Junior Management Science

How Do Companies Communicate Sustainability: A Semantic Analysis of German Automotive Manufacturers

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Abstract

CSR is increasingly becoming an integral part of a company´s business operation. To successfully implement a CSR strategy, companies must address their CSR actions to their stakeholders. This paper examines how companies communicate sustainability to their stakeholders through various communication channels. This paper supports the novel strand of research applying computer-aided quantitative analysis methods as an alternative to qualitative methods, commonly used in business ethics and sustainability research. With the application of a latent semantic analysis, four automotive companies were examined for their sustainability communication. The paper offers new insights into the use of different communication channels, highlighting that companies address specific aspects of their CSR actions depending on what stakeholder group they want to address.

Keywords: communication channels; computer-aided quantitative analysis; CSR; latent semantic analysis; sustainability; triple bottom line

1. Introduction

Since the early 1990s, researchers and economists have called upon a new way of conducting business. Leaders should pursue to create not only economic value but also environmental and social value, therefore, making sustainability a main goal for businesses (Beal et al., 2017). Nowadays, sustainable development is considered integral to business operations (Schaltegger & Burritt, 2018). This shift has been attributed to two factors by prior research studies. For one, economic forces drive companies to increase profitability and improve their brand value. By implementing voluntary social and environmental activities, in form of corporate social responsibility actions (CSR), into a company's business strategy, companies can reduce manufacturing costs, lower operating risks, and build trust and customer loyalty (Kang et al., 2016; Russo-Spena et al., 2018). Moreover, stakeholders such as regulators, customers, and shareholders are becoming increasingly more attuned to sustainability topics. And further, are placing more pressure on companies to address challenges that come with it such as climate change and economic inclusion (Beal et al., 2017; Marcelino-Sádaba et al., 2015). Hence, stakeholder management and communication play a crucial role for a successful implementation of sustainable development strategies. By communicating their commitment and actions in a transparent and truthful manner, companies can mitigate legitimacy threats and establish a clear brand identity.

As researchers and companies recognize the importance of sustainability communication, multiple studies have been conducted on CSR disclosures and their impact on financial performance (Du et al., 2010; Miller et al., 2020), as well as the motivation behind sustainable development actions (Russo-Spena et al., 2018). Although there has been research conducted on CSR communication, most analyze one single channel, e.g., CSR reporting (Du et al., 2010; Mann et al.,

2021) or social media (K. Lee et al., 2013), while very few include both channels. Moreover, hardly any apply quantitative methods. Lock and Seele (2016) point out that there is a need to apply quantitative content analysis to the field of business ethics and CSR. This is because these fields traditionally use human-encoding and judgmental text interpretations which are more exposed to bias. Further, the context can only be represented on a one-dimensional level. Besides that, less than a handful of studies (Kountouri et al., 2019; Liao et al., 2018; Lock & Seele, 2016) include a computer-aided textual analysis.

However, the three previously mentioned studies focus on just one communication channel. This thesis addresses that gap by applying a latent semantic analysis (LSA), a computer-aided methodology for textual analysis, to assess how companies use different channels to communicate sustainability to different stakeholders. The use of LSA allows statistical text theme extraction while minimizing the risk of bias judgement. Through LSA but more so because this study emphasizes three channels, namely financial and non-financial disclosures (NFD), and social media, this thesis provides new insights about sustainability communication for multiple stakeholders. This thesis assesses four automotive companies on how they communicate their sustainable development actions to various stakeholders (shareholders, customers, and legislation) and compares them to each other.

The research offers new insights into the sustainability communication of companies. The findings indicate that companies emphasize different aspects of the triple bottom line framework (Elkington, 1998) when addressing specific shareholders. More so, the results highlight that companies must find a way to communicate all three aspects of the TBL in each channel. Selective disclosure as it has been observed in this research could lead to stakeholders perceiving the companies' communication as a greenwashing strategy. This could have grave implications for their brands and lead to reputational damages.

Furthermore, contributes this study to prior research that apply quantitative methods to the fields of business ethics and sustainability. It highlights that computer-aided quantitative textual analyses can be successfully applied to these fields of research and can be used as an alternative to traditional human-encoded methods which are more prone to bias interpretations of data.

The research paper is structured as follows: after outlining important aspects and frameworks behind sustainable developments and sustainability communication, the methodology section will provide specifics about the sample collection. Additionally, the data analysis process will be explained as well as how the outputs of LSA were interpreted. Following, the results will be discussed and interpreted. Lastly, the conclusion present theoretical, practical and policy implications together with limitations of the study and an outlook for future research.

2. Theoretical Background

2.1. Firms, Sustainability and Business Performance

2.1.1. The Triple Bottom Line

Sustainability is described as development that meets today's needs while preserving the future of coming generations and their chance to meet their own needs (United Nations, 2015). The triple bottom line (TBL) or 3Ps (People, Planet, Profit) is a framework coined by Elkington (1998) that was designed to include social and environmental dimensions into the previously finance-focused metrics of business performance (Elkington, 1998; Loviscek, 2020). It thereby indicates that companies must conform to societal expectations, minimize their negative environmental impacts, and maintain economic profitability. It is paramount for companies to balance all three pillars and pursue all three goals simultaneously to truly achieve sustainable development (Elkington, 1998; Lock & Araujo, 2020; Mish & Scammon, 2010; Sanchez-Chaparro et al., 2022). In terms of the social dimension, companies must build social capital by establishing long-term relationships with various stakeholders (Mann et al., 2021). Social capital entails improving lives and the community through fair treatment, implementing welfare policies, and providing educational opportunities for stakeholders and society. To further environmental goals, companies must secure as well as expand natural capital by not endangering the planet and minimizing the impact of its business operations on the environment. For instance, this could be in form of protecting land, air and water and using sustainable materials, products, or renewable energy. Lastly, goals of the economic dimension include the overall economic growth of the company and society, improving brand image and sales along with reducing production costs (Elkington, 1998; Mann et al., 2021). Although it is imperative to strike a balance between the three dimensions, they can be conflicting since stakeholders place varying weight on priorities at times (Goh et al., 2020; Mann et al., 2021). Past research shows that companies occasionally neglect environmental and societal aspects for the sake of economic opportunities because the financial outcomes can be better quantified and to maintain the company's positive, short-term cashflows (Elkington, 2018). To overcome frictions, companies must embrace and even take advantage of them by creating synergies that could enable sustainable development. These synergies and more importantly sustainable development can be achieved by establishing long-term partnerships, knowledge sharing, and conjointly founded solutions by private and public sectors, groups of main interest, and companies along the supply chain (Goh et al., 2020; Loviscek, 2020; Mann et al., 2021). This highlights that the TBL is a qualified framework to drive positive change as it evaluates social, environmental, and economic impacts across various stakeholders, e.g., community and legislation (Mann et al., 2021; Shinkle & Spencer, 2012).

2.1.2. Corporate Social Responsibility

When companies engage in corporate social (CS) activities they comply with societal rules, statutory regulations, and policies concerning social issue e.g., human rights or the environment. Notably, these policies only require companies to achieve the minimum standard of compliance which can be monitored through audits, fines for noncompliance or reports (Miller et al., 2020). Companies may voluntarily choose to exceed the obligated CS requirements and commit to further sustainable development that considers the interest of all stakeholders within and outside the business operations (Funk, 2003; Homburg et al., 2013; Raghubir et al., 2010; Wolff et al., 2020). This constitutes corporate social responsibility. At

the core of CSR lies the TBL framework. Hence, all CSR actions taken by the firm must reflect the three pillars of the TBL (Lock & Araujo, 2020). Typical for firms undertaking CSR actions is implementing sustainability management which is outlined by e.g., life-cycle assessments, sustainability reports, cleaner production measures, dialogue-based management and redesign of products with more sustainable alternatives (Schaltegger & Burritt, 2018). The United Nations Global Compact define six steps for companies for sustainable development strategies: commit, assess, define, implement, measure and communicate sustainability targets. (United Nations Global Compact et al., 2019).

2.1.3. Impact of Sustainability on Business Performance

Over the years there has been an increase in CSR activities and philanthropic engagement (Homburg et al., 2013; Schaltegger & Burritt, 2018). Around 90 percent of Fortune 500 companies have executives and departments solely dedicated to CSR (Homburg et al., 2013). Prior research has shown that sustainable actions have a beneficial long-term effect on the company value and secure a competitive advantage since it can decrease manufacturing costs, build a positive reputation which aids crisis management and attract talent (Du et al., 2010; Miller et al., 2020; Sanchez-Chaparro et al., 2022). Key drivers for this change are the pressure stakeholders placed on firms along with reputation management and the pursuit of shareholder value growth (Cone Communications, 2017; Cone Communications, & Ebiquity, 2015; Sanchez-Chaparro et al., 2022). Consumers expect companies to produce high quality products and services while simultaneously pursuing societal and environmental values. Moreover, they are demanding improvements in business practices and for companies to address social matters drive positive change (Miles & Covin, 2000). If companies can manage to conform to their expectations they can gain the consumer's trust which in turn can increase buyers intent, in addition to higher willingness to pay, and positively influence the overall attitude towards their business (Klein & Dawar, 2004; Sanchez-Chaparro et al., 2022). Should companies fail to even meet CS standards, consumers go as far as to boycotting the company altogether (Cone Communications, & Ebiquity, 2015; Porter & Kramer, 2006). Thus, stakeholder management is crucial for successful sustainable

development. At times it can be challenging as integrating all stakeholder interests requires compromises between the groups that could potentially lead to greenwashing strategies to appease all parties involved (Engert et al., 2016; Sukitsch et al., 2015).

Whenever new policies concerning CS are introduced by the legislation, companies need to find new ways to incorporate them into their business strategy. More so, government agencies and strategic partners evaluate companies by their rating and brand value when considering alliances. Companies can improve their rating by engaging in CSR activities. Hence, it is crucial for companies to integrate sustainable actions into their operations (Kang et al., 2016; Miller et al., 2020).

In addition to consumers and legislation, shareholders play a significant role when it comes to CSR. Considering that CSR activities increase brand value, shareholders are strongly invested in advancing sustainable development as an increase in brand value leads to an increase in shareholder value. (Miller et al., 2020; Mishra & Modi, 2016).

Despite CSR possibly bringing in negative temporary cashflows, CSR shapes a company's brand positioning and corporate identity, legitimizes their existence claim and overall increases their profitability long-term (Mann et al., 2021; Shinkle & Spencer, 2012).

2.1.4. Sustainable Development in the Automotive Industry

Hitherto the automotive industry has had a considerably ambiguous relationship to sustainability (Shinkle & Spencer, 2012). This is owed to their significant impact on carbon emissions due to their value-adding activities, their customer's use of their products but also their possible positive influence on economic development (Cone Communications, 2017; Mayyas et al., 2012; Shinkle & Spencer, 2012). With global warming and resource depletion, the industry faces one of its greatest challenges. Therefore, they must modify their modus operandi to meet policy makers demands on reducing greenhouse gas emissions and environmental protection but more importantly conform to societal expectations (Sukitsch et al., 2015). This is imperative as the automotive industry is under the highest scrutiny for sustainable development as it is one of the highest CO_2 producers (Wolff et al., 2020). In fact, a strategic reorientation can support their moral legitimacy and reputation. Additionally, willingly implementing CSR strategies can reduce threats of regulation imposed on the automotive industry (Russo-Spena et al., 2018).

It is important to mention that the automotive industry holds a major influence on sustainable development, having value chains that reach and connect multiple regions. If committed the industry could become a key driver in advancing sustainable development and reshape its reputation (Mayyas et al., 2012; Wolff et al., 2020).

2.2. Sustainability Marketing
2.2.1. Functions of Sustainability Marketing

As stakeholders' interest in CSR activities is growing and sustainability is becoming crucial for business survival, financial performance and overall a company's corporate identity (Du et al., 2010; Mann et al., 2021; Miles & Covin, 2000), transparency and credibility are key for CSR (Cone Communications, 2017). To achieve that, companies utilize sustainability marketing and public communication. Both tools lead to higher brand visibility, enhanced reputation, and trust which in turn builds credibility for CSR actions (Becker-Olsen et al., 2011; Mann et al., 2021; Miles & Covin, 2000; Raghubir et al., 2010). More so, the reputational advantages of authentic CSR and sustainability communication are vital to create long-term brand value (Mish & Scammon, 2010). When companies share their actions and points of view on social issues, they can gain the customer's support and even increase chances of customers switching to their brand and their willingness to pay (Mann et al., 2021; Sanchez-Chaparro et al., 2022). Likewise, sustainability communication is as equally important for shareholders and government regulators as it is for customers. Authentic CSR reporting leads to higher ratings which reduces perceived risks that can result in favorable discount rates and increases shareholder value. Additionally, it can minimize regulatory compliance activity and build long-term relationships with government regulators that allow them to contribute to developing new environmental regulations and receive concessions (Mann et al., 2021). Being able to get involved in new policies is highly relevant since government policies can shift consumers environmental behaviors (Kalamas et al., 2014; Minton et al., 2012).

As illustrated, sustainability marketing and communication are essential to building stakeholder trust and performance. Both must be authentic and truly reflect the company's image. Otherwise, it could raise skepticism among stakeholders and companies could run the risk of damaging their reputation.

There have been scandals such as the Volkswagen Dieselgate, where companies make use of deceptive communication (Kang et al., 2016; Siano et al., 2017). Siano et al. (2017) describe it as a new form of greenwashing. Consequently, it is when companies deliberately promote promising sustainable projects with no support and make false claims that they are not able to carry out (Porter & Kramer, 2006; Siano et al., 2017). This can be in form of selective or inaccurate disclosures and incomplete comparisons. Companies may resort to these strategies as it can be challenging to pursue all stakeholder interests simultaneously at times. Regardless, they must advert from these strategies as it could them at risk of severely damaging their reputation that they might not recover from. For example after the Dieselgate got public VW's stocks crashed one day by 22% (Li et al., 2018).

2.2.2. Channels of Sustainability Communication

To build stakeholder trust and achieve effective communication, companies need to directly engage with stakeholders.

Financial disclosures and NFDs are integral tools for companies to report their actions and are considered as standardized frameworks for accountability (Kountouri et al., 2019). Prior research indicates that one of the most effective ways to communicate a company's CSR actions is through their sustainability reports which are usually independent from the company's annual reports (Lock & Seele, 2016). They provide additional information to stakeholders about the company's actions aside from their financial performance. If utilized responsibly, NFDs can facilitate building up a company's moral legitimacy and help gaining stakeholders' trust.

Aside from the traditional sustainability communication instruments, are companies using new media platforms like Twitter to engage with stakeholders and disclose CSR actions. Specifically, consumers are drawing information from social medial (SM) platforms. This is due to information being more accessible on SM platforms as well as less complex to comprehend (Lock & Araujo, 2020). Additionally, it gives consumers the opportunity to voice their opinions and directly address concerns to companies (S. Lee & Cho, 2011). From the company's perspective, do SM platforms enable dialogue and connecting with consumers on a personal level (K. Lee et al., 2013). In particular does the platform Twitter allow two things: connecting with consumers in form of bidirectional sharing and mass broadcasting. If companies succeed at this form of communication, it allows them to restore the consumer's trust after scandals and rebuild or improve their reputation.

To what degree SM platforms are effective to communicate with consumers depends on culture and consumer behavior (Minton et al., 2012). Minton et al. (2012) research reveals that SM use among consumers and their attitude towards sustainability varies between cultures. More so they suggest that sustainability marketing should acknowledge these differences in locations to successfully communicate sustainability to consumers.

3. Methodology

This research takes form of a latent semantic analysis (LSA) conducted with the program Python. LSA, a computer-aided topic modeling method, is a natural language processing technique that enables the identification of relationships between a set of documents as well as between terms within them (Kountouri et al., 2019). Namely, LSA highlights underlying conceptual meanings by uncovering similarities and differences in term and phrase usage. Thus, it produces textual themes in data (Deerwester et al., 1990). Hence, LSA overcomes problems of polysemy (a words having multiple meanings) and synonymy (multiple words sharing the same meaning).

By applying LSA, one can reduce the risk of bias related to subjective interpretation since no human coding concerning the topic themes is necessary. Hence, computer-aided identified themes are more reliable without having to predetermine categories of interest.

There has been broad use of quantitative content analysis ranging from automated essay grading to fields of medical or financial analyses, which shows how beneficial this application is for a vast array of fields of research. However, this has rarely been applied to the field of business ethics and sustainability (Lock & Seele, 2016). Kountouri et al. (2019) research of CSR is one of a few that proves that LSA can successfully be used as a tool for textual analysis.

The study focuses its analysis solely on the automotive industry. This industry was selected for multiple reasons. For one, external communication is becoming essential for companies in view of economic challenges like climate change mitigation and resource depletion. (Mayyas et al., 2012; Russo-Spena et al., 2018; Wolff et al., 2020). Secondly, their operations and strategic relations stretch around the entire globe. With their far-reaching value chains, they have the ability to influence sustainable development of entire regions.

For this study, particularly to facilitate the analysis, the assumption of designated communication channels for specific stakeholders has been made. Therefore, official reports, e.g., annual reports, are analyzed for shareholder and legislator communication and social media as a communication channel for consumers.

Additionally, this study includes a cross-country (UK and USA) component for the consumer analysis since consumer behavior and their sentiment towards sustainability depend on culture (Minton et al., 2012). Hence, it is of interest to examine if sustainability focuses vary within the consumer communication.

3.1. Data Collection

Data from the past three years was collected from four German automotive companies: Mercedes Benz, Audi, BMW, and Volkswagen. Since no complete reports of the year 2022 have been released yet, the time period was set from 2019 to 2021 . There are various reasons for the selection of the timeframe and sampled companies. Firstly, it is of interest to examine if CSR communication changed throughout the years. Secondly, the chosen companies have been selected due to their dominance in the automotive industry, especially in Germany. Data was only extracted from their official pages. These include annual reports, CSR reports, NFDs, and posts Twitter (see Table 1). In total, the sample consisted of 71 disclosures and 45302 Twitter posts. Moreover, two data sets, one from the United Kingdom (UK)and the other from the USA (US), were collected for each company's communication through Twitter. This cross-country examination was conducted as past research shows that cultural differences are reflected in consumer behavior (Becker-Olsen et al., 2011). For example, do consumers place different weighing on environmentally friendly goods. Hence, this research assumes that sustainability content might differ, depending on what region the company wants to reach.

3.2. Data Analysis

This section provides a description of the necessary steps of a LSA. Further, section 3.2.3 explains how the outputs were interpreted. All detailed Python code sheets as well as the outputs can be found in the appendix (see A1).

3.2.1. Preprocessing Data

The analysis was conducted using the software Python. Before applying LSA, the data was cleaned and prepared. First, all text from reports, annual reports, CSR reports and NFDs, was extracted and compiled into text (txt.) file format to analyze them in Python. The same process was done for social media posts. For the next steps the "nltk" package was applied, which is a natural language processing package that enables natural language processing analyses with Python, to clean text files (corpus) for further analysis. This cleaning process encompassed the following steps:

1. All text formatting was removed. This includes pronunciation, special characters, capitalization, and digits.

2. The text was tokenized into small units with "nltk.tokenize". Thus, the corpus was split into single terms which was important to classify the terms later on into topic themes.

3. From the tokenized data, all stop words were eliminated. Stop words are defined as terms that do not contribute to the underlying context of the corpus or do not hold any value. They function as neutral values. Additionally, all words that are extremely common were removed as well. Stop words typically entail names, articles, prepositions, days, weeks, months, and pronouns, e.g., she, hers, Friday. The complete stop words list can be found in the digital appendix (see A15).

4. Next, the text was stemmed, which is the process of finding the root of a word, with Porter's algorithm. The goal of stemming is to reduce derivationally related forms of a word to a base form. As an example, words cat, cats, cat's, and cats' would be returned to cat. Porter's algorithm is made up of five phases of word reduction. To visualize it, this would mean sses would become ss, ies to i, ss to ss and s would be eliminated. For example:

   - sses: caresses = caress
   - ies: ponies = poni
   - ss: caress = cares
   - s: cats = cat

5. In addition to stemming, lemmatization was applied to reduce inflectional related forms of a lemma. Lemmatization is a process of finding the form related of the related word in the dictionary. For example, with the tool "WordNetLemmatize" the token "wrote" would be returned to "write".

Table 1: Data sample

Company	Annual report	Sustainability report	Disclosures	Twitter (USA)	Twitter (UK)	Total
Audi	3	3	19	6482	3712	10219
Volkswagen Group	3	3	11	1071	6517	7605
Mercedes-Benz	3	3	15	5418	6673	12112
BMW	3	3	6	4718	6213	10942
Total	12	12	51	17689	23115	40879

3.2.2. The LSA Algorithm

The algorithm starts with employing the preprocessed data (d = number of compile files, with i = report) as the $[t_i \times 1]$ term-frequency vector. Each element of the vector is equal to how often the unique term was used in the document. The elements are calculated as the number of occurrences of the term divided by the total number of terms of the document. This term-frequency vector is applied since it is understood that if a word is more frequently used in a text, it should contribute more to the content and meaning of given text.

The term-frequency vectors are linked together afterwards. Therefore, common terms were only maintained once they formed the following matrix:

$$t \times d \tag{1}$$

where $t = \max\{t_i\}$, $i = 1, \ldots, d$ is the number of unique terms across the corpus.

Consequently, the rows of the matrix represent each unique term in the corpus and the columns represent each data sample. The frequency rates of every unique term make up the elements of the matrix. The term-document matrix (X) was built by reducing the elements by subtracting the corresponding row mean.

The process models each data sample in vector-space. Hence, each data set was decomposed into a simple vector of unique term frequencies. By applying singular value decomposition, LSA sets itself apart from regular word counting and ranking. Singular value composition reduces the dimensions of the matrix. This is also called noise reduction. Since polysemy and synonymy basically provide the same underlying information, more unique terms will be present. Singular value composition eliminates that noise and henceforth extracts the main underlying textual themes within a text. The themes are extracted from the covariances between the term frequencies of a text. Singular value composition therefore breaks the term-document value down into

$$X_{t \times d} = U_{t \times d} \times S_{d \times d} \times V_{d \times d}^t \tag{2}$$

U is the contribution of each unique word to the themes. The V columns are the principal values of X, which are defined as the contribution of each theme to each document. Lastly, S describes the matrix of singular values. With this matrix, it is possible to extrapolate the importance of each theme to the text corpus in decreasing order. Figure 1 visualizes the above-mentioned function of singular value decomposition.

For the LSA algorithm the "genism" package available for Python was used. This package enabled to model LSA.

3.2.3. Interpretation and Evaluation of Themes

After retrieving the topics from LSA, the topics were evaluated and interpreted by the terms connected to each topic. For this interpretation it is important to mention that the positive values for each term do not necessarily mean that they have a positive or negative attachment to the topic. The values are determined by the vector of the SVD matrix. Since vectors can be both negative or positive, this means that the values of the terms are either positive or negative depending on the vector. The importance lies in considering the absolute value of each term. The higher the value the stronger the importance of the term to the underlying meaning of the text context.

After retrieving the theme topics or main trends of the LSA model, the topics were interpreted and evaluated by classifying them into the three categories: economic, environmental, and social. These categories are rooted in the triple bottom line framework by (Elkington, 1998). The topic classification was executed for each of the three stakeholders of the respective companies. As discussed in Section 2.1.1, the core of the TBL lies in striking a balance between the three pillars to achieve sustainable development. Rightfully so, the companies were assessed by how balanced the topics for each of their stakeholder communication channels were distributed across the three categories. Therefore, more evenly distributed topics for each channel, imply a higher degree of successful sustainability communication.

It is important to note that negative or positive coefficients in the LSA decomposition are not necessarily meaning negative or positive attachment to a topic since the basis can also have negative vectors. What is true is that a higher absolute value usually means a stronger relationship with the corresponding vector. Therefore, the term adds more value to the context of the content.

4. Results

4.1. Shareholders

This section will highlight the most important findings of the LSA analysis. As mentioned, each theme was classified
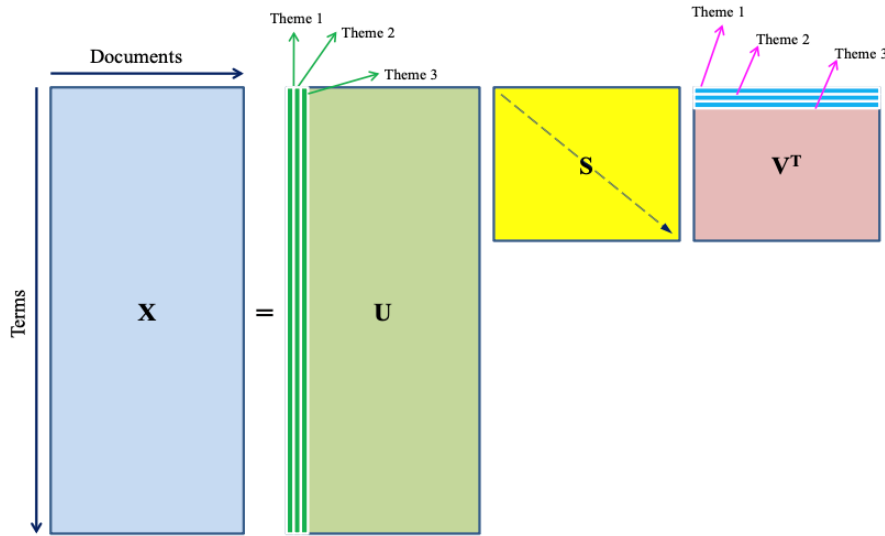
Figure 1: Singular value decomposition (retrieved from Kountouri et al. (2019))

into the three categories "economic", "environmental" and "social" by evaluation and interpreting the 50 terms and their values that comprise each topic. The following sections will highlight the most important findings for each stakeholder for each channel of the respective companies and summarize the topics in a comprehensive manner. For further insights please refer to section A3-A14 of the appendix which includes tables with all topic themes including five terms with the highest value. The list with all terms that were used for interpretation is available in the digital appendix (see A15).

The sample for shareholders consisted of the companies' annual reports from the years 2019 to 2021. The average annual report comprised about 320 pages.

As one can see, Audi has the most fluctuation in length, this is due to the fact that Audi changed its format from 2020 to 2021 from vertical to horizontal which allows more space. Furthermore, it is to mention that as of 2020 Audi combined their annual report with their sustainable report. Generally, Table 2 shows that all companies release annual reports of similar length with BMW scoring the highest page average of 368 and Audi the lowest with 274.

4.1.1. Mercedes-Benz

The coherence value (CV), which indicates how many topics are needed to explain the underlaying context of a text (Table 3), determined 18 topic themes. From the 18 topics, 16 were identified under the economic aspect with two falling under the environmental classification. Therefore, about 89% of the annual reports of Mercedes-Benz report on economic aspects and economic performance. The majority of environmental topics outline the themes financial performance compliance and reporting, and market value. Additionally, from Table 3 one can identify that the most frequently listed terms were "finance". "statement" "manage", "busi" (meaning business, which was shortened due to the

stemming tool) and "market" for environment but also in total. To understand, how the topics were interpretated into themes and then classified into topics the following demonstrates an exemplary interpretation using the 10th highest terms of topic 1.

Example:

Topic 1: 0.768*"finance" 0.417*"statement", 0.414*"consolid" 0.156*"note" 0.075*"manag" 0.071*"risk" 0.066*"asset" 0.059*"servic" 0.057*"instrument" 0.047*"liabil" 0.043*"posit"

All terms are components of a balance sheet that are used to evaluate a company's financial performance. Hence, the theme for topic 1 would be labelled under "financial performance" which then will be classified under the economic aspect of the TBL since the financial performance focuses on e.g., investment returns, liquidity and revenue.

When addressing environmental aspects, Mercedes primary objective lies in reducing carbon emissions and supply chain changes and/or management. Interesting to mention is that these terms are listed in combination with compliance. Thus, it is difficult to determine if these fall under CR or CSR actions. More so, no topic with social aspects could be identified

4.1.2. Audi

Through the LSA analysis three topics were identified. The determined topics were classified into the economic and social categories, with two belonging to the former. One of them comprises financial performance with terms including "asset", "liabil", "statement", "instrument" and "risk". The other was identified as business reorientation with terms like "risk", "manage", "opportunity", "market" and "product". This can be interpreted as development in new products that can lead to capturing higher market value. Lastly, the topic concerning social aspects includes "vote", "right", "law", "exceed"

Table 2: Annual reports

Company	2019	2020	2021	Average
Mercedes-Benz	350	267	348	322
Audi	274	381	138	264
Volkswagen	354	342	398	365
BMW	368	262	353	398

Table 3: Mercedes-Benz shareholders: topic themes

	Economic	Environmental
Terms with high frequency	"finance", "statement", "manage", "busi", "market"	"carbon", "emiss", "market", "vehicle", sustain"
Themes	Financial performance, reporting, compliance	Carbon emission, change in supply chain
Number of topics	16 (88,9%)	2 (11,1%)

and "human". This was understood as integrating different stakeholders and exceeding laws and policies which include human rights. Since the social aspects are defined as actions contributing to the community, this topic was classified as social. For better visualization Table 4 summarizes these findings, indicating the identified themes, the highest value terms and number of topics with overall percentage.

4.1.3. Volkswagen

Results for Volkswagen show a CV of 13 and correspondingly 13 topic themes. All 13 themes were identified as part of the economic class. Like the companies above, financial performance was one of the most often identified themes, in total 7 out of 13 times. Frequent terms being "finaci", "hedg", "risk", "asset","statement", "tax" and "market".

Further the themes sales, market and brand value, and product/ car development were identified (see Table 5). They were both identified by two topics. Terms for sales include "sale", "market", "commerci", and "vehicl". The terms"Brand", "market", "credit" were interpreted for brand and market value. The two topics outlining car development contained the terms "car","vehicle", "develop", "passeng", and "chang".

4.1.4. BMW

For BMW, the CV indicated a topic number of 24. 17 were classified under the economic aspect and 11 under environmental with none being identified as social. Four of these topics (topic 3, 4, 15 and 21) overlapping. The overlapping topics mainly outline how environmental measures such as reduction in carbon emission in car development or sustainable resource (topic 3, 15) use, impact BMW's financial performance. Again, results show that financial performance is the most frequent theme, with four topics (topic 1, 7, 9, 10) being identified as such. Most frequent themes for the environmental category are sustainable supply chain (2 topics) and development of sustainable cars/ products. Interestingly, more diverse themes were found, ranging from carbon emission footprint of production (topic 11) to alliances and joint ventures (topic 13). This is because a wider variety of terms

was detected by the LSA. Table 6 shows the most frequent terms that were determined through the LSA.

4.1.5. Cross-company comparison

As results showed, none of the companies' annual reports reflect all three aspects of the triple bottom line. Volkswagen showed the lowest performance by only representing the economic aspect in their annual report (see Table 7). The only company that had at least one theme classified as social is Audi. On the other hand, Mercedes-Benz and BMW show themes in the environmental category. Although, it is important to mention that BMW demonstrate more balanced results with 45,8% of its overall topics being classified as environmental compared to Mercedes' 11,1%.

4.2. Legislation

In this section, results for sustainability reports and other NFDs are shown which are considered for the analysis of the communication between legislation and the respective companies. Overall, the average sustainability report is about 159 pages long. As seen in Table 7, from all companies Mercedes has the lengthiest reports with an average of 232 and BMW the shortest with about 87 pages. Notably, Volkswagen has been the most consistent in report length averaging with 103 pages.

4.2.1. Mercedes-Benz

Three topics were defined by the CV. Two of them (topic 1 and 3) were classified as environmental aspects of the TBL (see Table 8). The first one contains terms such as "sustain", "manage", "protect", "human", "emiss" and "environment" and thus, was categorized as sustainability management and environmental action within the business operation. Topic 3 includes terms like "manage", "emiss", "product", "sustain", "material and "vehicle" which was outlined as the theme development of environmental-friendly products. Lastly, Topic 2 was classified under the aspect social outlining the theme employee protection and work environment. Terms included are "sustain", "manage", "employee", "human", "train" and "protection".

Table 4: Audi shareholders: topic themes

	Economic	Social
Highest value terms	"fianci", "statement", "product", "asset", "risk"	"vote", "right", "amount", "attribute", "law"
Identified theme	Financial performance,	Policies/stakeholder integration
Number of topics	2(66,7%)	1(33,3%)

Table 5: Volkswagen shareholders: topic themes

Financial performance (topic 1-3, 5, 8, 10, 12)	"financi", "asset", "statement", "hedge", "consolid",
Brand and market value (topic 5, 11)	"brand", "market", "vehicle",
Sales (topic 4, 9)	"sale", "manage", "revenue", "market"
Car / product development (topic 7, 13)	"car", "vehicle", "develop", "passeng",

Table 6: BMW shareholders: topic themes

	Economic	Environmental
Terms with high frequency	"finance", "statement", "asset", "busi", "market", "risk"	"carbon", "emiss", "market", "service"," vehicle", sustain", "develop"
Most frequent themes	Financial performance, reporting, compliance	Carbon emission reduction/ compliance, change in supply chain, product development
Number of topics	17 (54,2% single; 70,8% incl. overlapping themes)	11 (29,2% single, 45,8% incl. overlapping themes)
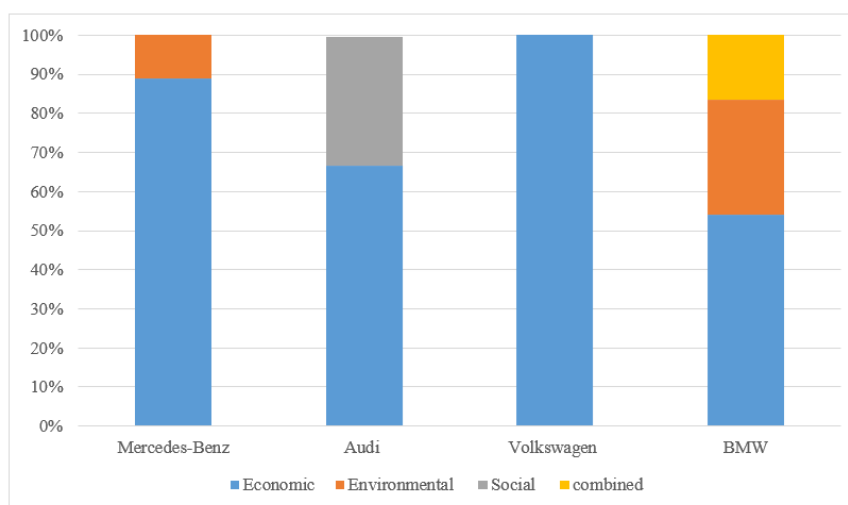
Figure 2: Cross-company comparison of shareholder communication

Table 7: Sustainability reports

Company	2019	2020	2021	Average
Mercedes-Benz	205	193	298	232
Audi	127	381	139	215
Volkswagen	100	97	111	103
BMW	142	74	45	87

4.2.2. Audi

With a CV of 13, four topics (topic 2-4, 8) were classified as social, another four as environmental (topic 1, 5-7) and five (topic 9-13) as economic. The environmental themes mainly outline reduction of carbon emission of business operation and products, while social themes include work culture and employee right, and forming partnerships with various partners (see Table 9) Lastly, the five topics classed as

Table 8: Mercedes legislation: topic themes

	Environmental	Social
Terms with high frequency	"sustain", "manage", "protect", "emiss", "employe"	"sustain", "manage"," employee", "compliance", "risk"
Themes	Sustainability management, sustainable product development	Employee protection, work environment
Number of topics	2 (66,7%)	1 (33,3%)

economic comprise terms like "vehicle", "strategi", "profit", "busi", "oper" and "suppli". Thus, leading to the interpretation of the themes production and manufacturing, profitability and business strategy. Overall results show a fairly even representation of all aspects of the TBL in Audi's sustainability communication to legislation actors.

4.2.3. Volkswagen

Results show that 9 topics were identified by the CV of the LSA. From these, 7 topics were interpreted as aspects of the environmental class. One of them, Topic 5, was categorized under both classes, social and environmental, and outlines the theme environmental action with integration of the public and partners. Terms include are "human", "busi", "emiss", "integr", and "partner". Main themes that fall under the environmental class are sustainable business/ management, the implementation of sustainable supply chain management and environment/ climate-conscious car production. Frequent terms of this class include "sustain", "chain", "suppli, "emiss", "human" and "busi".

Furthermore, the other theme that was identified for the social category describes the communication and integration of the public in the company's actions and performance. Terms linked to this theme for instance are "inform", "public", "directly"," complianc", "integr" and "partner" which indicate that companies disclose their compliance to the public and consider various stakeholder groups into their business operations.

Lastly, the only theme that was able to be interpreted as economic is topic 7 which outlines the impact of green finance and sustainability on the financial performance. This interpretation was based on the LSA assigning high values to terms like "financ", "green", "bond" and "portfolio".

4.2.4. BMW

For this group, 17 topics were able to be identified. From these 14 (topic 1, 2, 4, 6-10, 12-17) have been classified under the environmental aspect of the TBL. Main themes outline the reduction of carbon emission and the use of renewable energies as well as climate conservation action. Terms often included in these topics are "emiss", "carbon", reduc", and climate" (see Table 10) Notably, environmental themes make up about 80% of the entire data set.

Further topic 13 and 15 have been classified as both economic and environmental, were interpreted as conforming to GRI regulations and reaching climate targets. Reasoning behind the combined classification is, that from those term

it was not possible to determine whether these are CR or CSR actions since deciphering the motivation behind the environmental action was not feasible. Hence, both topics were given both classifications.

Moreover, two topics of the social classification were identified (topic 3 and 5) which were interpreted as themes about employee care and the integration and exchange between the company and the public. Notable terms belonging to this group are "societi", "employe", "sustain", and "manage". Lastly, another economic theme, besides the topic 3 and 5, was "identified". Topic 11 outlines the theme product procurement and supply chain. Terms linked to it are "target", "supplier", "purchase", "scope" and "suppli".

4.2.5. Cross-company comparison

Overall, results show that Audi is able to achieve a balance in addressing all three aspects of the triple bottom line, with a near equal distribution of the TBL classes (seen in Figure 3). Important to highlight is that all companies, except for Mercedes-Benz, address all three aspects to some degree. From Figure 3 one can see that Volkswagen and BMW show similar classification distributions. Although the combined classification of VW refers to the social and environmental category. Whereas for BMW, it addresses the combination of environmental and economic aspects.

Notably, for all four companies the environmental aspect dominated in the legislation communication. Most frequent theme addressed is the reduction of carbon emission of production and vehicles, and climate-conscious production and supply chain management, and the use of renewable energy. For the social classification, employee care and work environment are most frequently addressed as well as the integration and dialogue with the public and various stakeholders.

Lastly, for the economic side, companies most frequently address the financial performance and the impact of environmental activities on it.

4.3. Consumers
4.3.1. Mercedes-Benz

As can be seen in Table 12, the UK channel is more active than the US channel with about 500 more Twitter posts. In total Mercedes-Benz' UK. Twitter account released 6673 posts within the three years whereas the US account posted a total of 5498 posts. Moreover, from the LSA of US consumers communication the derived coherence value indicated a topic number of 3. Two of them were interpreted as economic. Majority of terms included are names of car models e.g., "gle",

Table 9: Audi legislation: topic themes

	Environmental	Social	Economic
Terms with high frequency	"sustain"; "manage", "employee", "emiss", "develop"	"employee", "sustain", "society", "emiss", "manage"	"vehicle", "strategi". "oper", "compliance", "suppli"
Themes	Carbon reduction, sustainable business operation	Work culture, dialogue with partners, partnerships	Production/manufacturing, business profitability
Number of topics	4 (30,8%)	4 (30,8%)	5 (38,4%)

Table 10: Volkswagen legislation: topic themes

	Environment	Social	Economic
Terms with high frequency	"sustain", "emiss", "integr", "suppli", "busi"	"employee", "sustain", "human", "suppli", "partner"	"green", "finance", "framework", "bond", "elig",
Themes	Sustainable business/ supply chain, climate-conscious prodcution, resource/ raw material	Public and stakeholder integration reporting,	Financial performance with sustainable actions
Number of topics	7 (66,7% single, 77,8 % combines)	2 (11,1% single, 22,2% combines)	1 (11,1%)

Table 11: BMW legislation: topic themes

	Environment	Social	Economic
Terms with high frequency	"emiss", "carbon", "reduc", "climate", "suppli"	"employe", "societi", "manage", "sustain", "train"	"suppli", "chain", "risk", "supplier", "gri"
Themes	CO_2-emission reduction, renewable energy, sustainable supply chain	Employee conditions, integration & interaction with stakeholders	Meeting targets in business operations and supply chain
Number of topics	14 (70,6%), 16 (82,3 % combined)	2 (11, 8%)	1 (5,9%), 3 (17,6% combined)
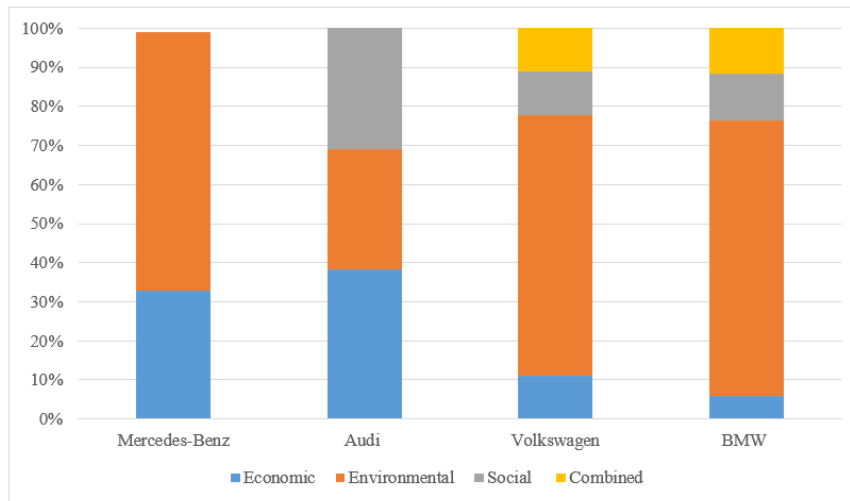
Figure 3: Cross-company comparison of legislation communication

"gclass", and components of cars. Thus, this is construed as advertisement and promotion of products. Topic 2 describes customer service with terms such as "team", "custom", and "assist". Therefore, it was classified under the social aspect of the TBL.

For the UK consumer channel, a coherence value, and

hence a topic number of 6 was identified. All six topics fall under the social aspect and outline the theme customer service and public audience engagement. Most frequent terms include "team", custom", "service", "reach", "thank", and "email", indicating communication between customers and the company is primarily about customer inquiries.

Table 12: Mercedes- Benz consumers: topic themes

| | US consumers (n=5498) | | UK consumers (n=6673) |
	Economic	Social	Social
Terms with high frequency	"gle", "sclass", "allnew", "design", "mbambassador"	"team", "custom", "hear", "sorri", "assist"	"team", "service", "custom", "contact", "please"
Themes	New product advertising, Product innovation	Customer service/ Communication with community	Customer service/ Communication with community
Number of topics	2 (66,6%)	1 (33,3%)	6 (100%)

4.3.2. Audi

Audi's results for its customer communication show that Audi's UK Twitter account is almost twice as active as its US counterpart. In total Audi UK posted 6483 tweets and Audi US 3712 tweets. For the US channel a CV of 2 was determined with both topics outlining customer service and strengthening the relationship to the public. Therefore, the topics were classed as social. Terms that led to this interpretation are "pleas", "inform", "reach", "thank", "assist" and "conveni".

Similarly, all identified topic themes for the UK analysis were classified under the social category. In total the CV indicated 5 topics. All topics include similar terms that also outline the theme customer service and strengthening public relations. As seen in Table 13 topics include terms such as "pleas", "hear", "thank", "assist", and "concern".

4.3.3. Volkswagen

The total number of tweets posted on the US account are 1071 posts which is comparatively a small fraction of the UK account with 6517 posts. Nevertheless, results show more variety within the topics of the US sample. With 18 topics in total, 13 (topic 1, 2, 5-12, 14, 16, 17) of them, making it almost three quarters of the total, were classified into the economic category. Most common themes of the 13 topics are product and brand promotion as well as announcements of new products. These themes were identified by the high occurrence of car model names such as "jetta", "tiguan" and "atla". Besides car models, terms included are "sale", "latest", "announce", "concept" and "celebrat".

Additionally, three (topic 3, 4, 18) environmental and two (topic 13, 15) social themes have been identified. Environmental themes addressed product changes with environmental impact. Terms that were included are "mobil", "future", "electric", "sustain" and "batteri". Both social themes illustrate forming partnerships and integrating various actors into the research & development process as well as educational programs. Terms included and used for interpretation are "join", "hub" "research", "student" and "learn".

In contrast, all 16 topics for the UK channel fall under the social category with the main theme being customer service and communication to the public and community, with terms like "please", "thank", "team", "touch ", and "contact".

4.3.4. BMW

23 topics for the data set for US consumer communication, 2 themes of the economic category were identified. Terms of the two topics show that BMW tweet economic content for sales promotion and information about car models. Included terms in the topics are "drive", "power", "experi" (see Table 15) The 21 remaining topics are compiled under the theme customer service and community engagement.

In contrast, results for consumer communication for UK indicate that all 26 topics are related to customer service and community engagement. Frequently listed terms are "please", "sorri", "thank and "team".

4.3.5. Cross-company and cross-country comparison

Overall, results and data sample show that the companies' UK Twitter accounts are more active in releasing higher quantities of posts. Moreover, it is to highlight that majority of themes fall under the social aspect of the TBL with the most frequent theme being customer service. Further, UK Twitter content differs from US content within each company and across companies (see Figure 4). For example, does BMW US address economic and social aspects and BMW UK exclusivley social aspects. Hence, content released in one region does not automatically correspond with the content of other regions.

As seen in Figure 4, the majority solely address the social aspect. Only Volkswagen US results show that all three aspects are addressed. Important to highlight is that the environmental aspect is strongly underrepresented with only Mercedes-Benz US and Volkswagen US addressing environmental aspects.

5. Discussion

The purpose of this study is to investigate how companies use different channels to communicate sustainability efforts to different stakeholders. Correspondingly, the LSA method was applied to examine the communication of four automotive manufacturers. The results show that the companies primarily focus on disclosing its financial performance when addressing the economic side of the TBL to shareholders. If environmental elements are mentioned, it is only in correlation to its added value to the company's financial operations. This demonstrated tendency to meet performance targets and communicate them to shareholders is coherent with what prior research (Miles & Covin, 2000; Schaltegger

**Table 13:** Audi consumers: topic themes

	US consumer (n= 3712)	UK consumers (n=6482)
	Social	Social
Terms with high frequency	"please", "http", "best", "addit", "assist"	"pleas", "thank", "look", "good", "concern"
Themes	Customer service/ inquiries	Customer service/ inquiries
Number of topics	2 (100%)	5 (100%)

Table 14: Volkswagen consumers: topic themes

	US consumers (n = 1071)			UK consumers (n = 6517)
	Economic	Environmental	Social	Social
Terms of highest frequency	"sale", "suv", "product", "design", "announce"	"future", electr", "sustain", "drive", "develop"	"join", "design", "team", "hub", "learn"	"please", "team", "touch", "contact", "problem"
Themes	Product/ brand promotion, new product introduction	Product changes with environmental impact	Alliances and integration of different actors in research & development	Customer service, public communication
Number of topics	13 (72,2%)	3 (16,7%)	2 (11,1%)	16 (100%)

Table 15: BMW consumers: topic themes

	US consumers (n=4718)		UK consumers (n=6213)
	Economic	Social	Social
Terms with high frequency	"drive", "ultim", "coup", "power", "experi"	"please" "sorri", "team", "custom", "learn"	"please", "sorri", "hear", "thank", "team"
Themes	Sales promotion, Test drive	Customer service, community engagement	Customer service, public relations engagement
Number of topics	2 (8,7%)	21 (91,3%)	26 (100%)
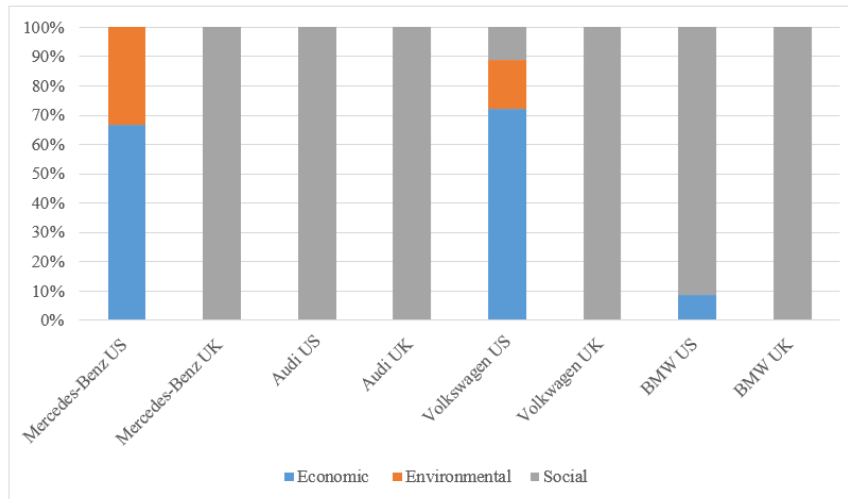
Figure 4: Consumer communication: Cross-country and cross-company comparison

& Burritt, 2018) has revealed. As annual reports are first and foremost catered to shareholders and investors, disclosing a company's financial performance shows to be the most relevant aspect for this group. This is due to the investors' and shareholders' motivation to maximize their own shareholder value. It can be observed from the analysis' results that terms such as "cost", "profit" and "cash" are linked to the economic aspects. Like Raghubir et al. (2010) and Russo-Spena et al. (2018) mention, can CSR actions lead to short-term negative cashflows but can also have a long-term positive effect

on the company's value. Companies must therefore proof to investors that the long-term benefits outweigh its short-term negative impact on cash flows. Through annual reports can companies justify their rationale behind taking CSR actions and highlight to shareholders that sustainable actions can secure the company's viability and with it its shareholder value.

Moreover, reports are largely being used as a tool in the decision-making of investors and rating agencies. Companies are motivated to primarily disclose its financial performance in regard to CSR as it has a direct influence on cost of capital. This is because investment decisions are partially based on what companies disclose (Clarkson et al., 2013; Richardson & Welker, 2001). Correspondingly, a possible reason for companies to focus on financial aspects is that measures and metrics are more coherent and standardized for financial performances (Elkington, 2018), which can decrease estimation risk. This facilitates rating agencies in their company evaluation. Because companies seek to improve their rating to attract investors and overall increase their reputation and brand value, setting their focus on financial performance shows to be the most effective strategy to achieve these targets.

Interestingly, only Audi touches upon the social aspect by outlining the importance of integrating various stakeholders such as legislation into their business decision-making and operations. It is possible that companies barely address social or environmental actions in isolation to shareholders because they might be more interested in what implications CSR action have on them instead of the motivation behind it. Hence, the financial outcome of these actions is emphasized in annual reports in form of cost of capital, profitability and most importantly its effect on shareholder value.

In contrast to the shareholders communication, results for the legislation communication indicate a more balanced communication. All companies, except for Mercedes-Benz, who merely discloses environmental and economic aspects, address all three aspects of the TBL.

Notably, the most covered category is the environmental category. Although it is important to highlight that for this analysis NFDs were used. Hence, its content and targets are specifically designed to address sustainability and therefore all three pillars of the TBL.

The most common themes identified for the environmental aspect are efforts of reducing carbon emissions in production as well as car design, the implementations for more sustainable, climate-conscious supply chains, and the use of renewable energy. These results align with prior research that points out that the automotive industry faces pressure from stakeholders and stands under intense scrutiny due to being one of the highest carbon emission producers.

Hence, disclosing efforts in regard to carbon emissions reduction and climate preservation becomes vital to them to withstand pressure and conform to expectations from stakeholders. With policies and regulations in place for carbon emissions mitigation, companies address these issues in their NFDs to show compliance and possibly decrease the threat of new regulations or further compliance costs (Dhaliwal et al.,

2011; Russo-Spena et al., 2018).

Additionally, showing compliance and more so communicating actions to exceed them, by taking steps towards sustainable development throughout the entire supply chain, builds trust and credibility. As Mann et al. (2021) points out, building credibility and especially gaining policy makers' trust offers companies the opportunity to build relationships with government regulators which possibly allows them to influence future decision-making regarding environmental regulations.

Similar to shareholder communication, it was observed that companies address their financial performance in connection to sustainable action to legislation. Other economic aspects they address are meeting operational targets. To gain trust and build credibility, it is essential to report actions truthfully and authentically (Mish & Scammon, 2010). Therefore, one can infer from the study's results that companies disclose their financial performance and benefits from CSR actions as they are in its core a business and hence, strive to stay profitable. Solely reporting CSR actions could raise skepticism from stakeholders and could be perceived as inauthentic.

More so, indicating that their business operations can generate positive outcomes on various levels, for example financially and environmentally, can increase the company's chances of forming alliances with government agencies (Kang et al., 2016).

The study's result also show that all companies address social aspects except for Mercedes-Benz. Though, it must be noted that the social aspect is overall strongly underrepresented with an average of just 16%. The only company that has been able to strike a balance and address all aspects in an equal manner is Audi. The dominant themes that the companies address are labor practices and fair operating practices. This shows that companies emphasize on implementing practices to improve their employees' work conditions and welfare. Terms such as "health", "employee", and "train" indicate that the respective companies introduce training programs for employees and health care policies. This aligns with Elkington (1998) classification of the social bottom line, which is defined as efforts towards better welfare and fair treatment of the community and stakeholders.

This study suggests that disclosing labor conditions and complying to labor policies has a similar effect on legislation as the compliance to environmental and CR regulations. If companies showcase efforts towards sustainable and ethical labor conditions, they can reduce the threat of new and stricter regulations being imposed on them. Further, this could attract new talent and improve their reputations as employers. Hence, CSR reports can additionally serve as recruitment tool by highlighting employee benefits to possible job seekers.

Equally important to stress is that the length of reports as well as the quantity of disclosures published does not automatically correlate with greater efforts towards sustainable development. This could be observed in this study. As an example, Mercedes-Benz published the most NFDs, yet it was

the only company that focused exclusively on environmental and economic concerns.

According to the consumer communication analysis, Twitter serves as an instrument to interact and connect with consumers. In contrast to other channels, companies are able to interact directly with the targeted stakeholder group. Notably, most interactions encompass customer inquiries about issues and customer service-related matters. Additionally, results show that the communication is bidirectional with oftentimes consumers initiating the conversation by inquiring about an issue that occurred to them. As a result of connecting with customers and responding to their questions, the company is able to build relationships. The study shows that Twitter can also serve as a customer service touchpoint and a forum for Q&A besides sharing information. From a consumer's perspective, social media, in this study Twitter, allows them to become proactive and initiate communication in contrast to the traditional communication where interaction is usually initiated by the companies in form of disclosure releases or posts. It is true that strengthening relationships with consumers and the community falls under the social bottom line, but a crucial part of the social bottom line is largely overlooked. Contributions to the community and social issues like labor conditions are not addressed. A possible rationale behind this could be that most communication that outline the social bottom line is initiated by consumers. Thus, they primarily revolve around customer service matters.

On the other hand, the results show that for the US economic content has been released that primarily focuses on promoting new car releases or innovations to current models. This indicates that Twitter is instrumentalized as an additional channel for advertising and marketing.

There is a noticeable neglect of environmental aspects of the TBL. Findings show that environmental aspects are only addressed in connection to new product released. However, the values of the term, e.g., "emiss", "carbon", relating to the environmental bottom line indicate a weak relation between the terms and the overall context of the topic. The use of Twitter by companies may be primarily for social interactions and for strengthening relationships with consumers. Therefore, it is possible that companies use other platforms such as Facebook or Instagram for more informational content since Twitter posts are limited to a maximum of 280 characters (K. Lee et al., 2013). This makes it difficult to appropriately address important issues that may require more context and space than 280 characters allow. As pointed out by S. Lee and Cho (2011), Twitter can be used to quickly resolve issues which in turn can be useful for crisis management. This is seen in this study as companies directly respond to customer inquiries and can therefore maintain customer satisfaction.

The cross-country analysis implies that the use of SM as well as the degree of which it is utilized depends on the region the company wants to reach. Results show that UK consumers are more active and outspoken about issues that occur. This is seen by the number of Twitter posts collected for the analysis. The number of tweets from the UK accounts ex-

ceed those of the US account. In addition, it can be inferred that UK consumers place a higher value on customer service. Meanwhile in the US emphasize more on informational content in regard to products and car models. Therefore, companies evaluate the region they operate in and tailor their communication to different audiences. This makes it interesting for future research to examine to what degree SM presence and its focus differ from region to region.

Coming back to Elkington (1998) triple bottom line framework a company is truly sustainable and committed to sustainable development if they incorporate all three aspects, economic, environmental, and social, into their business operations. After applying the framework to this study and examining each stakeholder channel, the results show that companies rarely address all three aspects in one channel. Results show that companies are particularly focused on one aspect of the TBL, depending on which stakeholder they wanted to address. It was observed that companies utilize annual reports to disclose their financial performance to shareholders who are motivated to increase their own shareholder value. Meanwhile for legislators, they heavily reported on environmental aspects such as actions towards climate preservation and carbon emissions reduction. As for the communication to consumers, companies focus on customer care and building relationships with.

In light of these findings, it can be said that companies selectively communicate parts of sustainability to specific stakeholder groups. Companies must act with caution as a high level of selective disclosure can be perceived as manipulative "cherry picking", and only disclosing what is beneficial to them. This form of greenwashing could in turn severely damage their reputation (Porter & Kramer, 2006; Siano et al., 2017).

For this study and its analysis, the assumption was made that companies use one channel for a specific stakeholder. With this consideration, the results indicate that only legislation communication was capable of fulfilling the TBL and, thus, succeeding at communicating sustainability. Nevertheless, it is important to stress again that for this stakeholder group CSR and NFDs were used which are specifically designed to address all aspects of the TBL.

When considering the companies' communication as total sum of all their channels it is plausible to recognize that they attempt to address and communicate the TBL in an equal manner to stakeholders. Arguably, it is reasonable to suspect that companies use multiple channels to disclose CSR action to a stakeholder group which as was not investigated in this study and should be explored in future research.

5.1. Limitations and Future Research

As this study exclusively focused on textual content, findings cannot be generalized or applied in a larger context to their entire communication. Results in a different study could differ if for example images or even special characters are considered which are disregarded in an LSA. Therefore, future research should examine how textual content in connec-

tion with image content is used in sustainability communication.

Moreover, this research is restricted by computer-processor capacities. Data collection and sampling was therefore limited. A larger sample might yield more nuances and context to the results.

Nevertheless, this study shows that computer-aided quantitative analysis can be a powerful tool for textual context analysis. Notably, the topics identified by the LSA were afterwards human-encoded and classified into the three aspects of the TBL which exposed the results to the risk of bias as the interpretation of each theme is subjective. Nonetheless, this study shows that this risk is strongly reduced beforehand since no preliminary human-encoding is needed which is an essential step in traditional textual analyses.

Although LSA proves its benefits in this study, LSA is limited in capturing multiple meanings of a word. This problem could be overcome by additionally applying a latent dirichlet allocation method as it enables the detection of multiple meanings of a word. This would offer new research directions to widen the use of computer-aided textual analyses in the field of business ethics.

Because the study solely focuses on the automotive industry, results might be homogenous and could vary when applied to other industries. This should be further explored in future research.

6. Conclusion

The aim of this paper is to examine how companies communicate sustainability to different stakeholders. Under the assumption that companies use one channel for each stakeholder, a latent semantic analysis has been conducted to examine the communication of four companies of the automotive industry.

The study offers new insights into company communication and draws attention to the fact that companies are still not disclosing all aspects in one communication channel through their textual content. More so, it shows that companies use specific channels to disclose different aspects of their company and tailor them to the stakeholder they want to reach. Findings show that companies emphasize different aspects of the TBL when communicating to stakeholders. For shareholders, its focus is on the company's financial performance and its implications for shareholder value, therefore, addressing primarily the economic bottom line. On the other hand, environmental issues such as carbon emission reduction stand at the forefront of legislation communication. Lastly, the focus of the consumer communication lies on the social side of the TBL. In this case, companies prioritize on connecting with customers and its community through dialogue and interactions on social media platforms, here Twitter.

Drawing from the research findings, companies still lack the capability to address all aspects of the TBL in each channel. It is crucial for companies to find a way to address all

three aspects of the TBL in all their communication channels individually and turn away from selectively reporting information to specific stakeholders. Otherwise, they run the risk of severe reputational damage.

This paper expands and contributes to the limited research (Kountouri et al., 2019; Liao et al., 2018; Lock & Seele, 2015) which applies quantitative methods for content analyses and offers researchers in fields of ethical business and sustainability new method approaches in addition to traditional qualitative methods. Moreover, it illustrates that computer-aided content analyses can reduce the risk of bias. Although further research needs to be conducted in terms of finding alternatives or extensions to LSA since this method is still prone to bias during interpretation of the topic outputs.

Lastly, this research highlights the strength of computer-aided methods that enables large data collection and analysis in a shorter timeframe. With a strong computer processor, a substantial amount of data can be collected. This would enable a cross-industry and multi-channel analysis with far reaching implications that can be applied to a wide range of industries and could facilitate companies to successfully communicate sustainability.

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