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Visualizing the triple bottom line: A large-scale automated visual content analysis of European corporations' website and social media images

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Abstract
With the "visual turn" online, images have become increasingly important for companies to attract stakeholders to their online CSR communication. To investigate how far businesses' visual sustainability language reflects a balanced triple bottom line, this study compared the most profitable European corporations' websites images (N = 21,841) and visual Twitter posts (N = 3,637) through automated content analysis using computer vision algorithms. The findings of this big data-analysis reveal that European companies overemphasize the financial bottom line on both owned and shared media. The channel matters as firms are more likely to communicate people-, planet-, and profit-related images via social media than their website. Corporations from environmentally sensitive industries tend to highlight the social dimension, though this is where they impact less, and do so more often through their website. Thus, this study confirms the criticism that the business case is dominant in CSR strategies also for visual communication.

KEYWORDS
automated content analysis, computer vision, corporate social responsibility, social media, sustainability, triple bottom line, Twitter, visuals, websites

1 | INTRODUCTION

A lot of research has been conducted on how companies communicate their activities regarding corporate social responsibility (CSR), via social media (e.g., Illia, Zyglidopoulos, Romenti, Rodríguez-Cánovas, & Del Valle Bren, 2013; Araujo & Kollat, 2018), by means of CSR reports (e.g., Lock & Seele, 2015; Fifka & Drabble, 2012), or via websites (e.g., Tagesson, Blank, Broberg, & Collin, 2009; Tang, Gallagher, & Bie, 2015). By and large, these studies have focused on textual content only. The visual dimension of communicating CSR activities has often been neglected (Tuan, Dalli, Gandolfo, & Gravina, 2019). However, decades of research into visuals and their effects show that they attract readers to media (Kress & van Leeuwen, 1998), enhance understanding and memory (de Haan, Kruikemeier, Lecheler, Smit, & Van der Nat, 2018; Smith-Rodden & Ash, 2012), and are processed quickly by the human brain, even faster than text (Thorpe, Fize, & Marlot, 1996).

These qualities of visuals, with a focus on images, also play out in the communication of CSR, in companies’ owned as well as shared media (Macnamara, Lwin, Adi, & Zerfass, 2016). Online, people encounter lots of information, and often have difficulty navigating through this clutter (Paivio, 1991). For a company that attempts to attract stakeholders to its website containing most of its official CSR information (Wanderley, Lucian, Farache, & de Sousa Filho, 2008), this overload creates a challenge. Likewise, to initiate a dialogue about CSR on social media (Etter, 2013), companies use visuals because of...
their emotional effects (Chung & Lee, 2017). Furthermore, images work independent of language, which is important for multinational operations in different language regions such as—condensed—in Europe and are an important information source on social media (Tuan et al., 2019).

One of the most prevalent understandings of CSR and corporate sustainability is that of the triple bottom line of social, economic, and environmental impact and responsibilities of business (Elkington, 1998). Arguing that the CSR activities of companies match their communications (Basu & Palazzo, 2008), this triple bottom line should largely be reflected on corporate websites as one of the most important tools of CSR communication (Capriotti & Moreno, 2007) and on its social media channels in order to engage in more interactive CSR communication (Johansen & Ellerup Nielsen, 2011). “The importance of balance regarding actions toward the planet, profit and people is paramount in moving sustainability forward” (Gallagher, Hrivnak, Valcea, Mahoney, LaWong, 2018, p. 782). It is proposed—and tested—here that this tripartite understanding of corporate responsibilities is not only reflected in the written content (e.g., Martínez-Ferrero, García-Sanchez, & Cuadrado-Ballesteros, 2015; Fifka & Drabble, 2012), but also in the visuals.

However, despite numerous empirical analyses of textual contents of CSR websites and Twitter (e.g., Araújo & Kollat, 2018; Gomez-Carrasco & Michelon, 2017; Tang et al., 2015; Vollero, Conte, Siano, & Covucci, 2019), the same empirical insight is not available for images on the same channels. This paper aims to fill this gap with a particular focus on the comparison between owned and shared media (Macnamara et al., 2016) by asking:

**RQ1** To what extent do the website and social media images of the most profitable companies in Europe reflect the triple bottom line (people-planet-profit)?

**RQ2** In how far does the visual communication reflect the triple bottom line differently on owned (website) and shared (Twitter) media?

While automated methods for text analysis have been employed for quite some time (Boumans & Trilling, 2016), the same method has not been available for large amounts of images. Since content analyses using human coders cost a lot of resources in terms of time and money, processing large data sets is often not feasible (Lock & Seele, 2015). With recent developments in computer vision methods, automated content analyses of visuals, however, have advanced rapidly and allow for processing of large amounts of images at comparatively little time.

Thus, to get a coherent picture of what companies communicate visually on their owned and shared media, this article reports from a large-scale automated content analysis of images of the CSR websites ($N = 21,841$) and images posted by the Twitter accounts ($N = 3,637$) of the 24 most profitable companies in Europe. Stakeholder communication on websites was found to be of better quality for larger businesses due to their larger resources (Uysal, 2018). Furthermore, the sample is chosen because the European economy covers an array of different cultures and languages, where visuals play an arguably even more important role because of their universal comprehensibility, and because Europe is among the largest economic areas in the world. Thus, focusing on the most profitable businesses in this area will also provide meaningful and comparable results for further analysis of corporate players in other strong economies such as the US and China. All of these corporations are listed in the sustainability rating conducted by the financial rating agency RobecoSAM (2018), thus being amongst the firms in their industries with a sustainability performance that can be evaluated and compared by investors.

## 2 | LITERATURE REVIEW

### 2.1 | The importance of visuals for communicating CSR

The “visual turn” through the Internet (Oeldorf-Hirsch & Sundar, 2016, p. 625) explains the trend that images and videos have become more prevalent and important online. Thus, corporations use images as vital tools to build their agenda with an array of stakeholders such as the media, consumers, or non-governmental groups (Kiousis, Popescu, & Mitrook, 2007). Corporate communication via visuals draws people’s attention to specific content because the brain processes images much quicker than text (Kress & van Leeuwen, 1998). Images help people break through the clutter of online information (Paivio, 1991), and are thus an important medium for companies to communicate with stakeholders. Not only are images important for attracting readers to websites or media content, they also evoke specific effects: images aid in understanding contents better, elicit emotions (Smith-Rodden & Ash, 2012), and improve memory and recall of information (de Haan et al., 2018). Comprehensibility is of great importance in CSR disclosure, which has scored low on readability and understandability measures (Lock & Seele, 2016). In addition, facilitating memory and recall of CSR communication could aid in making also positive information on CSR stick with stakeholders, who are often scrutinizing this information for negative or scandalous contents, speaking to emotions (Illia, Romenti, Rodríguez-Cánovas, Murtarelli, & Carroll, 2017). Recent research has furthermore shown that visual CSR communication has a significant effect on the intentions of stakeholders to engage with the company and impacts their perceptions of corporate motives (Chung & Lee, 2017). Thus, it is about time to look at images’ impact from not only the effects, but also the content side.

### 2.2 | Routes of CSR communication

Organizations can follow various routes of CSR communication to reach their stakeholders. Particularly in Europe, with recent regulation at the supranational level (European Commission, 2014), CSR reports have moved center stage. However, reports are long, often difficult to read, and not tailored to stakeholders’ specific needs (Lock &
Seele, 2016). Another form of owned media are corporate websites (Macnamara et al., 2016). Websites are a window into an organization’s business conduct, also called their digital “business cards” (Kent & Saffer, 2014). Contemporary corporate websites are image-heavy due to the advantages of visual communication described above. Past research has predominantly analyzed the textual contents of CSR websites (Tagesson et al., 2009; Tang et al., 2015; Vollero et al., 2019), which was often limited to specific topics (an exception is: Ott, Wang, & Bortree, 2016) or CSR-related analyses on websites such as diversity (Pasztor, 2019), but has neither focused on websites’ visual content nor taken into account the whole website. Visuals have played a role in CSR communication research so far mostly on the effects side (Chung & Lee, 2017), or in industry-specific analyses of CSR reports (Lock & Seele, 2015). However, analyses that stretch beyond single industries’ or countries’ samples are lacking (Tuan et al., 2019). Thus, this study attempts to provide an overview of the state-of-the-art of the use of visuals on the websites of European corporations focusing on the most profitable businesses.

While websites are predominantly used to provide information, social media are theoretically more apt for two-way communication (Johansen & Ellerup Nielsen, 2011). However, in practice, companies are rather cautious when interacting with their audiences (Etter, 2013). Given the increasing importance of such shared media for direct stakeholder communication (Macnamara et al., 2016), social media contents on Twitter have been increasingly researched in CSR (Araujo & Kollat, 2018), also because of their potential for dialogue-building with stakeholders (Rybalko & Seltzer, 2010). However, most of these studies have neglected the visual aspect of communication (Tuan et al., 2019) and instead used social network analysis and/or focused on the tweets’ texts or metadata (e.g., Araujo & Kollat, 2018; Etter, 2013; Gomez-Carrasco & Michelon, 2017). This lack is particularly striking as visuals foster re-tweeting behavior (Araujo, Neijens, & Vliegenthart, 2015) in different industries (Soboleva, Burton, Mallik, & Khan, 2017). Furthermore, as a relevant factor when engaging in a dialogue (Johansen & Ellerup Nielsen, 2011), images evoke emotions in audiences (Chung & Lee, 2017), which is particularly relevant for moralized communication as in the context of CSR (Glozer & Morsing, 2019).

2.3 CSR concepts and criticism

Stakeholders are often more skeptical toward CSR communication than toward other forms of corporate communication (Illia et al., 2013). This has many causes: The concept of CSR is ill-defined (Dahlsrud, 2008) and overlapping approaches have been introduced over the years that other than clarifying the term have often rather blurred its meaning. Many of these concepts have focused on the instrumental business case logic of CSR, implying that acting socially responsible also has to yield monetary returns for the company (Hockerts, 2015). Past instances of corporate greenwashing have raised—or only enabled—awareness of CSR communication among stakeholders and resulted in lowered expectations regarding these communication contents (Seele & Gatti, 2017). Since stakeholders prefer intrinsic over profit-seeking motives for CSR engagement (Illia et al., 2013; Yoon, Cürhan-Canli, & Schwarz, 2006), companies have often tried to overshadow their intentions with altruistic claims that did not reflect corporate reality (Basu & Palazzo, 2008). An approach to counter these tensions between the shareholder value idea (Friedman, 1970) and ethical motives can be seen in the triple bottom line ( Elkington, 1998). Here, it is argued that corporations bear responsibility not only for their financial returns and risks, but also for their social impacts and those toward the environment. Wheeler and Elkington (2001) have called for communicating online along these principles even before the Internet has become a mass communication medium. However, “research on all three dimensions of sustainability and potential antecedents such as culture is limited” (Gallagher et al., 2018, p. 781). The reflection of the triple bottom line has been investigated in textual CSR communication material—mostly reporting—for several years (e.g., Hussain, Rigoni, & Oriji, 2018). Researchers observed country-level differences in Europe (Fifka, 2013), surfacing mostly when compared to countries outside the continent, for instance, US versus Germany (Chen & Bouvain, 2009; Einwiller, Ruppel, & Schnauber, 2016); also CSR web disclosure in developing countries has witnessed cultural differences (Wanderley et al., 2008). However, more recent investigations that account for the harmonization of reporting practices across Europe and that compared European samples have not confirmed these (Lock & Seele, 2016). In a similar vein have sector-level differences been observed since researchers started investigating CSR reports (Sweeney & Coughlan, 2008), but these have not persisted in subsequent studies (Lock & Seele, 2016). Thus, for both cultural and sectorial influences, research on CSR communication is (a) by and large focused on CSR reports rather than online communication, (b) not unanimous regarding more recent results, and (c) not focused on the triple bottom line but—also in consequence of the report focus—mostly tested along reporting guidelines’ parameters.

While the triple bottom line idea has informed many of these standards, however, its impact has been somewhat limited and not led to systematic change, as Elkington (2018) critically reflects. Other critics in the area of CSR reporting have argued that companies often try to overshadow their social impacts by reporting more widely on the environmental dimension that they have less impact on, and vice versa (Boutin-Dufresne & Savaria, 2004). Such a claim traces back to a theory of testaments applied to the domain of corporate social performance measurement, where Mitnick (2000) proposed that to render reports about socially responsible behavior more impactful, companies pile up information regarding this behavior to make it appear more credible. For companies from environmentally sensitive sectors (Branco & Rodrigues, 2008) this would mean that they report more on the social dimension. However, such critique has largely been motivated theoretically, but has only in some industries and selected countries been substantiated with content analyses of CSR communication (Branco & Rodrigues, 2008; Lock & Seele, 2015), in others not (Lock & Seele, 2016), and has never been clarified with regard to visuals. Thus,
to address these contradicting findings and enlarge the analysis to visuals, the following hypothesis is tested:

H1 Companies from environmentally sensitive industries visually communicate more about the social dimension of CSR than companies from non-environmentally sensitive industries.

3 | METHOD

To answer the research questions and hypothesis, the images of the CSR websites of the Forbes ranking of 24 most profitable companies in Europe (Stoller, 2017) were scraped. Of the initial list of 25 companies, one firm had to be removed because of Spanish language content only (Banco Santander, see Table 1).

Twelve of the sampled companies belonged to environmentally sensitive industries (Lock & Seele, 2016; marked with an asterisk in Table 1). These companies’ websites were scraped up iteratively, starting at the homepage (round 1), following all the links in that page, and in the pages linked from that page, with this process being repeated up to the fifth round. Since the sample contained companies from various industries, for comparability reasons we excluded product-specific webpages. The reason for scraping images from all mentioned parts of the websites and not only the CSR-related sections is theoretical in nature. The triple bottom line assumes that to contribute to sustainable development, a company must mind all three bottom lines at the same time (Gallagher et al., 2018). Thus, to get a coherent picture of the level of CSR of a company, all facets of the business need to be regarded. A total of 21,876 images were downloaded during the months of October and November 2017.1

Tweets from the official accounts (as evident from the self-descriptions on Twitter) from each company (N = 24) were collected in December 2019. Two sources were used. First, the Twitter API was used to retrieve the tweets of each of the official accounts. The Twitter API, however, restricts this download to the latest 3,200 tweets of each account. As the interest of the research was on comparing the tweets from 2017, we employed as a second source the Python module GetOldTweets3, as it collects tweets beyond this threshold. In total, 104,977 tweets were collected for all companies without filtering by timeframe. The earliest tweet was from January 2011, and the

<p>| TABLE 1 | The 24 most profitable corporations in Europe (Stoller, 2017) with number of employees, country of origin, and position in industry-specific sustainability ranking (RobecoSAM, 2018) |</p>
<table>
<thead>
<tr>
<th>Company</th>
<th>Industry</th>
<th>Country</th>
<th>Sustainability rating RobecoSAM</th>
<th>No. employees 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allianz</td>
<td>Insurance</td>
<td>D</td>
<td>100</td>
<td>142,460</td>
</tr>
<tr>
<td>AXA</td>
<td>Insurance</td>
<td>F</td>
<td>95</td>
<td>125,934</td>
</tr>
<tr>
<td>BASF</td>
<td>Chemicals</td>
<td>D</td>
<td>63</td>
<td>115,490</td>
</tr>
<tr>
<td>Bayer</td>
<td>Chemicals</td>
<td>D</td>
<td>82</td>
<td>116,998</td>
</tr>
<tr>
<td>BMW</td>
<td>Cars</td>
<td>D</td>
<td>88</td>
<td>134,682</td>
</tr>
<tr>
<td>BNP Paribas</td>
<td>Bank</td>
<td>F</td>
<td>80</td>
<td>202,624</td>
</tr>
<tr>
<td>Daimler</td>
<td>Cars</td>
<td>D</td>
<td>42</td>
<td>298,683</td>
</tr>
<tr>
<td>Deutsche Telekom</td>
<td>Telecommunications</td>
<td>D</td>
<td>85</td>
<td>215,675</td>
</tr>
<tr>
<td>Gazprom</td>
<td>Oil and gas</td>
<td>RUS</td>
<td>51</td>
<td>469,600</td>
</tr>
<tr>
<td>HSBC</td>
<td>Bank</td>
<td>UK</td>
<td>37</td>
<td>235,217</td>
</tr>
<tr>
<td>ING group</td>
<td>Bank</td>
<td>NL</td>
<td>80</td>
<td>54,804</td>
</tr>
<tr>
<td>Nestlé</td>
<td>Food</td>
<td>CH</td>
<td>98</td>
<td>308,000</td>
</tr>
<tr>
<td>Novartis</td>
<td>Pharmaceutical</td>
<td>CH</td>
<td>94</td>
<td>125,161</td>
</tr>
<tr>
<td>Prudential</td>
<td>Insurance</td>
<td>UK</td>
<td>42</td>
<td>23,792</td>
</tr>
<tr>
<td>Roche</td>
<td>Pharmaceutical</td>
<td>CH</td>
<td>100</td>
<td>94,442</td>
</tr>
<tr>
<td>Rosneft</td>
<td>Oil and gas</td>
<td>RUS</td>
<td>45</td>
<td>325,600</td>
</tr>
<tr>
<td>Sanofi</td>
<td>Pharmaceutical</td>
<td>F</td>
<td>90</td>
<td>110,000</td>
</tr>
<tr>
<td>Sberbank</td>
<td>Bank</td>
<td>RUS</td>
<td>N/A b</td>
<td>325,075</td>
</tr>
<tr>
<td>Shell</td>
<td>Oil and gas</td>
<td>NL/UK</td>
<td>84</td>
<td>82,000</td>
</tr>
<tr>
<td>Siemens</td>
<td>Conglomerate</td>
<td>D</td>
<td>100</td>
<td>379,000</td>
</tr>
<tr>
<td>Total</td>
<td>Oil and gas</td>
<td>F</td>
<td>95</td>
<td>104,000</td>
</tr>
<tr>
<td>UBS</td>
<td>Bank</td>
<td>CH</td>
<td>98</td>
<td>66,888</td>
</tr>
<tr>
<td>Volkswagen</td>
<td>Cars</td>
<td>D</td>
<td>54</td>
<td>302,554</td>
</tr>
<tr>
<td>Zurich</td>
<td>Insurance</td>
<td>CH</td>
<td>93</td>
<td>53,535</td>
</tr>
</tbody>
</table>

aCompany belongs to environmentally sensitive industry (Lock & Seele, 2016).

b Replaced by sample mean = 78.
latest tweet was from December 2019. We then filtered tweets only posted in 2017, which restricted the dataset to 47,195 tweets, and 3,637 unique images. Both the timestamp as well as the presence of and link to images were extracted from Twitter’s own metadata for each tweet.

To analyze this large number of images, we chose for an automated method of content analysis, where the images are processed through three machine vision automated programming interfaces (APIs) using a supervised machine learning approach. The output of these APIs comes in the form of labels per image that indicate image contents. These image labels were used in a supervised machine learning approach to predict the likelihood of an image to belong to one of the three categories people, planet, and profit. Of the image population, we randomly sampled a sub-set of approximately 5%² (n = 943) of the images for manual coding by two coders who assigned images to the three categories (see the coding sheet in the Appendix), which served as the labeled dataset for the machine learning procedure (Burscher et al., 2014; Burscher et al., 2015). The development of the codebook was based on previous content analysis codebooks on CSR disclosure and image coding, and regulatory guidelines for distinguishing the three dimensions (Lock & Seele, 2015; Rebich-Hespanha et al., 2014; GRI G4 Guidelines). It was pretested once and refined inductively based on coding a sub-sample of 12 randomly selected images per company (n = 296). The categories were not mutually exclusive because images tend to show more than one category at the same time (e.g., a family relaxing in front of a mountain lake, resulting in coding people and planet). The people dimension included images showing human beings in general and in work-related scenes, however, it excluded entrepreneurs or customers, since this pertains to the profit dimension. Planet-related pictures showed (parts of) the natural environment, landscapes such as urban scenes, and also references to regenerative energy. Profit, as the most latent dimension of the codebook, included amongst others the product of the company, scenes of industrial production, office buildings, sports or cultural sponsorships where the logo of the company was present. The intercoder reliability results were good for people and planet (Krippendorf’s α = 0.82 and 0.78) and borderline for profit (Krippendorf’s α = 0.58), showing the difficulty of coding such latent categories.

The final sample of 21,841 images (reduced due to classifier restrictions) and M = 36.17 (SD = 6.25) images per company was analyzed using three machine vision APIs: Google Vision, Microsoft Azure, and Clarifai Vision. The output labels of these APIs were fed into support vector machines and stochastic gradient descent algorithms for supervised machine learning (the authors, 2018). Separate models were run for people (F1-score = 0.87), planet (F1-score = 0.89), and profit (F1-score = 0.76) as binary variables, because one single image may portray more than one dimension. The 3,637 Twitter images were then subsequently categorized.³

To test hypothesis 1, three multilevel binary logistic regressions (random-effect models) with the image as the unit of analysis predicting the likelihood of occurrence (binary; yes/no) of the three dimensions people (People), planet (Planet), and profit (Profit) and the company as the contextual level were performed in STATA. Independent variables were:

- **Environmental sensitivity (EnvSens):** the extent to which an industry has a significant impact on the environment due to the way businesses operating in the sector consume natural resources, produce emissions or waste (Brando & Rodrigues, 2008; Lock & Seele, 2016). Binary variables where the chemicals, cars, telecommunications, oil and gas, pharmaceutical sectors count as environmentally sensitive (1), and insurances, banks, conglomerates, and food companies do not (0).
- **Social media (SM):** binary variable indicating whether the visuals were communicated via the company’s official Twitter account (1) or the its website (0).
- **Firm size (Size):** the number of employees of a business as of 2018 reported on the firm’s websites.
- **Sustainability rating (SusRot):** sustainability ratings add to firm value and communication transparency (Taylor, Vithayathil, & Yim, 2018) and are thus an important indicator of sustainability performance. The variable displays the sustainability assessment score of each company within its specific industry showcasing its sustainability performance in an ordinary scale ranging from 100 (best) to 0 (worst; RobecoSAM, 2018, replacing one missing value with the mean).

### 4 RESULTS

Table 2 presents the descriptive statistics per company and social, environmental, and economic bottom line. For both website and Twitter, profit is the most frequently represented category (Mweb = 56%, MSM = 63%), followed by people (Mweb = 37%, MSM = 37%), and planet (Mweb = 17%, MSM = 13%). A strong pronouncement of the profit dimension in both owned and shared media over all others is observed for Sberbank (Web = 86%, SM = 88%), Volkswagen (Web = 87%, SM = 81), and BMW (Web = 74%, SM = 86). While all companies report less than 40% planet-related images over all channels, we observe slight differences between website and social media. BNP Paribas, for instance, shows one of the most balanced visual communication across dimensions on its website (PeopleWeb = 42%, PlanetWeb = 37%, ProfitWeb = 28%), while it shows much less planet-related visuals via social media (PlanetSM = 6% vs. PlanetWeb = 37%). Channel-related differences surface even more regarding people: while BMW communicates less people-related images on Twitter than on its website (PeopleSM = 8% vs. PeopleWeb = 62%), for Siemens the picture flips (PeopleSM = 47% vs. PeopleWeb = 6%). Whether these differences are attributed to the environmental sensitivity of the two companies’ industries is tested in hypothesis 1 below.

To briefly answer RQ1, the triple bottom line is represented in visual CSR communication with a clearly emphasized economic dimension. Regarding RQ2, the descriptive statistics point to channel-related differences relating above all to the dimensions people and
planet, while the financial triple bottom line seems to be prominent across both owned and shared media.

To analyze whether the environmental sensitivity of the sector (H1) and the channel (RQ2) impact the visual communication across sustainability dimensions, we ran three random effects logistic regression models:

\[
\text{xtlogit} \quad \text{People} = b_0 + b_1 \times \text{EnvSens} + b_2 \times \text{SM} + b_3 \times \text{Size} + b_4 \times \text{SusRat} + U_j + \varepsilon
\]

\[
\text{xtlogit} \quad \text{Planet} = b_0 + b_1 \times \text{EnvSens} + b_2 \times \text{SM} + b_3 \times \text{Size} + b_4 \times \text{SusRat} + U_j + \varepsilon
\]

\[
\text{xtlogit} \quad \text{Profit} = b_0 + b_1 \times \text{EnvSens} + b_2 \times \text{SM} + b_3 \times \text{Size} + b_4 \times \text{SusRat} + U_j + \varepsilon
\]

(Note: \(U_j\) denotes the unexplained variance at the company level.)

The odds ratios and corresponding significance levels along with model selection criteria AIC and BIC are reported for each model in Table 3.

The results confirm hypothesis 1 in that companies from environmentally sensitive industries are more likely to show images with people than firms from non-environmentally sensitive industries. The model controlled for the size of the firm and its sustainability rating, none of them being significant in the people model. To single out the hypothesized effect, the same regressions were performed with the dimensions planet and profit as dependent variables. None of these models showed the same significant effect of environmental sensitivity on visual content (Table 3). Thus, H1 is accepted.

To confirm the observation from the descriptive statistics regarding channel-related differences (RQ2), the three random effects models additionally included social media as a predictor. The results in Table 3 show that companies are more likely to communicate people-, planet-, and profit-related images via social media than via their website. Thus, channel-related differences prevail across all dimensions, as also shown in the predictive margins with Bonferroni corrections reported in Table 4.

However, when looking at the interaction effect between environmental sensitivity and channel, we only find significant differences for the people dimension (see Table 4, people-column). Relating to

### Table 2
Rounded percentage of images belonging to one or more sustainability dimensions (N = 21,841) per company (alphabetical order) and channel (website = web; SM = social media)

<table>
<thead>
<tr>
<th>Company</th>
<th>People Web</th>
<th>People SM</th>
<th>Planet Web</th>
<th>Planet SM</th>
<th>Profit Web</th>
<th>Profit SM</th>
</tr>
</thead>
<tbody>
<tr>
<td>AXA</td>
<td>41%</td>
<td>43%</td>
<td>16%</td>
<td>6%</td>
<td>59%</td>
<td>82%</td>
</tr>
<tr>
<td>Allianz</td>
<td>28%</td>
<td>18%</td>
<td>19%</td>
<td>12%</td>
<td>58%</td>
<td>66%</td>
</tr>
<tr>
<td>BASF*</td>
<td>36%</td>
<td>43%</td>
<td>23%</td>
<td>18%</td>
<td>52%</td>
<td>55%</td>
</tr>
<tr>
<td>BMW*</td>
<td>62%</td>
<td>8%</td>
<td>16%</td>
<td>17%</td>
<td>74%</td>
<td>86%</td>
</tr>
<tr>
<td>BNP Paribas</td>
<td>42%</td>
<td>46%</td>
<td>37%</td>
<td>6%</td>
<td>28%</td>
<td>69%</td>
</tr>
<tr>
<td>Bayer*</td>
<td>37%</td>
<td>38%</td>
<td>21%</td>
<td>21%</td>
<td>57%</td>
<td>49%</td>
</tr>
<tr>
<td>Daimler*</td>
<td>32%</td>
<td>40%</td>
<td>21%</td>
<td>8%</td>
<td>62%</td>
<td>71%</td>
</tr>
<tr>
<td>Deutsche Telekom</td>
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<td>66%</td>
<td>12%</td>
<td>9%</td>
<td>58%</td>
<td>58%</td>
</tr>
<tr>
<td>Gazprom*</td>
<td>50%</td>
<td>41%</td>
<td>16%</td>
<td>19%</td>
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<td>65%</td>
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<tr>
<td>HSBC</td>
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<td>36%</td>
<td>20%</td>
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<td>59%</td>
</tr>
<tr>
<td>ING group</td>
<td>28%</td>
<td>30%</td>
<td>17%</td>
<td>9%</td>
<td>63%</td>
<td>55%</td>
</tr>
<tr>
<td>Nestle</td>
<td>29%</td>
<td>61%</td>
<td>12%</td>
<td>10%</td>
<td>48%</td>
<td>40%</td>
</tr>
<tr>
<td>Novartis*</td>
<td>54%</td>
<td>40%</td>
<td>15%</td>
<td>11%</td>
<td>41%</td>
<td>55%</td>
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<tr>
<td>Prudential</td>
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<td>19%</td>
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<td>63%</td>
</tr>
<tr>
<td>Roche*</td>
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<td>27%</td>
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<td>8%</td>
<td>48%</td>
<td>53%</td>
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<tr>
<td>Rosneft*</td>
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<td>62%</td>
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<tr>
<td>Sanofi*</td>
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<td>9%</td>
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<tr>
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<td>0%</td>
<td>3%</td>
<td>0%</td>
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<td>88%</td>
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<tr>
<td>Shell*</td>
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<td>23%</td>
<td>9%</td>
<td>53%</td>
<td>55%</td>
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<tr>
<td>Siemens</td>
<td>6%</td>
<td>47%</td>
<td>7%</td>
<td>10%</td>
<td>27%</td>
<td>57%</td>
</tr>
<tr>
<td>Total*</td>
<td>40%</td>
<td>19%</td>
<td>23%</td>
<td>17%</td>
<td>56%</td>
<td>75%</td>
</tr>
<tr>
<td>UBS</td>
<td>20%</td>
<td>32%</td>
<td>14%</td>
<td>5%</td>
<td>48%</td>
<td>52%</td>
</tr>
<tr>
<td>Volkswagen*</td>
<td>39%</td>
<td>44%</td>
<td>17%</td>
<td>7%</td>
<td>87%</td>
<td>81%</td>
</tr>
<tr>
<td>Zurich</td>
<td>30%</td>
<td>48%</td>
<td>17%</td>
<td>21%</td>
<td>58%</td>
<td>46%</td>
</tr>
<tr>
<td>Mean</td>
<td>37%</td>
<td>37%</td>
<td>17%</td>
<td>13%</td>
<td>56%</td>
<td>63%</td>
</tr>
<tr>
<td>SD</td>
<td>12%</td>
<td>15%</td>
<td>7%</td>
<td>8%</td>
<td>15%</td>
<td>13%</td>
</tr>
</tbody>
</table>

*Company belongs to environmentally sensitive industry (Lock & Seele, 2016).

### Table 3
Results from random effects logistic regressions, odds ratios are reported per independent variable along with standard errors in brackets and probability levels: *\( p < .05 \), **\( p < .01 \), ***\( p < .001 \)

<table>
<thead>
<tr>
<th></th>
<th>People</th>
<th>Planet</th>
<th>Profit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmentally sensitive</td>
<td>1.84 (0.28)**</td>
<td>1.2 (0.15)</td>
<td>1.24 (0.25)</td>
</tr>
<tr>
<td>Social media</td>
<td>1.75 (0.12)***</td>
<td>0.66 (0.06)***</td>
<td>1.24 (0.08)**</td>
</tr>
<tr>
<td>Env. sensitive X social media</td>
<td>0.38 (0.03)***</td>
<td>0.92 (0.11)</td>
<td>1.09 (0.09)</td>
</tr>
<tr>
<td>Firm size</td>
<td>1 (0)</td>
<td>1 (0)**</td>
<td>1 (0)</td>
</tr>
<tr>
<td>Sustainability ranking</td>
<td>1 (0)</td>
<td>0.99 (0)*</td>
<td>1 (0.01)</td>
</tr>
<tr>
<td>Intercept</td>
<td>0.64 (0.25)</td>
<td>0.44 (0.14)**</td>
<td>1.1 (0.56)</td>
</tr>
<tr>
<td>Intraclass correlation</td>
<td>0.03 (0.01)</td>
<td>0.02 (0.01)</td>
<td>0.06 (0.02)</td>
</tr>
<tr>
<td>AIC (Akaike’s information criterion)</td>
<td>32,911</td>
<td>23,060</td>
<td>34,213</td>
</tr>
<tr>
<td>BIC (Bayesian information criterion)</td>
<td>32,968</td>
<td>23,117</td>
<td>34,270</td>
</tr>
</tbody>
</table>
TABLE 4  Means in percent per triple bottom line dimension and industry cluster/social media usage

<table>
<thead>
<tr>
<th>Env. sensitive?</th>
<th>People</th>
<th>Planet</th>
<th>Profit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Web SM</td>
<td>Web SM</td>
<td>Web SM</td>
</tr>
<tr>
<td>No</td>
<td>30%</td>
<td>15%</td>
<td>53%</td>
</tr>
<tr>
<td>Yes</td>
<td>42%</td>
<td>20%</td>
<td>57%</td>
</tr>
</tbody>
</table>

Note: Web vs. SM (social media) reports the results of pairwise comparisons of adjusted predictions (with Bonferroni corrections for multiple comparisons).

H1, companies from environmentally sensitive sectors are more likely to communicate people-related images via their website than via social media, while firms from non-sensitive sectors report more people-related images via their social media accounts.

5  | DISCUSSION

There is a clear dominance of the profit dimension in European corporations’ images on their websites and Twitter accounts. This finding confirms Elkington’s own critical appraisal of his concept (2018): “Clearly, the Triple Bottom Line has failed to bury the single bottom line paradigm,” where the shareholder value idea prioritizes the interests of financiers over those of all other constituents (Friedman, 1970).

Thus, the business case logic of CSR is well reflected in these companies’ visual communication. Overall, the environmental dimension appears to be underrepresented in images on corporate websites. Thus, accusations of greenwashing in the literal sense of the word, namely referring to the environment, cannot be upheld regarding Europe’s most profitable businesses; however, if we follow the idea that greenwashing is constructed through an accusation (Seele & Gatti, 2017), these companies can still engage in window-dressing practices. The imbalance of the three dimensions people-planet-profit in the visual CSR communication of the most profitable corporations in Europe likely reflects their corporate strategic focus (“doing,” Basu & Palazzo, 2008), which is the root of the problem why sustainability has not advanced (Gallagher et al., 2018).

Our big data analysis of corporate website and social media images found that companies are more likely to communicate people-, planet-, and profit-related images via shared than owned media. This relates to the different stakeholder groups and contents that are targeted via these channels (Macnamara et al., 2016), where Twitter is used more to reach a larger number of external stakeholders such as the general public or investors than to target internal stakeholders such as employees (Rybaklo & Selzter, 2010). Furthermore, adding an image to a tweet increases the likelihood of retweeting (Araujo et al., 2015), an effect that was found also across different industries (Soboleva et al., 2017). However, whether adding a people-, planet-, or profit-related visual feature increases virality has not been tested yet.

Another finding relates to the overshadowing effect in CSR communication, which we can confirm also for visuals. Environmentally impactful companies visually communicate more about social matters, which they impact less (Boutin-Dufresne & Savaria, 2004), than companies from less environmentally sensitive industries. Thus, companies from the cars, pharmaceuticals, chemicals, oil and gas, and telecommunications sectors are likely to show images related to the social dimension of CSR. Such communication that focuses on the part of the triple bottom line where they impact less can be interpreted as a strategic move to divert readers’ attention from their actual environmental footprint by piling up information (Mitnick, 2000). In addition, we found that this overshadowing effect is more pronounced on owned media than on shared media. A possible explanation is that shared media such as Twitter allow for more interactivity (Johansen & Ellerup Nielsen, 2011), potentially opening corporate visual communication to more immediate criticism via two-way communication. Companies have less control over shared than owned media (Macnamara et al., 2016) and thus might pronounce the social dimension more on their website. Quite some people-related images address topics relevant for employees, such as diversity in the workforce (Pasztor, 2019).

Since Twitter is not a preferred channel for employee communication (Rybalco & Seltzer, 2010), topics relevant for employees such as diversity are reported more on the website for impression management (Pasztor, 2019). Whether this overshadowing effect in CSR communication is observed more on owned or shared media, in any case a potential consequence is increased cynicism amongst stakeholders regarding corporations’ online communication (Illia et al., 2013).

6  | MANAGERIAL IMPLICATIONS

The finding that profit-related visuals are most common in the sample confirms the failed transformation inherent in the triple bottom line concept (Elkington, 2018) as the financial bottom line still supercedes social and environmental concerns also in communication. Thus, companies’ online communication seems to reflect the criticism that companies tend to communicate their social, environmental, and economic responsibilities - and potentially engage in such behavior - mostly out of profit-oriented motivations (Yoon et al., 2006). However, this focus on the financier as the primary stakeholder and audience of CSR communication in owned as well as shared media speaks against the decades of research advocating for a broader view on constituents (Johansen & Ellerup Nielsen, 2011). Given the substantial effects of images on the emotions and perceptions of stakeholders (Smith-Rodden & Ash, 2012), let alone their potential to attract them to media contents (Kress & van Leeuwen, 1998), and their importance for social media (Tuan et al., 2019), companies are advised to pay...
better attention to balancing their visual communication along the triple bottom line.

Managers should also mind that the textual and visual parts match in terms of content, because divergences can open the door for perceived misinformation (Leckner, 2012). Particularly on images, salient shared media, attention to consistent and balanced visual communication is a point of consideration for communication professionals, as stakeholder scrutiny on these channels is higher and instant feedback mechanisms can lead to an upsurge in public criticism (illa et al., 2017). Greenwashing accusations are a possible consequence, as they bring corporate miscommunication on the agenda in the first place (Seele & Gatti, 2017). Future CSR communication, thus, needs to be thought of not only from the text, but also from the visualization of the triple bottom line.

7 | LIMITATIONS AND FUTURE RESEARCH

Such an automated approach to visual analysis bears limitations. With the current state of machine vision APIs are at the comprehension level of pre-school children (Savage, 2015), only rather simple categorization tasks can be fulfilled (e.g., people, planet, profit). Indeed, this limits the depth of coding to basic perceptual features (Searle, 2015) such as recognizing objects in an image. While such analysis does not give a lot of depth for analysis, it bears the possibility to analyze a large amount and wide range of companies’ images from different industries, as performed here with a sample of more than 25,000 images.

Moreover, limitations need to be acknowledged from a research design perspective. First, it is important to note that the sample sizes of social media and of website images were unbalanced. While for social media we have strived for including only a sample of images posted during the year of 2017 (N = 3,637), for websites our sample is composed of a snapshot of the corporate websites around November 2017 (N = 21,843) as not all website content can be attributed to a specific timeframe. Second, the models developed for website images were also used to classify images posted on Twitter, which may lead to differences in classifier performance. These differences in performance should, however, be counterbalanced by (a) the common theoretical framework of the triple bottom line; and (b) by the companies themselves being the source of the content in both platforms—thus ensuring a level of standardization and comparability in terms of what is published.

Furthermore, the analysis is limited to European corporations and with the choice of the most profitable ones overly represents specific industries such as oil and gas or banking. However, the choice for the most profitable companies was made because these are the businesses with the highest economic impact and thus influence in Europe and have a reputation for sustainability, as evident from the sustainability ratings.

Last, a focus on visuals does not provide a full picture of the contents of online CSR communication. But with the “visual turn,” website designs that focus increasingly on visuals, and the higher likelihood of visual social media posts being spread, such an analysis is an important step to better understand this communication mode in relation to CSR. Future analyses can learn from this study’s methodology to perform large-scale image analyses with a supervised machine learning approach. Such studies could go beyond visual analyses to focus on—and compare—them with the textual content of corporate communication. More in-depth visual content analyses could engage in extracting the frames that companies use to purport their business model and the understandings of their responsibilities. From a stakeholder perspective, it would further be interesting to analyze the user-generated content that various groups post with regard to companies, for instance, on visual platforms such as Instagram or Pinterest.

8 | CONCLUSIONS

This study for the first time analyzed website and Twitter images at a large scale using automated visual content analysis. Its results suggest that visual online communication shows a business case understanding of CSR and that the environment is visually underrepresented. Generally, the channel matters when firms visualize the triple bottom line, because firms are more likely to communicate people-, planet-, and profit-related visuals via shared than owned media. However, companies with a significant impact on the environment tend to visually communicate more about people than planet and prefer websites over social media to do so. Overall, the overrepresented profit theme in website and social media images speaks to the criticism that the triple bottom line concept has not yielded much impact in transforming to a more sustainable world. With climate change as an imminent threat to the planet’s livelihood whose impacts are increasingly felt by corporations, rethinking corporate engagement and resulting communication on this topic is due.

ACKNOWLEDGEMENTS

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ENDNOTES

1The data collection took place across several days, as the scrapers worked in an iterative process for each website. It is important to note that the webpages are dynamic and constantly updated, and as such the comparisons done in this paper are between companies or sectors, using a snapshot of their website as the source for these comparisons.

2It is important to note that there is little consensus within machine learning of a general a priori standard for the (relative) size required for a labeled dataset, with studies pointing to the performance of classifiers becoming stable after a certain threshold (e.g., for text: Burscher, Odijk, Vliegenthart, de Rijke, & Vreese, 2014; Burscher, Vliegenthart, & de
As such, we have strived for a large dataset that would provide variation in terms of the presence of each CSR dimension.

The Twitter analysis was performed 2 years after the original analysis. As the computer vision API from Google had changed its models in the meantime, and there was no possibility to use the same categories as in the initial classification of the website images, we have used the second-best performing models which only relied on the Clarifai API (which contains version control) for Profit (F1-Score of 0.71 instead of 0.72 of the original model) and Planet (F1-Score of 0.92 instead of 0.93 of the original model). For Planet, the algorithm used was a Gradient Boosting Classifier (instead of Stochastic Gradient Descent).

REFERENCES


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APPENDIX: ABBREVIATED CODING SHEET PEOPLE-PLANET-PROFIT

Coder instructions
For this codebook, multiple variables may apply across categories (people-planet-profit). If an image cannot be classified into one of the variables, code “other” and in addition use the open text entry to specify the image’s content. All codes are binary (0 not present; 1 present).

People
- Images pertaining to this category can include people in general showing one or more human beings, such as Children, Employees, Non-political leaders & celebrities, Political figures, Scientists, Tourists, Protesters, Regular people. Includes depictions, illustrations, or
- Images pertaining to this category also include images of future products, for example, prototypes. Includes logos of company or brand.
- Images pertaining to this category also include Customers and consumers Image depicts consumers of the company's products or services, for example, a person drinking the company's beer. Includes images of a sale.
- Images pertaining to this category also contain images of managers and entrepreneurs: Entrepreneur/manager, for example, CEO: An individual or group engaged in managing a business or engaging in entrepreneurial activities.
- Images pertaining to this category show company-related information such as graphs/diagram/infographics showing numbers regarding turnover, products sold, profits, and so forth. Includes images of an annual report or corporate brochure. Includes a company's mission, vision, or strategy statements. Includes awards the company has received, or announcements of rankings, that is, "the world's best bank." Includes images of money. Includes infographics, graphs, and tables that are related to the company's business, for example, "importance of industry," or simple graphs that, for example, depict a relationship.
- Images pertaining to this category show company buildings: Image shows office buildings, a campus, or the inside of a shop or the office of the company. Images include images of a fair/conference/exposition of the company's stand. Includes maps indicating the business location. DOES NOT include a buying-selling situation with a customer and employee present.
- Images pertaining to this category also include sponsorships: Images that depict sportsmen with a shirt of the logo of the company or athletes that play in a cup sponsored by the company. Images that show a company's education efforts, such giving computers to children in schools, pupils visiting a factory, or a fair promoting engineering jobs among girls. The company as the sponsor has to be visible, for example, via its logo or slogan or color scheme. Image showing a cultural event, for example, concert, with the logo of the company or brand. Other

Images pertaining to this category show scenes other than the ones described above. Specify in open text entry.