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# **FOLLOWING THE CSR FOOTPRINTS IN SUSTAINABILITY REPORTING**

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## **Abstract**

In this study, we develop a theoretical framework to describe interorganizational efforts to establish, promote, and sustain socially responsible practices that result in environmental, social, and ethical impacts. A Social Responsibility Platform (SRP) refers to a digital ecosystem in which various organizations and stakeholders with shared interest in corporate social responsibility (CSR) come to learn, adopt, and practice socially responsible behaviors. The platform is composed of loosely connected information systems that enable firms, NGOs, and intermediaries to store, exchange, and use data on firms' CSR activities. However, despite market interest in linking CSR activities to firm valuation, a lack of compliance policy, standards, and infrastructure is slowing adoption and practice. A focus of this study is concerned with deriving business intelligence from voluntary disclosure of CSR reports. The study introduces an advanced business analytics approach, specifically with latent Dirichlet allocation (LDA) based topic modeling, to codify intangible knowledge embedded in annual sustainability reports to infer a firm's strategic intent behind voluntary disclosure. We then model a firm's CSR maturity as a function of its strategic intent using a dataset of annual sustainability reports of 618 firms over a three-year period between years 2013 and 2015. Our findings indicate that external stakeholder engagement is the primary motivation behind voluntary disclosure of CSR reporting, but we also find firms are starting to engage internal stakeholders through social discussion around labor practices. The study demonstrates a toolset to index and evaluate the social responsibility performance of firms as an intangible asset.

## **Keywords**

Green IS, social responsibility platform, voluntary disclosure, latent Markov model, topic modeling

## Introduction

Firms believe that CSR initiatives create a positive signal to stakeholders such as investors, customers, and employees (Epstein-Reeves 2012). According to a 2014 global survey conducted by McKinsey & Company<sup>1</sup>, there is broad recognition among corporate executives that environmental sustainability is a business imperative, with a majority of the survey participants acknowledging the importance of sustainability to manage corporate reputation (72%), products/service marketing (59%), and regulatory strategy (53%). The surge in sustainability interests is driven by the growing percentage of intangible assets representing market value, overtaking physical and financial assets. For instance, a 2010 study estimates that intangible assets make up 81% of S&P 500 market value in 2009 (Tomo 2010), a stark contrast to 17% in 1975. Investors are demanding clarity in the intangible assets component of firm valuation, and a number of financial service providers such as Bloomberg and Thomson & Reuters have created various indices to rank a firm's value using CSR disclosure performance. One index the financial services industry has come to some consensus around is ESG, which is a catch-all term covering environmental, social, and governance issues material to firm performance, risk, profitability, and overall viability of the firm. The data source to construct and measure a firm's score using this index includes questionnaires, interviews, and analyses of company reports such as annual sustainability reports, to name a few. The emergence of Socially Responsible Investing (SRI) and impact investing has made such services valuable to financial analysts and investors in the marketplace.

Despite interest in integrated reporting around the social responsibility of firms, Green IS scholars have not considered this important phenomenon, though it is clear information systems (IS) is playing a key role. Our study proposes an integrative view of information systems as a Social Responsibility Platform (SRP), a digital ecosystem in which various organizations and stakeholders with shared interest in development and implementation of corporate social responsibility (CSR) practices come to learn, adopt, and practice socially responsible behaviors. The primary role of information systems is provision of a digital platform, composed of loosely connected information systems and service architecture to enable firms, non-governmental organizations (NGOs), and infomediaries to store, exchange, and use data on firms' CSR-related activities.

A key focus of our study is concerned with deriving business intelligence from a knowledge repository of information artifacts that firms contribute on their voluntary disclosure of CSR related activities. A lack of accepted practices on reporting standards and metrics constrains interpretability of an individual firm's CSR efforts into comparative evaluation of firms across industry. For instance, firms release annual sustainability reports that are text based, often exceeding hundreds of pages, to shareholders, which makes it difficult to assess a firm's performance against past years, let alone compare against competitors. We introduce an advanced business analytics approach of codifying intangible knowledge embedded in annual sustainability reports, to infer a firm's strategic intent behind voluntary disclosure.

We use a dataset obtained from Global Reporting Initiative (GRI)—a non-governmental organization that provides CSR reporting guidelines—that includes procedures and commonly used metrics to assess a firm's CSR-related performance. While GRI is not a certifying nor an enforcement body of CSR compliance, the reporting guidelines they provide are among the few guidelines that are gaining acceptance among organizations, especially by those in the financial industry. We track 618 firms over a three-year period between years 2013 and 2015 and analyze the CSR reports to infer their maturity level. Using latent Dirichlet allocation (LDA) based topic modeling techniques, we identify three categories of strategic intent—(1) environment performance, (2) social engagement, and (3) general CSR—and assign the extent to which firms express such intent in the reports. We then model a firm's CSR maturity as a function of its strategic intent using a latent Markov model (LMM) to estimate the statistical significance and the extent of their relationships.

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<sup>1</sup> McKinsey & Company, "Sustainability's strategic worth" <https://www.mckinsey.com/business-functions/sustainability-and-resource-productivity/our-insights/sustainability-strategic-worth-mckinsey-global-survey-results>, accessed July 10, 2017

Our findings indicate that firms are slow to adopt and commit to voluntary disclosure of CSR activities. Of the firms that continue to report practices, the main strategic intent is to manage firm reputation to external stakeholders such as customers and investors in the marketplace. However, we also find firms are starting to engage internal stakeholders such as employees through social discussion around labor practices. Last, we find firms that report environmental performance as compliance reporting tend to stay committed. The study demonstrates a toolset to index and evaluate the social responsibility performance of firms as an intangible asset.

## **Related Literature**

Information systems scholars have recently given much attention to the development of new theories on the role of information systems and technologies concerned with environmental sustainability issues relevant to industry, firms, communities, and individuals. Much of Green IS research has focused on reducing the environmental impact through efficient design or energy use (Zhu et al. 2008), which leaves out considerations of the social impact on individuals, communities, and wildlife, as well as the business impact regarding profitability. Second, a view of self-governance in which firms will voluntarily act towards sustainable practices (Melville 2010) is incomplete without extending beyond firms' operational boundaries. For instance, the theoretical model should incorporate external influences to a firm's decision to initiate CSR practices such as market interests and industry competition. While niche markets such as impact investing or socially responsible investing suggest viability of environmentally oriented firms, a lack of research on consensus building across organizations limits generalizability of Green IS research and calls for a more integrative view of environmental sustainability (Dao et al. 2011).

Past studies on the materiality of CSR to firm performance have been largely mixed. Although earlier studies have shown empirical evidence for positive effect of CSR on firm performance (Eccles et al. 2014) by enhancing firm capability with managing risk and improving operational outcome (Hart 1995; Teo et al. 2017), recent studies have shown that the impact is marginal (Taylor et al. 2016). Despite a lack of direct impact of CSR on firm performance, firms may have alternate motivations to undertake CSR initiatives besides signaling firm quality to investors. One rationale for disclosing CSR activities is managing relationships with external stakeholders through reputation management (Margolis and Walsh 2003). A number of studies have shown customers demand firms have sustainability as part of their corporate strategy (Robinson et al. 2013; Sheikh and Beise-Zee 2011), and show their support through brand loyalty (Van den Brink et al. 2006).

Another rationale may be for managing reputation with internal stakeholders such as employee attraction and retention (Bhattacharya et al. 2008). Firms leverage human capital as a core resource to operate and deliver products or services to customers. Promoting and maintaining a good reputation in terms of a good working environment can not only motivate a firm's workforce (Kowal and Roztocki 2015) but also translate into a competitive edge against other firms (Edmans 2011). Thus, evaluating a firm's underlying intention and more importantly, its commitment, is crucial to understanding the functional role of CSR for firms.

## **Methodology**

### ***Data***

Our dataset comes from the GRI database. The vision of GRI reporting is to create "a sustainable global economy where organizations manage their economic, environmental, social and governance performance and impacts responsibly and report transparently," and its mission is to enable firms to make reporting standard practice by providing guidance and support to organizations. It is a toolset to make firm production activities transparent and accountable to internal and external stakeholders for the impacts the firm causes on the environment. The implementation a firm undertakes to disclose material topics related to sustainability reporting is choosing between (a) Core or (b) Comprehensive criteria, where the latter requires more extensive reporting of indicators according to material aspect. There are six groups of indicators: (1) Economic, (2) Labor, (3) Product Responsibility, (4) Environment, (5) Human Rights, and (6) Social. Based on a firm's maturity level, some or all of these indicators will be included in

the report for the internal and external stakeholders to read, understand, and evaluate a firm's readiness to tackle the challenge of balancing a firm's interest with environmental sustainability.

We selected three years of annual sustainability reports of 618 firms filed between years 2013 to 2015. Each report is filed and categorized according to the firm's industry such as agriculture, financial services, manufacturing, and so forth. A firm may choose to use GRI's reporting guidelines, or choose to submit a generic annual sustainability report. The GRI's reporting guidelines is currently in its fourth iteration (G4). Each revision has remained relatively similar, with the later version adding more performance indicators to stay current.

We then transformed the dataset with a number of data processing procedures to prepare for analysis. First, since the reports are stored as PDF document files, they were converted to text files for further processing. We used R programming language and a set of libraries to transform the PDF files, which are equivalent to image files, using an Optical Character Recognition (OCR) algorithm that recognizes symbolic representation of texts, words, and layout information to extract a table of firm performance indicators. In addition, we saved detailed text descriptions of the six performance indicators as separate documents for text mining. Thus, a total of up to six document files were generated for each firm in a given year. We then coded whether a firm chose to report each of the six indicators as a binary variable. We then applied latent Dirichlet allocation (LDA) based topic modeling algorithm (Blei 2012) to identify and summarize common themes expressed in a collection of documents. A topic modeling is a machine algorithm designed to discover hidden thematic structures embedded in documents in order to organize and summarize a collection of documents. The model assumes the distribution of topics and allocation of topics to documents follow a Dirichlet distribution. From the topic modeling analysis, we identified three themes and assigned probability scores for each document. We also coded a firm's industry type as a binary variable for control variables in our model.

### **Model Estimation**

Our model investigates the maturity level of a firm's reporting practices. In addition, we also explore how a firm's maturity changes over time, reflecting its strategic direction aligning with market interests. More specifically, we use the six indicators as a collective measure of a firm's maturity level. To better understand the factors that influence a firm's decision to report these measures, we identify themes expressed in a given year's report as covariates in the model. We further model a firm's intention behind its reporting decision as unobservable states, using a latent Markov model approach. For instance, a firm's intention to report CSR initiatives may be driven by the desire to attract and retain employees, or it may be driven by the goal of maintaining customer relations. In addition, these intentions may switch over time. We do not make any *a priori* assumptions about the number of intentions. In our model, we also allow firm intention to switch from year to year, whose effect remains constant to simplify the model estimation.

The model consists of six indicators as our dependent variables: (1) Economic (EC), (2) Labor (LA), (3) Product Responsibility (PR), (4) Environment (EN), (5) Human Rights (HR), and (6) Social (SO), with each indicator as a categorical response of report (1) or no report (0). Our specified model includes three topic variables: (1) Environmental discussion (E), (2) Social discussion (S), and (3) General CSR discussion (G). The list of words that make up each topic is included in the appendix. Last, we included industry code as dummy variables for control variables. To estimate hidden states which represent the strategic intent of the firm in reporting six indicators as response variables, we use latent Markov model. We use R programming library LMest to estimate the optimal number of hidden states that leads to the best fit for our model. We start with two hidden states to thirty states to accommodate possible combinations of reporting up to six indicators, and we found that a model with six hidden states performed best, using BIC. We further ran a model with six hidden states and three topics as covariates to estimate the statistical significance of the three topics influencing the hidden states, in terms of initial and transition probabilities.

## Findings

Table 1 shows the summary of our analysis on conditional response probabilities of response variables. The table shows which of the six indicators are associated with hidden states. Similar to dimensionality reduction techniques such as PCA or factor analysis, we use this table to derive labels for the hidden states. Table 2 shows the initial probabilities associated with each hidden state, which we derive from the model estimation as firm motivation behind CSR reporting, along with the distributions of the three topics in the detailed sections of each indicator documents.

First, we observe the “No disclosure” (ND) hidden state in which firms are unlikely to report any indicators or are simply terminating reporting practices. Unfortunately, most companies are likely to start in the no disclosure state (0.36) in our sample. We observe a number of hidden states whose strategic intent is managing external stakeholders. The customer relations management (CRM) hidden state reflects a firm’s intent to manage firm reputation with customers, and based on its initial probability (0.21), external stakeholder management is most frequent within our sample. Similarly, “Socially Responsible” (SR) and “Global Compliance” (GC) are part of external stakeholder management strategies. We also observe hidden states that reflect internal stakeholder management strategic intent. For instance, “Workforce Engagement” (WE) represents a firm’s intent to attract and retain talent by disclosing firm activities associated with labor practices and human rights involvement. Last, the “Environment Performance” (ENV) hidden state is part workforce management and part investors management strategic intent.

It is interesting to note that few firms are reporting on compliance related indicators (0.08). One rationale for this is a lack of compliance standards and enforcement, especially in the U.S. However, other continents are starting to ramp up efforts to require firms to meet various reporting standards such as the European Union’s directive to require firms with 500 or more employees to release sustainability reports by 2018.

Hidden State/Indicators*	EC	EN	HR	LA	PR	SO	Label
1	0.00	0.00	0.00	0.00	0.00	0.00	No disclosure (ND)
2	0.00	0.00	0.03	0.00	0.98	0.01	Customer relations management (CRM)
3	0.41	0.98	0.10	0.42	0.08	0.19	Environmental performance (ENV)
4	0.19	0.00	0.41	0.70	0.18	0.02	Workforce engagement (WE)
5	0.43	0.62	0.78	1.00	0.80	0.91	Socially responsible (SR)
6	0.02	0.05	0.30	0.10	0.62	1.00	Global compliance (GC)

**Table 1. Hidden State Summary**

\*Indicators: EC=Economics, LA=Labor, PR=Product Responsibility, EN=Environment, HR=Human Rights, SO=Social, NA=Not Applicable

Hidden State Labels	Initial Probabilities	Topic (E)	Topic (S)	Topic (G)
No disclosure (ND)	0.36	0.00	0.00	0.00
Customer relations management (CRM)	0.21	0.29	0.36	0.30
Environmental performance (ENV)	0.16	0.29	0.31	0.37
Workforce engagement (WE)	0.09	0.32	0.41	0.23
Socially responsible (SR)	0.09	0.32	0.35	0.31
Global compliance (GC)	0.08	0.32	0.39	0.26

**Table 2. Initial Probability**

\*Topic E=Environment, S=Social, G=General CSR

Table 3 further shows a firm's commitment to CSR activities. The diagonals of the table report a firm's intention to maintain course with its current strategy, which we operationalize as a firm's commitment to CSR. Not surprisingly, many firms choose to switch to no disclosure strategies, reflecting a lack of commitment to sustain their practices. The "sticky" behavior of voluntary disclosure reporting commitment, measured by transition probabilities in the diagonals, is highest with maintaining customer relations management (CRM), a result that is consistent with Taylor et al. 2016. This result strengthens the argument that firms choose to engage in CSR activities for customer relations management. However, we also observe that workforce engagement is also a significant driver for CSR initiatives (0.58).

from/to state	ND	CRM	ENV	WE	SR	GC
No disclosure (ND)	0.42	0.01	0.26	0.11	0.12	0.09
Customer relations management (CRM)	0.00	0.99	0.00	0.00	0.00	0.00
Environmental performance (ENV)	0.43	0.00	0.56	0.00	0.00	0.00
Workforce engagement (WE)	0.41	0.00	0.01	0.58	0.00	0.00
Socially responsible (SR)	0.45	0.00	0.00	0.00	0.55	0.00
Global compliance (GC)	0.33	0.00	0.01	0.01	0.00	0.64

**Table 3. Transition Probability**

Table 4 and Table 5 show selected results with topics discussed in a firm's annual sustainability report as the main variables of interest, in terms of their influence on a firm's strategy switching behavior. Table 4 shows transition probabilities for ND as a prior hidden state, and results are displayed as multinomial logit, with CRM as base or reference. The coefficients are interpreted as the odds of choosing one of five hidden states relative to base hidden state. For instance, Table 4 showing a positive coefficient of 3.19 in the WC column indicates that firms whose prior hidden state was ND is more likely to switch to WC,

relative to CRM (Table 4). Positive and statistically significant coefficients in Social discussion rows indicate that more discussion on social engagement activities are likely to increase firm's strategy switching behavior to other hidden states, showing an increase in its maturity level. Table 5 further improves the model by including industry code as dummies, and shows selected results for estimating the effects of three topics on switching behaviors of firms whose prior hidden state is ENV. The results show that discussion of both environment and general CSR issues are likely to decrease switching behavior for WC, indicating that firms are likely to remain within ENV strategy.

Base=CRM	WC	ENV	SR	ND	GC
intercept	-8.52***	-4.07***	-8.46***	-8.61***	-5.57***
E	-1.18	-1.24	-0.51	-0.89	-0.78
S	3.19***	3.26***	3.14***	3.20***	3.26***
G	-0.80	-0.97	-1.01	-0.86	-1.02

**Table 4. Transition Probability for ND**

\*  $p < 0.1$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$

Base=ENV	WC	SR	CRM	ND	GC
intercept	0.22	0.03	0.24	-0.24	-0.32
E	-1.31***	-3.73***	-1.08	1.20	0.25
S	-4.42***	1.26	1.07	1.04	0.39
G	-2.34***	-1.71**	1.41	0.55	0.23
Industry Controls Included					

**Table 5. Transition Probability for ENV**

\*  $p < 0.1$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$

## Conclusion

The current study explores a firm's maturity level in adoption of CSR practices by examining a firm's voluntary disclosure of annual sustainability reports. The findings from our study show that most firms are unwilling to stay committed in their reporting behavior over time. Of the firms who do report, our preliminary evidence suggests that most firms choose to disclose CSR activities to manage relationships with external stakeholders, but workforce engagement strategic intent is gaining acceptance. Future studies will further investigate contextual factors such as comparison between industries.

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