Defining characteristics of the most innovative companies

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Abstract: In this study, a text analytics approach was employed to analyse the mission statements of the most innovative companies to help uncover emerging trends and unlock the value of unstructured textual data. The tools that were used to conduct this analysis were R and SAS Enterprise Miner. The dataset that is used for this analysis contains the mission statements of the top 50 most innovative companies ranked by Boston Consulting Group. Valuable information was extracted by classifying, clustering, and visualising the most frequently appearing and significant terms found across the mission statements of the most innovative companies.

Keywords: innovation; innovative companies; mission statement; text analytics; unstructured data.

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1 Introduction

One would agree that innovation is one of the most crucial factors in achieving and sustaining a competitive advantage. While a variety of factors may contribute to innovation and creativity in any given business, in general, companies driven by an innovative culture often outperform their competitors. On the other hand, companies failing to innovate and refusing to adapt to technological advances may soon be irrelevant. In other words, innovation is a must for companies to sustain their economic growth and stay relevant in the competitive market.

A company's future may even depend on innovation. As argued by Zeb et al. (2021), innovation is the basic input to organisational endurance. Similarly, Ogrean (2019) holds that to survive, businesses must innovate. Therefore, according to a survey conducted by

Boston Consulting Group in 2021, 75% of executives said that innovation was among their organisations' top three priorities (BCG, 2021).

Cassidy (2018) argues that an innovative organisation is one that "introduces new processes, services, or products that affect positive change in their business". Innovation has been widely regarded as a powerful tool for stimulating economic growth (Manohar and Pandit, 2014), and is of key importance to business performance and success (King and Forbes, 2013). Consequently, innovation must be measured and properly managed (Davila et al., 2005) as innovative entrepreneurship is at the heart of economic development in all modern economic systems (Colombelli et al., 2020).

This study analyses the mission statement of the top 50 most innovative companies ranked by Boston Consulting Group (BCG) which surveyed 1,500 executives to rank the most innovative companies of 2021 (BCG, 2021). Using both R and SAS Enterprise Miner, text analytics was performed on the mission statement of the most innovative companies to gain insights into their defining characteristics and to see if they share some similarities and differences in terms of their common values, visions, and goals. While numerous studies conducted in the past explored and investigated the most innovative companies using various variables of interest, to the best of our knowledge, none of the past studies employed text analytics to analyse the mission statements of such companies.

2   Relevant literature

What sets innovative companies apart from non-innovative companies has been examined in the literature. For instance, Archer et al. (1998) examined 72 North American companies to determine if there were any differences between innovative and non-innovative organisations. Medina et al. (2002) conducted a similar study to explore specific organisational characteristics that innovative companies possess. Using a slightly different approach, Ercis and Unalan (2015) analysed the most innovative companies with respect to the industry to which they belonged. Studies conducted by Lewrick and Raeside (2012) and Ogrean (2019) examined the most innovative companies in terms of their profiles, attributes, and main characteristics. Using a sample of 181 firms that belong to the manufacturing and services industries, Medina et al., (2011) made comparisons between 'best innovative companies' and 'worst innovative companies'. Their findings suggest that most innovative companies achieve systematically higher scores for all dimensions of human, organisational and social capital than the worst innovative companies. Finally, Lichtenthaler (2018) developed a meta-ranking of the world's most innovative companies, exploring the relationship between firm performance and organisational innovation.

Several studies analysed the most innovative companies on a local or a regional scale. For instance, Zahariev (2014) surveyed small innovative companies in Belgium. In the same year, Manohar and Pandit (2014) investigated the role of 'core values and beliefs' of leading innovative companies in India and abroad on how they go about creating a unique innovation culture. Zizka et al. (2016) analysed the most innovative companies in the Czech Republic in terms of their economic performance using effectiveness and efficiency as variables of interest. Staniewski et al. (2016) evaluated the innovativeness of the small and medium-sized enterprises (SMEs) in the construction sector in Poland and found that the SME companies in Poland were characterised by a level of innovativeness similar to that of other enterprises. Penalver et al. (2017) explored the

relationship between the actions of corporate social responsibility (CSR) and its influence on innovation in the agribusiness sector in Spain. Moreover, Camio et al. (2018) conducted a study to identify variables that distinguish Argentinian software companies with high innovation results and high innovation impacts. Daas and Doef (2020) explored various companies in the Netherlands to determine if a company is innovative by studying the text on its website.

In addition to the foregoing studies, numerous studies investigated how various factors affect innovation in companies. For instance, a study conducted by Seidler-de Alwis and Hartmann (2008) suggests that knowledge sharing helps develop successful innovation. Schneider and Veugelers (2010) argue that firms that combine newness, and high R&D intensity achieve significantly higher innovative sales than other innovative firms. Guo and Shi (2012) state that such factors as policy and law, social culture, finance, science, and technology have a significant impact on the growth of innovative SMEs. Arcari et al. (2016) argue that a managerial control system (MCS) can improve product and service innovation. Li et al. (2021) investigated the impact that intellectual capital (IC) and value creation have on a firm's performance. Finally, Azeem et al., (2021) hold that organisational culture and knowledge sharing appear to be major factors in driving organisational innovation.

The above studies suggest that although the world's most innovative companies have been explored from a variety of perspectives in the past, no text analytics has been performed on their mission statements to make a comparison with respect to their defining characteristics, attributes, goals, and visions. Consequently, in the following sections, we perform text analytics and report on our analysis.

3 Research method

This study utilises the data compiled and published by Boston Consulting Group on its website (BCG, 2021). BCG is a global management consulting firm founded in 1963 and headquartered in Boston, Massachusetts, USA. BCG states its mission is to "help businesses tackle their most important challenges and capture their greatest opportunities" (BCG, 2021).

According to its website, to produce the top 50 innovative company ranking, BCG used four variables: *global mindshare:* the number of votes from all innovation executives, *industry peer review:* the number of votes from executives in a company's industry, *industry disruption:* a diversity index to measure votes across industries and *value creation:* total share return.

Once the list of the most innovative companies published by BCG was retrieved, we then visited each company's website and copied its mission statement into a text file. If no mission statement was available, other similar statements such as a statement of purpose, vision, goal, and philosophy were retrieved and copied instead. The text file containing the mission statements was then analysed using both R and SAS Enterprise Miner to identify significant terms, clusters of words, and common themes without sifting through the entire document. Figure 1 illustrates the text analytics process utilised in this study.

R is an open-source data analysis environment. It has been widely used by data scientists across the globe to analyse data and generate high-end statistical graphics. SAS

Enterprise Miner is data mining software from the SAS Institute. It helps end-users quickly develop descriptive and predictive analytics models through a streamlined data mining process.

Figure 1   Text analytics process (see online version for colours)
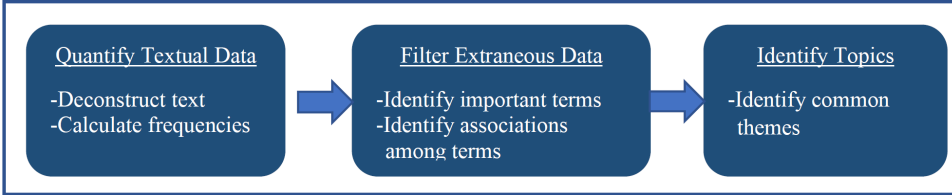
4   Data analysis and results

4.1   *Most innovative companies*

The most innovative companies produced by BCG are tabulated in Table 1. As seen, the list features some of the best-known technology companies such as Apple and Google as well as pharmaceutical companies such as Pfizer and Moderna that have done groundbreaking work during the COVID-19 pandemic.

Table 1   Most innovative companies

Most innovative companies				
Rank: 1–10	*Rank: 11–20*	*Rank: 21–30*	*Rank: 31–40*	*Rank: 41–50*
Apple	Siemens	Toyota	Xiaomi	Inditex
Alphabet	LG Electronics	SalesForce	Ikea	Moderna
Amazon	Facebook	Walmart	Fast Retailing	Philips
Microsoft	Alibaba	Nike	Adidas	Disney
Tesla	Oracle	Lenovo	Merck & Co.	Mitsubishi
Samsung	Dell	Tencent	Novartis	Comcast
IBM	Cisco Systems	Procter & Gamble	eBay	GE
Huawei	Target	Coca-Cola	PepsiCo	Roche
Sony	HP Inc.	Abbott Lab	Hyundai	AstraZeneca
Pfizer	Johnson & Johnson	Bosh	SAP	Bayer

Source: BCG (2021)

The most innovative companies were first classified by where they are headquartered. As seen in Table 2, as the largest economy in the world, the USA is home to the largest number of innovative companies followed by Germany. Although it's a major economic power, the UK is home to only one innovative company. Both China and Japan, significant economic powers, made the list with four innovative companies. No company from South America and Africa made the list.

Table 2   Most innovative companies by counry

Country	Count of company
USA	27
Germany	5
China	4
Japan	4
South Korea	3
Switzerland	2
Netherlands	2
Hong Kong	1
Spain	1
UK	1
Grand Total	50

The most innovative companies were also broken down by industry (Table 3). Companies in consumer goods and technology industries make up more than half the list, followed by ten companies in the healthcare industry, one of the largest industries in the USA.

Table 3   Innovative companies by industry

| Industry	Count of company
Consumer goods	16
Technology	16
Healthcare	10
Transport and energy	6
Media and telecomms	2
Grand total	50

4.2   Parsing the mission statements

Since the generated text file contains unstructured data, a series of analyses was performed to quantify information contained in the file to make sense of data and extract meaningful information from unstructured textual mission statement data.

The text file containing the mission statements was parsed using the text parsing node which allows one to quantify all terms in a given document. In other words, the purpose of text parsing is to eliminate parts of speech, getting rid of the superfluous parts of speech. It helps to break down the overall text file into smaller chunks and make the file more manageable. It then begins the process of allowing for statistical data to be collected about the text.

Using the text parsing node in SAS Enterprise Miner, the most frequently occurring terms in the mission statements were quantified and extracted. Figure 2 depicts the top ten most frequently appearing terms across the mission statements of the top fifty most

innovative companies. As seen, the terms 'life', 'world', 'people', 'create', and 'technology' are among the most commonly appearing terms across the mission statements. Scanning through these terms, one can draw simple conclusions about the content of the text file containing the mission statements. For instance, it may be inferred that the most innovative companies engage in creating new products and technology that help their customers and people improve their lives across the world. It may be further inferred that through their branded products and services these companies create and bring value to the lives of their customers.

Figure 2   Top ten most frequently occurring terms (see online version for colours)
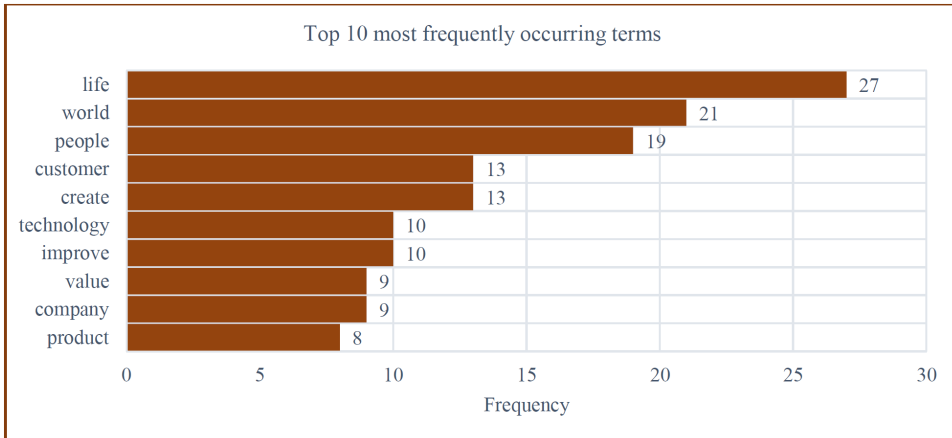
4.3   *Identifying the most important terms in the dataset*

It should be noted that the text parsing analysis does not take into account the weight or importance of the terms. In other words, just because a term is frequently used within the dataset does not mean it holds value or is necessarily important in terms of differentiating documents or mission statements. Consequently, the text filter node was utilised to identify the most important terms or words across the mission statements of the most innovative companies (Table 4).

A term in a text analytics analysis is considered important when that term appears many times in one specific area of a document as opposed to a term that appears many times throughout the document (Chakraborty et al., 2013). A term that occurs many times in a concentrated space holds more importance or weight than a term that appears sporadically, hence making the variable 'weight' our main focus in the text filter node. Take, for example, the terms 'society' and 'quality' in Table 4. They are not among the most frequently occurring terms depicted in Figure 2. However, they hold more importance than the terms depicted in Figure 2, thus offering us more valuable information than these insignificant terms.

Table 4   Most significant terms

Term	Role	Weight
Society	Noun	0.647
Live	Verb	0.647
Quality	Noun	0.647
Business	Noun	0.647
Power	Noun	0.647
Service	Noun	0.647
Achieve	Verb	0.647
Better	Adv	0.647
Develop	Verb	0.647
Future	Noun	0.647

The weight of the terms in a document collection is determined by TF-IDF, where

$$\text{TF: Term frequency} = \frac{d \text{ (number of documents containing a given term)}}{D \text{ (the size of the collection of documents)}}$$

IDF: Inverse document frequency IDF(t)

$$= \log\left(\frac{\text{Total number of documents}}{\text{Number of documents with term t in it}}\right).$$

The relative importance or weight of individual words in a document collection varies between zero (0) and one (1). Surprisingly, as tabulated in Table 4, the top ten most significant terms have the same weight of 0.647. Skimming through the mission statements, it appears that various innovative companies speak of *contributing to a better global society* (Samsung), *leading the future mobility society* (Toyota) and *development of society* (Mitsubishi).

4.4   Concept link diagram

Having identified the most significant terms, a concept link diagram was created to examine the relationships and associations among the most important terms tabulated in table 4. By analysing some of these connections, valuable information can be derived and studied to determine the best features of the most innovative companies. The concept link graph enables the ability to see terms and their linkage to other terms of varying importance. The lines coming off of the central term indicate words most commonly associated with terms that have the highest weights/importance. The thicker the line is between the word being analysed and a connecting word, the more often the two are associated with one another.

As illustrated in Figure 3, one of the most important terms in the mission statements document is the term 'society', which has a strong association with the term 'service' as indicated by the thickness of the line connecting the two terms. The term 'society' also has significant associations with the terms 'value', 'product', 'company', 'create', 'life', and 'world'. Figure 3 was further expanded. As seen, the term 'value' has a strong association with the terms 'develop', and 'achieve'. Similarly, the terms that have the strongest relationship and association with the term 'service' are the terms 'customer' and 'experience'.

Figure 3   Concept link diagram (see online version for colours)
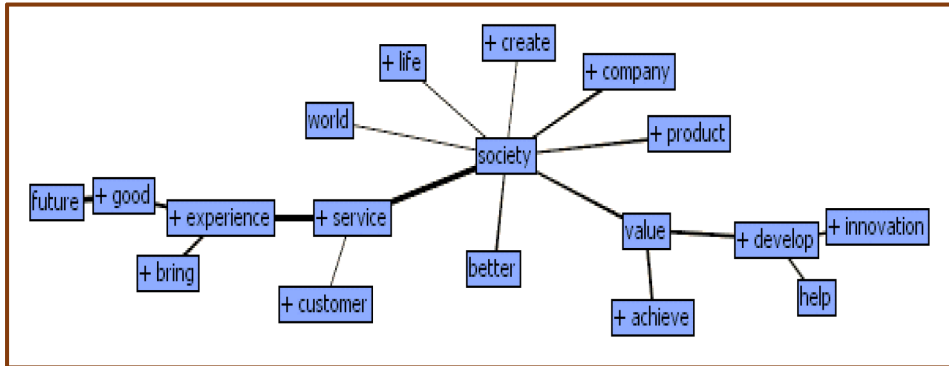
As pointed out before, some of the most innovative companies analysed in this study in their mission statements speak of *contributing to a better global society* (Samsung), *making positive contributions to the sustainable development of our society* (Mitsubishi), *leading the future mobility society* (Toyota) and *growing in unity with society* (Fast Retailing). Similarly, several companies surveyed in this study allude to *providing products and services of superior quality* (Proctor & Gamble), *providing product and service excellence* (Mitsubishi), and *creating superior product and services* (Samsung).

4.5   Cluster analysis

In addition to identifying the terms with the highest significance, a cluster analysis was performed which groups terms into clusters to illustrate relationships and to give an idea of what terms will yield significant information regarding the mission statement analysis. Clustering is useful in textual data analysis as it breaks down large datasets into clusters that allow one to easily identify common themes through their shared descriptive terms.

Table 5 summarises the clusters generated in this analysis. Clusters 1 and 3, the two largest clusters, appear to have descriptive terms focusing on creating technology that improves and makes people's lives better, bringing the best experience to customers, giving people the power to build communities, and providing customers with quality products. Cluster 5, the third-largest cluster, essentially speaks of creating a better future for customers, bringing added value to the lives of consumers, and empowering companies. Finally, cluster 4, which is the smallest cluster, includes descriptive terms focusing on creating technology to make customers' lives better, providing customers with quality products, and empowering people to achieve more.

Table 5 Cluster analysis of the mission statements

Cluster ID	Descriptive terms	%
1	Creates people better + create communities experiences technologies + technology + life + achieve	0.27
2	Experience services + customer + service experiences best bringing quality society products	0.16
3	Bring + good people + improve + innovation lives world help power + community	0.27
4	Achieving + create + technology + achieve + community quality products + life customers better	0.08
5	Live companies creating + company value business future customers power + achieve	0.22

5 Discussions and conclusions

Large volumes of unstructured textual data can be transformed and translated into structured data which then can be analysed using various software applications to determine patterns and trends and to extract meaningful insights.

Aided by both R and SAS Enterprise Miner, in this study we performed text analytics on the mission statements of the most innovative companies ranked by Boston Consulting Group. Valuable information was extracted through classifying, clustering, and visualising the most frequently appearing and significant terms found across the mission statement of the most innovative companies.

While the terms such as 'life', 'improve', 'world', and 'people', are among the most commonly appearing terms across the mission statements, the terms 'society', 'service', and 'quality' are among some of the terms holding significance for the most innovative companies.

Cluster analysis yielded that the most innovative companies appear to have descriptive terms centring around creating technology that improves and makes people's lives better, bringing the best experience to customers, giving people the power to build communities, and providing customers with quality products. In addition, in their mission statements, they allude to creating a better future for customers, bringing added value to the lives of consumers, and empowering companies. Finally, in their mission statements, they include descriptive terms focusing on empowering people to achieve more. Taking a holistic view, it appears that the most innovative companies focus on creating technology that improves peoples' lives and serves society through empowering people.

One would agree that innovation is a must to achieve sustained economic growth and prosperity. In other words, for a business to establish itself as a leader in its industry, it must understand what it takes to be innovative. Consequently, this study may be used as a frame of reference by those who would like to have a better understanding of what common attributes and characteristics the most innovative companies share. Additionally, decision makers and executives who are in charge of various companies operating in different industries may want to use the results of this study to engage in self-examination with respect to where they stand in comparison with the most innovative companies explored and analysed in this study.

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