was an indication of how useful a web resource was considered by their colleagues.

> It does take a lot of time, but if it kind of intrigues you then you spend a lot of off hours trolling for interesting resources and then you share. We share our resources a lot so I feel a lot of people are using them, it's really collaborative. Teacher 1 (personal communication, March 22, 2011)

Relevance

One of the definitions for the term *relevance* by the Merriam Webster online dictionary is as follows: the ability (as of an information retrieval system) to retrieve material that satisfies the needs of the user (Merriam-Webster, 2011). There were five topics that emerged from the data that were related to the concept of content relevance. These included the ability to customize and personalize content, authorship and creditable sources, connections to contemporary life, building teacher capacity, and out of date content and broken links.

Ability to customize and personalize content.

When the teachers described the need or ability to change content, either by modifying text or photos, this was coded as the ability to *customize and personalize content* topic code. In a discussion with Teacher 2 about grade specific web resources, she said,

> Right now the big push in education is personalizing. I just wanted to finish that [thought] because it's kind of a buzzword right now. But part of my thinking about that is that you need to take kids where their interests are and you can't be pigeon holing them into the topic of each grade level. Teacher 2 (personal communication, March 25, 2011)

Teacher 4 mentioned how even on a technical level, locked content in the form of PDF file types prevents them from customizing the learning experience for their students. Teacher 4 is a teacher in the French language school system and looks for resources that can be changed from English to French.

> Another thing that is hard is when it's PDF files and we can't use them at all. So if things are changeable so that if it is in English and there are some words we can kind of change to make them more child friendly or we can add pictures to them, that always makes it easier. Teacher 4 (personal communication, March 31, 2011)

This comment is in direct conflict with a well-established practice among web developers to use PDF files. PDF file formats are commonly found online as they are often considered preferred methods of providing large amounts of text to online users.

Authorship and credible sources.

Known authorship and use of creditable sources were traits mentioned by two teachers that contributed positively to their impressions of a web resource. It was important for them to know who developed the website and the content. "It has the authorship. You can figure out who created the resource and you can follow, just for authenticity." Teacher 1 (personal communication, March 22, 2011)

Providing authorship and credibility goes beyond the makers of the website. Teacher 3 discussed the in-depth examination of the content itself and the experts related to the project:

> But I think having the cognitive ability to dissect the information that's been given to you

> is also a critical skill. It's not just that it comes from the Glenbow Museum that makes it credible source but who is saying the information. What's the lens? What's the bias? You're meant to take a look at the stories that people tell and how they tell it. Teacher 3 (personal communication, March 29, 2011)

Connecting to contemporary life.

While reviewing the Blackfoot website, Teacher 2 discussed how the contemporary images of the Blackfoot people on the website were engaging elements of the content.

> I just like the images of the contemporary Blackfoot people and I would probably use it for that quite a bit because we do a lot with artifacts and the traditional way of life at the museum and the Museokits. But this, I would probably use for the contemporary…. Like I say, I'm really impressed by the images of contemporary Blackfoot life and I'd really like to get that more across to my children. Teacher 2 (personal communication, March 25, 2011)

Building teacher capacity.

Three of the four teachers discussed the issue of websites that support teacher learning in specific subject areas. Building the teacher's capacity in the targeted subject area contributed to their perceived usefulness of that resource. Teacher 2 discussed the idea of having a mirror teacher version of websites.

> So I think you almost need a teacher's version to do background knowledge and to build

> teacher capacity for the subject. And then you should have a link for students. Bookmark it as the student's portion. Teacher 2 (personal communication, March 25, 2011)

Teacher 3 discussed how building teacher capacity and familiarizing themselves with the content helped them customized the learning opportunities for students.

> I liked that it was easy to find information in regards to teacher resources. I was really looking for background information. So not necessarily ideas for how to use it [the website] but to gain an understanding of different concepts of Blackfoot culture…. It's really just background and you do what you can with that information in your own way. Teacher 3 (personal communication, March 29, 2011)

Broken links.

Broken links on a website are a common annoyance for web users and it is known to negatively impact the user experience. Broken links create glaring content gaps, interrupt the flow of information, and force the users to search for the content they were expecting in the link in other ways. From Teacher 1's perspective, it also reduces the credibility of the website.

> Dead links are super frustrating… It's kind of deadly for kids though. If the site sounds like it was good but the links don't work or you can't follow up on it, you can't follow the author. You can't Google it and anything that will collaborate it. Teacher 1 (personal communication, March 22, 2011)

Common Themes Across All Interviews

Following the coding process, all the topic codes were listed in a table to track their occurrence in each of the interviews. Appendix D, *Topics discussed by teachers during interviews*, shows which topics were most common among the four teachers. There were two themes that were discussed by all four teachers: audiovisual content and the ability to customizing and personalize content. The next most common themes mentioned throughout the interviews (3 out of 4 interviews) were interactives, manipulatives and the use of SMART boards, authorship and credible resources, and finally, too much text. These final themes will be furthered explored in the discussion section of this paper.

Discussion

The findings from this study indicate that many factors contribute to a teacher's perceived usefulness of an online educational museum resource. For teachers interviewed in this study, there were four broad categories of web usability that emerged from the data: features and functionality, readability, findability and relevance.

Within each of those categories, there were several specific topics that appeared in multiple interviews. I have chosen the topics that were discussed by at least 3 out of 4 teachers for discussion here, as they represent some general trends from the study.

The major findings from this study showed that within the broad themes of web usability, there were five specific topics raised by the teachers. These topics emerged from the data as factors that contributed, either negatively or positively, to the teachers' perceived usefulness of a resource. These were:

Features and Functionality

1. Use of audiovisual content

2. Interactives, manipulatives and use of SMART boards

Readability

3. Too much text

Relevance

4. Ability to customize and personalize content

5. Authorship and credible sources

Many of the findings confirmed some of the well-known elements of website usability. For example, the topic codes t*oo much text* and *authorship and creditable sources* are both well-documented factors affecting online user experiences (more details below). This study, however, provides a richer understanding of how these issues manifest in the classroom and why these factors impact teachers' experiences with online educational resources. I also found that some of the findings were quite surprising and were not as expected. In particular, I found the use of SMART boards and the need for audio equivalence for text to be very revealing about the teacher's practical uses of online resources.

Use of Audiovisual Content

As technology tools improve and user trends evolve, there are more demands for media-rich experiences online. Consequently, it is not surprising that teachers discussed audiovisual content as an element that contributed to their perceived usefulness of a website. One of the major findings from the study is the varied and multiple uses of audio media in the classroom. Prior to conducting the interviews, I considered audio elements to be a non-essential content

item, secondary to the core text based content. The Blackfoot website is an example of this approach. Audio is used in a few areas of the website as a transitional background item or as ambient sounds for interactive activities. For example, when a user navigates from one webpage to another, a short audio piece of a Blackfoot elder speaking is played automatically. There are no text equivalencies or a translation of what is being said, rending the audio clip as a secondary, atmospheric sound. Even in the section titled *Our Traditional Stories,* where audio is used to tell eight Blackfoot stories there are no audio equivalencies for the French and English text. The audio clips are only available in Blackfoot. This means that for students who don't read yet, have difficulties reading, don't understand Blackfoot, or have different learning styles, the stories are inaccessible.

When we think about web accessibility, often the focus is on making a website accessible to those who have learning disabilities, are visually impaired and/or are using assisted technologies. The World Wide Web Consortium (W3C) is an international organization that develops universal web standards, including accessibility guidelines and standards that help developers reduce any barriers to the web. W3C described their vision as follows:

> The Web is fundamentally designed to work for all people, whatever their hardware, software, language, culture, location, or physical or mental ability. When the Web meets this goal, it is accessible to people with a diverse range of hearing, movement, sight, and cognitive ability. (World Wide Web Consortium, 2011, Accessibility, para. 2)

While these are critically important accessibility efforts to implement, the guidelines overlook a section of the audience that does not fit in these categories but also has difficulties

accessing web content. The W3C's Web Content Accessibility Guidelines (WCAG) 2.0 lists several guidelines to provide alternatives for non-text content but not vice versa (i.e. alternatives for text-only content). For example, the W3C provides the following perceivable guideline that is very specific to text based content: "1.1Provide text alternatives for any non-text content so that it can be changed into other forms people need, such as large print, braille, speech, symbols or simpler language" (World Wide Web Consortium, 2011, Web Content Accessibility Guidelines). One of their guidelines is "3.1 Make text content readable and understandable" (W3C, WCAG, 2011). The details of how to meet this guideline, however, are text specific, such as providing a definition of terms and abbreviations and alternative reading level of text (W3C, 2011, WCAG).

This study suggests that audio equivalencies for most—if not all—of the text would be useful for the average student who may not be a strong reader, who is not at an age that is capable of reading, has a different learning style or does not use specialized assisted technologies. Often teachers read text out loud or make their own audio recordings when sharing resources in a classroom setting. Providing them with audiovisual tools that assist them in their teaching practice and enhance the activities they do already would greatly contribute to the perceived usefulness of the website.

Interactives, Manipulatives and SMART Boards

Another topic raised by the teachers under the *features and functionality* category was the use of SMART boards in the classrooms. The increased use of technologies other than the personal computer is a factor to consider when developing user interfaces and content for digital resources. This study indicates that it is important to think of how online educational resources

will be used, displayed and shared through external technologies, and how the technologies can add to a user's online experience.

How well the websites function with external technologies can contribute to a user's perceived usefulness of the website. With the advances in Smartphones, tablets and SMART boards, mobile technology and access to the Internet will become increasingly significant for teachers and students. The combination of mobile technology and e-learning has become a field of its' own called mobile learning or m-learning (Trifonova & Ronchetti, 2003). In a conference paper on m-learning, Ally (2004) wrote that wireless technology and mobile devices cannot be ignored by trainers and educators, and that the development of resources must employ "information-rich rather than textual strategies" (p.7). There is growing indication that the display technologies themselves should be considered when creating online educational resources.

Too Much Text

Too much text on a website is a known problem and as expected, the issue was raised by the teachers when asked what they considered negative aspects of online educational resources. They felt that too much text on a webpage was a barrier for themselves and their students.

Web professionals know that online users don't read but scan the text on a webpage. Web usability expert Jakob Nielsen (2008) wrote that a typical web user reads at most 28% of the text on a webpage during an average visit, and perhaps more realistically 20%. In another revealing statistic, Nielsen (2008) wrote, "On an average visit, users read half the information only on those pages with 111 words or less" but that a typical webpage contained 593 words. This means that website developers must consider how to display information that increases comprehension without sacrificing core content goals. As previously mentioned, Ally (2004)

wrote that content strategies for m-learning must focus on information-rich formats that are less text based. He concluded that when developing educational course material "… the writing style of course developers has to change from textual writing to a greater use of visuals, photographic, videos and audio" (Ally, 2004, p. 7). In addition to providing information-rich formats, the text itself can be modified to better meet the needs of online users. Developers and content providers can reference an abundance of web writing best practices available from various sources, including Useit.com, Usability.gov and W3C.org to name a few examples.

Customizing and Personalizing Content

All four teachers discussed the ability to customize and personalize learning experiences for students when using online educational resources. They commented on their teaching practices in the classroom and how they approached online resources to help customize content for students. This discussion also provided insight into how websites could better accommodate a personalized approach to online resources and the practical tools teachers looked for when determining the perceived usefulness of a resource.

Hoffman, Hartley and Boone (2005) suggested that learners should be in control or have the ability modify the content to their individual needs and learning styles. They wrote,

> Individual differences in the ability to recognize information are accommodated by providing multiple examples of content in different media and formats, with critical features highlighted and background context supported. Providing a learner with the ability to modify the pace of presentation, change visual formats, or view text-only versions of graphics are just some of the many options to enhance universal design (Hoffman et. al., 2005, p. 172).

Teachers from this study looked for these relevant features as well. Multiple entry points, editable documents for use in the classroom, and learning outcomes that are not specific to grade levels all contribute to the perceived usefulness of a resource.

Authorship and Credible Sources

Three of the four teachers interviewed for this study identified authorship and credible sources as factors that contribute to their perceived usefulness of a resource. This is also a well known issue for web based content. Users need to trust the information source at every level of the content.

As reported by Burkell and Wathen (2002), there are many factors affecting website credibility ranging from graphic design to writing style to organizational reputation. If websites do not meet the user's evaluative criteria for crediability, they are likely to leave the site. One of Burkell and Wathen's (2002) recommendations for addressing website credibility is to make the sources of the site's authority transparent: "The source credibility of the site should be made obvious by presenting institutional or individual credentials, showing quality ratings awards, and highlighting links to and from other credible Web sites" (p. 142). Echoing this information, the teachers wanted to know what the sources of information were so that they could follow up and confirm credibility for themselves. I think for many online educational museum resources, it can be as simple as making authorship and data source information, which is already collected by the content providers, available to the users in a transparent way, such as credit and references webpages, and detailed biographies of experts.

Consideration of Weaknesses

Four interviews were conducted for this study over the course of 10 days, a relatively short amount of time. The interviews were collected one after the other without formally analyzing each interview before conducting the next interview. I think the lack of early analysis is an area of weakness for this study. As Corbin and Strauss (1990) wrote, the interplay between data collection and analysis is a necessary part of grounded theory research and that analysis of the data should begin as soon as data is collected. They stated that the initial analysis "… is necessary from the start because it is used to direct the next interview and observations" (Corbin & Strauss, 1990, p. 6). While it is expected that earlier data will affect the collection of future data, there is a systematic approach to the analysis. Corbin and Strauss (1990) also wrote that, "In order not to miss anything that may be salient, however, the investigator must analyze the first bits of data for cues. All seemingly relevant issues must be incorporated into the next set of interviews and observations" (p. 6).

I believe analysis of the earlier interviews for this study could have been more rigorous as prescribed by Corbin and Strauss. While I was aware and was affected by each interview, my observations were not formally incorporated into subsequent interviews. Early analysis of the data could have resulted in more exploratory lines of questioning on certain topics.

I found that the teacher responses in the first two interviews were very revealing and surprising. Then, when I conducted the third and fourth interviews and I found that I was anticipating some of their answers. In addition, there were instances where I did not explore a topic because it was a well known online user experience issue. For example, several teachers raised the topic of too much text, which is a common problem. This issue could have been delved into a bit more with additional questions such as, at what particular points in the Blackfoot website was there too much text? What is the appropriate amount of text for them?

Recommendations for Web Development

The findings from this study suggest there are several aspects of online resource development that could be adjusted to better meet the needs of (elementary) teachers and their students. The data analysis process of this study pointed to a few practical and effective resources that can be implemented in any web development project without changing the core goals of the project while at the same time positively contributing to the perceived usefulness of the project.

- Audio equivalencies to text - Include audio equivalencies for the majority, if not all, of the text.

Although this is an extremely costly feature (i.e. fees for professional voice talent, time in a recording studio and editing services), audio can appeal to several different audiences for several different reasons. Audio can be used for students who are visually impaired, who are too young to read, have literacy challenges, have different learning styles or do not have access to specialized assisted technologies. Audio equivalencies for text can also provide a different learning modality and assist teachers when they display the website in a group environment.

- Reduce text – edit, edit and edit.

The amount of text on a website is always a challenge for resource developers. How do content providers sufficiently present enough information to meet their content goals and still engage their users in an online environment where reading is drastically reduced? Encouragingly, there are many studies that show reducing word counts can increase usability and user comprehension. By reducing text, your information will become more useful to an online audience.

- Editable files - provide editable files instead of PDFs.

Provide editable files such as Word documents or rich text files instead of locked PDFs. While standard practice is to provide information rich-content as PDFs, there should be additional considerations for resources targeted to specific audiences, such as teachers. PDFs are usually recommended as an accessible format on the web because in the general public PDF reader applications are more readily available on personal computers than specific word processing applications, such as Microsoft Word. PDF reader applications are also free to download and install, which represents a lower accessibility barrier than expensive software costs. However, in the teacher population, software accessibility is less of an issue and should be given greater consideration when providing downloadable documents.

- Teacher specific areas – Teachers click here.

Build specific teacher areas on online resources and use the plain language term "teachers" as a navigation item and label. The section itself needs to be obvious and a distinct area of the website. Depending on the context, perhaps the division at the splash page should be teacher or student.

- Authorship and creditable sources – Who are the experts?

Organizations work hard to ensure creditable experts are used to develop content, and museums are no exception. Authorship of online educational resources, however, is not always presented in an obvious manner for teachers to inspect and follow up on. Increasing the visibility of authorship can take the form of more detailed author biographies, reference lists and credit webpages. As one teacher put it, "It's not just that it comes from the Glenbow Museum that makes it a credible source but who is saying the information?" Teacher 3 (personal communication, March 29, 2011).

Recommendations for Future Research

While this study provided some information about the teacher user experience with online educational museum resources, there were several topics that emerged from the data that could have been explored in more detail. Future research considerations could include more specific questions about the types of audiovisual elements that are engaging for students and teachers. How does this manifest in a web-based resource? What are the practical tools teachers use and which are most suited to a web environment?

Also, with the increase of technology capabilities in the classroom, such as SMART boards, it may be interesting to discuss how group learning environments that include multi-players and/or multi-touch screens would impact learning experiences and how online educational resources can best meet these types of technology use.

Conclusion

This study sought to explore the qualitative aspects of teacher user experiences with online educational museum resources, capturing their opinions and views in their own words. Using the TAM model as a framework, the interviews were conducted with the goal of understanding what makes online resources useful to teachers. More specifically, this study sought to determine what aspects of the user experience contributed to the perceived usefulness of the website, with the assumption that increased perceived usefulness leads to greater adoption of the resource. The findings show that the teachers in the sample evaluated websites based on several web usability factors, including: 1) features and functionality; 2) readability; 3) relevance and 4) findability. Within each of those categories there were several specific topics raised by the teachers, notably, the need for audio equivalences for text, the challenge of too much text, the ability to customize and personalize content for students, and more transparent authorship. By addressing these categories with a greater understanding of how teachers approach and use

resources in the classroom, resource developers can increase the usability of their online educational resources.

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Appendix A: Information Sheet

University of Alberta

INFORMATION SHEET

Title of Research Project: Evaluation of an online museum based education resource by teachers [draft project title].

Researcher:
Cherry Sham
University of Alberta

Email: sham1@ualberta.ca

Project Supervisor:
Katy Campbell, PhD
University of Alberta
Phone: 780-492-2681
Email: katy.campbell@ualberta.ca

Purpose:
The objective of this study will be to gain insights into how useful an online museum educations resource is perceived by teachers. Through qualitative surveys, content analysis and interviews with participants, opinions and beliefs regarding a specific online resource will be collected.

Methods:
Participants will be interviewed over the telephone. Participants will be asked to review the website prior to the scheduled interview and if possible, be sitting in front of the computer during the interview.

Voluntary Participation
You have the right to refuse this invitation to participate or to refuse to answer any of the questions asked during the interview. You are also free to stop the interview at anytime or request that we withdraw your information (transcripts, audiotapes, notes).

Confidentiality
The information gathered during the interviews will be used in a case study. Only aliases will be used in the case study to represent the participants. Participants will not be identified by their real names in the final case study. Only the researchers listed above will have access to personal contact information.

Analysis
Audio recordings will be typed into transcript format, removing all identifying information. Transcripts and audio recordings will remain the sole possession of the researchers listed above. Following the completion of the case study (to be completed no later than August 31, 2011), all transcripts and audio recordings will be destroyed.

Benefits:
This study may or may not have any direct benefits for you.

Risks:
It is not expected that being in this study will harm you. However, if you would like to speak to someone after the interview, you may contact either of the researchers identified above.

Withdrawal from the study:
You may withdraw from the study at any point. If you chose to withdraw from the study, the audio tape and any transcripts that have been made will be destroyed immediately. You are also free to refuse to answer any questions that you are not comfortable with at any time during the interview.

Use of your Information:
The interview will be recorded, carefully reviewed, and included in reports and recommendations for future research, programs and services. None of the reports will have your name in them and any information that may identify you will be removed.

Thank you very much for taking part in this study.

The plan for this study has been reviewed for its adherence to ethical guidelines and approved by the Faculties of Education, Extension and Augustana Research Ethics Board (EEA REB) at the University of Alberta. For questions regarding participant rights and ethical conduct of research, contact the Chair of the EEA REB at (780) 492-3751.

Appendix B: Informed Consent Agreement

University of Alberta

CONSENT FORM

Title of Research Project: Evaluation of a online museum based education resource by teachers [draft project title].

Researcher:
Cherry Sham
University of Alberta

Email: sham1@ualberta.ca

Project Supervisor:
Katy Campbell, PhD
University of Alberta
Phone: 780-492-2681
Email: katy.campbell@ualberta.ca

Please circle your answers:

Do you understand that you have been asked to be in a research study?	Yes	No
Have you read and received the Information Sheet?	Yes	No
Do you understand the benefits and risks involved in taking part in this study?	Yes	No
Have you had an opportunity to ask questions and discuss this study?	Yes	No
Do you understand that you can quit taking part in this study at any time? Do you understand that you can withdraw at any time during the data collection part of the study and that any comments that you provided up to that point will not be used?	Yes	No
Has confidentiality been explained to you?	Yes	No
Do you understand who will have access to the data collected?	Yes	No
Do you know that the information that you provide will be used for written reports, presentations and recommendations for future research?	Yes	No
Do you understand that the interviews will be audio-recorded and transcribed?	Yes	No
Do you understand that you have up until _____ (insert date 2 weeks later) to withdraw what you have shared in the interview?	Yes	No

If you have further questions regarding the research, please contact Cherry Sham (above).

This study was explained to me by: _____
I agree to take part in this study.

_____ _____
Signature of Research Participant Date (dd/mm/yyyy)

_____

Printed name

The plan for this study has been reviewed for its adherence to ethical guidelines and approved by the Faculties of Education and Extension Research Ethics Board (EE REB) at the University of Alberta. For questions regarding participant rights and ethical conduct of research, contact the Chair of the EE REB at (780) 492-3751.

Appendix C: Interview Questions

University of Alberta

Title of Research Project: Evaluation of a online museum based education resource by teachers [draft project title].

Date:
Time:
Interviewer:
Interviewee:
Demographics

How many years have you been teaching?
How many years have you been teaching social studies/history subjects?

Museum Knowledge

Have you ever been to a museum for a class field trip?
If yes, how many times have you visited the museum with your class?
When was your last visit?
Did you visit the museum's website to plan for your field trip?
If yes, how useful did you find the information available?
What type of information was not present but would have been useful?

Technology Usage

Do you use online resources either in your classroom and/or for lesson preparation?
How many times a week do you use online resources in your classroom and/or for lesson preparation?
What online resources do you use often in class or for lesson preparation?

Perceived Usefulness of the Online Museum Teacher Resources

What do you think makes a good online resource? Examples?
What do you think makes a bad online resource? Examples?
Why do you use this resource often?

Blackfoot website specific questions

How do you use this resource?
How did you learn about this resource?
What are your first impressions?
What type of information are you looking for? How would you find this information?

Are there any topics you would like to discuss that I have not asked?

Appendix D: Interview Code Matrix

Table 1

Topics Discussed By Teachers During Interviews

INTERVIEW CODES	TEACHER 1	TEACHER 2	TEACHER 3	TEACHER 4
Museum and Technology Background Knowledge				
Has visited the museum with a class	•	•	•	•
Used the museum's corporate website	•	•		•
Use web resources in their teaching practice	•	•	•	•
Features and Functionality				
Audiovisual content	•	•	•	•
Interactives, manipulatives & use of SMART Boards	•	•		•
Replication of worksheets	•	•		
Readability				
Content available in French				•
Non-kid friendly language				•
Too much text	•	•	•	
Findability				
Difficult to find				•
Information architecture (IA)	•		•	
Sharing with other teachers	•			•
Specific teacher areas				•
Relevance				
Ability to customize or personalize content	•	•	•	•
Authorship & credible sources	•	•	•	
Building teacher capacity		•	•	
Connections to contemporary life		•		
Out of date content & broken links	•			