Understanding Smart Data Disclosure Policy Success: The Case of Green Button

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ABSTRACT
Open data policies are expected to promote innovations that stimulate social, political and economic change. In pursuit of innovation potential, open data has expanded to wider environment involving government, business and citizens. The US government recently launched such collaboration through a smart data policy supporting energy efficiency called Green Button. This paper explores the implementation of Green Button and identifies motivations and success factors facilitating successful collaboration between public and private organizations to support smart disclosure policy. Analyzing qualitative data from semi-structured interviews with experts involved in Green Button initiation and implementation, this paper presents some key findings. The success of Green Button can be attributed to the interaction between internal and external factors. The external factors consist of both market and non-market drivers: economic factors, technology related factors, regulatory contexts and policy incentives, and some factors that stimulate imitative behavior among the adopters. The external factors create the necessary institutional environment for the Green Button implementation. On the other hand, the acceptance and adoption of Green Button itself is influenced by the fit of Green Button capability to the strategic mission of energy and utility companies in providing energy efficiency programs. We also identify the different roles of government during the different stages of Green Button implementation.

Categories and Subject Descriptors
J.4. [Computer Applications]: Social and Behavioral Sciences – Communication.

General Terms
Management, Economics, Standardization.

Keywords
Smart Disclosure, Open Data, Innovation, Green Button, Energy Efficiency.

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1. INTRODUCTION
In May 2009, the U.S. government pioneered the policies of opening government data through the launch of data.gov. The follow-up Open Government directive enacted in December 2009 requires government agencies to publish at least three high-value datasets online and to register them to data.gov for public use [21]. Opening government data has been associated with various benefits. Vivek Kundra, former U.S. Chief Information Officer, argues that open data stimulate social, political and economic change [18]. Opening data to public is expected to create economic potential through increased public innovation [15,18]. In the pursuit of innovation potential, open data has expanded beyond government and users qua citizens to the wider environment of government, citizens, business and civil society organizations [12]. Government has empowered open data users to innovate through the promotion of greater data disclosure, coined as "smart disclosure" [14]. One manifestation of expanded interaction within open data as government policy is the recent enactment of smart disclosure by U.S. government in the area of energy efficiency policy.

Cass Sunstein, the former administrator of the Office of Information and Regulatory Affairs (OIRA), defines smart disclosure as a "new tool that helps provide consumers with greater access to information they need to make informed choices [26]". Smart disclosure policy requires wider collaboration between government agencies and users of open data including businesses and citizens. Smart disclosure policy encourages business to disclose to the consumer their own product usage information to enable consumer making informed choices. In recent, there are two manifestations of smart disclosure in the US, namely: Blue Button and Green Button. Blue Button is an initiative from the Veteran Administration (VA) started in August 2010 to facilitate VA's clients to access and download their own personal health records. The clients can then use their own data to search for health facilities and services that suit their upmost needs. Hence, Blue Button could facilitate effective patient engagement [4]. The key factors of smart disclosure are the release of data in standardized, machine readable formats in timely manner [14].

Green Button is modeled after the same common-sense concept of Blue Button but applied in the energy and utilities industry. Green Button focuses on enabling and empowering consumers to have access to their own energy usage information. Green Button, however, is not fully comparable to Blue Button in that while Blue Button is government-led initiative, Green Button is industry-led initiative, meaning that the energy and utility industry is the driver of Green Button implementation (www.greenbuttondata.org). In response to a White House call-to-action in September 2011, a group of energy and utility

companies in California were able to successfully implement Green Button in 90 days [25]. Per January 2013, there are 58 energy and utility companies serving approximately 35.7 million customers implemented or committed to Green Button [7].

Extant literature on disclosure motivation argues that unless otherwise mandated by the government, organization have full discretion in deciding what, when and how much information to disclose. Economic literature has long since posited that the decision to disclose information was predominantly determined by economic motives, such as: cost and financial benefits [11]. Phenomena like Green Button where for-profit companies are encouraged to disclose more information that might otherwise be proprietary to them contradict the basic assumption of voluntary disclosure motivation. The adoption rate and rapid implementation of Green Button gives rise to important research questions: How can smart disclosure policy such as Green Button which relies on for-profit voluntary participation be successful?

This paper explores the implementation of Green Button to try to answer this question. Drawing on semi-structured interviews and secondary data, this paper presents motivations and success factors driving the implementation of Green Button as smart disclosure policy. The institutional arrangements that facilitate the success of collaboration between public and private to support smart disclosure policy are introduced and discussed. This paper is structured into five sections, including the foregoing introduction. Given the novelty of smart disclosure policy, section 2 provides brief overview of smart disclosure as regulatory policy. Section 3 describes the research method and data in detail. Section 4 presents the results and findings. Section 5 provides concluding remarks and suggest preliminary model for understanding the disclosure motivation in the new policy setting.

2. LITERATURE OVERVIEW

2.1 Smart Disclosure as Regulatory Policy

In order to limit direct intervention, government has been using disclosure as policy to govern the market [10,29] with the intention to balance the information needs for both knowledgeable and less knowledgeable consumers reducing information asymmetry [9,29]. The hope is to have more information available for consumers to decide for themselves which products/organizations to transact with by encouraging organizations to disclose more information so that consumers can make better decisions. Until recently it has been argued that organizations/sellers have more information regarding product-attributes while consumers have more information regarding their own use of a product [1,2]. Thaler & Sunstein [27] refute this basic assumption arguing that consumers are in fact not keeping records of their own consumption patterns [1,2,27]. Thaler & Sunstein further argue that altering the choice architecture through the disclosure of product use information will enable consumers to make better choices and decisions [27].

The Obama administration embraced this idea and began to implement it through the use of smart disclosure as policy to support efforts to reduce information asymmetry. In January 2009, the Office of Information and Regulatory Affairs (OIRA) issued a Memorandum on Disclosure and Simplification as Regulatory Tools on June 2012. This memorandum served to provide guidance for the use of disclosure as a regulatory approach, including "smart disclosure" policy. Cass Sunstein defines smart disclosure as "timely release of complex information and data in standardized, machine readable formats in ways that enable consumers to make informed decisions" by providing information upon which choices can be made by the public [26]. The follow-up Memorandum on Informing Consumers through Smart Disclosure, released in September 8, 2011, outlines the seven principles which characterize smart disclosure namely: accessibility and usability, standardization, machine readable formats, timeliness, interoperable, market adaption and innovation, and disclosed in ways that fully protect consumer privacy [26].

The basic premise of smart disclosure is giving more power to the general public by transferring the control of personal data from the hand of corporate interests to the public [6]. By providing more control of information to the public, smart disclosure is linked to many profound benefits such as: promoting innovation, economic growth and job creation. For example by disclosing their own energy usage, consumers could construct better energy efficiency plans for themselves. The Memorandum also presents two primary ways smart disclosure can work: 1. either government agencies require private entities to disclose information directly to consumers, or 2. government agencies collect information from private entities and disclose it to consumers [26]. The two most notable smart disclosure initiatives in the U.S. are the Green Button and Blue Button initiatives. Blue Button is an initiative from the Veteran's Administration (VA) that started in August 2010 to enable VA's clients to access and download their own personal health records. Green Button represents the sharing of information related to personal energy consumption and savings with consumers [14].

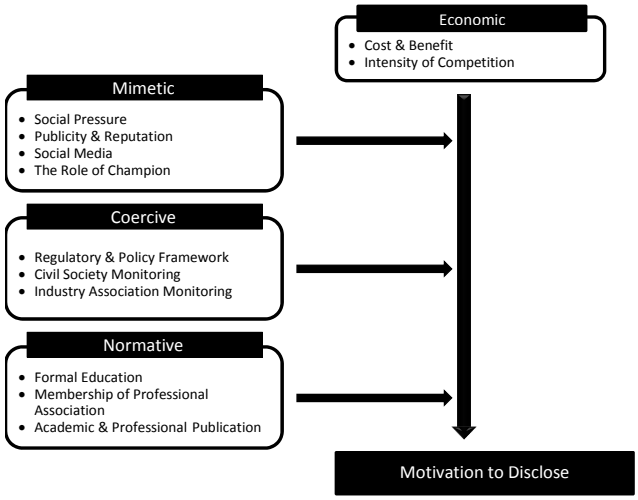

Figure 1. Preliminary Model

2.2 Preliminary Framework

A review of the literature finds that factors other than economic ones have been found to influence organizations in their decisions to disclose. As argued by Gray et al. [11] economic rationale needs to be understood within an environment influenced by social, political and institutional elements [11]. This study seeks to understand the response of organizations to the interests of social actors, other than the organization itself, and the institutional environment underlying the response using the lens of institutional theory. This study proposes that economic motives are mediated by two categories of institutionalization forces, coercive and mimetic. The drivers for coercive forces are policies and regulatory frameworks and external monitoring. The drivers

for mimetic forces are social pressure, publicity and reputation, social media and networks, and the role of champions. These elements have been found to mediate the decision to disclose information. For instance, organizations might choose a future market position derived from a current increase in reputation rather than pursuing short-term objective of cost reduction. Or, organizations might comply with current regulatory frameworks now rather than risking the higher cost of non-compliance later. Considering the novelty of smart disclosure as a topic of study this study does not consider normative forces in the model. The preliminary model is depicted in figure 1 above.

3. RESEARCH METHOD

3.1 Data Collection

Data are collected from two sources, semi structured interviews and openly available sources. Interviews were conducted with four experts involved in Green Button. In principle, Green Button implementation involves three groups, the government, the energy & utility companies and technology companies. Correspondingly, interviewees were selected to represent each of the three groups. Five interviews were conducted. Two interviews were conducted with an individual from an operating government agency, one with the member of White House's Task Force on Smart Disclosure and one with the developer of SGIP standards from NIST-SGIP. Two interviews were conducted with individuals from the energy and utility industry, and one with a technology company that builds applications with Green Button data. All interviews were conducted either remotely over the phone or through online tools such as skype. Each interview lasted 50 to 80 minutes and was recorded and transcribed. All interviews were semi-structured to provide the flexibility to follow up on new information presented in the context of an interview and to explore responses in depth.

To offer richer analysis and interpretation, the findings from the interviews was combined with findings from secondary data analysis. Two types of secondary data were used in the study: 1. results from interviews and focus group discussion conducted by the California Public Utility Commissions or the energy & utility industry association pertaining to Green Button, and 2. quantitative data related to energy efficiency programs for the energy and utility industry and also publications pertaining to Green Button. For instance, we use the Lexis Nexis database to extract news and publications pertaining to Green Button and correlated the findings with the dates of commitment to provide suggestive evidence on the impact of publicity.

3.2 Green Button Case Description

On September 2011 during the last day of the four-day annual GridWeek conference, the first U.S. Chief Technology Officer (CTO) Mr. Aneesh Chopra challenged the energy and utility industry with a call-to-action to develop Green Button to enable consumers to have access to their own energy usage data [5]. In the same month, Mr. Chopra's contact with the energy and utility Companies in California made through a call to PG&E (Pacific Gas & Energy) CEO, Karen Austin and the energy and utility companies in California resulted in a response to his challenge. The director of the Technology Innovation Center of the Pacific Gas & Electric Company's (PG&E) recalled the event leading to the implementation of Green Button in California during a webinar conducted by the Association for Demand Response in January 2012:

> …Aneesh called my CEO, Karen Austin [from PG&E] and put out a simple question… why don't utility allow customer to download their data in a standard format? We thought about that for a second… So Karen thought that Aneesh has a great idea and inviting our friends in SCE and SDG&E to sat down and discuss this in details. Again at that meeting, we eventually agree to enable…go forward with the green button project.

In October 04, 2011, PG&E hosted a meeting of the other utility companies in California and members of the Silicon Valley Leadership Group to discuss this challenge in detail, Mr. Chopra attended this meeting. In mid November, the energy and utility companies met with NIST (National Institute of Standard and Technology) and SGIP (Smart Grid Interoperability Panel) and agreed to a specification and standard for utility. In December 2011, two of the energy and utility companies in California, PG&E and SDG&E, launched Green Button on their websites; Green Button is accessible through the customer energy portal within these websites. The time from the call-for-action until the initial launch by the energy and utility companies in California took only 90 days.

Table 1. The Timeline of Green Button

Time	Event
June 2011	The White House released "A Policy Framework for the 21st Century Grid: Enabling Our Secure Energy Future"
July 28, 2011	CPUC (California Public Utility Commission) Adopts Rules to Protect the Privacy and Security of Customer Electricity Usage Data
Sept 15, 2011	Aneesh Chopra, U.S. CTO, launches a call to action for Green Button
Sept 2011	Mr. Chopra challenges the CEO of California's Energy & Utility Companies
Oct 04, 2011	PG&E hosted a meeting with other Utility companies and the members of Silicon Valley Leadership Group. Mr. Chopra attends.
Nov 2011	Utility Companies in California met with NIST and SGIP and agreed to a specification and standard.
Dec 12, 2011	CPUC held a workshop on the Green Button Implementation in California for the Energy & Utility companies in California (PG&E, SDG&E and SCE).
Dec 2011	PG&E and SDG&E launched Green Button capability on their websites.
Jan 18, 2012	Green Button was officially launched at a Silicon Valley Leadership Group event.

The speed with which Green Button went from concept to implementation in California was enabled by two crucial elements. First is the role of CPUC (California Public Utility Commission). In December 12, 2011, the CPUC held a Smart Grid workshop to discuss the necessary points that the energy and utility companies need to pay attention during their filing with the Commission regarding Green Button implementation. The workshop accelerated the filing process as during the workshop had a chance to hear points of concerns from various stakeholders

and were advised as to what should be covered in their filing. The second factor that enabled the rapid implementation of Green Button in California is the availability of an industry standard to support Smart Grid development in the U.S. NIST (The National Institute of Standards and Technology) and SGIP have been developing the industry standard format known as ESPI (Energy Service Provider Interface) to support Smart Grid development for years starting from the appointment of NIST by Congress in 2007 and later the establishment of SGIP in 2009. The SGIP was established to support open and collaborative public and private sector development of the standard. This standard is published by the NAESB (North American Energy Standard Board) based on the OpenADE (Open Automated Data Exchange) requirements. The availability of this standard significantly supported the speedy launch of Green Button.

The use of an open existing standard was also part of the key principles of Green Button implementation mentioned in Mr. Chopra's presentation during the closing remarks of the GridWeek conference in September 2011 [5]. He explained the character of Green Button:

> … It challenges to us to establish in an open collaborative model the ability to empower our consumers. And we have the raw materials. …We'll harness the SGIP standards, we'll pursue this in open collaborative manner, we'll do this in a multi-stakeholders way, we'll adopt the principles of our good friend Eric Reis in the "lean start-up" and we'll ensure that this is easy to use…

As asserted in the above excerpt, there are four key principles of Green Button, namely: use SGIP standard, open and collaborative, multi-stakeholders, use "lean-startup", and it should be easy to use. The first principle means that Green Button uses the existing consensus-based SGIP standard. SGIP is a public-private partnership created in November 2009 to coordinate and accelerate standard development for Smart Grid [30]. Green Button's file format is a subset of ESPI standard developed by SGIP and ratified by NAESB. This standard incorporates data model from PAP 10 energy usage information to enable standard format to provide energy information to the consumers via website [30]. There are two stages to the development of Green Button, the first stage is business to consumers and the second is business to business. Table 2 presents some facts on and the status of Green Button.

Table 2. Facts and Status of Green Button

Descriptor	Detail
Official launch date	January 2012
# of Energy &Utility Companies	33 energy & utility companies committed or implemented.[1]
# of Green Button Companies	45 technology companies committed or implemented[1]
Data format	CSV format
Potential Adopters (Household)	More than 35.7 million households (per June 2012).[2]
# of Apps	65 apps & tools (per December 2012)[1]
Capability of GB	B2C (1st stage) & B2B (2nd stage)

[1]Information derived from the http://greenbuttondata.org

[2]IEE (Institute of the Edison Foundation) issue brief of September 2012

4. RESULTS & FINDINGS

This section describes the findings about success factors and motivation to implement Green Button. The success factors are expounded in terms of economic rationale, regulatory and policy incentives, technology incentives and mimetic forces.

4.1 Economic Rationales

This section explains the possible economic rationales that might serve as incentives to adopt Green Button and explores whether economic rationales are sufficient to incentives adoption.

4.1.1 The Utility Rate Making System – Disconnecting Profit from Revenue

Traditional revenue mechanisms correlate the number of sales with profit, thus companies have more incentives to sell more energy to gain more revenue and have disincentive to do otherwise. To support energy efficiency goals, States have introduced a rate mechanism policy called revenue decoupling.

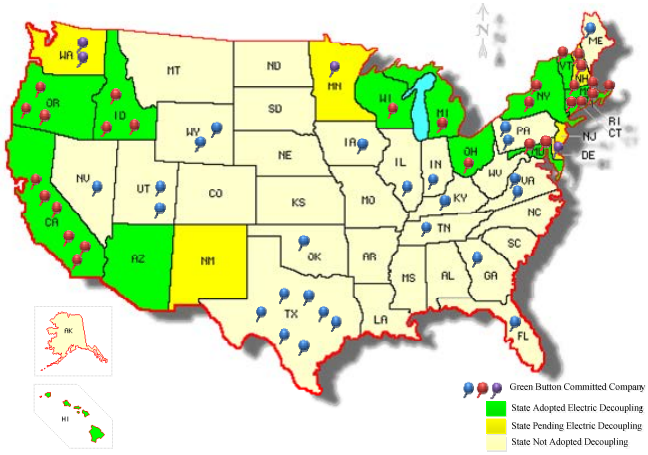

Figure 2. Mapping De-Coupling Mechanism to Green Button

Revenue decoupling is a revenue mechanism disconnecting the dependency of profit on sales volume by disconnecting sales from fixed cost recovery. Using decoupling, a company will be able to obtain the predefined revenue without competing to sell more energy to consumers. However, as of January 2012 not all 50 states have adopted decoupling, in fact only 15 states have adopted electric decoupling or have their adoption pending.

Green Button aims to facilitate energy efficiency by helping consumers reduce their energy consumption. In this sense, Green Button is the antithesis of the traditional revenue model and is a perfect fit with the goals being sought through revenue decoupling. In this case, companies located in States with decoupling have more incentive to adopt Green Button while those in states without decoupling will be less eager to do so. If this logic holds, there should be a high correlation between Green Button companies and companies that exist in states which have adopted decoupling. Figure 2 maps the companies which have adopted Green Button against states' status on revenue decoupling. Figure 2 shows only 55% of companies adopting Green Button are located in states permitting revenue decoupling while the rest are located in states with no decoupling. To further test the relationship, we performed correlation analysis (table 3)

and found a low correlation between decoupling commitment to Green Button commitment with correlation coefficient 0.3151 (p_{value}:0.0243). The result indicates that only 9.9% of variance in Green Button commitment is associated with the variance in the decoupling commitment. Consequently, 90.1% of variance in Green Button commitment is not linked to the decoupling commitment. This finding provides suggestive evidence that economic rationale in terms of revenue retention is not the only factor incentivizing companies to participate in Green Button.

Table 3. Correlation: Green Button to Decoupling

	Indicator
% of Green Button in Decoupling States	32 (55%)
Pearson correlation (ρ)	0.3151* (0.0243)
Variance (ρ^2)	0.0992

This suggestive evidence points to two factors influencing Green Button implementation. First, economic rationale in terms of revenue retention or acquisition through decoupling is not the only factor incentivizing companies to participate in Green Button. There are other influential factors in terms of both economic and non-economic incentives. Second, the market condition and industry structure by states matters in affecting the decision of companies to participate in Green Button. Market for energy and utility in the US is unique in the sense that different states enacted different policies to govern the market. For instance, the state of Texas implements retail competition for their energy market structure that is different to other states, such as California. On the other hand, despite the energy retail competition policy, the largest number of companies committed or implemented Green Button are located in Texas (figure 2) which further suggest for a disconnection between revenue decoupling and Green Button adoption. This disconnection leads to the consideration of three plausible economic related factors, namely: the state energy market structure, role of competitiveness in energy market and the cost of Green Button implementation.

4.1.2 Green Button as Competitive Advantage

Figure 2 shows the largest number of companies adopting Green Button are located in Texas (seven companies), a state that has a very different energy market situation. Texas adopted market deregulation and instituted a competitive market structure in 2002 [13]. In the current market structure, Texas energy customers have unrestricted ability to switch between different retail providers. The switching cost to change energy retail providers is very low. The ABACCUS Survey indicates that Texas has 100% switching level. With a very competitive market, customer acquisition and customer retention is crucial for the survival of energy retailers. As result, Texas energy retailers need a distinct competitive advantage to retain and acquire customers. Satisfying customer's intrinsic need for value could result in increasing customer loyalty and increase trust in the relationship between an energy retailer and their customers. Green Button provides a tool not only for strategic differentiation but also for customer engagement. As described by the VP of Residential Segment Marketing of Reliant Inc, a Texas based energy retailer, during his interview with the Association for Demand Response;

> We seek to differentiate ourselves to consumers in a lot of ways, but one of the ways is innovative products and services that allow us to be trusted advocate or advisor to consumers. One of the answers to that question in terms of providing consumers the ability to understand their usage and to save by getting on a rate plan that really works for them.

4.1.3 Low Cost Solution: Harnessing the "Low Hanging Fruit"

Other markets, such as California are quite different. California has a captive market with significant limitations on customer flexibility in terms of competitive electricity retailers [23]. With low competition and the revenue decoupling option, providers have less incentive to pursue growth through sales and instead have greater incentives to pursue growth through cost efficiency. As such, one of the incentives to implement Green Button is driven by the desire to harness the "low hanging fruit" of IT investment. The Director of Technology Innovation Center of the PG&E explained his strategy:

> "low hanging fruit" that I really think we should focus on in this industry, and the Green Button is a fantastic example [of] that and in less than 90 days some brilliant person like Aneesh thought of ..."hey lets pick, ... let's cut some low hanging fruit and lets have some immediate value out of this" ... smart grid going to take several years and we definitely going to pursue that but let's also try to focus on this immediate value that could be accomplished.

Green Button is considered a low cost solution for energy providers due to three elements, a) standard (ESPI standard) is available to support Green Button capability, b) the cost to implement is very cheap, and c) the privacy problem has been dealt with. For instance, the respondent from Simple Energy indicates three benefits of the ESPI standard in supporting Green Button adoption: a) supporting the interoperability capability, b) reducing cost and time for implementation and c) eliminating the need for custom solution. As he explained:

> The critical piece ... green button is basically a manifestation of the ESPI, the energy services provider interface standard that SGIP and NIST have been working on for a number of years ... that's a standard for interoperability that has been under development for a while, ... its very valuable to both the provider and receiver of that data, its reduces integration cost and time and there's a lot of benefits to knowing what you're gonna get if you are receiving that data and there's a lot of benefits if you are the provider of that data to know that you do not have to do a custom solution for every application or every consumer of that data and that's the real value of a data standard.

4.2 Technology Related Incentives

Analysis of the interview results and the secondary data indicate three technology-related incentives for Green Button adoption, a) clear-cut privacy and security requirement, b) data standards supporting interoperability already exists, and c) smart grid technology supports the availability of data for Green Button.

4.2.1 Privacy Issue Has Been Dealt With

Based on the case of California implementation, the Director of Technology Innovation Center of PG&E pointed out that privacy for Green Button in Phase one (Business to Consumer) is clearly defined. The privacy requirement indicates that the responsibility of energy provider terminates once the customer moves the data

from the provider's portal. Privacy protection is up to the customer and the 3rd party. The White House's policy framework for the 21st Century Grid[3] did not provide additional privacy requirements for Green Button. Section 5.4 asserts the use of FIPP (Fair Information Practices Principles[4]) in governing the privacy related to consumers' energy usage data [22] including Green Button. There are no additional requirements for privacy other than the FIPP requirement.

Similarly, the California Public Utility Code also applies a very general obligation on the energy and utility industry in terms of providing security of data. Section 8380.d explicated that the energy and utility company is to provide responsible security procedures and practices to protect a customer's unencrypted electric or gas consumption data from unauthorized access, destruction, uses, modification or disclosure. Section 8380.d of the CPU code is similar/conforms to the principle of integrity/security in the FIPP. The non-complicated privacy requirements for Green Button phase one and the existing policy that immunizes the energy and utility industry from the liability creates incentive for quick implementation of Green Button.

4.2.2 Interoperability and Data Standardization

The existence of a data standard that enables interoperability provides strong incentive to participate in Green Button. Interoperability provides incentives for the companies in term resource utilization. Adopting interoperable standard reduces the costs, time and enable the creation of a "one-fit-all" solution. An interviewee from Simple Energy, one of the first technology companies to build a Green Button application, provides further insight about how the benefits of interoperability lended support to Green Button adoption:

> Green Button is basically a manifestation of the ESPI, the energy services provider interface standard that SGIP and NIST have been working on for a number of years … that's a standard for interoperability that have been under development for a while, … its very valuable to both the provider and receiver of that data, its reduces the integration costs and time …and there's a lot of benefits if you are the provider of that data to know that you don't have to do a custom solution for every application or every consumer of that data.

4.2.3 Smart Grid Technology Supporting Data Availability

The existing smart grid technology is supporting availability of data. Green Button implementation incurs minimal cost because the data already exists, produced by the smart grid technology such as smart meters. No more effort is necessary other than the routine operation to get the data. The IT program manager for smart meter in SDG&E explained the data collection process, "…so the way it works is that we read out the meters every night as part of our normal interrogation schedule and that data is made available on the internet the next day…" The advanced metering infrastructure (AMI) installed in about 90% of residential customers enables automated measurement and recording of data from the meter. The AMI supports measurement and recording of electricity usage at different intervals from minimum hourly intervals to real-time data. This allows energy and utility companies to collect data and provide data to customers at least once daily[5]. The data is collected and made available as part of the daily operation of the energy and utility companies. Given that the data is available as part of the routine operation, providing the same data to the customer results in a very marginal additional cost.

4.3 Regulatory Framework, Policy Incentives and Coercive Element

4.3.1 Policies and Regulations Supporting Energy Efficiency

During a January 2012 webinar administered by the Association for Demand Response, Nick Sinai, a senior policy analyst in the White House's OSTP, explained that Green Button as energy efficiency policy is voluntary and not mandated by the Federal government and regulations and policies pertaining to data access are within the jurisdiction of State government [25]. The federal agencies did not endorse specific rules pertaining to Green Button. Notwithstanding, the success of Green Button is attributed to the set of policies and regulations that indirectly support the implementation of Green Button.

Table 4. Policies and Regulations Supporting Energy Efficiency and Security in the U.S.

Date	Development of Policy and Regulation for Energy Efficiency Security
Dec 10, 2007	The Energy Independence & Security Act of 2007 is signed. NIST (National Institute of Standards & Technology) is designated by Congress to coordinate standard development for Smart Grid.
Feb 17, 2009	Congress endorsed The American Recovery and Reinvestment Act of 2009 (Recovery Act), investing $45 billion and accelerated the development of smart grid technologies.
March 30, 2011	The White House released the Blueprint for a Secure Energy Future
June 2011	The White House released "A Policy Framework for the 21st Century Grid: Enabling Our Secure Energy Future"
July 28, 2011	CPUC (California Public Utility Commission) Adopts Rules to Protect the Privacy and Security of Customer Electricity Usage Data

Table 4 lists existing policies and regulations supporting the implementation of Green Button. First, the EISA of 2007 is mandating the development of interoperable standard for smart grid development. The availability of interoperable standard is crucial for the implementation of Green Button. Second, the role of EISA of 2007 in forcing the development of standard was

[3]For more information refers tohttp://www.whitehouse.gov/sites/default/files/microsites/ostp/nstc-smart-grid-june2011.pdf

[4]For more information refers to http://www.ftc.gov/reports/privacy3/fairinfo.shtm

[5] For more information refers to http://www.eia.gov/tools/faqs/faq.cfm?id=108&t=3

supported with the ARRA of 2009 that provides funding for accelerating the development of smart grid technologies including the interoperability standard to enhance security of U.S. energy infrastructure and ensure reliable electricity delivery to meet growing demand. Third, federal government release a policy framework outlaying series of principles to encourage State governments, utility providers, and consumer advocates to empower consumer with their own timely, machine-readable energy information. Fourth, the State government has more jurisdictions related to energy and efficiency policies including Green Button. In the case of the state of California, The state agency such as the CPUC endorsed policies and regulations to support energy efficiency including Green Button, such as customer's privacy and security protection.

4.3.2 "Power to the Bully Pulpit"

As earlier indicated, Mr. Sinai sees Green Button as an industry-led effort, not a federally mandated one. However, he does recognize that its genesis as the result of a White House Challenge puts more weight on the providers and technology companies to adopt. An interviewee from Simple Energy speaks of the power of the bully pulpit;

> ...fundamentally the biggest motivator that has gotten utility to do this is the power of the "Bully Pulpit", it's the White House reaching out to utility and saying..."are you on board on this"...that's probably in many ways the number one motivation for many people to actually do that ... having been there with some of the utility executives and folks from White House ...when the White House asked "will you stand up and do this" for many of those executives whatever motivation is to do so ...they want to say "yes we will"....

4.3.3 The regulation itself is incentive regulation

In the energy and utility industry, government imposes regulations as proxy for price competition [8]. A number of studies assert that regulations imposed by government on the energy and utility industry are incentive regulations [3,16]. Such regulations imposed by governments have dual functions as "carrot and stick". As explained by interviewees from Simple Energy, "they are structures in different ways some of them, if utility did not hit that goal then they can be fined or penalized, [also] there's like rewards or incentives if they hit that target. You know stick and carrot or both." The regulations impose restriction to what the energy and utility company can do but at the same time the regulations also provide incentives for the companies to act in ways that could maximize their shareholders interests.

4.4 The Effect of Mimetic Forces

This section introduces the two mimetic forces at play in Green Button adoption, a) the role of political champion, and b) the power of publicity.

4.4.1 Political Champion Promoting Green Button

A champion has the ability to sway public opinion to favor action chosen by the champion, especially when the champion has high social status [20]. Rapid implementation of Green Button was attributed to the role of champions in the form of political leadership, high level government officials and executives of energy and utility companies. Credit as a champion goes first to President Obama, as the political leader whose high position was important in creating the public awareness necessary to promote Green Button. This awareness in turn stimulated a large number of responses from industry. Also notable is Aneesh Chopra and the White House's OSTP team for championing Green Button by not only promoting, inspiring and challenging the energy and utility industry but also by identifying the opportunity more generally. This team was able to identify the simple and most straightforward path toward leveraging existing consensus-based standards to reduce the cost of Green Button implementation, thereby accelerating such efforts. As explained by the Smart Grid Standards & Interoperability Coordinator at the U.S. Department of Energy, "the particular credits goes to the Aneesh and the OSTP crowd that recognize the simpler path still can provide a lot of value".

4.4.2 Publicity and Visibility

Publicity in term of news coverage has the potential to increase the visibility of companies engaged in such efforts which in turn leads to building a company's reputation and credibility in the eyes of stakeholders. The commitment of energy & utility companies to implement or to commit to implement Green Button happened gradually, from November 2011 through October 2012. As argued by a number of studies in institutional theory, early adopters of innovation ground their decisions in efficiency arguments, while later adopters aim to gain social legitimacy [17,28]. To explore the relationship between publicity and visibility and commitments to Green Button, correlations between company commitments and publication trends on Green Button are examined.

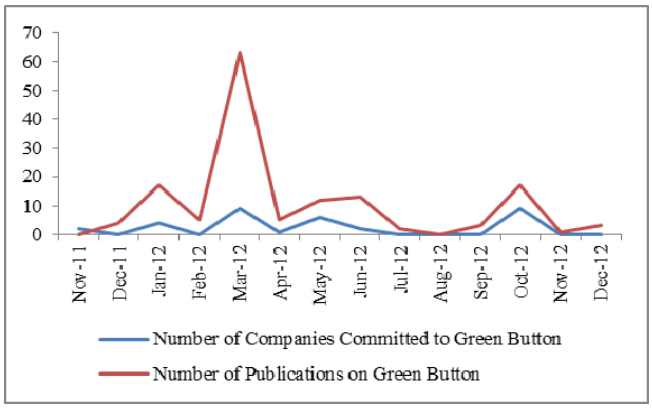

Figure 3 Correlations of Green Button Commitment & Publication on Green Button

Figure 3 shows the correlation between the dates of commitment to the publication trends. The data for the publication trends was generated using Lexis Nexis. Data extraction was based on several specifications, namely: a) only U.S. based news, b) including publication in blogs, c) the date of the publication ranges from September 10, 2011 to December 31st, 2012. The news extraction was also based on three keywords {"Green button" AND "White House" AND "Electricity"}. Using this method, 145 publications were identified starting from December 16, 2011 to December 12, 2012. As indicated in figure 4.4, the fluctuation of company commitments to implement Green Button corresponds to the fluctuation of publications pertaining to Green Button. Allegedly, the graph provides suggestive evidence of the influence of publications on company commitments.

We also conducted a correlation analysis of the results from the graph. We found high correlation between the numbers of company commitments to the number of publications on Green Button. The correlation is significant (p_{value} 0.001) with coefficient of 0.7763. The variance indicates that 60.1% of variance in company's commitment to Green Button is associated with the variance in publications on Green Button. Accordingly, only 39.9% of the variance in company commitments to Green Button is not explained with variance in the number of publications.

Table 5 Correlation: Green Button to the number of publications

	Indicator
Pearson correlation (ρ)	0.7763* (0.0011)
Variance (ρ^2)	0.60264

4.5 Strategic Fit and Alignment as Driver to Participate

In addition to the external drivers outlined in section 4.1 to 4.4, the interviews also highlight the role of internal drivers in terms of strategic fit and alignment on the success of Green Button implementation. The important role of strategic fit in influencing the organization's adoption and implementation of Green Button is manifested in the alignment of mission and strategy with the capability of Green Button. William Holford, the manager of public affairs at Bluebonnet Electric Cooperative, expressed the importance of fit and alignment during a webinar with eMeter in June 2012:

> [In] Bluebonnet philosophy…we believe they are [customers/members] entitle to have the same transparency, the same information that available to us in our control center and our billing system. We believe that in order for us to be able to achieve the sustainable … our member have to be able to access that data.

The importance of fit and alignment between mission and strategy to the capability of Green Button also manifest in the vision and strategic plan of two of California's energy and utility pioneering Green Button implementers. PG&E's corporate responsibility report for 2011 indicates the alignment of their smart grid vision with their strategy to introduce "proven, sophisticated technology into the business …to create a flexible grid that allow customers to understand their energy usage and be empowered to make energy related choices (p.23)".

5. DISCUSSION & CONCLUDING REMARKS

5.1 Preliminary Model

This paper explores the motivations and success factors driving the implementation of Green Button. The Green Button implementation showcases the successful collaboration between for-profit organizations with government to support energy efficiency through smart data disclosure policy.

Drawing from semi-structured interviews and secondary data, the analysis shows the interaction between external and internal factors underlying the successful implementation of Green Button. There are four groups of external factors influencing the success of Green Button, namely: economic factors, technology related factors, regulatory contexts and policy incentives, and some roles of mimetic forces. We also identify the important role of strategic fit and alignment as internal drivers that motivate an organization to adopt Green Button. The interaction of external drivers and internal drivers contributes to the successful implementation of smart data disclosure policy such as Green Button (Figure 4).

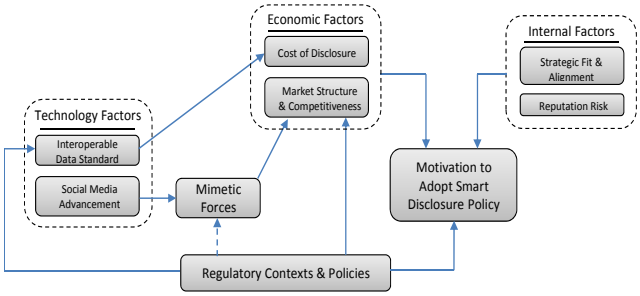

Figure 4. Proposed Model of Success Factors of Smart Data Disclosure Implementation

The interviews and secondary data indicate the interaction and combination of market and non-market external drivers in creating an institutional environment that incentivizes energy and utility companies to implement Green Button. In the case of energy, regulatory contexts are the skeletal structures enabling the success of energy efficiency initiatives based on smart data disclosure policies such as Green Button. The regulatory contexts have a critical impact on the other three external factors, economic, technology, and the mimetic forces. The regulatory contexts influence the economic factors in two ways, namely: influencing market structure and indirectly affecting the cost of providing Green Button.

The U.S. energy market has been undergoing significant changes through the introduction of price competition to replace natural monopoly in the market since 1990[6]. A natural monopoly is a situation in which product offering from one provider is deemed more efficient than price competition [24]. On the other hand, US energy market is regulated by three different levels of government with different jurisdictions, some aspects are federally regulated, some are state-regulated and some may be regulated locally. Different states enacted different policies to govern the market especially related to retail energy market, some state de-regulated some functions such as customer billing and treated them as competitive and other states treated the same functions as monopoly [19]. The different market structure imposed by different regulations in different states affect the motivation for accepting Green Button. In the state where electricity retail market is competitive, the interviews and secondary data indicate that adoption of Green Button is for competitive advantage. Green Button is seen as a way to differentiate one company against another thus providing more leverage in the competitive environment. In state where retail market is more regulated, companies' acceptance of Green Button was to magnify their reputation through the disclosure of credible information to the consumer and show their commitment to support energy efficiency.

[6] Started with the introduction of wholesale competition supported by the Energy Policy Act of 1992 (EPACT)

The regulatory contexts also affect the technology related factors influencing Green Button adoption. Green Button is accepted because three technology related aspects that are crucial to Green Button are available, namely: a) resolution of the privacy issues, b) industry-based consensus on interoperable data standard, and c) smart grid technology to provide data availability. These three issues have been handled due to the series of regulations and policies enacted by the government, such as: EISA of 2007, the ARRA of 2009, the White House' Policy Framework for the 21st Century Grid in 2011, and others. The availability of these technologies in turn affects the success of Green Button directly but also reduces the cost for adopting Green Button.

The regulatory contexts and policies also indirectly affect and create mimetic forces in the market. For instance, figure 2 indicates three major time peaks for both publications and Green Button commitments; January, March and October. These three time peaks coincide with three events hosted by the White House. It is plausible to argue that the success of the White House efforts to draw attention to these efforts in the media created coercive pressure for the CEO's of energy and utility company to commit to adoption.

Although the external factors contribute to creating the necessary environment for the successful implementation of Green Button, the decision to adopt or express commitment to Green Button is influenced by the alignment of an organization's mission and strategy with the capability of Green Button. The Green Button capability to provide information for consumers fit with the mission of energy and utility companies to achieve energy efficiency through the provision of services that allow customers to understand their energy usage and be empowered to make informed choice.

Conclusively, we argue that the success of Green Button is due to the interaction between a set of specific internal and external factors. The external factors create the necessary institutional environment for the Green Button implementation. In addition, the acceptance and adoption of Green Button is influenced by the fit of Green Button capability and the strategic mission of Energy and Utility companies. Based on the above justification, we propose a simple model as depicted in Figure 4.

5.2 The Role of Government

While all agree Green Button is an industry-led initiative, the interviews and secondary data indicate that government has played several roles in these efforts. Government has played the role of identifier of opportunity as well as promoter and challenger to the industry during Green Button conceptualization, policy development and implementation.

a. Government as identifier of opportunity

The standards development work led by NIST SGIP has a long-term focus characterized by continuous cycles of revision and re-development of the standard as a product. This continuous work limits the ability of NIST SGIP to show immediate tangible products. The White House provided ideas for reaping immediate value from the NIST SGIP efforts. The Green Button initiative produced tangible immediate value from the work done by NIST SGIP. As indicated in the webinar conducted by the Association for Demand Response [25], Aneesh Chopra and the team from OSTP were the identifiers of this opportunity. They were able to identify and show the low hanging fruit that can be harvested by the companies to produce high value.

b. Government as challenger for the Industry

The role as challenger to the industry to implement Green Button was initiated by Mr. Chopra's call to action in September 2011 during the GridWeek conference. Mr. Chopra as the US CTO also made contact with the CEOs of energy and utility company in California as the pilot state. The active role of government to challenge industry to implement Green Button was also evidenced in the series of events conducted by the White House in relation to Green Button.

c. Government as promoter of the initiative

along with governments role as a challenger of industry, government also, in this case, actively promoted Green Button through a series of events. The efforts of the White House in promoting Green Button by initiating series of events resulted in increased commitment of the energy and utility companies to commit to or implement Green Button.

Figure 3 indicates three major time peaks of both number of publications and Green Button commitments from September 2011 to December 2012. These three time peaks coincided with three events hosted by the White House. January 18, 2012 was the initial launch date of Green Button by Aneesh Chopra at the Silicon Valley leadership group event. March 22, 2012 was the date of a CEO roundtable at the White House hosted by Presidential Science Advisor Dr. John P. Holdren and U. S. Secretary of Energy Dr. Steven Chu, responding to President Obama's call-to-action for energy and utility companies. October 1, 2012 was the date of the White House's Energy Datapalooza to demonstrate innovative applications based on energy data. Thus, it is plausible to argue that the high visibility of the White House drew increased attention from the media, and at the same time attracted the interest of the CEO's of energy and utility companies.

The three peaks also have different deviations with the March 22 peak being higher the other two. This different deviation indicates the influence of social status and visibility in generating commitment and attention. While the events in January and October were administered by the OSTP, the March event was a response to the President.

5.3 Concluding Remarks

This paper identifies the drivers for successful implementation of smart data disclosure policy supporting energy efficiency called Green Button. Green Button showcases the collaboration between government, business, and citizens in expanding the capability of open data. In the Green Button, the source of the data was under the jurisdictions of the industry while the ownership of the data is in the consumers' hand.

The case indicates how government's role changes from data provider to creator of institutional environments necessary to support data linking in the interests of for-profit organizations and citizens. While the acceptance of the Green Button itself depended on the strategic fit and alignment to the organization's mission, the implementation would not be possible without the necessary institutional environment enabled by the government. The case also indicates the possible interaction between market and non-market drivers. The economic risks were mitigated by non-market factors that become influential in the acceptance and adoption of public policy requiring for-profit entities to disclose their proprietary data.

This study provides suggestive evidence about the factors that drive successful implementation of smart data disclosure policy. Further research is needed to establish more concrete evidence on the motivation of energy and utility companies to disclose by comparing those who committed to Green Button and those who did not. A survey could potentially establish more generalized findings on the linkage between the individual motivation, organizational motivation and external drivers to support smart data disclosure policy.

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