The roles of Canadian Science Museums: making sense of mission statements

NATALIE M. SADOWSKI[1], CHRISTINE D. TIPPETT[1], ANIK MEUNIER[2]

[1]*Faculty of Education*
University of Ottawa
Canada
nsado072@uottawa.ca
ctippett@uottawa.ca

[2]*Département de didactique*
Université du Québec à Montréal
Canada
meunier.anik@uqam.ca

Abstract

Although the last quarter of the 20th century was a period of rapid expansion for science museums, both in terms of the number of institutions and of visitors, the first decades of the 21th century have been to a large extent characterized by a rethinking of the institution. Will science museums maintain their purposes and roles? The time has come for science museum professionals to reflect upon their current practices, reassess how they wish to rebuild as well as re–envision their relationships with the communities they strive to serve, and redraft their missions to ensure that they remain relevant today and in the future. A mission statement is part of a museum's organisational culture that describes the raison d'être of the institution. Science museum mission statements (SMMSs) guide museum staff and influence their activities, and also send a message to visitors and the general public about the museum's purpose. In order to explore the role of Canadian science museums our research aimed to put a light on the following question: What are the roles of Canadian science museums according to their mission statements? Our dataset enabled us to study of 80 SMMSs and analyze them by the following sub–questions: How readily available are SMMSs? What are the lexical features of SMMSs? What does a thematic analysis of SMMSs reveal? Using lexical and thematic analysis, we determined the common characteristics of the public portrayal of science museums' institutional identities as suggested by their mission

statements, also providing insight into their roles. Although, as museums change as do the public's expectations, so too will their mission statements as they attempt to capture changing roles and purposes to maintain their public relevance. The following questions: Who do we serve? Why do we exist? remain relevant for science museums.

Keywords

Canadian science museums, mission statements, museum mission statements, roles, science centres, science museums

Résumé

Si le dernier quart du 20e siècle a été une période d'expansion rapide pour les musées scientifiques, tant en nombre d'institutions que de visiteurs, les premières décennies du 21e siècle ont été, dans une large mesure, caractérisées par une refonte de l'institution. Les musées des sciences conserveront–ils leurs objectifs et leurs rôles ? Le temps est venu pour les professionnels des musées des sciences de réfléchir à leurs pratiques actuelles, de réévaluer comment ils souhaitent reconstruire et repenser leurs relations avec les communautés qu'ils s'efforcent de servir, et de redéfinir leurs missions pour s'assurer qu'elles restent pertinentes aujourd'hui et dans le futur. Un énoncé de mission fait partie de la culture organisationnelle d'un musée qui décrit la raison d'être de l'institution. Les énoncés de mission des musées des sciences (EMMS) guident le personnel du musée et influencent ses activités. Ils envoient également un message aux visiteurs et au grand public sur l'objectif du musée. Afin d'explorer le rôle des musées de sciences canadiens, notre recherche a visé à mettre en lumière la question suivante : Quels sont les rôles des musées de sciences canadiens selon leurs énoncés de mission ? Notre corpus de données nous a permis d'étudier 80 EMMS et de les analyser selon les sous–questions suivantes : Dans quelle mesure les EMMS sont–ils facilement disponibles ? Quelles sont les caractéristiques lexicales des EMMS ? Que révèle une analyse thématique des EMMS ? À l'aide d'une analyse lexicale et thématique, nous avons déterminé les caractéristiques communes de la représentation publique des identités institutionnelles des musées de sciences, telles que suggérées par leurs énoncés de mission, fournissant également un aperçu de leurs rôles. Cependant, à mesure que les musées changent, tout comme les attentes du public, leurs énoncés de mission changeront également alors qu'ils tentent de saisir l'évolution des rôles et des objectifs pour maintenir leur pertinence pour le public. Les questions suivantes: Qui servons–nous ? Pourquoi existons–nous ? restent pertinentes pour les musées scientifiques.

Mots–Clés

Musées de sciences canadiens, énoncé de mission, énoncé de mission de musée, rôles, centres de sciences, musées de sciences

Introduction

Working in the area of museums, and considering our personal interests in education and science, we began to wonder about the roles of science museums in the 21st century. Although the last quarter of the 20th century was a period of rapid expansion for science museums, both in terms of the number of institutions and of visitors, the first decades of the 21th century have been to a large extent characterized by a rethinking of the institution. Societal shocks such as the Covid–19 pandemic highlighted many of the flaws inherent in current science museum practice and in science communication. As a matter of fact, many still think of science as immutable and stable while, on the contrary, it is constantly changing and evolving. Recently, science museums, as most sectors of society, have been the subject of lively debates and discussions around the rethinking of science museum practices, translating into several concrete actions.

For example, the long–term, unresolved problems of systemic social and economic inequality which science museums will have to address, in addition to gaining a greater understanding of the public they serve and do not serve. A never–ending string of science–related global threats will demand that science museums devote ever–greater attention to them. This convergence is not only a challenge but also an opportunity. Will science museums maintain their purposes and roles? The time has come for science museum professionals to reflect upon their current practices, reassess how they wish to rebuild as well as re–envision their relationships with the communities they strive to serve, and redraft their *missions* to ensure that they remain relevant today and in the future.

This is why we are interested in looking more closely at the mission statements of science museums, considering the role it plays for museums in communicating with the stakeholders and citizens they serve. In fact, the mission of a museum, and especially of a science museum, is one way of clarifying how they represent themselves to the public and within the field of science communication and education. We therefore decided to focus on Canadian science museums and design a study based on the research question: *What are the roles of Canadian science museums according to their mission statements?* However, even with this narrow focus on Canadian science museums, identifying roles was not a straightforward task because we first had to decide what constituted a science museum. The term 'museum' is often used as a broad concept that includes all types of informal science institutions (ISIs) or settings outside of school where science

is learned (Coll & Coll, 2019). Alan Friedman[1] argues that science museums are now dedicated to public education but do their mission statements confirm that assertion?

To define what a science museum is, we began by consulting the International Council of Museums' definition of a museum, which at the time of writing was:

> 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, para. 1).

This definition does not explicitly exclude or include (ISIs). In fact, ICOM (2007) has previously stated that "institutions holding collections of and displaying live specimens of plants and animals, such as botanical and zoological gardens, aquaria and vivaria [and]…science centres and planetaria" (para. 3) can be considered museums. Despite naming and therefore differentiating science centres from museums, some scholars recognize science centres as a modern or newer generation of a science museum (Bradburne, 1998; Friedman, 2010; Janousek, 2000; Schiele, 2014). To address these varying conceptions, in this paper we use the term *science museum* to include all manner of ISIs.

Identifying the roles of museums

Our next step was to identify the potential roles that Canadian science museums might have, so we explored the historical and contemporary roles of both museums in general and science museums in particular. The housing of a collection – whether living or nonliving – is one of the earliest roles or mandates of a museum. In the 15th and 16th centuries, collecting artifacts gained popularity in Europe, forming a historical link between archaeology, science, and museums with antiquarians, natural scientists, and others developing extensive personal collections. The acquisition or collection function is present in historical definitions of museums. For example, in the 18th century museums were described as "a chamber of treasures – rarities – objects of nature – of art and of reason" and "a Repository of learned Curiosities" (Alexander, 1995, p. 3).

These museums – then called cabinets of curiosity – served as representations of an individual's socioeconomic status and sometimes led to the creation of national museums; for example, the British Museum was founded with the purchase of the vast private collection of Sir Hans Sloane (Alexander, Alexander, & Decker, 2017; Marples, 2019). By increasing access to their collections, museums were able to take on

1 Alan Friedman is a consultant in museum development and science communication and has been the director of the New York Hall of Science from 1984 to 2006.

additional roles beyond acquisition and collection (Alexander et al., 2017). An interest in discovery and a desire to understand the natural world led museums to the mission of preservation and research. If the museums' early aim was to collect, they now also aimed to preserve and conduct research about what was collected. Museums' objects were eventually displayed for the public through exhibits.

Historically, sharing objects with the public was considered a form of education. Museums' professionals opening their doors to the public (i.e., giving access to the collections) was considered an educational gesture. However, museums did not always include labels with their artifacts and so the message conveyed by them was often unclear (Alexander et al., 2017), particularly if there was no curator present to describe the objects. Museums with "an explicit educational mission" appeared in the mid–19th century in response to a "demand for educating the lay public" (Filippoupoliti & Koliopoulos, 2014, p. 783). This demand was less evident in Canada, and in an exploration of the roles of Canadian science museums, we would be remiss to exclude the uniquely Canadian context. Canadian museums did not prioritize the role of education in the late 19th and early 20th centuries. The leading Canadian museums in the late 1800s were located within 150 miles of Montreal and municipal museums did not exist (Sheets–Pyenson, 1988). Furthermore, although 1930s Canadian museums have been praised for their history in collections, "educational museums were embryonic" (Sheets–Pyenson, 1988, p. 18). However, education was eventually accepted as a valuable function, as evident by its inclusion in the Museums Act (1990), which states that national institutions must "inform the public… by such means of education and communication as are appropriate" (p. 8). The Act separates the roles of communication and education even though they are combined in ICOM's (2007) definition as also in most Canadian museums.

Communication and education are considered by some as separate but related roles (Desvallées & Mairesse, 2009). However, in Canada and the United States, science centres were created and funded for the specific purpose of increasing the public's scientific literacy (Cain & Rader, 2017; Friedman, 2010) and science centres became synonymous with science communication (Schiele, 2014). The role of science centres was defined around communication, as opposed to collection (Cain & Rader, 2017). Traditional means of communicating, such via artifact labels, exhibits, and lectures, were replaced with hands–on and interactive experiences (Meunier, Belleville, & Grant, 2018). The popularity of science centres moved museums from the "look–and–learn model to a more participatory paradigm of communication" (Cain & Rader, 2017, p. 5). Today there are a plethora of related words that are used by museums to mean both communication and education, such as animation, mediation, and interpretation (Jacobi & Meunier, 1999). For the purposes of this paper, we used the term communication to mean 'sharing a message' and separated it from education 'providing an enlightening experience'.

Museum roles of acquisition, preservation, research, exhibiting, and communication continue, as reflected by ICOM's (2007) definition. However, collections in 21st century museums are substantially different than their predecessors with museums increasingly featuring oral histories, language, traditions, and other forms of intangible heritage alongside tangible, physical items such as archives or artifacts. The emphasis on collection is also changing as Davies (1994) argued that the permanent collection "is perhaps an outdated idea" (p. 35) and museums, including science museums, must fill other roles that best fit society's needs. Broadly speaking, museum roles evolved from roles concerning collections, such as acquisition, conservation, research, and exhibition, to roles concerning people and the messages delivered by their collections (Maczek & Meunier, 2020).

The importance of a social role for museums is becoming increasingly apparent in the literature (e.g., Brown & Mairesse, 2018; Gray & McCall, 2020; Latham & Simmons, 2014), although the idea that museums exist to serve the people and the community has been documented since the 1970s (Brown & Mairesse, 2018). A social role means that museum staff have a responsibility to pursue "social purpose for all that they do, putting the needs (as well as the wants) of society uppermost in their objectives" (Davies, 1994, p. 37). In order for science museums and science centres to put society's needs first, they might have to revisit their actual roles and identities. Pedretti and Iannini (2020) argued that this shift is slowly occurring with the emergence of what they call fourth–generation science museums; these museums work towards agency and social change and explicitly invite participation and critical discussion. Although the social role of museums is suggested by the phrase "in the service of society and its development" in ICOM's 2007 definition, this phrasing suggests a more passive approach than is practiced by fourth–generation science museums.

Acknowledging that ICOM's 2007 definition was 15 years old at the time of writing, and that the roles that a science museum might play are complex and changing, we turned to two more recently proposed definitions, shown in Table 1. ICOM had developed and proposed a new definition in 2019, but after debate amongst members this definition was not adopted (ICOM, 2019). ICOM has since undertaken an intensive review process and plans to present its new definition in late summer 2022 (ICOM, 2022). To add the Canadian context to museum definitions, we explored a definition proposed by ICOM–Canada. ICOM–Canada, one of ICOM's 119 National Committees, was part of the international museum definition review process and presented key words and concepts in the form of its own proposed definition. We have added bold font to emphasize the possible roles identified in each of the three definitions.

TABLE 1

Various ICOM definitions of a Museum and the roles in those definitions

Current definition ICOM (2007)	Proposed definition ICOM (2019)	ICOM-Canada's proposed definition (2019)
A museum is 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.	Museums are democratising, inclusive and polyphonic spaces for critical dialogue about the pasts and the futures. Acknowledging and addressing the conflicts and challenges of the present, they **hold artefacts and specimens** in trust for society, **safeguard diverse memories** for future generations and **guarantee equal rights and equal access** to heritage for all people. Museums are not for profit. They are participatory and transparent, and work in **active partnership** with and for diverse communities to **collect, preserve, research, interpret, exhibit**, and **enhance understandings** of the world, aiming to contribute to human dignity and **social justice**, global equality and planetary wellbeing.	A museum is a non-profit, permanent, dynamic and responsive institution in the service of a living planet. It is a public place that **welcomes all people, fosters cooperation, cross-cultural exchange and public understanding** of human and environmental interdependence. The museum **acquires, conserves, researches, communicates** and **exhibits** arts and cultures, the tangible and intangible heritage of humanity and its environment for the purposes of **education, study, enjoyment** and the promotion of **social and environmental justice**.

Even though the ICOM definitions do not result from an explicit theoretical construction, but rather from a compromise between social, national and international actors, these definitions are useful to circumscribe the main roles devolved to museums, in general. We are well aware that grasping the historical dynamic would have been pertinent in giving more magnitude to the analysis, but we deliberately chose to focus on the successive definitions from 2007 to 2019. The purpose of this study is not to assess the changes within ICOM's definitions but to identify the roles they assign to museums.

Regardless of the history and original roles of museums, today most museums do have specific roles. However, the roles stated and implied in the definitions – either individually or combined – do not necessarily represent the current roles of Canadian science museums. Museums and their roles are socially constructed and thus change over time (Gray & McCall, 2020) and are influenced by factors including funding and location.

We determined that a reasonable place to locate Canadian science museums' roles would be their mission statements. Mission statements are unique to each institution and would theoretically reflect their individual roles as perceived by the institutions themselves. But do they really do? That is what this study intends to find out.

What is a mission statement?

Mission statements are a common aspect of most businesses and organizations (Bart, 1997a; Mullane, 2002; Sattari, Pitt, & Caruana, 2011). But what exactly are mission statements, and why are they important? A strategic management tool for businesses and organizations, mission statements can establish purpose, outline goals, and influence operations (Bart, 1997b; Bartkus, Glassman, & McAfee, 2000; Mullane, 2002). A mission statement is an institution's raison d'être (Fitzgerald & Cunningham, 2016) or statement of purpose (David & David, 2003). Mission statements can direct, guide, and inform the activities undertaken by the institution or organization (Mullane, 2002).

Strategic purpose aside, the requirements for a good mission statement are not overly clear, with more than 20 possible components identified in the literature (Bart, 1997a,b). Pearce (1982), in a widely cited paper on mission statements, recommended that mission statements contain eight components: customers; products or services; markets served; technology; concern for survival, growth, and profitability; philosophy; self–concepts; and concern for public image. Other scholars have suggested that a mission statement does not need this many components. For example, Want (1986) identified five components: purpose, principle business aims, corporate identity, policies of the company, and values. Campbell and Yeung (1991) suggested that mission statements should include purpose, strategy, behaviour standards, and values; these four components are known as The Ashridge Model. Similarly, Piercy and Morgan (1994) recommended that a mission statement include overall philosophy, scope of the organization, key beliefs and values, and success factors.

Although widely recognized as a business tool, mission statements are prevalent in all manner of institutions and organizations, including museums. However, there are differences between components of corporate mission statements and components of museum mission statements (MMSs), which may be attributed to the non–profit status of most museums and the specific nature of museums (Fleming, 2015; Paulus, 2010). Corporate mission statements tend to be concerned with internal staff, with components relating to growth and profits, whereas MMSs direct their messaging to the public as well as staff (Fleming, 2015). According to the American Alliance of Museums (AAM):

> A mission defines the museum's unique identity and purpose, and provides a distinct focus for the institution. It articulates the museum's understanding of its role and

> responsibility to the public and its collections, and reflects the environment in which it exists (2017, para. 1).

MMSs are key to a museum's identity and its strategic plan. In fact, Fleming (2015) argued that "nothing is more important for a museum to sort out than its mission" (p. 3). MMSs can serve as a management tool, stating the roles the museum claims to have (Anderson, 2019) and giving museum visitors and audiences an idea of what to expect. Mission statements should (in theory) influence a museum's internal policies and activities, and guide staff in their tasks. For example, as part of interpretive planning, scholars and practitioners recommend that museum programming should connect to the institution's mission (Ham, 2016; Wells, Butler, & Koke, 2013).

Ideally, MMSs should answer three questions: "What business are we in? Who do we serve? Why do we exist?" (The Ontario Ministry of Heritage, Sport, Tourism and Culture Industries [Ontario Ministry], 2017, p. 2). In reality, MMSs tend to vaguely reference the museum's purpose and mostly refer to what museum staff do (Ontario Ministry, 2017), that is, the role of the museum. For our project, we chose to focus on the four components that we labeled stakeholders, geographic scope, role, and specialization. These four components allowed us to explore whose interests are served (stakeholders), where the intended audience is from (geographic scope), what the purposes are (role), and what the focus is (specialization). Table 2 provides an overview of how each of these components has been featured in the recommendations and realities reported by the authors cited in this paper.

TABLE 2

Components of Mission Statements: recommendations and realities in the literature

Author(s)	Mission Statements Components			
	Stakeholders	**Scope**	**Role**	**Specialization**
Pearce (1982)	X	X		X
Want (1986)			X	X
Campbell and Yeung (1991)			X	
Piercy and Morgan (1994)		X		X
Bart (1997b)	X		X	X
Paulus (2010)	X	X	X	~
Fleming (2015)	~		X	
Fitzgerald & Cunningham (2016)	X	X	X	~
Anderson (2019)	X		X	~

Note. Exact terms vary. We indicate suggested components that align with our components of interest using X = explicitly present and ~ = implicitly present.

Although there are numerous suggestions in the literature about the kind of content that a mission statement in general and MMSs in particular should include, there are other aspects of mission statements that should also be considered in an analysis. Indeed, one may wonder whether the mission statements found on a museum's website have not been specifically crafted for communication purposes. Therefore, we also investigated the availability of the science museum mission statements (SMMSs), a measure of how difficult it was to locate the mission statement on the museum's web site. We also conducted a lexical analysis of our corpus of SMMSs, drawing from Bolden and Moscarola (2000), Cortés (2021), and Krippendorff (2013) to determine what aspects of a lexical analysis might be possible and meaningful given our dataset. We decided to examine lexical variables of word count, lexical diversity, and readability.

Availability

A mission statement that is not readily available is not useful to either the science museum or the various stakeholders that museum might serve. Furthermore, if an institution that claims to serve the public, like a science museum, does not readily share its mission with its intended audience, the issue of transparency arises. This issue is also one of communication; museums without publicly available and easily accessible mission statements lose an opportunity to communicate what they offer and what functions they serve. Therefore, it was important for us to examine SMMSs to understand how science museums represent themselves to the public that they serve.

Word Count, Lexical Diversity, and Readability

Because word count is a key characteristic of mission statements that appears across the literature, we decided to explore the length of the mission statements by word count of our dataset. Recommended word lengths have ranged from no more than eight words (Anderson, 2019; Starr, 2012) to 250 words (David, 2011). Some recommendations are quite vague suggesting "longer than a phrase or sentence, but not a two–page document" (David & David, 2003, p. 11). We decided to investigate whether Canadian SMMSs followed the general suggestion that shorter is better.

Lexical diversity across a corpus (i.e., frequency of words in entire dataset) can be determined by ordering words according to frequency, which will, by definition, highlight the most often used words (Baron, Rayson, & Archer, 2009). The lexical diversity of our dataset of SMMSs might provide insights regarding how science museums attempt to differentiate themselves from other institutions (Paulus, 2010), and could suggest the priorities of Canadian science museums.

Closely related to the number of words used in mission statements is the issue of readability, a term that describes how complex a text is and therefore how easy – or difficult – it is to read and understand (DuBay, 2004). Although there are reasons to

be critical of how readability might be calculated (e.g., reader variables are omitted), the results of most widely used readability formulae can provide a snapshot indication of the clarity of a particular text. Wasike (2018) found that the average readability of Texas newspapers was at a grade level of 11.63 as determined using the Flesh–Kincaid formula, noting that this result suggested many newspaper items would exceed the literacy of the population. Using the Fry scale, Johns and Wheat (1984) found that Chicago area newspapers had an average reading level of Grade 9 or 10, depending on whether items were personal or impersonal. Johns and Wheats also noted that average newspaper readability was about Grade 8. Some technical writers (e.g., Kelly, 2020) now recommend aiming for a readability range of Grades 8–10. The relevance of using the F–K et al. index as a standard is not clearly demonstrated here but is not the focus of this study. This index locks the analysis into a quantitative logic and has the advantage of allowing an elementary word count.

In order to explore our research question *What are the roles of Canadian science museums according to their mission statements?* we were guided by the following sub–questions:

a. What does a thematic analysis of SMMSs reveal?
b. How readily available are SMMSs?
c. What are the lexical features of SMMSs?

Methods[2]

To analyze the mission statements of Canadian science museums, we first had to determine which institutions we would include and then locate the mission statements of those institutions. Because there is no official list of Canadian science museums, we used the membership lists of three relevant Canada–wide associations: the Canadian Association of Science Centres (CASC), the Alliance of National History Museums of Canada (ANHMC), and Canada's Accredited Zoos and Aquariums (CAZA). The members of these three associations all fit the definition of a museum; more specifically, they fit our definition of a science museum. The lists that were publicly available in August 2021 showed 45, 13, and 28 member institutions for CASC, ANHMC, and CAZA respectively (see Appendix B for a full list of members). After we compiled the lists and removed duplicates, we were left with a dataset of 80 science museums.

Our thematic analysis of the SMMSs presents the components of mission statements that were found in the literature (see Table 2, i.e. components of stakeholders, geographic scope, role, specialization). We scored the component of availability and also undertook a content analysis that included lexical analyses (i.e., variables of word count, lexical

2 See Appendix A for the details of the methodology.

diversity, readability). Our lexical analysis focused on the variables of word count, lexical diversity, and readability across the dataset retaining only one dimension of lexical analysis, that of the character string. Member checking was discussion–based as we refined the codebook at multiple stages in the analysis.

Results and discussion

We present here the results of our analyses and provide a discussion. We report on the various variables and components that were outlined above: stakeholders, geographic scope, role, specialization availability, word count, lexical diversity and readability.

Stakeholders

First, we identified any stakeholders included in the SMMSs (e.g., faculty, audience, visitor, teachers, staff). To help us identify stakeholders, we asked "Who or what does the museum serve?" We considered both animals and humans as stakeholders, but the mere mention of one or more of these groups was insufficient. For example, in MS46, animals were not considered stakeholders because the museum is not directly serving marine life, while in MS71, both animals and people were considered stakeholders.

> MS46: Our mission is to foster curiosity about local marine life and inspire action toward personal and global sustainability through display, interpretation and direct action.
>
> *MS71: Connecting people, animals and conservation science to fight extinction.*

We found six categories of stakeholders in 53 SMMSs, as seen in Table 3.

Table 3

Categories of Stakeholders as Identified in SMMSs

Category	Frequency	Examples from SMMSs
Human		
General people	48	people, human beings, society, population, public, all ages
Visitors	15	our audience, visitors, guests
Education-related	6	teachers, educators, students, program participants
Families and children	5	kids, children and their grown-ups
Future populations	5	future generations, future conservationists
Non-human		
Animals	5	indigenous and exotic species

Note. A SMMS may have included more than one category of stakeholder, so the total is not 53.

Most SMMSs referred to people in general rather than identifying specific stakeholder groups. Education–related stakeholders, such as teachers and students, families and

children, and visitors were also mentioned, suggesting that some science museums prioritize these groups. Although animals were mentioned in many mission statements (see specialization below), only five SMMSs mentioned animals as stakeholders. That is, the museum claimed to directly serve animals in some way or another. Although having a mission statement does not guarantee that a museum is guided by its contents, we can speculate that museums specifying particular stakeholder groups might better cater to their needs. It is therefore perhaps unrealistic for museums to claim they serve all people, albeit this phrasing is more inclusive. Interestingly a few SMMSs referred to future populations as stakeholders, indicating that these museums are future–oriented. These museums might consider utilizing vision statements, which are concerned with long–term goals and impact, rather than mission statements, which are concerned with day–to–day activities (Anderson, 2019).

Geographic Scope

We coded any indication of geographic scope (i.e., local, national, or international audience). We were guided by the question, "Where is the intended audience from?" Asking this question allowed us to examine the intended reach of the science museum, rather than its physical location or where its contents come from. For example, both MS48 and MS61 include "the world", however, only MS48 indicates the world is the intended audience.

> MS48: To explore, preserve, and share the unique stories of the NWT with the world.
>
> MS61: We inspire people of all ages to be engaged with the science in the world around them.

We identified geographic scope in 18 SMMSs which ranged in proximity from local communities to the world at large. We categorized all instances of scope into the five categories shown in Table 4.

TABLE 4

Categories of Geographic scope as identified in Mission Statements

Category	Frequency	Examples from MS
Regional	8	UBC community, local, southwestern Ontario
Provincial	4	Alberta, province
National	1	nation
International	3	the world, globally
Other	3	at large, visitors, the population

Note. A SMMS may have included more than one category of geographic scope, so the total is not 18.

One science museum used the term "nation" in its mission statement, which is ambiguous and could refer to a country or a smaller community of people. However, we deemed nation to refer to Canada as a whole, given the museum's status as a national museum. Three SMMSs included terms that hinted at geographic scope but were not location specific. We do wonder about the feasibility of SMMSs including an international scope. However, examining how science museums enact their reach as identified in their mission statement was outside the scope of this paper.

Role

From ICOM's 2007 definition, we identified five roles for museums that became our initial codebook: acquire, conserve, research, communicate, and exhibit, as shown in bold in Table 1. We decided to separate educate from communicate, because we consider education and communication having distinct finalities although some aspects of their respective aims might be similar and concordant. We began coding each of the SMMSs, looking for these terms and their synonyms. We also looked for the presence of other roles that might become new codes, beginning with the additional roles included in ICOM's (2019) proposed definition of a museum: equal access, social justice, active partnership. We modified our codebook frequently, grouping codes into themes simultaneously and adding new themes as needed. We identified the component of role in all 74 SMMSs, and we found 12 themes: acquire; conserve; research; communicate; exhibit; educate; inspire; support equity, diversity, inclusion, accessibility (EDIA); connect; encourage action; engage; and other. The frequencies with which these roles appeared are shown in Table 5, along with examples drawn from the SMMSs.

All five roles in ICOM's 2007 definition were present in the SMMSs. This finding is not surprising, because these roles have appeared in ICOM's definitions since 1974 (Desvallées & Mairesse, 2009), and many Canadian museums have mission statements that may have been drafted in the 1980s (Ontario Ministry, 2017). Historical museum roles, such as acquire and research, appeared less frequently than contemporary roles, such as educate and inspire. Conserve – a historical role when related to objects – has a different meaning for institutions such as zoos and aquaria, where it means conservation of living things. For example, a natural history museum may want to conserve specimens to prevent degradation, and a zoo may want to conserve a species via a breeding program. We did not differentiate between conservation of objects and conservation of species, which could account for the prevalence of this role. As we anticipated, given trends in the literature, we saw a social purpose emerging with the presence of roles such as connect and engage. Some museums are also extending into the community and contributing to change, as evident through roles such as encourage action, engage, and support EDIA. Our results suggest that science museums are moving towards roles that include people as well as objects. We discovered that many SMMSs

clearly address roles that reflect the needs of their stakeholders in a move to becoming fourth–generation institutions.

TABLE 5

Frequency of roles of Canadian Science Museums as identified in their mission statements

	Role	Frequency	Examples from SMMSs
Initial Roles from ICOM 2007	Acquire	10	collecting, principal repository
	Conserve	29	care and enrichment, preservation
	Research	14	explore, seek knowledge
	Communicate	43	share stories, fun
	Exhibit	17	display, presentation
Additional Roles from ICOM 2019	Educate	43	interpret material, foster lifelong learning
	Inspire	34	ignite wonder, inspire interest
	Support EDIA	5	accessible, inclusive spaces
	Connect [people] to [x]	7	stimulate connections, partnership
Additional Roles from Coding	Encourage action	9	encourage respect, transform lives
	Engage [people]	5	engagement in a 21st century global context
	Other	2	consulting

Note. A SMMS may have included more than one role, so the total is not 74.

Specialization

Finally, we identified the institution's specialization (i.e., its focus or subject matter) by asking, "What is the museum about?" In the example of MS46 above, the specialization was both local marine life and sustainability. The codes we generated for specialization were grouped together into nine categories of specialization, as shown in Table 6 along with frequencies and examples. Only five SMMSs did not identify an area of specialization.

Specialization was the second most frequently occurring component after role. Since our sample included zoos and natural history museums, it is perhaps not surprising that nature and conservation were the most prevalent specialization's categories in the SMMSs. Conservation in this particular analysis specifically meant conservation of plants and animals or of the environment more broadly. Of interest is the prevalence of culture, heritage, and history as a specialization's category of science museums, particularly since the frequency (n=17) is larger than the number of members of ANMHC (n=13). This discrepancy suggests that natural history museums may be members of associations outside of ANMHC, or that other ISIs are adding human elements to their museums. We recommend that science museums be specific when including specializations in their mission statements, in order to differentiate themselves from other science museums and to facilitate the alignment of programming.

TABLE 6

Categories of specialization of Canadian Science Museums as identified in Mission Statements

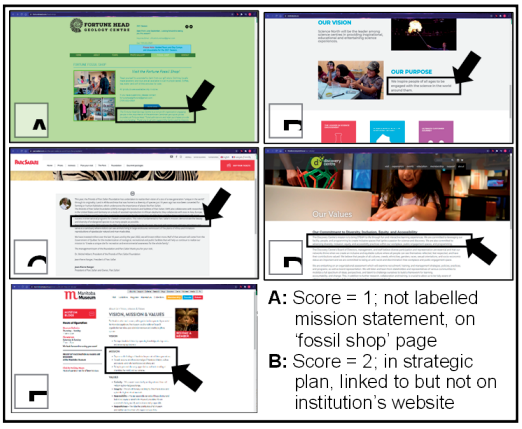
Category	Frequency	Examples from SMMSs
Nature	25	environment, natural world, natural ecosystems
Conservation	24	preserve wildlife, fight extinction, steward
Science and Technology	21	science, technology, engineering, math
Culture/heritage/history	17	human history, stories, cultural content
Animals	13	insects, endangered species, marine life
Paleontology/geology	8	mining, fossilized trilobites
Person/group	2	Joseph Armand Bombardier, First Nations
Other (science-specific)	4	biology, health, Artificial Intelligence
Other (misc.)	2	curiosity

Note. A SMMS may have included more than one specialization, so the total is not 69.

Availability

With availability scores ranging from 0 to 5, the average availability score for the 80 mission statements was 3.89. After removing the six institutions whose mission statements we could not locate, the average availability score was for the final dataset of 74 was 4.20. The majority (n=60) of mission statements were located on an institution's 'About Us' or 'Home' page. Examples of mission statements that were scored from 1 to 5 are shown in Figure 1. Although there are no requirements for an institution to have a mission statement publicly available, some associations require a mission statement for membership. For instance, Canada's Accredited Zoos and Aquariums (CAZA) asks institutions applying for membership to provide a mission statement.

FIGURE 1



Examples of SMMSs with a Range of Availability Scores (In each example the location of the mission statement is indicated with a rectangle and arrow

Word Count

The word count of SMMSs ranged from 7 to 88. The average length of the 74 mission statements we analyzed was 33.7 words, with a standard deviation of 21.03, mode of 17, and median of 26. Clearly, most science museums were not limited by the recommendation for an eight–word mission statement. However, given the quantity of information that SMMSs are expected to contain, eight words does not seem sufficient. The number of words used to describe a museum's mission does not seem to be as important as which words are used to determine and present the mission statement. A more appropriate target might be 35 words or less, which encompasses both recommendations and realities.

Lexical Diversity

The lexical diversity of our SMMSs, once we removed stop words, numbers, and proper nouns, was 443 different words and word groups that appeared a total of 1182 times. Only 198 words/word groups appeared more than once across all 74 SMMSs; a word cloud representing these words/word groups is shown in Figure 2. Moreover, all words/word groups that appeared 10 or more times are shown in Table 7.

FIGURE 2

Words appearing more than once across the collected Mission Statements

TABLE 7

Words Appearing 10 Times or More in MMS

Word	Frequency	Word	Frequency
mission	33	educational	12
inspire	26	*engaging*	11
science	24	*promote*	11
preserve	17	**visitors**	11
conservation	16	**appreciation**	10
world	16	*connect*	10
nature	15	**culture**	10
people	15	**heritage**	10
experiences	14	**learning**	10
Natural	13	*provide*	10
programming	13	*research*	10
discovery	12	**understanding**	10

Note. The nouns are identified in bold font, the verbs in italics, and the adjectives in plain text.

We further categorized the 24 words/word groups in Table 7 in an attempt to expose any grammatical patterns in SMMSs. The majority were nouns (n=15), one quarter were verbs (n=6) and a few are adjectives (n=3). However, given our limited corpus and the multiple meanings inherent in many of the words and word groups contained within that corpus, our analysis of word choice likely provides a starting point for future lexical explorations of SMMSs, MMSs, or mission statements in general rather than yielding implications on its own. For example, what does the word group advance/advances/advancing actually signify? Does it mean advances in technological or scientific equipment? Advancing knowledge? Prepare in advance of your visit? Watch the animals advance towards your vehicle? All these questions arising around a single word group suggest that further lexical analysis is needed for more precision.

Readability

The average readability of our SMMSs corpus was a grade level of 14.82 (difficult/very difficult, requiring a college degree). Only 10 of the 74 SMMSs had a readability of Grade 10 or lower. This result suggests that most of the SMMSs would not be easily read and understood by the majority of the institution's stakeholders. If a mission statement is intended to be shared with the public, readability must be considered. For a more in–depth analysis of these results, the intent of the mission statement must be taken under consideration.

Concluding remarks and further reflections

The purpose of this project was to understand the role of Canadian science museums as represented in their mission statements, an institutional tool that can guide museum staff and send a message to visitors and the general public about the museum's purpose. Our main research question was *What are the roles of Canadian science museums according to their mission statements?* SMMSs are exactly that – statements of mission, not statements of fact. These statements, along with vision statements, can reflect what a museum perceives or reflects themselves to be or what they would like to become. Therefore, there can be differences between advertised and actual roles. A specific question thus arises: How is the role of a museum communicated by the mission statement placed on the web site of the institution? How does this communication strategy reflect and reveal parts or the whole mission of the institution? Future research might examine how science museums fulfill the roles stated within their SMMSs. Mission statements are intended to guide museum staff and influence their activities and furthermore, it would be pertinent to examine staff's perceptions about their institution's SMMS in relation to their practices. Their perspectives could provide pertinent information about what a mission statement could and should say and how a SMMS might be enacted. Because science museums are public institutions, future research might explore stakeholder views of SMMSs and their structure and content. Our lexical analysis only included word count, frequency, and readability; in the future we could use discourse analysis and might consider the public's views on readability of SMMSs. This information could be particularly useful when institutions are reconceptualizing themselves.

We acknowledge that our research was influenced by our personal biases and likely perpetuates Western perspectives of science and of museums. Our familiarity with Canadian science museums might have introduced bias into our research, which we attempted to minimize through numerous meetings and member checking. However, our personal knowledge also allowed us to identify limitations in our data collection. For example, our dataset included Ingenium, which we know is a corporation that oversees three national museums; however, these three museums were not individually represented in our dataset. Similarly, Montreal Space for Life, which was in our dataset, is comprised of five institutions, only two of which were also in our dataset.

Because our research examined the SMMSs of institutions affiliated with ANHMC, CASC, and CAZA we recognize that there are financial and institutional reasons for a museum not being affiliated with a national association, and so we do not claim that our results reflect the full spectrum of Canadian science museums. Also, there may be incentives to joining association, and affiliation may not be indicative of an institution's identity; although we have identified the institutions in our sample as science museums based on their affiliation, they may classify themselves differently. Museums may offer

scientific programming, but science may not be their primary focus, and so may not be mentioned in their mission statements. There are also varying degrees to which museums may utilize their mission statements.

When searching for SMMSs, we prioritized high traffic areas of museum websites such as the 'About Us' and 'Home' pages over other areas and we did not explicitly look for consistency in mission statements. Museum websites may have been inconsistent in displaying mission statements (e.g., one institution displayed one version on their 'Careers' page and another on their 'About Us' page).

In addition to these limitations, we acknowledge that mission statements are not static, and the SMMSs may have changed since we collected our data. Furthermore, although we used English SMMSs when available, these versions may have not been the same as available French versions. Our translations of mission statements from French into English may not accurately represent institution's intentions; they might articulate the mission statements differently than we did and thereby affecting our data and analysis.

The world of museums is changing, with institutions such as Museum of Toronto and Digital Museums Canada diverging from traditional views of museums as institutions with four walls. Future SMMSs may incorporate roles and components that reflect their digital presence and challenge the definition of museums as an institution who acquires, conserves, researches, exhibits, and communicates. As evident in our research, SMMSs are heavily influenced by ICOM's definition of a museum. With ICOM hoping to present a new definition in 2022, we predict that its acceptance, or lack thereof, may affect the roles that museums claim to fulfil in future mission statements. One thing, however, is clear – museums are increasingly focusing on people and stories rather than on presentations of objects and facts, moving towards what some authors, notably Pedretti and Iannini (2020), call fourth–generation science museums, working towards agency and social change and explicitly invite participation and critical discussion.

In defining the evolution of the science museum, Friedman (2010) acknowledged the fact that science museums and centers must continue to evolve, but he expects the way their exhibits function, their facilities, and staff are likely to remain basically as they have been for the past half century. According to him, what will be different in the next few years is the range of activities that science–technology centers will undertake, in particular with the wide possibility of the Internet offering a way for those institutions to make the web significantly more effective as a medium for improving the public understanding of science and technology. A large part of people who regularly visit these websites have not visited and probably never will visit the sites' home institutions.

Friedman gives the example of the new way of engaging the public: Citizen Science, through which nonscientists collect data for real science, many of these projects being initially based at science centers.

> Science–technology centers will undertake far more interdisciplinary and extramural collaborative projects. Nowadays, placing science in the traditional boxes of physics, chemistry, and biology is almost impossible. All the excitement in science is emerging from the intersections of conventional disciplines, in such fields as nanoscience, environmental biology, and neuroscience. And a similar kind of excitement is coming from areas in which science and technology intersect with the arts and humanities. The next generation of science museums may not be science museums at all but far broader institutions in which the sciences, the arts, and the humanities are inextricably bound together in exploring vital questions about the universe and its inhabitants (Friedman, 2010, p. 51).

More than ten years after the statements of Friedman (2010), John Falk a renowned researcher in the field of informal learning in museums founded in 2020 a think tank, organized a conference (Falk, Poston, & Koke, 2020) and produced a scientific report (Falk et al., 2022) entitled *Science Museum Futures* in which he and his collaborators state that to remain an important part of the STEM learning landscape, the future demands that science museums rethink how they fulfill their STEM education roles in four key areas : 1) Understanding : facilitating STEM learning so all users can more clearly become aware of how a greater understanding of science and technology favors a healthier and richer life; 2) Future Actions : supporting evidence–based solutions to challenges that every community currently faces; 3) Social Cohesion : making it possible for all sectors of society to experience STEM learning as a natural and integral part of their family, group and community's heritage and life experience; and 4) Physical Security : ensuring that all users have opportunities to come together (physically or virtually), interact, explore and learn STEM within a safe, healthy, anxiety–free and restorative environment. Moreover, he adds that "Going forward, science museums will need to re–envision how all four areas can be addressed, not just individually, but collectively as core, interdependent goals" (Falk et al., 2020).

In the recent reflections they led, Falk and his collaborators estimated that foundational to the entire process is a commitment to ensuring that any solutions offered be mission–consistent, financially sustainable and prioritize the well–being–related needs of all members of the community. Consequently, we think that the mission statements of museums might inform us about the orientations they favor, the aims and the way each institution functions. This is why we thought it was important to pursue an analysis work of the SMMSs. The way science museums represent themselves to the public through their mission legitimizes, in a way, their actions. Although, as museums change as do the public's expectations, so too will their mission statements as they attempt to capture changing roles and purposes to maintain their public relevance. The following questions 'Who do we serve? Why do we exist?' remain relevant for science museums.

References

Alexander, E. P. (1995). *Museum masters: Their museums and their influence*. AltaMira Press.

Alexander, E. P., Alexander, M., & Decker, J. (2017). *Museums in motion: An introduction to the history and function of museums*. Rowman & Littlefield.

American Alliance of Museums. (2017). Mission and planning standards. *American Alliance of Museums*. Retrieved from https://www.aam–us.org/programs/ethics–standards–and–professional–practices/mission–and–planning–standards/.

Anderson, G. (2019). *Mission matters: Relevance and museums in the 21st century*. Rowman & Littlefield.

Baron, A., Rayson, P., & Archer, D. (2009). Word frequency and key word statistics in corpus linguistics. *Anglistik, 20*(1), 41–67.

Bart, C. K. (1997a). Industrial firms and the power of mission. *Industrial Marketing Management, 26*(4), 371–383.

Bart, C. K. (1997b). Sex, lies, and mission statements. *Business Horizons, 40*(6), 9–18.

Bartkus, B., Glassman, M., & McAfee, B. (2000). Mission statements: Are they smoke and mirrors? *Business Horizons, 43*(6), 23–28.

Bolden, R., & Moscarola, J. (2000). Bridging the quantitative–qualitative divide: The lexical approach to textual data analysis. *Social Science Computer Review, 18*(4), 450–460.

Bradburne, J. M. (1998). Dinosaurs and white elephants: The science center in the twenty–first century. *Public Understanding of Science, 7,* 237–253.

Braun, V., & Clarke, V. (2019). Reflecting on reflexive thematic analysis. *Qualitative Research in Sport, Exercise and Health, 11*(4), 589–597.

Braun, V., & Clarke, V. (2021). Can I use TA? Should I use TA? Should I *not* use TA? Comparing reflexive thematic analysis and other pattern–based qualitative analytic approaches. *Counselling and Psychotherapy Research, 21*(1), 1–11.

Brown, K., & Mairesse, F. (2018). The definition of the museum through its social role. *Curator: The Museum Journal, 61*(4), 525–539.

Cain, V., & Rader, K. A. (2017). Science communication and museums' changing roles. In K. H. Jamieson, D. M. Kahan & D. A. Scheufele (Eds.), *The Oxford handbook of the science of science communication* (pp. 1–14). Oxford University Press.

Campbell, A., & Yeung, S. (1991). Creating a sense of mission. *Long Range Planning, 24*(4), 10–20.

Canadian Association of Science Centres (CASC). (2021). Our members. *Canadian Association of Science Centres*. Retrieved from https://www.canadiansciencecentres.ca/Our–Members.

Coll, S. D., & Coll, R. K. (2019). *Enhancing science learning through learning experiences outside school: How to learn better during visits to museums, science centers, and science fieldtrips*. Brill Sense.

Cortés, J. D. (2021). Journal titles and mission statements: Lexical structure, diversity, and readability in business, management and accounting research. *Journal of Information Science*, 1–15. Retrieved from https://doi.org/10.1177/01655515211043707.

David, F. R. (2011). *Strategic management: Concepts and cases*. Pearson.

David, F. R., & David, F. R. (2003). It's time to redraft your mission statement. *The Journal of Business Strategy, 24*(1), 11–14

Davies, S. (1994). A sense of purpose: Rethinking museum values and strategies. In G. Kavanagh (Ed.), *Museum provision and professionalism* (pp. 31–38). Routledge.

Desvallées, A., & Mairesse, F. (Eds.). (2009). *Key concepts of museology*. Armand Colin.

DuBay, W. H. (2004). *The principles of readability* (ED490073). ERIC. Retrieved from https://files.eric.ed.gov/fulltext/ED490073.pdf.

Falk, J., Poston, C., & Koke, J. (2020). *Conference: Science Museum Futures*. Retrieved from https://www.informalscience.org/conference–science–museum–futures.

Falk, J. Poston, C., Koke, J., & Vita, E. (2022). *Science Museum futures*. Institute for Learning Innovation, Scientific Report, 27 p.

Filippoupoliti, A., & Koliopoulos, D. (2014). Informal and non–formal education: An outline of history of science in museums. *Science & Education, 23*, 781–791.

Fitzgerald, C., & Cunningham, J. A. (2016). Inside the university technology transfer office: Mission statement analysis. *The Journal of Technology Transfer, 41*, 1235–1246.

Fleming, D. (2015). The essence of the museum – Mission, values, vision. In C. McCarthy (Ed.), *The international handbooks of museum studies: Museum practice* (pp. 3–25). John Wiley & Sons, Ltd.

Friedman, A. J. (2010). The evolution of the science museum. *Physics Today, 63*(10), 45–51.

Gray, C., & McCall, V. (2020). *The role of today's museum*. Taylor & Francis.

Ham, S. H. (2016). *Interpretation: Making a difference on purpose*. Fulcrum Publishing.

International Council of Museums (ICOM). (2007). *International Council of Museums*. Retrieved from https://icom.museum/en/activities/standards–guidelines/museum–definition/.

International Council of Museums. (2019). *The Extraordinary General Conference postpones the vote on a new museum definition.* Retrieved from https://icom.museum/en/news/the–extraordinary–general–conference–pospones–the–vote–on–a–new–museum–definition/.

International Council of Museums. (2022). *On the way to a new museum definition: We are doing it together.* Retrieved from https://icom.museum/en/news/on–the–way–to–a–new–museum–definition–we–are–doing–it–together/.

International Council of Museums Canada. (2019*). ICOM museum definition consultation 2: Keywords and concepts*. Retrieved from https://www.icomcanada.org/2021/03/14/icom–museum–definition–consultation–2–keywords–and–concepts/.

Jacobi, D., & Meunier, A. (1999). Au service du projet éducatif de l'exposition : L'interprétation. *La Lettre de l'Ocim, 61*, 3–7.

Janousek, I. (2000). The 'context museum': Integrating science and culture. *Museum International, 52*(4), 21–24.

Johns, T. L., & Wheat, T. E. (1984). Newspaper readability: Two crucial factors. *Journal of Reading, 27*(5), 432–434.

Kelly, L. (2020). *Why is newspaper readability important?* Readable. Retrieved from https://readable.com/blog/why–is–newspaper–readability–important.

King, N. (2012). Doing template analysis. In G. Symon & C. Cassell (Eds.), *Qualitative organizational research: Core methods and current challenges* (pp. 426–450). Sage.

King, N., & Brooks, J. (2018). Thematic analysis in organisational research. In C. Cassell, A. L. Cunliffe & G. Grandy (Eds.), *The Sage handbook of qualitative business and management research methods: Methods and challenges* (pp. 219–236). Sage.

Krippendorff, K. (2013). *Content analysis–An introduction to its methodology.* Sage.

Latham, K. F., & Simmons, J. E. (2014). *Foundations of museum studies: Evolving systems of knowledge*. Libraries Unlimited.

Maczek, E., & Meunier, A. (2020). *Des musées inclusifs. Engagements, démarches, réflexions*. Presses Universitaires de Dijon.

Marples, A. (2019). Creating and keeping a national treasure: The changing uses of Hans Sloane's collection in the eighteenth century. In T. Burrows & C. Johnston (Eds.), *Collecting the past: British collectors and their collections from the 18th to the 20th Centuries* (pp. 8–24). Routledge.

Meunier, A., Belleville, B., & Grant, O. (2018). Penser avec ses mains ou la philosophie du tinkering. *La Lettre de l'Ocim, 177*, 29–35.

Mullane, J. V. (2002). The mission statement is a strategic tool: When used properly. *Management Decision, 40*(5/6), 448–455.

Museums Act (S.C. c. 3.). (1990). Retrieved from https://laws–lois.justice.gc.ca/eng/acts/M–13.4/.

Paulus, O. (2010). Museums as serigraphs or unique masterpieces: Do American art museums display differentiation in their mission statements? *International Journal of Arts Management, 13*(1), 12–27.

Pearce, J. A. (1982). The company mission as a strategic tool. *Sloan Management Review, 23*(3), 15–24.

Pedretti, E., & Iannini, A. M. N. (2020). Towards fourth–generation science museums: Changing goals, changing roles. *Canadian Journal of Science, Mathematics and Technology Education, 20*, 700–714.

Piercy, N. F., & Morgan, N. A. (1994). Mission analysis: An operational approach. *Journal of General Management, 19*(3), 1–19.

Rosenberg, D. (2014). Stop, words. *Representations, 127*(1), 83–92.

Sattari, S., Pitt, L. F., & Caruana, A. (2011). How readable are mission statements? An exploratory study. *Corporate Communications: An International Journal, 16*(4), 282–292.

Schiele, B. (2014). Science museums and centres: evolution and contemporary trends. In M. Bucchi & B. Trench (Eds.), *Routledge Handbook of Public Communication of Science and Technology*. Routledge.

Sheets–Pyenson, S. (1988). *Cathedrals of science: The development of colonial national history museums during the late nineteenth century*. McGill–Queen's University Press.

Starr, K. (2012). The eight–word mission statement. *Stanford Social Innovation Review*. Retrieved from https://doi.org/10.48558/tddw–gk25.

The Ontario Ministry of Heritage, Sport, Tourism and Culture Industries. (2017). Standards for community museums in Ontario. Retrieved from http://www.mtc.gov.on.ca/en/museums/notes/Museum%20Note%20Governance%20Missions%20that%20Matter.pdf.

Tweedie, F. J., & Baayen, R. H. (1998). How variable may a constant be? Measures of lexical richness in perspective. *Computers and the Humanities, 32*(5), 323–352.

Want, J. H. (1986). Corporate mission. *Management Review, 75*, 46–50.

Wasike, B. (2018). Preaching to the choir? An analysis of newspaper readability vis–à–vis public literacy. *Journalism, 19*(11), 1570–1587.

Wells, M., Butler, B. H., & Koke, J. (2013). *Interpretive planning for museums: Integrating visitor perspectives in decision making*. Left Coast Press.

APPENDIX A

Methodology of the study

Data Collection

We undertook a four–step search for mission statements. First, we used Google and the name of the institution in quotations along with the search term mission. If the first page of results did not lead to a mission statement on the institution's website, the second step was to visit the institution's website and check their "About Us" page, or equivalent. If this page was unavailable, the third step was to the museum website's search tool, if available. If we could not locate a mission statement following these three steps, we searched "name of institution" and "mission" in Google once more, this time expanding the search to include third party webpages. Once a mission statement was found, we added it to our dataset and took a screenshot to record its location. The screenshot was also important because our results reflect a particular point in time and the SMMSs might change. We collected English mission statements when available; and translated any mission statements that were only available in French into English before we began our analysis. Our initial list of Canadian science museums consisted of 80 institutions, and we were able to locate mission statements for 74 of those institutions. Four of the SMMSs had to be translated from French into English.

Thematic Analysis

More specifically, we used template analysis (King, 2012; King & Brooks, 2018) which provided both structure and flexibility to our thematic analysis. Using template analysis allowed us each to regularly reflect on our assigned SMMSs and how they fit in within the entire dataset. Moreover, frequent discussions enabled us to member check concurrently with analysis. The flexibility of this approach allowed a holistic analysis. Using in–vivo coding, we coded the dataset using text exactly as it appears. Since we were interested in stakeholders, geographical scope, role, and specialization, our codes related to these four areas. We undertook a slightly different approach to each of the components because we were able to tailor the templates for each component. For example, we used inductive coding for stakeholders, geographic scope, and specialization, and a combination of deductive and inductive coding for role. In the case of geographic scope and role, grouping codes into themes tended to be more intuitive, whereas stakeholders and specialization required more discussion and decision making. We used a priori themes for role that were identified prior to beginning our analysis from ICOM's museum's definition. These themes served as a preliminary template. Each of us coded one third of the dataset, and we met regularly over Zoom to discuss emerging themes and modified the template accordingly. We quantified categories according to

themes and their frequency across the mission statements; each SMMS was considered its own unit of analysis. Multiple, different categories could be present in each SMMS but the same category could only be counted once.

Availability

We devised an availability scoring rubric based on the difficulties we encountered when searching for mission statements. The availability score ranged from 0 to 5, where:

0 = no mission statement found

1 = text that was not defined as a mission statement but shared its characteristics

2 = the mission statement was not on the institution's website (e.g., on a charity website)

3 = the mission statement was on the institution's website but it was hidden in a document or wall of text on an illogical page (e.g., donate page)

4 = the mission statement was on the institution's website on a logical page (e.g., about us) but was not clearly labelled (e.g., in a block of text)

5 = the mission statement was on the institution's website, on a logical page, was clearly labelled, and was not hidden in a block of text

To confirm the accuracy and reliability of our scoring rubric, one researcher scored the availability for all mission statements, and the other two each rated five randomly assigned statements. A comparison of scores showed that most disagreements arose because half points were not accommodated by the rubric; after extensive discussions, we were unable to establish a uniform scoring system for what constituted a half point score. For example, although we agreed that not all mission statements that scored 5 for availability were equally well presented, the use of half points introduced subjectivity, typically reflecting webpage design choices (e.g., too many clicks to reach a logical page). However, in only two instances were scores an entire point apart; in all other instances scores were within half a point, and in each case, we were able to reach consensus through discussion.

Content Analysis

The content analysis (Krippendorff, 2013) consisted of two main approaches, a lexical analysis (Tweedie & Baayen, 1998) that focused on lexical diversity and a thematic analysis (King, 2012; King & Brooks, 2018) that examined meaning. We used the word theme to mean "patterns of *shared meaning* underpinned or united by a core concept" (Braun & Clarke, 2019, p. 593) and in most cases our themes were the equivalent of categories.

Lexical Analysis

Given the usual nature of mission statements – short and concise – and the limited context – science museums – we did not conduct an extended linguistic analysis of the corpus. We counted the number of words in each individual mission statement using the word count function of Word and we calculated the mean for the entire set of SMMSs. To determine lexical density, we entered the compiled mission statements into the Free Word Cloud Generator (https://www.freewordcloudgenerator.com/), which provided us with an initial wordlist with stop words (Rosenberg, 2014) removed. We then cleaned the initial wordlist, starting by removing numbers and proper nouns (e.g., Fraser River) and merging words with common morphological roots according to highest frequency, or in the case of a tie, the shortest word. For example, learn (frequency=2) and learning (frequency=8) were merged to become learning (frequency=10); deliver, delivers, and delivery (frequencies=1) were merged to become deliver (frequency=3). Next, we removed all words with a frequency of 1. Finally, we used the cleaned wordlist with Wordclouds.com (https://www.wordclouds.com/) to create a word cloud.

We calculated readability for each mission statement using the free online tools at https://readabilityformulas.com/freetests/six–readability–formulas.php. We decided to use the average obtained from seven different formulae, which would give us the most accurate results by minimizing mismatches between formulae and the texts we were analyzing. The seven formulae were: 1) Flesch Reading Ease, 2) Gunning Fog, 3) Flesch–Kincaid Grade Level, 4) The Coleman–Liau Index, 5) The SMOG Index, 6) Automated Readability Index, and 7) Linsear Write. The variables used in each formula are shown in Table 1. Because the readability calculations required more words than individual mission statements contained, each mission statement was copied multiple times until we obtained between 150 and 200 words. We checked the impact of repeated text on readability results and found no effect.

TABLE A

Variables used in readability formulae

Formula	Variables
Flesch Reading Ease	Average sentence length; Average # of syllables per word
Gunning Fog	Average sentence length; Percentage of hard words (> 2 syllables)
Flesch-Kincaid Grade Level	Average # of words per sentence; Average # of syllables per word
The Coleman-Liau Index	Average # of characters per word
The SMOG Index	Average # of sentences; Number of polysyllabic words
Automated Readability Index	Average # of letters per word; Average # of words per sentence
Linsear Write	# of easy words (< 3 syllables); # of hard words (> 2 syllables)

We analysed our dataset using what Braun and Clarke (2021) refer to as a codebook approach to thematic analysis.

Member Checking

Each of us coded 10 randomly assigned SMMSs in addition to our assigned third. Following coding of these 10 SMMSs, we met to discuss and compare codes and to resolve any conflicts. Substantial discussion regarding components arose due to the distribution of the SMMSs. For example, themes that were evident in one third of the dataset were not necessarily observed in the rest of the dataset. During the final round of coding, we met as a group and coded random samples of the data individually to ensure we agreed with both the coding process and the assigned themes. As a final check, we recoded the SMMSs and verified that the numbers were in agreement.

APPENDIX B

TABLE B

Canadian Science Museums in Canada and their affiliated Associations

Science Museum	Affiliation	Science Museum	Affiliation
African Lion Safari	CAZA	New Brunswick Museum	ANHMC
Aquarium du Québec	CAZA	Okanagan Science Centre	CASC
Assiniboine Park Zoo	CAZA	Ontario Science Centre	CASC
ASTROLab du Mont-Mégantic	CASC	Pacific Museum of Earth	CASC
BC Wildlife Park	CAZA	Parc Omega	CAZA
Beaty Biodiversity Museum	ANHMC	Parc Safari	CAZA
BIG Little Science Centre	CASC	Petty Harbour Mini Aquarium	CASC CAZA
Biodôme de Montréal	CAZA	Phillip J. Currie Dinosaur Museum	CASC
Bird Kingdom	CAZA	Prince of Wales Northern Heritage Centre	ANHMC
Calgary Zoo	CAZA	Redpath Museum	ANHMC
Canada South Science City	CASC	Reptilia	CAZA
Canadian Museum of Nature	ANHMC	Rio Tinto Alcan Planetarium	CASC
Centre des sciences de Montréal	CASC	Ripley's Aquarium of Canada	CASC CAZA
Centre d'interprétation de l'eau de Laval	CASC	Riverview Park and Zoo	CAZA
Cherry Brook Zoo	CAZA	Rossland Museum and Discovery Centre	CASC
Cochrane Polar Bear Habitat	CAZA	Royal Alberta Museum	ANHMC
Ecomuseum Zoo	CAZA	Royal British Columbia Museum	ANHMC
Edmonton Valley Zoo	CAZA	Royal Ontario Museum	ANHMC
Entomica	CASC	Royal Saskatchewan Museum	ANHMC
Exploramer	CASC	Safari Niagara	CAZA
Fortune Head Geology Centre	CASC	Saskatchewan Science Centre	CASC
Fraser River Discovery Centre	CASC	Saskatoon Forestry Farm Park & Zoo	CAZA
Greater Vancouver Zoo	CAZA	Science East	CASC
H. R. MacMillan Space Centre	CASC	Science North	CASC
Ingenium	CASC	Science Timmins	CASC
Johnson GEO CENTRE	CASC	Science World	CASC
La Maison Léon-Provancher	CASC	steamlabs	CASC
Little Ray's Nature Centres	CASC CAZA	TELUS Spark	CASC
London Children's Museum	CASC	TELUS World of Science-Edmonton	CASC
Magnetic Hill Zoo	CAZA	The Discovery Centre	CASC

TABLE B

Science Museum	Affiliation	Science Museum	Affiliation
Manitoba Children's Museum	CASC	The Exploration Place Museum & Science Centre	CASC
Manuels River	CASC	The Manitoba Museum	ANHMC CASC
Marine Life at West Edmonton Mall	CAZA	THEMUSEUM	CASC
Montréal Space for Life	ANHMC	Toronto Zoo	CASC CAZA
Musée Armand-Frappier	CASC	Transportation Discovery Centre	CASC
Musée de la nature et des sciences de Sherbrooke	CASC	Vancouver Aquarium	ANHMC CAZA
Musée de l'ingéniosité J. Armand Bombardier	CASC	Yukon Beringia Interpretive Centre	ANHMC
Musée minéralogique et minier de Thetford Mines	CASC	Yukon Wildlife Preserve	CAZA
Museum of Natural Sciences at the University of Saskatchewan	CASC	Zoo de Granby	CAZA
Muskoka Steamships & Discovery Centre	CASC	Zoo sauvage de Saint-Félicien	CAZA