# Topic Modelling Application for Determining Competitiveness Factors of the Small Business Firms

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**ABSTRAK**

*Usaha kecil dan menengah memainkan peran penting di seluruh dunia, baik di negara maju maupun berkembang. Sebagian besar masalah usaha kecil saat ini adalah untuk bersaing dan mempertahankan bisnis mereka di antara dan di antara pesaing. Tujuan dari penelitian ini adalah untuk menghasilkan tema daya saing dari data tekstual dengan memperkenalkan pemodelan topik sebagai pendekatan penelitian. Jenis penelitian ini yaitu penelitian kuantitatif. Penelitian ini menggunakan pendekatan kuantitatif dan analisis deskriptif dengan menggunakan program Mallet Topic Modeling sebagai alat analisis. Sepuluh tema telah diidentifikasi, di antaranya dua topik Memahami Kewirausahaan dan Jaringan Kewirausahaan; dan Kondisi Industri dan Organisasi Pembelajaran memiliki proporsi komposisi topik tertinggi. Topik-topik ini digunakan untuk memahami faktor persaingan antara usaha kecil internal dan eksternal. Hasil penelitian ini yaitu menggunakan program Mallet Topic Modeling Tool, sepuluh faktor persaingan usaha kecil dapat diidentifikasi. Hasil penelitian ini dapat memberikan area kebaruan untuk arah penelitian di masa depan, sedangkan bagi pengusaha dan pelaku bisnis, dapat memperoleh faktor kompetitif yang sesuai untuk keberlanjutan bisnis mereka.*

**ABSTRACT**

Small and medium enterprises play an important role worldwide, in both developed and developing countries. A big part of the problem of small businesses today is competing and maintaining their business among competitors. This study aims to generate a theme of competitiveness from textual data by introducing topic modelling as a research approach. This type of research is quantitative research. This study uses a quantitative approach and descriptive analysis using the Mallet Topic Modelling program as an analytical tool. Ten themes have been identified, including two topics Understanding Entrepreneurship and Entrepreneurship Networks; and Conditions of Industry and Learning Organizations have the highest proportion of topic composition. These topics are used to understand the competitive factors between internal and external small businesses. This study uses the Mallet Topic Modelling Tool program, and ten factors of small business competition can be identified. The results of this study can provide a new area for future research directions. At the same time, entrepreneurs and business people can obtain competitive factors suitable for their business s sustainability.

## 1. INTRODUCTION

The abundance of academic literature being digitised and stored electronically in databases, researchers and scholars today need powerful automated tools to read these data and understand their underlying themes to find a novelty for future research (Blei, 2012; Kherwa & Bansal, 2020). Topic modelling is one of the powerful algorithm techniques that can uncover, discover, and annotate thematic structures in *scorpus* collections of documents (Blei, 2012; Habibabadi & Haghighi, 2019). Several studies have been conducted using topic modelling analysis for research in different domains. Other research applied topic modelling with the Mallet tool (Liu et al., 2019). Off-site construction research using topic modeling analysis to detect vaccination safety signals (Habibabadi & Haghighi, 2019). Other research applied topic modelling for leadership trait analysis (Sieweke & Santoni, 2020). Another study examines accounting history research using topic modelling analysis (Ferri et al., 2020). Topic modelling in marketing research (Reisenbichler & Reutterer, 2019). Other research applies topic modelling in materials science and engineering (Rani & Kumar, 2021). The application of topic modelling offers at least three

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benefits: first, it can help researchers identify important topics that they could not identify on their own; second, assisting researchers in obtaining appropriate automated coding of the content and measurement of large-scale phenomena; third, it is beneficial for researchers in manual coding of textual data to interpret and validate the results of the topic model (Storopoli, 2019). In other words, topic modelling analysis has the "robustness, replication, and scalability" of applying analytical tools (Ballester & Penner, 2022).

In the meantime, it has been recognised that small and medium-sized enterprises play an important role worldwide, both in advanced and emerging economies. This type of business has created 60 percent of jobs and contributes to about 40 percent of gross domestic product (GDP), especially in developing countries (World Bank, 2019). Most of the problems associated with this type of business are how to compete with others and how to ensure the sustainability of the business. In short, this problem is related to the competitiveness of a company (Cirillo et al., 2021; Hove-Sibanda et al., 2017). However, the concept of competitiveness always has a different meaning and is one of the multidimensional concepts associated with the market mechanism, both at the firm and country level (Bilbao-Osorio et al., 2012; Klaus, 2019; Lafuente et al., 2020; Siudek & Zawojska, 2014). Moreover, the research remind us that the term competitiveness has become a buzzword today, is an elusive concept, and is constantly changing over time, so researchers and scholars need to comprehensively analyse the existing literature (Bhawsar & Chattopadhyay, 2015). Therefore, many scholars and entrepreneurs are trying to find out what are the essential factors that make this type of small business competitive in order to achieve sustainable economic growth in a country.

Small Business is a productive economic business that stands alone and is carried out by individuals. Small Business is a productive economic business that stands alone, carried out by individuals or business entities that are not subsidiaries or branches of the company they own (Meinarni et al., 2021; Rasbin, 2019). The government protects small-scale people s economic activities to prevent unfair business competition (Nongtji, 2013; Nuriyah et al., 2018). The types of commodities or goods in the business are usually not fixed or can change anytime. Some advantages of Small and Medium Enterprises (SMEs) compared to large businesses are flexibility and the ability to adapt to rapidly changing market conditions compared to large-scale companies, which are generally bureaucratic (Himawan, 2019; Maretha et al., 2018; Mulyono & Kresnaini, 2016). However, the weakness of the small is related to marketing problems that are commonly faced are competitive pressures, both in the domestic market from similar products made by prominent and imported entrepreneurs, as well as in the export market (Ajismanto & Widyanto, 2020; Meliala et al., 2016). In addition, the limitations of small businesses are limited human resources in the aspects of entrepreneurship, management, production techniques, product development, quality control, accounting, machinery, organization, data processing, marketing techniques, and market research

Other research findings also state that small businesses need to be considered because they have a strategic role in national economic development (Crespo et al., 2020; Guevara & Thiagarajan, 2019; Singh et al., 2021). Apart from playing a role in economic growth and employment, they also play a role in the distribution of development outcomes. This study tries to find the right competitive factors for small business development by analyzing a large number of journal publications that cover the topic of competitiveness and small businesses using the Mallet topic modelling tool (Graham et al., 2012; Sukhija et al., 2016). This research aims to generate a topic of competitiveness from text data by introducing topic modelling as a practical research approach. Therefore, a researcher can label and categorize text data through topic modelling to produce a set or measure that can later be used for statistical analysis and hypothesis testing. It is hoped that the results of this research can be helpful for both researchers and entrepreneurs. The results of this study can provide a new area for future research directions. At the same time, entrepreneurs and entrepreneurs can obtain relevant competitive factors for the sustainability of their business through the results of this research.

## 2. METHODS

This study applies a quantitative approach and descriptive analysis. The secondary data collection technique in this study consists of all publication lists of academic journals. The data were then analysed using the Mallet topic-modelling program (Graham et al., 2012). Before creating a *corpus* for Mallet topic modelling, the inclusion and exclusion criteria were performed to achieve the purpose of this study (Carter et al., 2016). Then, the first keyword that matched the topic of the study was selected, which was "small business competitiveness". The search for this keyword began by entering it into the EBSCO Discovery Services (EDS) of the Web Library and yielded a substantial number of more than 350 thousand articles. To narrow down the results, several screenings and stemming of the related topic were

performed by applying strict restriction criteria, including only full-text and peer-reviewed journal publications, only English-language publications, academic journal types, and Business Source Premier and Elsevier publishers (Storopoli, 2019). In this way, the results can be narrowed down from about 160 thousand articles to 122 papers. From the final and satisfactory 122 related publications, in the last and clean phase, the summary was extracted and formatted into .txt files before being entered into the Mallet topic-modelling analysis software (Ferri et al., 2020). The final phase, the summary of the 122 selected topics, was performed under the following conditions: The number of iterations is 122, the total number of printed words is 20, and the total number of topics is 10.

## 3. RESULTS AND DISCUSSIONS

### Results

The first topic (Topic 1) is composed of the terms: strategic; managers; framework; sustainability; social; issues; actions; action; managerial; show; actors; rivalry; role; findings; engage; making; decision; process; movement; and responses. So, topic one is mainly concerned with the topic of strategic decision-making and the management process. Therefore, I call topic 1 as strategic decision-making process in management**.** The most representative document in the sample Topic 1 is titled "Strategic decision-making in SMEs: effectuation, causation, and the absence of strategy" (Hauser et al., 2019). Topic 2 possesses the following terms: firms; competitive; knowledge; relationships; theory; network; stakeholder; policy; ownership; benefits; success; trust; argue; potential; alliance; influence; members; alliances; direct; and high. In other words, this topic deals with the competitiveness of the firm and its stakeholders in the field of alliances. Thus, the entitle of topic 2 is "Firms competitiveness and stakeholder political alliances". The most representative document on this topic was written, stated that in order to be competitive, companies should develop better and lasting stakeholder alliances, i.e., they need to form better and reliable partnerships by working with other parties related to their business, with the title is "Dynamic capabilities, strategic stakeholder alliances and sustainable competitive advantage" (Lenssen et al., 2011).

Topic 3 contains the following terms: research; theory; change; behavior; work; analysis; view; time; organizational; article; theoretical; ambidexterity; studies; empirical; practices; management; mwb; context; unique; and processes. This topic is concerned with an appropriate and conducive work organisation and best management practises within the organisation. Therefore, I call this topic as "Organisation of work behaviour and empirical management practises". There are two papers that are representative of this topic, namely "Organisation of work behaviour and empirical management practises" and "Measuring innovative work behaviour" (De Jong & Den Hartog, 2010; Nguyen, 2010).

**Table 1.** Summary of Topics

| | Top 20 terms for each topic | Topic Name *(Proposed)* | Topic Proportion | Organisational Factors |
|---|---|---|---|---|
| 1 | strategic managers framework sustainability social issues actions action managerial show actors' rivalry role findings engage making decision process movement responses | Strategic decision-making process in management | 9.71% | Internal |
| 2 | firms' competitive knowledge relationships theory network stakeholder policy ownership benefits success trust argues potential alliance influence members alliances direct high | Firms' competitiveness and stakeholder political alliances | 9.20% | Internal & External |
| 3 | research theory changes behaviour work analysis view time organizational article theoretical ambidexterity studies empirical practices management mwb context unique processes | Organisation of work behaviour and empirical management practises | 9.65% | Internal |
| 4 | entrepreneur's entrepreneurial entrepreneurship institutional social examines ventures institutions | Understanding entrepreneurship and entrepreneurial | 12.08% | Internal & External |

| | Top 20 terms for each topic | Topic Name *(Proposed)* | Topic Proportion | Organisational Factors |
|---|---|---|---|---|
| | create networks insights growth propose understand temporal evidence life perspective differ highly | networks | | |
| 5 | organizations organizational conditions industry learning experience field resources resource study number findings critical process power mechanisms impact students Dubai survival | Industry conditions and learning organisations | 11.41% | Internal & External |
| 6 | innovation governance public technology corporate institutions private activities support provides agency risk ties organization uncertainty company family collective focus development | Innovation and technology support activities | 8.57% | Internal |
| 7 | capital firms' market human foreign environments relational opportunities countries internationalization local Argentine markets central state act minority developing recent including | Local and international opportunities of the market environment | 10.23% | External |
| 8 | firm performance study finds management results effect corporate investment CEO strategic positive success CEOs relations Japanese relationship positively based data | Corporate performance and strategic management | 8.68% | Internal |
| 9 | business international political emerging institutional economic global economy companies' economies government environmental strategies attention firms transition major multinational firm s increasing | Emerging economies and government strategies attention | 10.78% | External |
| 10 | strategy research capabilities literature discusses management paper key develop dynamic understanding factors explain firm-level important model implications question organizational legitimacy | Understanding dynamic firms and organisational capabilities | 9.69% | Internal |

Topic 4 has the following terms: entrepreneurs; entrepreneurial; entrepreneurship; institutional; social; examine; ventures; institutions; create; networks; insights; growth; propose; to; understand; temporal; evidence; life; perspective; differ; and highly. This topic is about the entrepreneurial networks and entrepreneurship theme. I refer to topic 4 as "Understanding entrepreneurship and entrepreneurial networks". The most representative working title for this topic is "Entrepreneurship and entrepreneurial ecosystems" (Malecki, 2018). Topic 5 consists of the following terms: organizations; organizational; conditions; industry; learning; experience; field; resources; resource; study; number; findings; critical; process; power; mechanisms; impact; students; Dubai; and survival. This topic relates to condition of industry and the field of organisation learning and experience. I propose this topic as "Industry conditions and learning organisations". The most representative paper on this topic is entitled "Linking entrepreneurial orientation and firm performance: the role of organizational learning capability and innovation performance" (Alegre & Chiva, 2013).

Topic 6 possesses the following terms: innovation; governance; public; technology; corporate; institutions; private; activities; support; provide; agency; risk; ties; organization; uncertainty; company; family; collective; focus; and development. The most representative paper on this topic is "Innovation and technology creation effects on organizational performance" (Huang & Huang, 2020). This topic mainly refers to innovation and technology, so the title of topic 6 is "Innovation and technology support

activities". Topic 7 contains following terms: capital; firms; market; human; foreign; environments; relational; opportunities; countries; internationalization; local; Argentine; markets; central; state; act; minority; developing; recent; and including. The terms of Topic 7 are mainly concerned with the market environment, both local and international. Therefore, I call this topic "Local and international opportunities of the market environment". The most representative document on this topic is "The concept of international opportunity in international entrepreneurship: a review and a research agenda" (Mainela et al., 2014).

The concepts encompassed by Topic 8 are: firm; performance; study; find; management; results; effect; corporate; investment; CEO; strategic; positive; success; CEOs; relations; Japanese; relationship; positively; based; and data. Most of the terms in this topic relate to strategic management and corporate performance, so the title of Topic 8 is "Corporate performance and strategic management". The most representative document title for this topic is "Financial management challenges in small and medium-sized enterprises: A strategic management approach" (Karadag, 2015). Topic 9 has the following terms: business; international; political; emerging; institutional; economic; global; economy; companies; economies; government; environmental; strategies; attention; firms; transition; major; multinational; firms; and increasing. This topic mainly concerned with emerging economies and the external attention of government strategies. Therefore, I call this topic "Emerging economies and government strategies attention". There are two representative papers on this topic entitled "Exploring the role of government involvement in outward FDI from emerging economies" (Wang et al., 2012), and "The impact of government financial support on the performance of new firms: the role of competitive advantage as an intermediate outcome" (Pergelova & Angulo-Ruiz, 2014). The development of small business competitiveness cannot be viewed in isolation from the role of government policies, especially in supporting emerging market economies. In other words, strong and vigorous government support is needed to implement appropriate strategic conditions to improve and increase small business competitiveness (Guevara & Thiagarajan, 2019).

The last topic is Topic 10, which includes the following terms: strategy; research; capabilities; literature; discuss; management; paper; key; develop; dynamic; understanding; factors; explain; firm-level; important; model; implications; question; organizational; and legitimacy. The most representative document on this topic entitled "Understanding Organizational Capabilities and Dynamic Capabilities in the Context of Micro Enterprises: A Research Agenda" (Inan & Bititci, 2015).This topic is mainly concerned with organisational dynamics and capabilities, so I call this topic "Understanding dynamic firms and organisational capabilities". Table 1 also shows the percentage of topics out of all selected topics. It is evident that Topic 4 (Understanding Entrepreneurship and Entrepreneurial Networks) and Topic 5 (Industrial Conditions and Learning Organisations) have the highest percentage of all topics with 12.08% and 11.41%, respectively. While Topic 6 (Innovation and Technology Supporting Activities) and Topic 8 (Business Performance and Strategic Management) have the lowest proportion with 8.57% and 8.68%, respectively. In terms of organisational factors related to the selected topic, internal factors (5 themes) predominate over external factors (2 factors). In addition, the Mallet topic modelling tool can provide the comparison result, called "result composition", by showing the highest contribution of the corpus topic, which is indicated by the highest contribution percentage of each topic (Figure 1) (Graham et al., 2012).
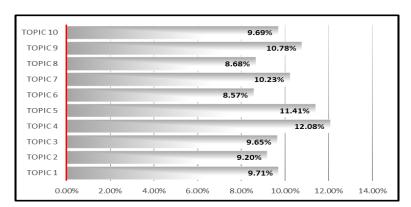


**Figure 1.** The Result Composition of the 10 Topic Comparison

Figure 1 shows that topic 4, i.e. Understanding entrepreneurship and entrepreneurial networks has the highest percentage of the total corpus (12.08%) followed by topic 5, namely "Industrial conditions and learning organisations" (11.41%).

**Discussions**

From Table 1 it can see the summary of the 10 extracted generated topics and the proportion of topics. However, originally the results of the Mallet topic model consist only of groups of words that are related but have no meaning, as you can see in the left column of the table titled "Top 20 Terms of Each Topic". The Mallet topic modelling program cannot provide the meaning of the words in a text (Graham et al., 2012). To make sense of the ten identified topics, they can be analysed using approaches such as word association, text clustering, text categorization, text summarization, or text term analysis, which are considered appropriate (Jacobi et al., 2016). Then, the proposed topic name for each of the 10 mallet modelling results can be provided. From the results of the topic modelling, the attainment of 10 topics of competitiveness in small businesses refers to both internal and external organisational factors that can affect the competitiveness of small businesses in day-to-day operations (Chung et al., 2016; Guevara & Thiagarajan, 2019). For example, the internal factors deal with the factors within the business that can be directly influenced by the management team. These include strategic decisions (Topic 1), work behaviour organisation (topic 3), innovation and technology (6), business performance and leadership (topic 8), and organisational capabilities (topic 10). The results are consistent with the study that internal organisational factors such as human capital, systems and processes, innovation, and technology are the most important organisational factors to be competitive (Adjekum & Tous, 2020; Lafuente et al., 2020).

While, the external organisational factors that cannot be influenced by the top level of the company consist of two topics, namely, the market environment (Topic 7), and economic and government policies (Topic 9). This is consistent with the research study, states that external organisational factors such as government regulations and foreign trade policies are beyond the company s ability (Martín Martín et al., 2021; Singh et al., 2021). Fascinatingly, there are three issues related to both internal and external organisational factors. These are business competitiveness and stakeholder political alliances (Topic 2), understanding entrepreneurship and entrepreneurial networks (Topic 4), and industry conditions and learning organisations (Topic 5). Interestingly, the three topics are related to the domain of internal and external factors, suggesting that in order to be competitive, a small business should consider the equilibrium scale direction of its organisational factors (Huang & Huang, 2020). In other words, a competitive small business should strengthen its internal organisational factors such as employees, technology, and the internal system, while paying close attention to changes in the external environment to become an adaptive and agile organisation (Ahmedova, 2015). However, this analytical program has a limitation: it cannot directly provide a meaningful interpretation of the found topics. A human approach is still required to overcome this. Nevertheless, this topic modelling analysis provides a quick and inexpensive way to get a good overview of a collection of essential documents by providing general patterns of topic usage over time. Based on the conclusion and limitations of the study, for the future research direction, it is recommended in expanding both the conceptual and empirical studies to provide a better understanding and more comprehensive results on the phenomena of small business competitiveness, especially in developing countries.

**4. CONCLUSION**

Based on the results and descriptive analysis, it can be concluded that by using the Mallet Topic Modelling Tool program, the ten competitive factors of small businesses can be identified. Among the ten selected topics, two topics have the highest proportion that have an equal balance between internal and external organisational factors, namely industry conditions and learning organisations; and understanding entrepreneurship and entrepreneurial networks. It has also been shown that the Mallet topic modelling tool can help and support researchers and entrepreneurs to find a new and appropriate topic to study the research objective.

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