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Kyle Nash

Minnesota State University, kylenashtx@gmail.com

Robin Wakefield

Baylor University, robin_wakefield@baylor.edu

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Examining GRI Sustainability Reports through the Lens of the Stakeholder Theory

Completed Research

Kyle Nash

Minnesota State University, Mankato
kyle.nash@mnsu.edu

Robin L. Wakefield

Baylor University
robin_wakefield@baylor.edu

Abstract

Publishing a successful sustainability report is a rising concern among organizations seeking to meet the expectations of their stakeholders. The purpose of this research is to examine how stakeholder engagement influences Global Reporting Initiative's (GRI) reporting processes. We use stakeholder theory to assert that an organization's sustainability practices are prompted by the demands of a variety of stakeholders. Cisco GRI reports were chosen for analysis because in 2020 Cisco was ranked 4th amongst the global 100 most sustainable corporations in the world. We conducted a longitudinal analysis of Cisco's corporate social responsibility reports from 2005 to 2020. Using text mining techniques and text statistical analysis we identified the primary stakeholders in each year's sustainability report and document stakeholder-related sustainability practices. Our results demonstrate that organizational sustainability practices are a function of the extent of engagement with core stakeholders. This study contributes to understanding how stakeholders' engagement relates to organizational sustainability reporting processes.

Keywords: Global Reporting Initiative, GRI indicators, Stakeholder Theory, Cisco, Sustainability, and Text Mining.

Introduction

Over the past two centuries, the rapid growth of the human population combined with technological developments has placed unprecedented demands on the global environment. As a result of these pressures, the earth is experiencing an accelerated loss of biodiversity and dramatic alterations to environmental patterns and processes. In 1987, the topic of sustainability rose to the forefront when the World Commission on Environment and Development (WCED) emphasized in their report that "*Humanity has the ability to make a development sustainable – to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs*" (World Commission on Environment and Development 1987). Following this declaration, organizational investing in sustainability practices and methods accelerated. However, the lack of standardization in sustainability reporting posed a challenge for organizations in communicating their efforts to maximize social responsibility and minimize the environmental impact of their businesses.

Since then, several governing bodies developed guidelines for organizational sustainability reporting practices. For example, the United Nations created a division that specializes primarily in sustainability issues and reporting. Their reports identify and communicate critical environmental issues to raise awareness and understanding of their implications for society, business, and governments. The most prominent sustainability report produced is the Global Reporting Initiative (GRI). The GRI is the result of efforts by researchers, industry, and consultants to leverage a multi-stakeholder approach from which to address sustainability ("Global Reporting Initiative" 2020). Today, leading organizations with a clear sustainability agenda understand how information systems' capabilities can enable and empower businesses' sustainability strategies and elevate them to a high level. Every year, organizations such as Cisco, IBM, Microsoft, and Apple document their sustainability strategies in a GRI report to highlight corporate dedication to sustainability and to their ongoing efforts to improve the global environment.

To address the sustainability challenge, organizations find they must work closely with their stakeholders because stakeholders are environmentally conscious and often have expectations regarding organizational sustainability practices. Thus, organizations must balance their profit maximizing goals with their responsibility to protect the environment and satisfy the expectations of stakeholders. The disclosure of organizational sustainability practices in standardized reports is the primary way that businesses inform stakeholders and engage them in their sustainability efforts. The greater the engagement between the organization and its stakeholders, the greater the need for the organization to disclose its sustainability performance (Lenssen et al. 2011). Furthermore, organizations that attract stakeholders based on successful sustainability outcomes have a responsibility to fulfill stakeholders' expectations and communicate their environmental activities (Petrini and Pozzebon 2009). The challenge for organizations is to balance ethical, responsible, and sustainable business practices with their capitalistic ventures (Freeman et al. 2010). Thus, as stakeholders become more aware of organizational sustainability practices and demand greater accountability, organizations' engagement with stakeholders is evolving.

Our study explores how leading corporations use formal social responsibility reporting to communicate sustainability strategy and meet stakeholder expectations. We use stakeholder theory to assert that organizational sustainability practices are undertaken to meet the expectations of stakeholders. Our primary research questions are: How do organizational sustainability practices change to meet the demands of stakeholders? How are GRI reports an indicator of stakeholder engagement? We conduct a longitudinal analysis of corporate social responsibility reports to demonstrate the evolution of sustainability practices as a function of organizational engagement with primary stakeholders. Further, we want to understand the relationship between stakeholders' engagement and company revenue. Our paper is divided into several sections. First, we present a background of the foundation for GRI indicators and stakeholder theory, prior to discussing how GRI indicators influence the report writing process. Next, we explain the analytical method for this study, followed by the results and discussion of the findings, limitations, and conclusion.

Background

Generally, sustainability research topics in the information systems, information technology, and management disciplines have focused on four main themes (Sedera et al. 2017). Those themes were green IT/IS conceptualization, green technology practices, green IT/IS adoption, and literature reviews. The emphasis of many of these studies is on challenges posed by green IT/IS. More recently, the business focus is on implementing IS capabilities to enable a sustainable business strategy (Boudreau et al. 2008) and (Abraham and Dao 2017). The (Benitez-Amado and Walczuch 2012) study finds support for the argument that IS and IT capabilities enable a proactive business strategy for sustainability. Moreover, IS/IT capabilities may indirectly increase the organization's performance with long-term advantage and greater revenue. Environmentally conscious stakeholders are likely to favor organizations that appreciate environmental sustainability and who share a similar vision of sustainability. As a result, organizations are likely to shift sustainability priorities to attract stakeholders because sustainability continues to challenge the global business landscape. Organizations continue to adapt and respond to growing sustainability demands from stakeholders, the general public, and government regulators (Hu et al. 2016). Stakeholder engagement has become a priority in the development of sustainability strategy and thus is a significant force in organizational change.

In 1984, Freeman defined the stakeholder as "*any group or individual who can affect or is affected by the achievement of an organization's objectives*" (Freeman 1984). Freeman's definition suggests a two-way relationship between the organization and its stakeholders. With the advent of environmentalism, stakeholder engagement for businesses became more critical (Freeman 2010) (Konar and Cohen 2001) because stakeholders recognize their influence on organizations' decision-making (Freeman et al. 2010) and business strategy. Engaging stakeholders via dialogue is likely to build trust and commitment as well as promote a shared vision of organizational involvement in sustainability. Stakeholder engagement in sustainability leads to the incorporation of sustainability principles and strategy that indirectly increases performance and revenue (Del Giudice et al. 2021). However, stakeholder's engagement is a complex interplay of shifting, ambiguous, and contested relationships that can affect the sustainability reporting process because sustainability reporting activities are embedded in the stakeholder network through the organization's policies and strategies. Because stakeholder engagement is a two-way process, the challenge

for organizations is to build an engagement network that is fully understood by the stakeholders (Gao and Zhang 2006).

Stakeholders often pressure the sustainability strategy of organizations to reduce negative impacts on the environment while simultaneously increasing positive impact on production (Sarkis et al. 2011). Consequently, an organization needs a sustainability network team dedicated to scripting a GRI report that addresses the variety of expectations held by a diverse set of stakeholders. This process takes time and a clear understanding of stakeholders' objectives and how the organization's sustainability strategy addresses the diversity of goals. The focus of stakeholder theory is on recognizing the unique relationships between an organization and a diverse set of stakeholders to create value for all stakeholders. We identify four types of stakeholders whose goals intertwine with organizations and their sustainability strategies. These include *customer(s)*, *employee(s)*, *society*, and the *environment(al)*.

Customer(s) refers to the characteristic group of individuals that transacts with an organization to receive a product or service and whose transaction behavior conveys a right to influence the organizations' practices and methods. This involves the customers as a group who are recipients of the business' benefits and who influence standard practices in the industry (Friedman and Miles 2006) (Gadenne et al. 2009)(Ogden and Watson 1999). *Employee(s)* address the dimension of personnel, individual contractors, and management teams as critical assets in maintaining and delivering the long-term value of the business (Lynch-Fannon 2004) (Friedman and Miles 2006). *Society* refers to the larger social setting that permits the organization to function in return for social benefits (Friedman and Miles 2006) (Freeman 1984). As for the *environment(al)* stakeholder group, the story is different and complicated because 'the environment' is an ambiguous entity. Researchers suggest stakeholder theory is often unable to distinguish among individuals and groups that are stakeholders from those that are not (Phillips and Reichart 2000). This complicates the ability of organizations to clearly identify the groups their sustainability strategies and reports should address. Boutilier (2011) states: "*the natural environment can be affected by a company's activities and, through channels such as climate change, can have an effect upon the company*" (Boutilier 2011). Thus, 'environmental' stakeholders may consist of facets directly and indirectly affected by organizations' sustainability strategies, yet unidentified as stakeholders.

Stakeholder theory suggests that the needs of shareholders cannot be met without satisfying the needs of other stakeholders (Foster and Jonker, 2005; Hawkins, 2006; Jamali, 2008), thus offering a renewed understanding of organizations' relationships with multiple constituencies (Jonker and Foster, 2002). GRI reporting is undertaken as a strategic plan by corporations to demonstrate the organization's sustainability performance to stakeholders. It is part of the dialogue and relationship building with stakeholders. Hence, stakeholder theory is a useful framework to evaluate GRI reporting to understand the relationship between the organization and its various stakeholders regarding sustainability. In the past, GRI reporting provided primarily subjective information strongly linked to the political structure of the organization. However, in the last two decades, the disclosure of objective environmental and social information has increased in amount and complexity indicating increased emphasis on stakeholder engagement.

The GRI is a public international independent standard organization that originated in 1997. The GRI's sustainability reporting guidelines are based on three factors - economic, environmental, and social impact. The reporting guidelines focus on a wide range of topics including energy use, diversity in the workplace, anti-corruption, and human rights. The GRI reporting guidelines enables any organization to increase transparency with their stakeholders. The reporting standards help organizations improve relationships with their stakeholders, enhance the organization's reputation, and build customer trust. Currently, 80 percent of the world's 250 largest companies report in accordance with GRI Standards ("FBRH" 2020). Cisco, for example, is an organization dedicated to bettering the environment using sustainable business strategies and has published GRI reports since 2005. Furthermore, Cisco has a dedicated sustainability team that gathers the necessary data to write the GRI report following GRI standards.

In the GRI (G4- Sustainability Reporting Guidelines), there are three categories of indicators based on economic, environmental, and social impact. In the GRI guidelines and protocols, each of these indicators is divided into sub-categories or components that cover different facets of the categories within the indicator. The GRI also lists 58 disclosures to provide the reporting organizations with an overview understanding of stakeholder engagement during the reporting processes (Krumay and Brandtweiner 2014) and (GRI Global Reporting Initiative) see Table 1. Hence, every published report is a result of stakeholders' engagement and collaboration with the sustainability team.

Standards Disclosures	Description
G4-24	“Provide a list of stakeholder groups engaged by the organization” (GRI Global Reporting Initiative, p. 43)
G4-25	“Report the basis for identification and selection of stakeholders with whom to engage” (GRI Global Reporting Initiative, p. 43)
G4-26	“Report the organization’s approach to stakeholder engagement, including frequency of engagement by type and by stakeholder group, and an indication of whether any of the engagement was undertaken specifically as part of the report preparation process.” (GRI Global Reporting Initiative, p. 44)
G4-27	“Report key topics and concerns that have been raised through stakeholder engagement, and how the organization has responded to those key topics and concerns, including through its reporting. Report the stakeholder groups that raised each of the key topics and concerns.” (GRI Global Reporting Initiative, p. 44)

Table 1: Stakeholder Engagement GRI Standards Disclosures (adapted from the G4-GRI Sustainability Reporting Guidelines)

Organizational structures and mechanisms can help resolve sustainability challenges; however, stakeholders' shared understanding is a prerequisite for solving these challenges (Elliot 2011). Thus, stakeholder engagement, communication, shared knowledge, and data are the foundation for building a business sustainability strategy (Eweje 2011). This also applies to building the GRI reports as it represents the organization's sustainability vision and mission in society. Furthermore, an organization that adopts a business model or strategy that resolves environmental issues might be appealing to similarly minded individuals that would want to work for that organization (Hoeffler et al. 2010). Hence, stakeholders' engagement, responses, and reporting to their organizations' substantiality team is of great importance because GRI reports may attract or repel future stakeholders.

Methodology

We adapted *text mining techniques* which are based on word and/or phrase analysis of text (Salton and Buckley 1988) and (Gaikwad et al. 2014) in our analysis of GRI reports. Text mining is defined as “the process of analyzing text to extract information that is useful for particular purposes” (Witten 2004). We enhanced this technique using the *text statistical analysis* of term frequency “words” captured within the GRI reports. To achieve a more accurate analysis, the Term Based Method (TBM) was used, which captures a word having semantic meaning (Gaikwad et al. 2014). The text mining techniques are appropriate to analyze the data because our assumption is that terms relating to groups or entities in the GRI reports represent organizational stakeholders. In this manner, we identify primary stakeholders and the nature of organizational engagement regarding sustainability issues. Similarly, text mining analysis reveals *what* organizations believe the sustainability expectations of stakeholders are at a given point in time.

We examined 16 years of Cisco annual sustainability reports between 2005 and 2020. The text was obtained from the GRI reports in a PDF format, the reports were downloaded from Cisco’s official websites, and we validated them in the GRI website. We also followed the text mining techniques and processed the 16 documents as a "corpus" (body) of texts, then applied the preprocessing techniques by ridding the document of unnecessary characters (Debortoli et al. 2016).

We used Term Frequency-Inverse Document Frequency (TF-IDF). This technique enabled us to understand how important a term in a document is as a part of a corpus (Figure 2). First, all report texts were transformed into a single string of text, called a corpus. Then we removed all non-standard UTF-8 characters ((e.g., “!”, “@”, “#”), along with stop words (e.g., “a”, “by”, “the”) from the corpus. We also stemmed the terms, meaning they were reduced to their word stem. To minimize this bias, we made use of the mean term frequency-inverse document frequency (tf-idf) to omit terms that have a low frequency and terms occurring in most documents. We only included terms which have a tf-idf value more significant than the median frequency (such as *Cisco*, *entrepreneurship*, *sustainability*, and *engagement*) (Köhl et al. 2019).

Results

The text mining techniques we used are centered on words and/or phrase statistical analysis and how important the word and/or phrase frequency is in the documents. We used R studio software to apply the text mining techniques to find a significant term's frequency and to match terms (i.e., *customer(s)*), and words or phrases (i.e., *environment(al)*) in the documents according to the semantics of the text. Table 2 lists the four unique stakeholder groups identified in the GRI indicators. Each of the four stakeholder groups has at least ten associated indicators implying they are recognized as predominant organizational stakeholders in the sustainability reporting guide. Thus, we use these stakeholder groups to evaluate their relationships with sustainability topics within GRI reports.

Stakeholder Group	Indicator code	Number indicators	Description
Customer	EN17, PR1 to PR9	10	The organization focuses on customer satisfaction by control of product responsibility and performance, and improvements or increased accessibility of the product.
Employee	EC3, EC7, LA1 to LA16	19	Directly enhance the well-being of employees related to turnover, wages, benefits, health and safety at work. Also, salary increases or intangible benefits such as training and facilities.
Environment	EC2, EN1 to EN34	34	Assess implications, risks and opportunities for the organization's activities due to climate change that impacts natural systems including ecosystems, land, air, and water.
Society	EC8, SO1 to SO11	11	This group's goals are to bring benefits to society and improve the impact organizations have on local communities including technology advancements and research. Also, decreasing risks to society related to operations and products.

Table 2: Indicators for each Stakeholder Group (GRI Sustainability Reporting Guideline) and (Mascena et al. 2018))

After identifying primary stakeholders associated with GRI reporting guidelines, we analyzed the annual sustainability reports (or Corporate Social Responsibility Reports, CSR) of Cisco Systems across the years 2005 to 2020. We chose Cisco for several reasons. Cisco Systems is a worldwide leader in the networking industry that was founded in 1984. In 2005, Cisco published their first Corporate Social Responsibility (CSR) report that covered 29 indicators. In the 2005 report introduction section, Cisco revealed their vision for engagement in sustainability processes with two stakeholder groups, customers and employees. Cisco's mission is to transform how people connect, communicate, and collaborate. In 2017, Cisco recorded revenue of \$48 billion with a 72,900-employee count. In 2018, Cisco ranked in 1st place over U.S. organizations and 7th place globally according to the Global Corporate knights green ranking. Thus, Cisco has a long history of sustainability reporting, stakeholder engagement, and recognition for sustainability.

The text for Cisco's sustainability reports was obtained from Cisco's GRI report in a PDF format from their official website. These reports were validated with the GRI website. We scrubbed the reports manually to obtain an only text. We followed recommended text mining techniques and processed the documents as a "corpus" (body) of texts (Debortoli et al. 2016). The preprocessing of the reports included the removal of the punctuation, numbers, white space, and the English language stop words. We also evaluated public revenue data to explore the relationship between stakeholders' engagement and corporate income received in exchange for goods or services.

Table 3 presents the word use frequency results for the stakeholder groups termed (*employee(s)*, *customer(s)*, *environment(al)*, and *society*) used in each annual sustainability report. We also collected frequency data for the words *sustainability* and *entrepreneurship* for additional insight. Word use frequency is an important indicator of stakeholders' engagement with organizational sustainability teams during the reporting process. During the first couple of years 2005-2006, the terms' use frequency was relatively stable showing only a moderate increase in the word *society* in 2006. A synopsis of the information in these first reports details how Cisco contributes to society in three different ways. First, it supports nonprofit organizations with grants and products donations. Cisco also conducted educational and economic development programs and encouraged their employees to volunteer in local social

programs. Hence, the use frequency of the term *society* indicates it was the main stakeholder in organizational sustainability strategy during this time.

Year \ Term	Customer	Customers	Customer(s)	Employee	Employees	Employee(s)	Environment	Environmental	Environment(al)	Engagement	Sustainability	Society	Entrepreneurship	Revenue
Report_2005	18	41	59	74	157	231	50	49	99	8	3	8	0	24801
Report_2006	12	42	54	66	176	242	30	61	91	6	5	25	0	28484
Report_2007	12	40	52	60	190	250	62	78	140	15	18	41	0	34922
Report_2008	27	42	69	103	313	416	98	116	214	18	39	48	5	39540
Report_2009	43	84	127	134	406	540	135	225	360	61	81	57	1	36117
Report_2010	17	40	57	74	185	259	58	94	152	30	32	22	4	40040
Report_2011	41	96	137	139	237	376	235	239	474	56	149	153	7	43218
Report_2012	36	92	128	172	248	420	247	235	482	90	258	196	10	46061
Report_2013	45	117	162	165	338	503	272	204	476	101	244	249	5	48607
Report_2014	48	88	136	102	237	339	195	224	419	74	176	170	4	47142
Report_2015	58	87	145	98	178	276	195	197	392	56	175	201	6	49161
Report_2016	57	81	138	142	272	414	223	173	396	117	110	219	18	49247
Report_2017	42	69	111	112	240	352	302	185	487	80	133	303	60	48005
Report_2018	42	72	114	130	241	371	37	137	174	70	116	202	68	49330
Report_2019	40	61	101	128	269	397	64	377	441	97	161	312	64	51904
Report_2020	50	75	125	148	301	405	205	308	406	104	188	298	72	49301

Table 3: Word Frequency in Cisco GRI Reports

In 2007, an increase in emphasis on the environment and society is shown, as well as an increase in emphasis on sustainability and engagement compared to the prior years. In fact, the GRI report used the term *society* only 8 times in 2005 and then 41 times in 2007, representing a 412% increase. This reflects the importance of society as the primary focus of stakeholder engagement in 2007 compared to environmental stakeholders with a 41% increase. In 2007, Cisco's GRI report included 26 sustainability indicators, using EC8 for the first time. The EC8 indicator signified that Cisco was now investing in and developing an infrastructure service to serve the public through commercial, in-kind, or pro bono engagement.

The 2008 GRI report shows an increase in the number of sustainability indicators from 26 in 2007 to 33 in 2008. Importantly, the EN4 indicator was added to the report in 2008. The EN4 covers the indirect energy consumption that is made by a primary energy source. In this regard, Cisco reported their partnership with Pacific Gas and Electric, which was a local utility company, to reduce energy consumption in their San Jose, California campus during peak periods. The primary goal was to direct the saved energy to be deployed elsewhere, to build an automation system to control the task of turning off the unnecessary lighting, to reduced-power modes, and to raise threshold temperatures for cooling in buildings. This environmental engagement approach to save energy was clear in the company reporting results. The term *environment(al)* was used 214 times in 2008, compared to the previous year in which it was used only 140 times, representing a 53% increase. Analysis of the 2008 GRI report reflects a clear emphasis on engagement with *environment(al)* (53% increase) and *employee(s)* stakeholders (66% increase).

In 2009, Cisco increased the number of pages in the GRI report to 273 pages from 164 pages in 2008 as more sustainability indicators were added. In total, Cisco's efforts now covered 48 sustainability indicators. As expected, the incremental increase in pages in the GRI positively affected the frequency of the terms. The term *environment(al)* emerged 360 times as a function of the inclusion of additional (EN) indicators, representing a 68% increase from 2008. For example, (EN23) the total number and volume of significant spills was reported for the first time in Cisco's GRI report. In this indicator, Cisco revealed they have a comprehensive emergency response system in place to prevent unintended spills or discharges from any Cisco facility or operational site. The report also leveraged the company's regional initiatives such as Environment Day in India, specifically the Act Green in Bangalore, where Cisco promoted 'Think Green'. The company started promoting their employees and their participation in environmental sustainability through events such as Bike to Work Day and Earth Hour (*Cisco Corporate Social Responsibility Report*,

2009). Furthermore, Cisco created a formal partnership with vendors who provide services with low impact on the environment. For example, Cisco’s print jobs contract was awarded to Xerox, a company who uses recycled paper stocks. Also, Cisco’s landscape services provider “Valley Crest and Scape Maintenance” follows a standard process of recycling the waste oil used in landscape trucks and equipment, as they recycled over 200 quarts of oil each year. The growth in use frequency of *environment(al)* is representative of the engagement of this stakeholder in Cisco’s 2009 sustainability strategy.

In the 2010 report, while stakeholder engagement appears to decline from 2009, the sustainability emphasis shows an alignment of the organization with two sustainability stakeholders, Cisco employees, and society. This is clear through the frequent use of the terms “*collaborative*”, and “*entrepreneurship*” seeking to align activities and stakeholder engagement with broader business strategies and corporate values. For example, Cisco’s management and the employees interacted informally through team meetings and internal communications. This resulted in 85% of Cisco employees completing the annual pulse employee survey in 2010, compared to the 80% in 2009. As a result, Cisco resources were more effectively aligned with stakeholder goals as demonstrated by the frequency of term use.

In 2011, an increasing interest in sustainability research and reporting affected the reporting process in general (Sedera et al. 2017). The year 2011 shows a substantive increase in all stakeholders’ engagement as indicated in the word frequency of the GRI. For example, the average use of the term *society* in the reports from 2005 to 2010 is 33.5, but in 2011 the term *society* is used 153 times in the report. Overall, in 2011, most GRI reporting organizations changed reporting processes and Cisco adhered to these changes as well.

The area chart in Figure 1 is a visual depiction of changes in stakeholder term frequency across the years with corporate revenue included as the line on the chart. After the drop in all term usage in 2010, the frequency of all stakeholder terms shows a substantial increase in 2011. Furthermore, the focus of the report changed to emphasize environmental stakeholders with term “*environment(al)*” increasing from 152 times in 2010 to 474 in 2011. Interestingly, the trend in corporate revenue appears to mimic the trend in stakeholder word use. This suggests an important relationship exists between stockholder engagement in sustainability and revenue. Sustainability researchers might find it valuable to explore this relationship further.

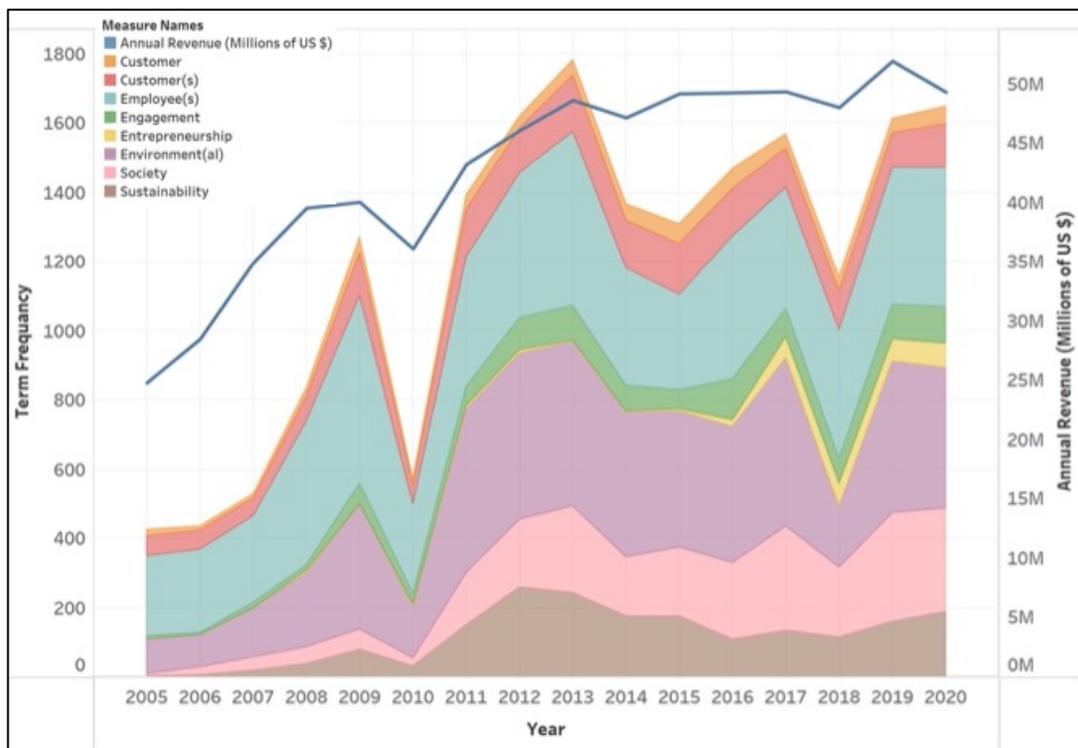


Figure 1: Cisco Annual Revenue, and Terms Frequency over the years of reporting.

In 2012, Cisco integrated a new enterprise sustainability information system (SIS) into its network to monitor and process their sustainability reporting metrics. The SIS system expanded and automated data collection about sustainability. The SIS also had a noticeable improvement on data accuracy, and an essential focus on more critical tasks such as evaluating and implementing mitigation projects. In 2013, Cisco’s GRI report accentuated the water consumption indicators of sustainability (EN8, EN9, and EN10). Additionally, they integrated a new SIS system that improved the company’s ability to track water consumption data for most of their facilities’ operations. After examining the stakeholders’ terms frequency in 2011, 2012, and 2013 reports, we found that the terms “employee(s),” “customer(s),” and “environment(al),” were used more, but the term “society” saw the most significant increase (63%). In 2013, corporate engagement and sustainability strategy focused on multiple stakeholders. Indeed, in 2013 Cisco was ranked in the 20th position in the Corporate Knights Global 100 Most Sustainable Corporations list. Since then, Cisco has maintained an enviable ranking as one of Corporate Knights’ top 100 ranked companies (see Table 4) with several top-10 rankings.

Year	Global Corporate Knights Ranking	Overall Score
2013	20	58.6
2014	11	66.2
2015	69	56.4
2016	57	61.6
2017	3	71.5
2018	7	77.00
2019	14	76.12
2020	4	83.59

Table 4: Cisco Overall Score in Corporate Knights Ranking (Corporate Knights website).

For the years 2014 to 2017 we applied a different analysis technique to understand the trends in stakeholder engagement. We used TF-IDF and the findings are shown in figure 2. First, the term "Cisco" was the most frequently used term, followed by *employee(s)* and *environment(al)* in the four years spanning 2014 to 2017. Additionally, the term *environment(al)* represented 2% of the overall terms across the 4 years. This illustrates Cisco’s ambition to link the environment and employees with their brand as a competitive advantage in their sector. The terms *employee(s)*, *customer(s)*, and *society* totaled 7% of the total terms’ frequency which suggests a strategy of continued engagement with these stakeholders on sustainability issues. Of note, the term *society* had a frequency of 303 in the 2017 GRI report, more than any previous year.

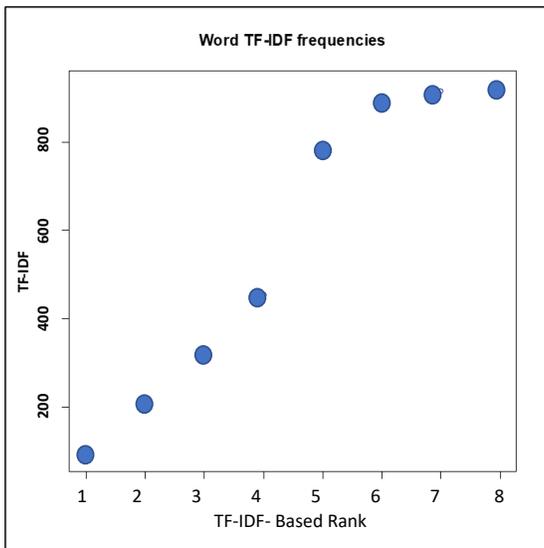


Figure 2: (TF-IDF) (Joachims 1996),
 1=customer(s), 2=entrepreneurship, 3=sustainability,
 4=engagement, 5=society, 6=environment(al),
 7=employee(s), 8=Cisco

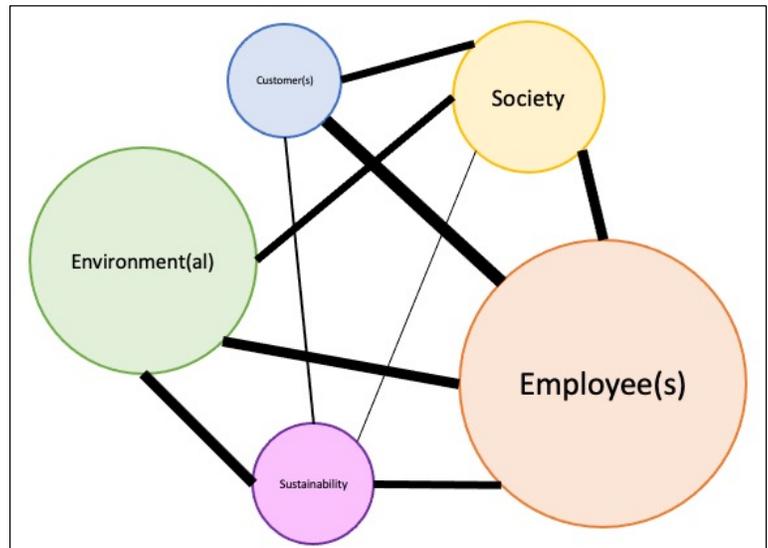


Figure 3: Word Distributions Network

As shown in Table 3, the term *entrepreneurship* was used fewer than ten times every year up to the year 2016 GRI report. In 2017, it appears the term *society* was leveraged with the term *entrepreneurship* in the GRI as Cisco was executing a new approach to engage society. We found that the Cisco 2019 GRI report approach was taken to a different level. The company shared their stakeholder engagement model throughout the reporting process. We analyzed the term *engagement* combined with stakeholder groups and the term was found to emerge with *employees* more than any other group under the internal engagement emphasis within the company.

We constructed a network of word distributions over the years in Figure 3 to visualize the relationships between stakeholder terms and their connections as they accrue over 16 years. The node size represents the total frequency of the term in the reports. The lines thickness shows the correlation between the terms according to their overlapping word appearance. The network is created using the R packages LDAvis, and tm. We found that the terms *customer(s)*, *employee(s)*, and *society* are tied and overlap. The term *employee(s)* is related to all stakeholder group terms with a thick line interpreted to indicate the constant effort by Cisco to include and engage employees with other stakeholders. This is supported in the finding that Cisco continues to engage customers through society in solving environmental challenges (“CSR Report” 2020), and environmental challenges are influenced by the employee(s) through *sustainability*.

Conclusion

Our results are subject to limitations. Our analysis is a disclosure of sustainability reporting based on the terms' frequency, stakeholder groups, and the determinants of their exposure for only one company's (Cisco) listed indicators that composed their GRI report. Also, we did not analyze or evaluate the 'use quality' (positive term quality or negative term quality) of the terms of frequency.

Our study uses stakeholder theory as a framework to understand stakeholders' engagement in organizational sustainability strategy and documentation during the reporting process. We used text analysis methods to analyze the representation of stakeholder groups in sustainability reports for Cisco across the years 2005 to 2020. We found that stakeholder engagement varies according to the sustainability strategy of the organization in any given year. That is, the frequency of word use in the annual sustainability report reveals how organizations prioritized and engaged different stakeholders in their sustainability strategies for that period of time. While it is not surprising that different stakeholders are engaged to a greater/lesser extent in sustainability strategies, our analysis shows definite trends. We believe these trends suggest sustainability strategies are adopted to meet the expectations of stakeholders whose interests, needs, and expectations vary across time. Furthermore, the accrual across time of word use frequencies for stakeholder terms indicates that employee stakeholders are highly prioritized in sustainability strategy followed by engagement with environment(al) stakeholders.

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