A Machine-Learning Analysis of the Impacts of the COVID-19 Pandemic on Small Business Owners and Implications for Canadian Government Policy Response

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This study applies a machine-learning technique to a dataset of 38,000 textual comments from Canadian small business owners on the impacts of coronavirus disease 2019 (COVID-19). Topic modelling revealed seven topics covering the short- and longer-term impacts of the pandemic, government relief programs and loan eligibility issues, mental health, and other impacts on business owners. The results emphasize the importance of policy response in aiding small business crisis management and offer implications for theory and policy. Moreover, the study provides an example of using a machine-learning–based automated content analysis in the fields of crisis management, small business, and public policy.

Keywords: COVID-19, crisis management, impacts, small business, topic modelling, Canada

Introduction
The spread of coronavirus disease 2019 (COVID-19) is possibly the biggest global exogenous shock in recent history (Sforza and Steininger 2020), affecting most economies in our highly interdependent and globalized world. By early January 2022, COVID-19 had infected upward of 300 million people in 222 countries, resulting in 5.5 million deaths and counting. It has affected 2.4 million Canadians, resulting in 31,000 deaths (Johns Hopkins University 2022), and the situation is still developing. The World Health Organization (WHO) declared it a global pandemic on 11 March 2020, leading to swift lockdowns...
The severity of COVID-19 is greatly affecting SMEs’ revenue and operations, owing to factors such as reduced customer demand, lack of employee availability, and disrupted supply chains. The increased global interconnectivity of organizations has resulted in greater impacts from large-scale events (Van Der Vegt et al. 2015). Government responses to contain the spread of COVID-19 through lockdowns are accentuating SMEs’ cash flow challenges because they tend to operate on small margins and do not have large safety nets to fall back on (Cowling, Brown, and Rocha 2020). Moreover, SMEs lack previous resilience and reserves to weather the pandemic. Clearly, COVID-19 is an exogenous shock that threatens the survival of SMEs (Pal, Torstenson, and Mattila 2014) and whole economic sectors (Fabeil, Pazim, and Langgat 2020).

A poll of Canadian small business owners found that 81 percent have been negatively affected by the pandemic (Small Business Administration 2019). In Canada, the context of SMEs is sparse. However, these findings for small businesses are lacking (Herbane 2010). The research on the impacts of the COVID-19 pandemic rather than a natural disaster or other external large-scale crisis on which previous research has concentrated (Asgary, Anjum, and Azimi 2012; Buchanan and Denyer 2013; Corey and Deitch 2011; Cowling, Liu, and Ledger 2012; Devece, Peris-Ortiz, and Rueda-Armengot 2016; Holland and Katzin 2019; Lim, Morse, and Yu 2020; Ogawa and Tanaka 2013; Runyan 2006; Smallbone et al. 2012). Moreover, our study extends the methodological repertoire typical of the crisis management literature by using a machine-learning research method (Herbane 2010).

Theoretical Background

Crisis

Although definitions of crisis abound (Williams et al. 2017), that of Pearson and Clair (1998) is the most commonly used and is relevant to a crisis caused by a global pandemic. Specifically, Pearson and Clair (1998, 66) define a crisis as “a low probability, high-impact situation that is perceived by critical stakeholders to threaten the viability of the
organization.” This definition implies four conditions: low probability, ambiguity, high consequence, and decision-making time pressure (Pearson and Clair 1998). More recently, three additional but related components have augmented this definition: rarity of the event, significance of the event, and level of impact on stakeholders (James, Wooten, and Dushek 2011). This line of research focuses on an event-centred perspective—that is, on exploring the aftermath of a crisis (Williams et al. 2017) as opposed to a crisis-as-a-process perspective that emphasizes the development of crises over time (Williams et al. 2017).

Crisis management refers to how organizations handle crises to minimize impacts and bounce back (Doern et al. 2019; Williams et al. 2017). It typically consists of three distinct phases: prevention, response, and recovery (Hills 1998). Similarly, Doern et al. (2019) use a six-phase event sequence approach to crisis: pre-crisis or incubation, event, crisis response management, investigation, organizational learning, and implementation. From this event sequence, we are positioning the context of our research, which is the responses of Canadian small business owners to the impacts of COVID-19, in the third phase, crisis response management.

Crisis in a Small Business Context

In Canada, small businesses are generally defined as having fewer than 100 employees, although this definition varies by country. Impacts of a sudden (Fabeil et al. 2020) external large-scale crisis on small businesses are momentous. Previous research has largely focused on crisis management in a large-enterprise context (Herbane 2010), with a focus on impacts from large natural disasters (Asgary et al. 2012; Corey and Deitch 2011; Runyan 2006) or from the 2008 global financial crisis (Cowling et al. 2012; Devece et al. 2016; Holland and Katzin 2019; Lim et al. 2020; Ogawa and Tanaka 2013; Smallbone et al. 2012). Unlike those crises, the COVID-19 pandemic has resulted in taxing uncertainties from national lockdowns, sudden and restrictive regulations, closure of international borders, and massive disruptions in global value chains, among others (Etemad 2020).

Sectors such as hospitality, tourism, retail, hair care and aesthetic services, and arts are experiencing severe hardship because pandemic mitigation strategies put forth by national governments have a negative impact on both demand and supply (Etemad 2020). Moreover, several of these sectors face few barriers to entry, resulting in intense competition and correspondingly high failure rates (Rodie and Martin 2001). Small businesses typically fund their operations from cash flows generated by revenues and cannot easily sustain weeks of closure. Using an intersectionality lens, Mo et al. (2020) found a significant negative impact on Canadian businesses owned by diverse groups such as women, immigrants, Indigenous peoples, persons with disabilities, and racialized people.

Nevertheless, not all small businesses suffer equally. In fact, smaller firms with strong contingency plans and dynamic capabilities and resources (Eisenhardt and Martin 2000; Jantunen et al. 2005) successfully transitioned their operations with innovative solutions and exploited opportunities brought on by the pandemic (Etemad 2020). For example, the founders of Monos, a direct-to-consumer luggage small business, pivoted their business model toward the development of a portable ultraviolet-C sterilizer to sanitize surfaces (“Pivot Point” 2020). Others who had a pre-pandemic online presence were able to counteract the lack of in-person sales (Etemad 2020). These examples illustrate various recovery paths, some involving incremental responses and others entailing radical responses. Still, younger and smaller businesses typically lack the resources and expertise to cope with sudden and large-scale crises (Etemad 2020). Compounding these issues, small business owners must make challenging and urgent decisions with limited information at a time of complex uncertainties and, for the most part, without the support of their network partners because they too are attempting to overcome the impacts of the pandemic (Etemad 2020). We therefore expect that most small businesses were caught unprepared by the COVID-19 pandemic.

Financial management is crucially important in a crisis situation, and this is particularly so for small businesses. However, previous studies have questioned the assertion that small business owners behave reasonably with regard to financial matters. They might not adjust their beliefs when faced with new information, might display unwarranted optimism, and might therefore not take appropriate action to guard against potential negative outcomes (Coelho and De Meza 2012; Parker 2006). Using a small case-study research approach, Herbane (2010) found that crisis is three-dimensional, with the three dimensions being lack of control, lack of cash, and compressed time to respond. Of those dimensions, lack of cash—cash flow restrictions and lost revenue—constitutes the clear impact of a crisis. The study suggests that lack of control and cash are more likely to be acute in small businesses (Herbane 2010), given their financial fragility (Bartik et al. 2020). Hence, we expect that small businesses negatively affected by COVID-19 will encounter sudden financial issues as well as a lack of control given the nature of the crisis.

The recovery of a business from a crisis depends in part on its planning for such crises (Pearson and Clair 1998). Research has demonstrated the positive relationship between planning and performance (Perry 2000). The fusion of crisis management with resilience suggests that preparation for unexpected events can facilitate resilience. Moreover, if firms do not have previous resilience to mitigate adversity before it arises and to adapt to disturbances, they are unlikely to recover from the crisis (Williams et al. 2017; Williams and Shepherd 2016). Small businesses do not typically engage in formal planning (Runyan 2006).
Moreover, a sudden, unexpected, and highly disruptive worldwide pandemic is tremendously challenging to plan for. That said, small businesses may have a unique recovery path that relies on localized responses (Williams et al. 2017), and they might be more likely and able to use creative actions to maintain functioning during an economic recession (Lai et al. 2016). In that vein, Shepherd and Williams (2014) have studied new ventures formed after a major natural disaster. They found that businesses with local values, knowledge, and local social connections are more likely to gain the trust of community members, which can facilitate an effective recovery from the widespread suffering (Shepherd and Williams 2014). Moreover, a recent study reported that building more local ties and using alternative approaches to continue operations helped business recovery from COVID-19 in Malaysia (Fabeil et al. 2020).

Emotional Effects of Crises on Business Owners

The potential failures of many small businesses as a result of the pandemic affect not only the economy at the macro level but also the lives and well-being of business owners, employees, and the families of both (Cowling et al. 2020). Employees’ characteristics, such as self-efficacy, emotional stability, self-regulatory processes, cognitive flexibility, and resourcefulness, play an important role in a firm’s resilience (Van der Vegt et al. 2015; Williams et al. 2017). Small business owners, unlike employees of larger corporations, are doubly affected because they must deal with the loss of revenue from their business as well as their own income. These stressors are coupled with the lack of control, COVID-19 uncertainties, and potential government response. Consequently, studies have noted the personal, emotional, and psychological effects of crises on entrepreneurs who report poor health in their aftermath (e.g., Doern 2016; Quarantelli 1993).

In his conceptual model of crisis, Herbane (2010) proposed that crisis can have both financial and emotional impacts. Qualitative interview research on the experiences of small business owners affected by the 2011 London riots found that owners and managers tended to experience stress, fear, and fatigue after the riots (Doern 2016). Small business owners also actively regulated their emotions to maintain psychological health after the riots. (Doern 2016).

The conservation of resources (COR) theory (Hobfoll 1989, 2001) is widely used to explain people’s subjective well-being. According to COR theory, environmental circumstances can threaten or deplete people’s resources (Hobfoll 1989). Psychological stress will occur when (a) people’s resources are threatened, (b) people’s resources are lost, or (c) people do not obtain sufficient resources after resource investment (Hobfoll 2001). Resources can be physical objects (e.g., real estate), personal characteristics (e.g., self-esteem), conditions (e.g., tenure, seniority), or energies (e.g., time, knowledge, credit). Of relevance to our study, the COR theory has delineated the relationship between loss of resources and stress after a crisis (Doern 2016). Drawing on COR theory, one can expect that personal and social resource (e.g., income, self-esteem, energies) losses due to the pandemic may negatively influence business owners’ and workers’ psychological health.

Another important principle of COR theory is that people must invest resources to protect against and recover from resource losses (Hobfoll 2001). It follows that individuals with a greater pool of resources are more capable of gaining additional resources and being protected against resource loss (Hobfoll and Shirom 2001). However, compared with owners of large companies, small business owners with fewer resources to invest are more vulnerable to resource loss and might find it more difficult to recover from the loss of resources resulting from a crisis (Herbane 2010). Given the paucity of small business management research on the personal impact of a crisis on business owners (Runyan 2006), we also examine the mental impacts of crisis on small business owners and their employees.

Canadian Small Business Context

SMEs account for 99.8 percent of businesses with employees in Canada, or 1.22 million firms. Of these, 97.9 percent are small businesses, defined as those having fewer than 100 employees (ISED 2020). Statistics Canada (2020) reports that more than half of Canadian businesses with fewer than 20 employees experienced a decline of 40 percent or more in revenues as a result of COVID-19. Moreover, it has been estimated that nearly 60,000 and 88,000 businesses closed in March and April 2020, respectively, and these two levels have not been observed since the beginning of the Statistic Canada monthly business openings and closures data series (Lafrance-Cooke, Macdonald, and Willox 2020). The number of business closures in April 2020 more than doubled relative to the number of closures in April 2019 (Lafrance-Cooke et al. 2020). Of note, the business closure level in Canada has been about 39,000 per month since the beginning of the monthly openings and closures data series in 2015. Moreover, Beland, Fakorede, and Mikola (2020) found a substantial decrease in small business ownership (~14.8 percent for incorporated and ~10.1 percent for unincorporated business firms) in Canada between February and May 2020. As elsewhere, the sectors most affected by the pandemic are in hospitality, retail, tourism, transportation construction, fashion, and personal services. Smaller firms dominate the most affected sectors. In the hospitality sector, restaurants are pushed to the brink, owing to subsequent waves of COVID-19 and dining bans or restrictions in major Canadian cities.

A high level of business failure during a pandemic is not unexpected. Among the Organisation for Economic
Co-operation and Development (OECD) countries, 78 percent of small business owners reported a drop in sales by mid-June 2020, of which 47 percent reported a drop of between 50 and 100 percent (OECD 2020). In July 2020, the Canadian Federation of Independent Businesses (CFIB; 2020a) estimated that the percentage of Canadian small businesses at risk of closure as a result of COVID-19 was between 5 and 19 percent. With the second wave, and now subsequent waves, a higher risk of closure is expected (CFIB 2020b). A survey of more than 4,000 small businesses by CFIB (2020a) found the following top worries among business owners: uncertainty related to subsequent waves, economic repercussions, reductions in consumer spending, business cash flow, and physical health impacts. Moreover, in terms of new business practices resulting from the pandemic, a June 2020 survey of Canadian small businesses reported that 44 percent of the surveyed businesses were facing several technology challenges (digital marketing, e-commerce, websites; OECD 2020).

**Canadian Government Response to COVID-19**

Governments worldwide have swiftly taken action to save lives, yet at the same time they have attempted to balance that goal with saving the economy from a recession (Lim et al. 2020). Urgent measures were rolled out to help small businesses mitigate the economic impact of the pandemic, with a focus on programs to sustain short-term liquidity and improve solvency (Gourinchas et al. 2020; OECD 2020). The OECD (2020) has been tracking the policy responses of some 60 countries to foster SME resilience since March 2020. It notes that many countries have introduced measures such as wage subsidies for employees and self-employed persons; deferral of tax, debt, rent, and utility payments; grants and subsidies; loan guarantees; and direct lending to SMEs (OECD 2020).

Canada is a decentralized federal system of 10 provinces, three territories, and a federal government (Migone 2020a). As expected, the COVID-19 government response was also decentralized and fragmented at times, with significant implications for crisis management and policy responses. Despite this multi-level governance system, the policy response in Canada was considered highly cooperative (Migone 2020b). Canada also shares the longest international border in the world with its closest and largest trade partner, the United States. However, both countries applied very different policy responses. Compounding the problem for small businesses, the border between the two countries was closed for nearly 19 months, starting on 21 March 2020.

Shortly after the WHO declared COVID-19 a global pandemic on 11 March 2020, the government of Canada leapt into policy action with a series of measures such as those noted by the OECD (2020). In addition to focusing on the health care system and the safety of Canadians, the government programs aimed to support individuals, students, businesses, and hard-hit economic sectors (Canada 2020b).

Canadian government support traditionally targets large corporations, creating an equity issue in the treatment of large versus small businesses. For example, the federal government rolled out a substantial multimillion-dollar loan program for large employers, the Large Employer Emergency Financing Facility (LEEFF; Canada 2020b). Aimed at preventing massive job losses despite wage subsidy programs, the LEEFF is viewed by some as a bailout measure for industry sectors such as the airline industry. Likewise, programs such as the Canada Emergency Wage Subsidy (CEWS), the single largest spending initiative in the federal government’s history, was open to all businesses, with few rules and restrictions. Top CEWS claimants included large public companies such as Air Canada, Fairfax Financial Holdings, and Imperial Oil (Brethour et al. 2021). Yet Canada is a country of SMEs, with 98 percent of the 1.2 million employer businesses having fewer than 100 employees but contributing 41.7 percent to Canada’s gross domestic product (Canada 2019). We anticipate that small business owners experienced challenges in accessing such government programs. We also expect that the government’s level of debt due to COVID-19 measures may affect access to funds for post-pandemic recovery, especially because access to financing was already a chronic problem for small businesses before the pandemic (Isabelle et al. 2019; St-Pierre, Sakka, and Bahri 2018). Adding to the issue of access to funding, these firms are often unaware of government support and critical of support agencies (Herbane 2010; Runyan 2006). Yet, despite substantial government relief programs, large numbers of small businesses in Canada and elsewhere are going out of business because they dominate the sectors most affected by the pandemic (OECD 2020).

**Method**

**Data**

We used publicly available data collected by The Discourse, a digital news media company based in Vancouver. The data include 38,463 comments from small business owners across Canada about how they have been affected by COVID-19. The data are anonymous and were collected through an open online call from Save Small Business (https://savesmallbusiness.ca). Save Small Business was a grassroots campaign launched by small business advocates and volunteers to provide a voice for small business owners. The aim was to raise awareness of the impacts of the pandemic on small businesses and to petition the Canadian government for support. It is therefore understood that this dataset does not represent responses from a random sample of businesses. The call was advertised through websites and social media and
supported by media, volunteers, and organizations (e.g., the CFIB, Toronto Association of Business Improvement Areas). In addition to the comments on the impacts of COVID-19, the dataset contains response time, self-reported business names, locations, and postal codes. All Canadian provinces and territories are represented in the dataset. However, no respondents’ names, contact information, or other identifiers were collected.

The dates of the first and last posts are 23 March 2020 and 9 September 2020, respectively. This period covers the entire first wave of COVID-19. Data from the first wave of COVID-19 are particularly valuable to investigate the effect of the emergent state of crisis. Moreover, policy insights from the first wave can provide helpful knowledge for future emergent policy considerations. Therefore, our aim was to evaluate initial reactions from concerned small business owners and responses to programs that the government of Canada quickly rolled out early on. At the time at which COVID-19 was declared a global pandemic (11 March 2020), nobody expected that it would evolve into subsequent waves. In Canada, the second wave started in late September 2020, followed by a third wave around March 2021. By early 2022, Canada was experiencing its fifth wave with the omicron variant.

### Data Analysis

We applied topic modelling, a probabilistic machine-learning method that discovers hidden thematic structures, by means of a group of inductive computational techniques, in a large corpus of documents, in our case common topics in small business owner narratives (Hannigan et al. 2019; Kim and Chen 2018; Westerlund 2020). Topic modelling uses statistical associations of words in a text to generate latent topics on the basis of co-occurring words that jointly represent higher-order concepts, without the aid of predefined, explicit dictionaries or interpretive rules; hence, topic modelling is an unsupervised approach (Hannigan et al. 2019; Murakami et al. 2017). Topic modelling makes no presumptions about the meanings of the words and is suitable for discovering hidden patterns in texts in any discipline (Westerlund 2020). It relies on interpretation and language-oriented rules but is also unique in its emphasis on the role of human researchers in generating and interpreting specific groups of topics (El-Assady et al. 2018) on the basis of the social contexts in which they are embedded.

The availability of large digital textual datasets and increased computational power have rendered topic modelling an increasingly attractive method for text mining in social science research (Schmiedel, Müller, and vom Brocke 2019). However, the process is computer intensive, and model selection and the validation process are time consuming (Piepenbrink and Gaur 2017). Topic modelling has recently been applied in sociology, marketing, and organizational research (Lindstedt 2019; Schmiedel et al. 2019; Westerlund, Leminen, and Rajahonka 2018). The methodology has yet to be applied in the academic field of public policy.

We use the latent Dirichlet allocation (LDA) algorithm (Blei, Ng, and Jordan 2003), which is the most used topic modelling algorithm (Asmussen and Moller 2019; Hannigan et al. 2019; Jacobi, Van Atteveldt, and Welbers 2016; Kim and Kang 2018). LDA is a Bayesian inference method that identifies key topics in a corpus (Lindstedt 2019; Piepenbrink and Gaur 2017).

Topic modelling has four distinct steps, represented in Figure 1: (a) collection of data from the documents forming the corpus; (b) pre-processing of the corpus by cleaning and coding the data to suit an unsupervised modelling technique; (c) content analysis, which combines quantitative analyses (i.e., algorithmic generation of the topic model) and qualitative interpretation (i.e., topic model validation); and (d) interpretation of results (Piepenbrink and Gaur 2017; Schmiedel et al. 2019).

We applied the topic modelling function of Orange 3.20.1, an open-source data visualization, machine learning, and data mining tool kit (Demsar et al. 2013) that allows normalization (turning capital letters into lowercase) and stopword removal (removing both standard and data-specific customized words to reduce noise) as recommended by Schmiedel et al. (2019). Topic modelling tools such as Orange, maintain links among coded texts, categories, and coded articles, allowing a scientific and rigorous process of text data analysis (Piepenbrink and Gaur 2017).

First, we cleaned the data by removing information-poor comments such as spam, empty comments, and non-English comments. As a result, the final dataset contained 31,438 comments. Second, we evaluated the trustworthiness of the dataset and suitability for topic modelling. We examined the word count of the comments. The shortest comment had one word, and the longest had 1,604 words. The distribution of word count in Figure 2 illustrates that the majority (66 percent) of the comments were short (fewer than 34 words), and 34 percent of comments reached or exceeded the mean value of 34 words. Moreover, three comments exceeded 1,000 words. The comments were most frequently between one and 50 words, with an emphasis on the range between four and 30 words. These results are in line with those of previous research using online posts (Westerlund 2020). For example, Sobkowicz et al. (2013) found that the message-length distributions of various forms of Internet-based written communications follow a similar pattern. This pattern reflects an attempt by writers to express their thoughts or emotions on a matter at hand (Sobkowicz et al. 2013). Huang, Jiang, and Zhang (2010) argue that short comments are typically a high percentage of online written post data. Given that the structure and pattern of the investigated dataset are in line with those of previous
Figure 1: Topic Model Process Flow Chart
Source: Authors.

Figure 2: Distribution of Comment Word Count
Source: Authors.
research, we deemed the dataset suitable for the intended data analysis.

Results
Applying LDA to textual data requires researchers to choose the number of topics to be generated, which is a key input parameter in topic modelling (Piepenbrink and Gaur 2017). This decision influences the quality of the analysis because of correlations between topics (Kim and Chen 2018; Maier et al. 2018). Building from the best topic modelling practices, our number of topics was selected on the basis of iterative runs, to avoid overlaps, ensure interpretability of topics, and warrant topic exclusivity (Asmussen and Møller 2019; Westerlund et al. 2018). A topic is considered exclusive if its top keywords do not appear within the top keywords of other topics. A small number of topics, 12 or fewer (Mathew, Agrawal, and Menzies 2018), avoids overlaps between topics (Calheiros, Moro, and Rita 2017), which helps to ensure construct validity (Schmiedel et al. 2019).

Our analysis resulted in seven topics that are distinct from each other and provide meaningful interpretation on the basis of their keywords. We labelled each of the topics generated by Orange on the basis of how their keywords were used in the associated dataset, focusing on the most relevant keywords (as measured by their weights in the topic model) to describe the essence of the topic (Schmiedel et al. 2019; Table 1 and Figure 3). This qualitative part of the methodology requires the expertise of researchers in the field being examined. We now discuss the interpretation of each identified topic.

Table 1: The Seven Identified Topics and Their Associated Keywords

| Topic | Keywords | Summary of Comments and Policy Implications | Selected Quotes |
|-------|----------|--------------------------------------------|-----------------|
| 1. Current situation | close, doors, forced, store, clinic, company, all, shop, situation, retail | • Many retail businesses stopped their operations, either temporarily or permanently. 
• Certain industry sectors, such as travel, hospitality, and recreation, have been greatly affected. 
• Impacts of sudden external large-scale crises on small businesses are momentous. The lack of control and depleted cash are more acute in small businesses (Herbane 2010). 
• Policy implications: Swift actions by governments are required to help small businesses mitigate the economic impact of the pandemic because these businesses are the most vulnerable to COVID-19. | “My supply chains are global and have already been affected by COVID-19. Our costs are already excessively high as we use sustainable and high-end fabrics for quality garments.” 
• “My business is handmade, bespoke footwear. We depend 100% on clients, appointments for fittings, and picking up finished shoes. Clients can no longer come into our shop so new business has completely stopped.” 
• “Wholesale Alcohol distribution in BC and AB, especially our business is built on exclusively work with imports, has almost stopped entirely for the month of March and with the hospitality industry nearly shutting down completely, there is zero revenue coming in.” 
• “I am a bed and breakfast, and everybody cancelled the reservations and are demanding refunds, and my operating costs here are approximately $6,000 per month and I already borrow $25,000 to get through the winter and I just borrowed another $25,000 which is almost gone because of maintenance like the yard and gardens and soon the pool.” 
• “My family’s business has shut down as they own a restaurant. A lot of the food has gone bad, things like chips and drinks will expire due to the quarantine. The big problem is that the food will be wasted and the loss of money due to the pandemic.” 
• “We’ve built a corporate entertainment platform to help [businesses and their employees] book live events & activities for entertaining clients or other employee. … Like the travel and hospitality industries, we’ve been immensely affected by COVID-19.” 
• “This has been a stressful time both on the monetary side and in terms of the future of the business.” 
• “Existing and future business opportunities have been drastically cut.” 
• “A very unsure future ahead.” 
• “Our fear is when life goes back to ‘normal’ how will our patients have been affected and will they be able to afford their treatments?” |
| 2. Long-term economic hardship | bills, survive, continue, commercial, future, cancelled, unable, events, payment, crisis | • The comments pointed to the fact that for the foreseeable future, the uncertainty would remain. Many small business owners are pessimistic about whether their business can survive during and after the pandemic. | |

(Continued)
Table 1: Continued

| Topic                                      | Keywords                       | Summary of Comments and Policy Implications                                                                 | Selected Quotes                                                                                           |
|--------------------------------------------|--------------------------------|----------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| 3. Government relief measures              | rent, government, shut, community, family, long, relief, studio, CERB, utilities | • The Canadian federal government provided several COVID-19 relief programs (e.g., CEWS, CERB, CERS, CER-CRA) to support the survival and continuity of small businesses and their employees.  
• Policy implications: Despite concerns and issues, Canadian government policies and relief support have lessened the impact of business failures. Given the continued pandemic, extensions and possibly new support programs might be required. Lessons learned from launch of original programs should be incorporated into extensions and new programs. | • “We have received the CEBA, CEWS, and rent relief and as a result we will not go out of business. Please advocate for the continuation of these programs for at least 90 days.”  
• “Wage subsidy; great program, if we were allowed to operate.”  
• “We are trying to keep our employee on payroll holding out for the CEWS, but we need to pay our employee before we can see any of this subsidy.”  
• “Most business just scraping by with majority of our revenue going to pay rent.”  
• “We will not survive without rent relief.”  
• “CEWS is not applicable for subcontractor workers, and we are left to pay them for the limited hours they work.”  
• “I still can’t afford the 25%. As we are closed, we are a service-based job. No clients because we are closed means no money coming in to pay the 25%.” |
| 4. Small business loans                    | small, work, help, income, loan, landlord, debt, money, support, clients | • The Canadian government set up small business loans and forgivable loans through financial institutions. Some business owners applied for the loan because of reduced revenue, and some other owners had more negative attitudes toward the loan program.  
• Policy implications: Policy-makers should consider streamlining the application process and modifying the criteria to make the CEBA loan program more accessible to SMEs. Research has shown that grants are preferable to loans as a government response (Cowling et al. 2020). Policy-makers will also need to assist small business owners in navigating the build-up of deferrals incurred during the pandemic. | • “Reduction of revenue, reducing staff time, applying for loan.”  
• “Loan do nothing to assist”  
• “Loan just put small business further in debt”  
• “Loan and payment deferrals are only short-term solutions.”  
• “Loan is a Band-Aid not a solution.”  
• “We don’t need loan, we need help.”  
• “We are trying to access loan, but will re-open with massive debt, if we are able to re-open at all”  
• “It’s just getting more loan and burden for our unclear future.”  
• “Stacking debt on top of my existing small business loan doesn’t help because I won’t be able to make an income pay off the extra debt.” |
Table 1: Continued

| Topic | Keywords | Summary of Comments and Policy Implications | Selected Quotes |
|-------|----------|---------------------------------------------|-----------------|
| 5. Qualifications for support | revenue, lost, qualify, online, hard, self, employed, economy, wage, season | - The comments pointed out that because of the eligibility requirements, many small business owners did not qualify for the assistance programs, particularly to the two flagship programs, CEBA and CEWS.  
- Small businesses have been disadvantaged in accessing some of the government support programs. Yet, profitable large companies received substantial subsidies from programs that were open to all businesses.  
- Policy implications: Policy-makers need to expand eligibility or allow appeals processes for those who have been classified as unqualified for the help.  
- Policy-makers should consider new ways to hear from the small business community. | “As a family-run business, we don’t hit the target for eligibility.”  
“With this pandemic, it forced the owners to lay off their entire staff, due to it being more beneficial for them to receive EI as it offered more consistent income in this trying time.”  
“We don’t qualify for the CEBA loan as a small business because we don’t have a payroll account.”  
“Business interruption insurance does not cover us, and we are not eligible for the government packages that have been released (CERB, etc.), because we are still doing admin work and seeing the occasional urgent patient to remove the burden from the hospitals.”  
“Landlord not participating in any relief funding.”  
“Don’t qualify since it’s less than a year old . . . don’t meet the minimum 2019 payroll requirement of $20,000.”  
“My corporation is structured so that it pays its shareholders and doesn’t show a salary of $20,000, so I don’t qualify for CEBA or CEWS.”  
“The wage subsidy doesn’t help when the people who work for you are hired as subcontractors.”  
“We are not eligible for the $40,000 loan, as we did not meet the salary criteria, and we cannot use the 75% wage subsidy because we cannot hire or utilize any of our staff when our events are shut down.”  
“The government needs to relax borrowing rules to receive the $40,000 loan.”  
“I still can’t afford the 25%. . . .We are a service-based firm. No clients because we are closed means no money coming in to pay the 25%.” |
| 6. Implications | staff, open, lay, essential, financial, service, non-interest, care, assistance | - The comments in this topic focused on the implications of non-essential business closure for employees and their families. Although business owners hope to re-hire their employees when the business goes back to normal, it is not clear how long the recovery will be post pandemic.  
- The recovery might be slower for small businesses that were forced to shut down during COVID-19.  
- Policy implications: Policy-makers need to find ways to protect small businesses for the remainder of the pandemic and help build resilience (Van der Vegt et al. 2015). Prior research has demonstrated that appropriate policy support provides significant benefits, such as speeding up recovery (Gourinchas et al. 2020). | “Many employees [laid off].”  
“I have laid off my staff for an indeterminate period of time as I will not be able to pay them. The rest as contractors will not be called in. They are all out of work.”  
“I need my staff to have a job and feel secure.”  
“Much of our staff live hand to mouth; we’ll support as best that a small business can, but it is a small business, nonetheless. No safety net for any of us in these unprecedented times.”  
“I’m also trying to top up my staff because they can’t survive on EI alone.”  
“We paid our staff two weeks but couldn’t offer more and they had to go on EI.”  
“This may influence my ability to hire staff for many months in the future.”  
“How can I hire these employees back if I’m farther in debt and lost all revenue.”  
“Our staff having to lose their medical benefits is cruel.” |
Table 1: Continued

| Topic | Keywords | Summary of Comments and Policy Implications | Selected Quotes |
|-------|----------|---------------------------------------------|-----------------|
| 7. Mental health impacts | employee, owner, completely, difficult, nothing, let, program, half, practice, delivery | The comments pointed to facts about mental health challenges of small business owners and resulting impacts. Both the financial hardship and quarantine negatively influenced business owners’ mental health. | “The government expects us to stay afloat while everyone is struggling emotionally, mentally, physically, and financially.” |
|  |  | Policy implications: There should be a shift in policy response from liquidity support measures for SME survival to support for business owners and employees’ mental health recovery. | “Health is very important but mental health is equally important.” |
|  |  |  | “We are physically and mentally burnt out.” |
|  |  |  | “Do better Canada. Not only are you ruining the economy, but you’re also leaving so many people in unsafe mental health conditions, financially unstable, and completely isolated.” |
|  |  |  | “It’s impacted us financially and mentally.” |
|  |  |  | “This has worsened my mental health.” |
|  |  |  | “Emotionally it’s taken a tremendous toll as the uncertainty and lack of clarity…” |
|  |  |  | “Making us carry the burden of this is both financially and emotionally [not] fair.” |
|  |  |  | “I’m stressed, sleepless, and trying not to fall into depression.” |
|  |  |  | “Huge psychological impact on employee morale worrying about their future.” |
|  |  |  | “This has been and will undoubtedly continue to be very difficult time—both financially and emotionally for small business owners and their employees.” |

Notes: CEBA = Canada Emergency Business Account; CECRA = Canada Emergency Commercial Rent Assistance; CERB = Canada Emergency Response Benefit; CERS = Canada Emergency Rent Subsidy; CEWS = Canada Emergency Wage Subsidy; COVID-19 = coronavirus disease 2019; EI = Employment Insurance; SMEs = small- and medium-sized enterprises.
Source: Authors.

**Interpretation of Topics**

**Topic 1: Current Situation**
The first topic, current situation, and its associated keywords refer to the closure of small businesses in Canada as a result of COVID-19. The overall situation is that small businesses closed their doors because of either government closure of non-essential businesses or financial duress. Many retail businesses stopped their operations, either temporarily or permanently. Upon examining the documents associated with this topic, we noticed that many affected retail small businesses tend to be specialized, selling a small range of products (e.g., furniture, vintage boutique, party, toys, gifts). For example, a retail store selling dance and gymnastics shoes had no sales because all studios in the community were closed and all competitions cancelled. The specialization of small business increases their vulnerability when faced with large-scale market risk such as a global pandemic.

Our data, covering the first wave of the pandemic, confirm that certain industry sectors, such as travel, hospitality, and recreation, were greatly affected. For instance, some small travel agencies and bike rental retail owners reported zero business during the first pandemic wave. The data also show ripple effects: some small businesses (e.g., manufacturing, construction, automotive) had to close or were significantly affected because they relied heavily on either supplies from wholesale businesses or orders from retail businesses, and these had stopped operating. For example, an owner of small information technology service firm claimed a 50 percent drop in business because the business depended on retail operators who had closed their doors because of the pandemic. As shown in Table 1, the restaurant sector was particularly hard hit.

**Topic 2: Long-Term Economic Hardship**
The second topic revolves around the long-term effect of COVID-19 on small businesses. Many small business owners were pessimistic about whether their business could survive the first wave of and after the pandemic. Not only were they temporarily closed, but many anticipated contracts, orders, projects, trips, and events were cancelled. Therefore, their survival and recovery post-pandemic are not assured. For example, small independent musicians lost all their future performances as a result of the cancellation of wedding events and closure of indoor restaurant bars. Related services, such as musical instrument repairs, saw their revenues evaporating. In addition, the comments reflect uncertainty in the foreseeable future and the fears that life and businesses will never go back to normal post-pandemic, at least not in the manner in which they were pre-pandemic.
Figure 3: Word Clouds of the Topics: (a) Current Situation, (b) Long-Term Economic Hardship, (c) Government Relief Measures, (d) Small Business Loans, (e) Qualifications for Support, (f) Implications, and (g) Mental Health Impacts

Source: Authors.
Figure 3: (Continued)

**Topic 3: Government Relief Measures**

The third topic refers to the government support and relief measures. The Canadian federal government unveiled several COVID-19 relief measures and programs to support the survival and continuity of small businesses and their employees. Several programs have since been expanded and extended or replaced with newer programs because COVID-19 is not abating. Specific programs targeted wage subsidies, such as the CEWS, which has since been replaced by new wage and rent support programs, and support for self-employed individuals, the Canada Emergency Response Benefit.

Because small businesses must still pay rent and utilities during closures, the Canadian government launched the Canada Emergency Commercial Rent Assistance (CECRA) in April 2020 to provide unsecured forgivable loans to qualifying commercial property owners to cover up to 50 percent of rent for up to six monthly rent payments for eligible small business tenants experiencing financial hardship because of COVID-19. As one owner stated, “We will not survive without rent relief.” However, this program quickly became controversial because landlords had to apply to obtain rent relief on behalf of small businesses and had to cover 25 percent of the rent. Many landlords either did not meet the criteria or did not want to apply, which created high levels of anxiety and stress for small business owners. The data show that rent was a very clear issue. Adding to these challenges, the rollout was slow and the application process cumbersome, pointing to an ineffective design and execution of a well-intentioned but hastily rolled-out program. The federal government eventually scrapped CECRA toward the end of the first wave and introduced the new Canada Emergency Rent Subsidy (CERS) in October 2020 to provide direct rent relief to businesses (Canada 2020a). The new rent subsidy provides benefits directly to qualifying small business tenants without requiring landlords’ participation.

**Topic 4: Small Business Loans**

The fourth topic relates to the small business loans and forgivable loans to small businesses. The Canadian government set up the Canada Emergency Business Account (CEBA), managed by financial institutions, to provide interest-free, partially forgivable loans of up to $40,000 to small businesses that have experienced diminished revenues because of COVID-19 (Canada 2020b). That amount was then increased by an additional $20,000 in December 2020, owing to the evolving pandemic situation. The program ended in June 2021, but the deadline to repay the CEBA loans has since been extended. Some business owners mentioned that they applied for the loan because of reduced revenue: “reduction of revenue, reducing staff time, applying for loan.”

Our data show the reluctance of several business owners to avail themselves of such loans. The negative attitudes toward the CEBA loan program might reflect small business owners’ pessimistic views of the long-term future. Some owners were afraid they would have to close their business and would not be able to pay back the loan.

Of note, in a survey of close to 4,000 small businesses, the CFIB (2020b) found that by far the most popular federal small business relief program was the CEBA, followed by the CEWS, and to a much lesser extent the CECRA. Our findings corroborate these results.

**Topic 5: Qualifications for Support**

The fifth topic concerns the consequences of being qualified or disqualified for government relief support. Comments highlight that because of eligibility requirements, many small business owners did not qualify for assistance programs, particularly for the two flagship programs, CEBA and CEWS.

According to the comments, these government programs need to expand eligibility or allow appeals for those who were classified as unqualified for the help. Other situations did not fit neatly into the programs’ requirements yet are not exceptional cases among Canadian small businesses. For instance, a family-owned small trucking company explained that their business “did not qualify since it’s less than a year old” and did not “meet the minimum 2019 payroll requirement of $20,000.” Similarly, an outdoor sports operator explained, “We are not eligible for the $40,000 loan, as we did not meet the salary criteria, and we cannot use the 75 percent wage subsidy because we cannot hire or utilize any of our staff when our events are shut down.”

A lot of family-owned shops desperately needed the help yet could not qualify, especially those owned by
single individual owners (e.g., market researchers, consultants, barber shops, taxi owners, small transportation companies) with no one on their payroll. These service firms tend to hire independent contractors rather than having employees. In essence, the program did not take into consideration the prevalence of the gig economy in Canada.

Most owners do not even have a separate payroll account to pay themselves, another issue with qualifications. Moreover, small businesses in a start-up stage would have a short operation history, which might disqualify them. For example, the owner of a daycare said they could not apply for CEBA support because the daycare “got licensed in November of 2019, started operations in February 2020, and was forced to close down on March 17th, 2020.” Yet, these small businesses that did not meet the criteria could have been those most vulnerable to the impact of the pandemic and in need of financial assistance to meet their operating costs. Because of their fixed cost investment in the start-up stage and inability to recoup these costs with revenue because they had not operated long enough, they were forced to close. In other situations, even though the business qualified for the wage subsidy program, the loss of revenue made it impossible for them to afford to pay their portion of their employees’ wages.

**Topic 6: Implications**

The sixth topic focused on the implications of non-essential business closure for employees and their families. Because of the closure and the decrease in revenue caused by the coronavirus, small businesses laid off employees. In the context of the first wave of COVID-19, Public Safety Canada (2020) developed a list of functions deemed essential according to ten sectors (i.e., energy and utilities, information and communication technologies, health, food, finance, water, transportation, safety, government, and manufacturing). If deemed non-essential, small businesses had no choice but to close their doors. Comments show that business owners were quite concerned about their employees. One business owner stated, “Much of our staff live hand to mouth, we’ll support [them] as best that a small business can, but it is a small business, nonetheless. No safety net for any of us in these unprecedented times.”

Although small business owners hope to re-hire their employees, it is not clear how long the post-pandemic recovery will be. For example, one owner commented, “$1.7 million in lost revenue, and no jobs for employees to return to.” Similarly, a dentistry owner said, “It will be difficult to reopen, and almost certainly we will not be able to employ all 10 staff members we had before.” Small businesses are the backbone of the Canadian economy and the main employers. Nine out of 10 Canadians in the private sector work for a small business, concentrated in the following five industries: wholesale and retail, accommodation and food services, manufacturing, construction, and other services (CFIB 2020a, 2020b; ISED 2020). Hence, our findings only cover the implications from the first wave of COVID-19.

**Topic 7: Mental Health Impacts**

The seventh topic concerns various facts about mental health challenges of small business owners and the resulting impacts. Comments include the following: “I’m devastated as I know everyone else is” and “The thought of all the money I will owe and the debt I will have is so very stressful.” The situation is especially problematic for people with more stress from family life, for example, “As a single mother, this is an extremely stressful time!” Not only does the financial hardship influence mental health, but we also observed that quarantine contributed greatly to psychological stressors: “I have been finding it very difficult to cope. My mental health has been impacted greatly. I am out of work, and I’m quarantined at home.” Some owners also addressed the impact on their employees’ mental health, for example, “Reduced hours and employee layoffs. Huge psychological impact on employee morale worrying about their future.” Moreover, financial difficulties limited people’s ability to seek mental health help for their psychological issues stemming from the pandemic, and containment strategies. A counselling clinic owner pointed out that “there is not the discretionary income for people to . . . support their mental health.”

**Discussion**

This study aimed to investigate the impacts of the first wave of COVID-19 on small Canadian businesses and their responses by topic modelling a dataset of more than 38,000 comments written by small business owners on the matter. The machine-learning automated textual analysis of the data revealed seven distinct topics: (a) current situation, (b) long-term economic hardship, (c) government relief measures, (d) small business loans, (e) qualifications for support, (f) implications, and (g) mental health impacts. We interpreted the identified seven topics in the light of insights from the data and findings from previous studies (e.g., Cowling et al. 2020; Gourinchas et al. 2020). The results have many implications for policy, theory, and practice.

**Implications for Policy**

Owing to their oversized contribution to the Canadian economy, small businesses cannot be neglected in a time of crisis because they are the most vulnerable to a large-scale crisis such as COVID-19 and the resulting post-pandemic outcomes (Beland et al. 2020). Our findings and those of recent studies show that government relief support has been crucial during COVID-19.
Notably, in their extensive modelling analysis of the impact of COVID-19 on business failures of SMEs in 17 European countries, Gourinchas et al. (2020) empirically demonstrate that without government support, the effects of COVID-19 on SMEs would be large and heterogeneous, whereas significant benefits, such as speed of recovery, can be achieved with appropriate policy support.

Canada can be applauded for its rapid intervention in designing and rolling out programs to help businesses and the labour market (Gunderson 2020; Jones et al. 2020; Robson 2020). By June 2021, CEWS had approved 3.8 million applications ($84.58 billion in contributions) since the launch of the program (Canada 2021a). Likewise, CERS had approved 1.2 million applications ($4.72 billion in value) by June 2021 (Canada 2021b). Despite the hiccups and issues outlined in our findings, we believe that the Canadian government’s policies and relief support have lessened the impacts or delayed the risk of business failures. It is likely that Canada’s wage subsidy initiatives had a positive impact on employment despite the pandemic. This is supported by Gourinchas et al.’s (2020) findings that labour subsidies in the European Union have a considerable effect on lowering the bankruptcy rate.

However, as our findings clearly demonstrate, small Canadian businesses have been disadvantaged in accessing such programs. Given their limited financial and accounting resources and the need to deal with the immediate impacts of the pandemic, many small business owners were unable to navigate the complexities and requirements of several relief programs. This was particularly so with the rent relief program (CECRA) because SMEs had to rely on their landlords to apply, which contributed to a lack of control, one of the three dimensions of crisis (Herbane 2010). Recognizing the shortcomings of some of the relief programs and the stumbles in delivering small business relief programs, the federal government has since amended requirements, extended relief programs, and replaced deficient programs with new programs.

Our findings are in line with those of Cowling et al. (2020), who suggest that government response should focus on how to effectively address cash and liquidity crises in businesses. Specifically, our findings support those of recent studies that recommend the use of direct government support to firms through grants rather than loans (Cowling et al. 2020). Cowling et al. (2020) point out that because most SMEs avoid loans in times of extreme uncertainty, government loan programs may be inadequate for small businesses. Moreover, our findings support the notion that SMEs are critical of support agencies (Herbane 2010; Runyan 2006).

Regarding resilience, Cowling et al. (2020) suggest that government grants to SMEs can lead to behavioural and strategic impacts to aid their revenue-generating capabilities. For instance, grants could help small businesses undertake new activities such as the adoption of online sales and business model adaptation and innovation to ensure their continuity while the crisis evolves and to help develop resilience in the process. Similarly, Lim et al. (2020) highlight the importance of the Canadian government’s support of high growth and business model innovation because firms that successfully emerge from a crisis enhance their value creation. Yet, it is worth noting that our machine-learning automated approach did not identify topics related to innovation or business models. This suggests that, at least during the first wave of COVID, small business owners managed the crisis by first focusing on financial aspects, government support, and business continuity decisions. Although it is outside the scope of this article, we note that the Canadian government has provided additional funding to existing innovation programs and created new ones to support SMEs through the pandemic. Effective government support for SMEs’ innovative activities is important for enhancing their resilience in times of crisis.

The pandemic and its successive waves will affect the government’s response in supporting SMEs because of its own financial constraints. This situation represents an opportunity to streamline programs, address gaps in current offerings, and look for mid- to longer-term initiatives (Deschryvere, Mikkola, and Conn 2020). This is particularly important for Canada because it led the world in pandemic spending during the first wave (Daly 2020), yet it is expected to fare worse than many countries that spent less (International Monetary Fund 2020). At the same time, national governments are preoccupied with extensions or design and delivery of additional urgent programs owing to subsequent waves of COVID-19 and restrictions, potentially causing more small businesses to close their doors permanently. Hence, governmental agencies are resource constrained to efficiently accomplish both the short- and the longer-term support of small business owners. The challenge for government in Canada and elsewhere lies in the balance between saving lives and saving the economy (Lu et al. 2020). Looking at the longer term, the OECD (2020) notes a shift in policy response from liquidity support measures for SME survival, although still a priority in most countries, to support for recovery.

Our results clearly exemplify the COR theory (Hobfoll 1989, 2001), which states that psychological stress occurs when people’s resources are threatened or lost and when people fail to obtain sufficient resources after resource investment. Hence, evaluating the effects of the COVID-19 pandemic on mental health outcomes will be important to inform policy responses in the evolving COVID-19 pandemic and future crises (Goldman et al. 2020).

Implications for Theory

Our study contributes to the crisis-based view of small business research (Herbane 2010). Previous research has

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doi:10.3138/cpp.2021-018
concentrated on crisis management of typically large organizations (Herbane 2010) and in the context of natural disasters (Runyan 2006) and global recessions (Devece et al. 2016; Smallbone et al. 2012). Although the impacts from such external large-scale crises are not insignificant, our study uses the context of the global COVID-19 pandemic, specifically the first wave, and focuses on impacts on small businesses and their responses. This context allows us to contrast our findings with prior scholarly research, such as similar studies worldwide using different methodologies, hence augmenting the field of crisis management. In so doing, our approach and findings from a large dataset go beyond what might appear at first glance as typical news reports in the media. Furthermore, the use of machine learning enabled us to discover latent topics not previously addressed in the current literature on crisis management and small business.

Moreover, our findings pave the way for crisis management and small business researchers to integrate the two fields in a more coherent and forward-looking fashion. As Herbane (2010, 60) suggests, there is a “potential role for crisis management and business continuity management researchers in raising awareness and changing mindsets among SME owners: they needed to be presented with a wide variety of threats to understand the vulnerability that their firm potentially faced.” Our findings are clearly aligned with Herbane’s (2010) assertion that among the three dimensions of crisis—namely lack of control, lack of cash, and compressed time to respond—the lack of cash constitutes the clear impact of a crisis and is more acute in small businesses in a time of crisis given their financial fragility (Bartik et al. 2020). SMEs face constraints in obtaining outside debt and equity capital (Ebben and Johnson 2011). Moreover, SMEs seldom conduct cash forecasting or draw up cash budgets (Mong 2012). Consequently, the sudden interruption of cash flow can significantly influence SME performance. A critical difference with previous crisis management research is that a pandemic such as COVID-19 lasts considerably longer than riots or natural disasters and creates long-lasting uncertainties. As evidenced by the comments from our dataset, that critical difference worsens the financial situation of small businesses, in addition to other negative effects, and increases the level of uncertainty.

Previous studies have noted the absence of formal crisis management and business continuity plans in SMEs (Herbane 2010; Spillan and Hough 2003). The lack of crisis planning, coupled with lower levels of preparedness, greater vulnerability, and greater personal impact on the owners of SMEs as well as their dependency on government and local agencies result in a higher level of impact from a crisis compared with impacts on larger businesses (Runyan 2006). However, and despite prior research demonstrating the positive relationship between planning and performance (Perry 2000), it is noteworthy that planning as a theme or even keyword did not come up in our topic modelling analysis. Hence, and in line with earlier results, our findings suggest that small businesses do not typically engage in formal planning despite the argument that planning is considered the best method to mitigate the negative effects of a crisis (Runyan 2006). Future global pandemics and other large-scale events are expected, and our findings suggest that small businesses should not only engage in a disaster recovery approach but also focus on the pre-crisis phase, that is, engaging in planning and increasing resilience. Given their limited resources and the challenges of planning for unexpected worldwide events such as COVID-19, small business owners should leverage their ability to develop innovative alternatives to develop business continuity (e.g., online marketing; product delivery) when a crisis hits (Williams et al. 2017). Moreover, small business owners should build and benefit from their local connections and trust from community members (Shepherd and Williams 2014).

Last, we contributed to novel methodology approaches. We responded to Herbane’s (2010) call for overcoming methodological difficulties in studying crisis management, a critical yet under-explored area of business survival research. Our study illustrates the use of topic modelling, a machine-learning–based automated content analysis method for the analysis of large textual datasets, which is becoming an valuable method in contemporary entrepreneurship and small business research. Thus, our study establishes further grounds for scholarly research in crisis management and small business using publicly available data and machine learning.

Implications for Practice
To quote Churchill, “Never let a good crisis go to waste.” As the world is struggling with successive waves of COVID-19, insights from our study can help reimagine the post-COVID world for small business owners, in Canada and elsewhere. Prior studies have found that the experience of a crisis, rather than factors such as the presence of a crisis management team, was the most influential driver of the adoption of formal crisis planning (Spillan and Hough 2003). Therefore, we can anticipate that small businesses that survive COVID-19 either had in place a formal crisis management system or will likely put one into place.

Deschryvere et al. (2020) suggest that a lack of ambition by SME owners in the United Kingdom and the European Union could prove to be a greater barrier post-pandemic. In Canada, others suggest that the impediment might be a lack of means to achieve their ambitions (Business Development Bank of Canada 2018). Regardless, innovative business owners could take the opportunity of a slowdown in their operations to invest in innovative technologies, digital skills (Deschryvere et al. 2020), and business model innovation. Consider that the stock
market indices of high-technology and Internet-based firms has increased substantially during the pandemic (Etemad 2020).

On a sober note, much remains to be done on the technology front. A survey of Canadian small businesses reported that 44 percent of surveyed businesses were facing several technology challenges to business continuity during the pandemic (digital marketing, e-commerce, websites; OECD 2020). Alarmingly, in an online survey of 1,020 Canadian small business owners, CIBC (2020) found that 74 percent of surveyed businesses were not currently equipped to sell or service online. However, 45 percent were considering diversification or pivoting to get through the crisis (CIBC 2020). Some suggests that wise pandemic pivots could make small businesses stronger in the long run (CIBC 2020; Morgan et al. 2020).

**Limitations of the Study**

Our findings are based on the Canadian small business context, which we argue has wider resonance in both developed and developing countries where, as in Canada, the proportion of small businesses is high and so are the dire consequences resulting from their potential failure. That said, the dataset, publicly available and anonymous, lacks information such as the age of firms, size of businesses, business performance before the pandemic, and owners’ experience with previous large-scale external crises. Firm age matters because older SMEs have more stable revenues and cash flows; hence, they are in a better situation to borrow in external capital markets in case of crisis (Cowling et al. 2020).

Save Small Business began by inviting small business owners to sign a petition demanding support. Thus, the dataset does not represent responses from a random sample of businesses. Moreover, participants might have been more likely to share stories related to the help they needed or the negative situations they faced given the purpose of the call. They might have been less motivated to share positive stories about successful recoveries or effective crisis management systems. However, it might be that small business owners saw an opportunity to share their hardship as a way to cope with their lack of control (Herbane 2010) during the initial wave of the pandemic. That said, the goal of our research and the use of topic modelling aimed to highlight and organize the problems reported by the many businesses experiencing COVID-19-related difficulties.

Similarly to Mo et al. (2020), the crowd-sourced dataset we analysed covered only the full first wave of COVID-19. However, it offers a comprehensive picture of impacts from that first wave, whereas the world is struggling through subsequent waves. The first wave resulted in immediate financial impacts, fears, and uncertainties. It is possible that perceptions of small business owners during the next waves would differ. We foresee that topics from subsequent waves would emphasize transformation (such as a rapid move to online stores), new business models, recovery, and adaptation. We expect that the mindset would be different from the first wave, namely less fear and a focus on adaptation to a new normal, hence moving from minimizing impacts of the crisis to bouncing back (Doern et al. 2019; Williams et al. 2017) and from crisis response to recovery (Hills 1998). These topics represent fertile ground for future research.

Topic modelling creates interpretive uncertainty (Di-Maggio 2015), in particular internal uncertainty, or “how can we be sure that our interpretation of the meaning of a topic is better than an alternative interpretation?” (Di-Maggio 2015, 4). The application of topic modelling in the social sciences is relatively recent and so are model-testing approaches. Hence, researchers’ expertise in the topic being investigated is therefore essential to ensure that the interpretation makes sense from the perspective of the research and provides a meaningful description of the topics. Further social science research applying topic modelling to ever larger datasets will no doubt help overcome these limitations.

**Future Research Directions and Conclusion**

How government should respond to exogenous shocks and help small business owners recover afterward is an under-researched area (Davidsson and Gordon 2016; Doern et al. 2019). After the COVID-19 pandemic, a study of the impacts on small businesses over the entire pandemic period is warranted to capture the compounding impacts of all waves of the pandemic. Future research using topic modelling could also benefit from the increasingly popular approach of structural topic modelling, which simultaneously reveals both the topics and the topic structures and thus helps researchers to order and even correlate topics, for example, hierarchically (Roberts et al. 2014).

Small businesses may take time to adjust to any new normal (Gunderson 2020). Longitudinal research designs on the periods before, during, and after the crisis would enhance our understanding of the impact of crises on SMEs (Buchanan and Denyer 2013; Doern et al. 2019) and shed light on crucial dynamics enabling a successful recovery. A time-based analysis of response changes coordinated with government announcements of new or extended programs would provide valuable insights to policy-makers. The evaluation of owners’ experience, training, and skill sets to carry out risk and business-contingency analyses, and how improved resilience influences SME survival (Herbane 2010), are yet other areas worthy of investigation. Given the inevitable next large-scale crisis, insights from an assessment of the effectiveness and impacts of government relief programs for small businesses is justified.
In closing, a better integration of the crisis-management literature with that of the literature on small business is warranted. Our study takes a small step in that direction because it reveals insights from impacts on small businesses from a global pandemic. Global pandemics and other external types of crises create unprecedented and taxing uncertainties for individuals, businesses, and governments. The possibility of recurrence of further global crises in a not-so-distant future points to the need for sustainability and resilience of small businesses.

Acknowledgements

This research received financial support from a Carleton University COVID-19 Rapid Response Research Grant under Contract 112787. Our heartfelt thanks go to editor Mike Veall and to the anonymous reviewers for their insightful comments and suggestions.

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