Funding Renewable Energy Innovations
Crowdsourcing as means to Facilitate Innovative Sustainable Technologies in the Energy Sector.

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Abstract

Technological innovations within the field of sustainable energy production require a substantial amount of capital investment in order to conduct research and development. Crowdsourcing represents an innovative and new approach to raising the capital investment needed for sustainable technological innovations in the sustainable energy sector and is inherently entrenched with Transition Theory.

The capacity for crowdsourcing to play a viable role for fundraising purposes was conducted using the Kvasir Project, which is a small-scale renewable energy innovation that generates energy from rainwater in storm drains. The crowdsourcing campaigns included a donation based website, Indiegogo™ campaign, viral media marketing strategies, and two search engine optimization campaigns (SEO).

The results of the Kvasir Project crowdsourcing campaigns were negligible, as no donations were received, despite over 1,200 page views. The lack of donations stem from a privation of initial capital needed in order to conduct the viral marketing media campaigns, SEO, and crowdsourcing specific activities. In addition, a lack of emotional appeal in sustainable energy issues and subsequent innovations likely played a role in the lack of donations. As a result, sustainable energy innovations should be funded by traditional investment means, unless there is a specific emotional appeal that can be exploited by viral media marketing techniques.

Keywords: Social Innovation, Crowdsourcing, Social Media, Fundraising, Transition Theory

Word Count: 11,265

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1 Introduction

Social Innovation is an immensely important aspect for developing products and institutions that aid in addressing specific societal challenges (Murray, Caulier-Grice, & Mulgan, 2010). By its very definition, social innovation is “new ideas (products, services and models) that simultaneously meet social needs and create new social relationships or collaborations” (Murray, Caulier-Grice, & Mulgan, 2010, p.3). Social innovation is critical in the energy sector, as the energy sector, particularly in industrialized countries, is essentially centralized by nature and is often dominated by large institutions, whose main objective is to maximize profits, which can lead to a conflict of interest between the maximization of profits and addressing societal challenges. The societal challenges within the energy sector are to reduce and ultimately eliminate greenhouse gas emissions. Since the profit motive is the focus of many actors in the sector, the sources used to produce energy must be inexpensive and the primary sources of conventional energy production are fossil fuel based, which emit greenhouse gases as a product of the combustion of fossil fuels. Outside of the alternative energy system development, the energy sector currently does not have a foundation in social innovation, outside of the alternative energy niche, and its production means are generally swayed by government energy policies (Seddon & Ramanathan, 2013). How can alternative energy innovations utilize the foundation of social innovation to help foster solutions for the societal problems associated with conventional energy production? What are the obstacles associated with sustainable social innovation solutions in the energy sector?

The Kvasir Project aims to challenge the neo-liberal foundation of the energy sector by utilizing a foundation in social innovation in order to develop sustainable energy production solutions. The roots of the Kvasir Project as described as “the need for environmentally sustainable energy solutions is what founded the Kvasir Project. It is imperative that we utilize as many possible sources of energy as possible in order to lessen the amount of greenhouse gases that are emitted by conventional energy production” (Kvasir Project, n.d.). The project is a continuation of the LUMES Program Making Change Happen Project, in which a prototype was designed and constructed. The Kvasir Project is described as “the Kvasir Project aims to develop localized sustainable alternative energy production from rainwater by utilizing existing storm drain systems. By utilizing existing storm drain systems, the Kvasir I, and its successors, can be easily installed and produce electricity when it rains...” (Kvasir Project, n.d.). The device produces electricity by utilizing the force of gravity on rainwater as rainwater falls through a storm drainpipe on existing structures. The prototype, titled
the “Kvasir I,” utilizes the force of falling rainwater in a storm drainpipe to spin a specialized turbine, which then spins a low rotation per minute (RPM) alternator, which then converts mechanical energy into electrical energy. The Kvasir I creates a new source for alternative and greenhouse gas emission free energy production, which is rainwater, that can be implemented in conjunction with existing alternative energy production means, which as wind and solar energy systems. In order to continue to develop the Kvasir I, like all social innovation products and institutions, additional funding is needed, but are conventional investment opportunities advantageous for funding a renewable energy innovation such as the Kvasir Project?

In order to fund social innovation products and institutions, there are two different means for generating the necessary funding in order to develop products and solutions. The traditional means for generating the initial capital is through conventional investment sources, such as venture capital firms, angel investors, etc. Conventional investment opportunities generally consist of loans, equity shares, and/or a royalty. Conventional investment opportunities may not be advantageous for products and/or institutions founded in social innovation as the emphasis for producing solutions for a societal challenge is shifted towards meeting the investor’s monetary return on investment (ROI).

As conventional investment opportunities may clash with the ideological foundation of social innovation productions and institutions, crowdsourcing has become a viable means for generating the initial capital needed to fund social innovation (Isman, Bennett, Judah, & Glenzer, 2012). The term crowdsourcing is very broad, but when it is applied to the context of funding social innovation, it can be thought of as orchestrating and organizing, through the internet or web platform, a targeted group of individuals to contribute financial capital in order to contribute to a social innovation based business and/or products. Crowdsourcing is an attractive alternative to conventional investment means, as the ideological foundation of social innovation remains intact. Is crowdsourcing a viable alternative to conventional investment opportunities for renewable energy innovations?

1.1 Aims

Given the current socio-economic atmosphere for developing products and institutions that address societal challenges, an exploration of the viability of crowdsourcing can play an important role in funding technical innovations. The aim here is to determine the effectiveness of social media networks in organizing and orchestrating role for crowdsourcing campaigns, and how effective search engine optimization (SEO) is to reach specific audiences to promote small-scale renewable
energy technologies through a crowdsourcing platform. To fulfill these aims, the following research questions are posed:

1) Is crowdsourcing a viable alternative funding model for small-scale renewable energy technologies?
2) To which extent can social media promotion facilitate crowdsourcing efforts for social innovation in the small-scale energy technology sector?
3) To which extent can Search Engine Optimization (SEO) be utilized to disseminate information for a crowdsourcing campaign for a small-scale renewable energy innovation?

1.2 System Boundaries

In order to address the research questions, a case study of a renewable energy innovation from the Kvasir Project is conducted. The case study includes crowdsourcing campaigns and the associated viral media marketing techniques needed for the dissemination of information. A quantitative statistical analysis is conducted through Google™ Analytics and the Kvasir Project website’s statistical backend, such that donations can be tracked from the originating traffic source. The research addresses crowdsourcing from a renewable energy innovation perspective, thus the scope is contextual for renewable energy innovations.

Theoretical background information on transition theory and innovation systems is discussed in chapter 2. Chapter 2 also addresses case study specific background information on crowdsourcing, social media network promotion, SEO, and the Kvasir Project. Research design and methods is addressed in chapter 3, which is followed by the results and analysis of the Kvasir Project crowdsourcing case study in chapter 4. The research questions are discussed and addressed in chapter 5. Chapter 5 also includes research and case study specific limitations as well as recommendations.

2 Background

2.1 Theoretical Background

2.1.1 Transition Theory
Because the use of crowdsourcing, social media promotion, and SEO campaigns for promoting small-scale renewable energy technologies involve complex interactions between multiple actors, regimes, and stakeholders, the relations between these entities must be evaluated, incorporated, and simplified by utilizing the transition theory framework.

Transition theory provides a framework to evaluate complex power relations between the various actors in a transition process. Specifically, the multi-level perspective of transition theory frames relationships between socio-technical systems (landscape), social groups who maintain and reproduce the elements and linkages (niches), and rules (regimes) that guide the activities of the actors (Geels, 2005). A landscape is defined as “aspects of the wider exogenous environment that affect sociotechnical development” (Geels, 2005, p.541). Specifically, a landscape is the foundation for which regimes and niches reside under and provide explicit context as to a particular trend. A regime is defined as “the most ‘dominant’ configuration of actors, structures, and practices; it dominates the functioning of the societal system and defends the status quo” (Avelino & Rotmans, 2009, p.545). Opposite to the regime are niches, which are “configurations in which non-conformism and innovation can develop... [but also] deviate from the dominant structures, practices and actors within that [regime’s] system” (Avelino & Rotmans, 2009, p.545). In order for a transition to occur, a niche must successfully challenge the regime by gaining more power in the context of the landscape. Then, the challenging niche becomes the regime, also known as a niche-regime, and the previous regime then becomes a niche. The transition of power between the niche and the regime, regardless of whether or not it is successful is defined as a transition process. The underlying driver for transition processes is power and power relations (Avelino & Rotmans, 2009).

Power is instrumental for transition theory. There are many different conceptualization of power, but given that transition theory specifically evaluates societal structures and actors, the notion of power also must be rooted in a societal context. Power is defined as “the ability of actors to mobilize resources to achieve a certain goal” (Avelino & Rotmans, 2009, p.550). This definition of power is crucial for transition theory, as power is solely possessed by the actors and not the societal system as a whole, which is a decentralized notion of power. Given Rotmans’ definition of power, resources are people, assets, materials or capital, including human, mental, monetary, artefactual and nature resources (Avelino & Rotmans, 2009). The notion power within transition theory is crucial in order to understand the use of power between niches and regimes. The exercise of power, or use of power, consists of five different types, being innovative, destructive, constitutive, transformative, and systemic (Avelino & Rotmans, 2009). Table 1 illustrates the different types of power. Appendix 1 provides a comprehensive overview of power in transition theory.
Table 1 (Avelino & Rotmans, 2009, p.552-553)

<table>
<thead>
<tr>
<th>Type of Power</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Innovative</td>
<td>The capacity of actors to create or discover new resources.</td>
</tr>
<tr>
<td>Destructive</td>
<td>The ability to destroy or annihilate existing resources.</td>
</tr>
<tr>
<td>Constitutive</td>
<td>The ability to constitute, or establish/institute/enact, a distribution of resources</td>
</tr>
<tr>
<td>Transformative</td>
<td>The ability to transform the distribution of resources, by either redistributing and/or replacing old resources with new resources.</td>
</tr>
<tr>
<td>Systemic</td>
<td>The combined capacity of actors to mobilize resources for the survival of a societal system</td>
</tr>
</tbody>
</table>

In the context of crowdsourcing as a means for funding a renewable energy innovation, one landscape is globalization, the regime is traditional investment means, and the niche is crowdsourcing. Globalization is the landscape for the traditional investment innovation means as it is the system that directly affects the exogenous environment of garnering investment opportunities. Traditional investment means, which are venture capital firms, angel investors, banks, etc., are the dominant regime[s], while crowdsourcing is a niche that is actively challenging the regime by excising transformative power.

2.1.2 Innovation Systems

Given the framework of transition theory, the model of crowdsourcing, social media network promotion, and SEO campaigns to fund small-scale renewable energy technologies are defined as a niche because a small scale renewable energy technology does not hold the market share, with the threshold being at least some level of adoption. Being a niche, the excise of power that a small-scale renewable energy technology company has is initially limited to innovative power, being that it creates or harnesses a new resource for producing energy or a non-utilized energy source, but does not have the power to redistribute or distribute resources. Since it is limited to excising innovative power to the regime, the successful transition to becoming a niche-regime is reliant on the spread of information based off its ability to mobilize and/or discover new resources, which is how crowdsourcing and social media network promotion campaigns become successful. In order to explore how these campaigns are successful at spreading information about a particular innovation, innovation diffusion plays an important role in understanding how the information is spread.
The Innovation Diffusion process is defined as “the process of the market penetration of new products and services, which is driven by social influences. Such influences include all of the interdependencies among consumers that affect various market players with or without their explicit knowledge” (Peres, Muller, & Mahajan, 2010, p.92). The innovation diffusion process dissects how information is spread about a new innovative technology, which is particularly important for crowdsourcing.

2.2 Case Background

2.2.1 Crowdsourcing

Crowdsourcing is a relatively new means of utilizing the collective intellect, which is the intellect of a group of people, of a given audience to solve problems while an individual or business mass-produces the solution. The use of crowdsourcing has evolved since its inception and it is now used in a variety of ways. While the term crowdsourcing has numerous definitions, the traditional definition of crowdsourcing was defined as “a new web-based business model that harnesses the creative solutions of a distributed network of individuals through what amounts to an open call for proposals” (Brabham, 2008, p.76). The original definition was merely a framework for an individual or business to solve a specific problem by offering a bounty, which generally involved a single monetary compensation that generally did not involve a share or stake in the company, by using a web platform to organize a group of people. The key aspect of this definition is that the individual or company that received a solution to a problem mass produces it and sells it.

The traditional use of crowdsourcing allowed individuals and companies to expand their problem solving capabilities outside of their own personnel and to harness the problem solving capacity of the collective intellect of a particular group to the individual or company’s benefit. Research has shown that “under the right circumstances, groups are remarkably intelligent, and are often smarter than the smartest people in them” (Brabham, 2008, p.79), which provides an incentive for individuals and companies to utilize the intellect of a particular group to solve a given problem. The adoption of original crowdsourcing implementations has also stemmed from the increased connectedness of the internet, which provides the perfect medium for a particular group of individuals to come together (Croon, 2013).

Since the original implementation and usage of crowdsourcing, crowdsourcing has evolved into a means for funding a project, product, and/or company. This implementation generally follows the
traditional definition of crowdsourcing, but instead of utilizing the collective intellect of a group of people, it utilizes the collective financial backing of a group of people through a specific web-platform, which can be used to fund products and research and development.

Web-platforms such as Kickstarter.com™ and Indiegogo.com™ allow individuals and businesses to raise capital for a project or product by incentivizing the user base to send a monetary donation in exchange for a “perk,” which is either an acknowledgement or tangible product that is sent from the fundraiser. These “perks” are an indirect way of selling a product or an intangible good at a price that is set by the individual or company, which is generally much higher than its retail value. “Perks” do not necessarily have to be a physical product, but they can be personalized e-mails, distribution rights, ethical gratification, etc. This allows a company or individual to greatly increase the amount of money raised for a product or project while incentivizing users of the web-platform to send a monetary donation. The web-platforms monetize the crowdsourcing process by charging a small percentage of the total amount of money raised for each product when the individual or company reaches their fundraising goal and receives the funds.

An example of a successful crowdsourcing campaign through a third party crowdsourcing platform is GravityLite™. The GravityLite™ Indiegogo™ campaign ran from December 6th, 2012 through January 15th, 2013 and raised $399,590 (Indiegogo, n.d.). The GravityLite is a product that generated energy for lighting a small room through the motion of gravity, which is designed to provide lighting to homes in rural Africa. The potential for crowdsourcing, as a means to fund innovations, is quite high, and in the case of GravityLite™, roughly $400,000 was generated.

While there are established crowdsourcing web-platform’s available, an individual or company can create their own platform, which is a website designed to engage their audience and to generate monetary donations to fund their project or products. The success of the platform is heavily reliant on promotion and engaging with a targeted audience, primarily through social media networks (Walker, Rajagopalan, Anand, & Jagannathan, 2013). There are many different actors involved in crowdsourcing, ranging from large multinational corporations and government institutions to individuals funding new innovations, with each crowdsourcing campaign being relatively unique (Isman et al., 2012).

Crowdsourcing can be an effective tool for small-scale businesses and start up companies to facilitate the innovation diffusion process while simultaneously provide the necessary funding in order to further product development, develop distribution, and/or further their product reach. The
effectiveness of a crowdsourcing campaign is the ability and efficiency for which the fundraisers engage and promote their campaign through social media networks to their targeted audience, with the ultimate goal to establish a social enterprise (Walker et al., 2013).

2.2.2 Social Media Marketing

As crowdsourcing has evolved over time, the ability for social media networks to facilitate the promotion of crowdsourcing campaigns and marketing, in general, has expanded as well. Social media is defined as web-platforms that allow users to create user profiles that enables users to socially engage with members of a platforms user base, which include forums, discussion boards, social networks, and micro blogs (Fakayode, 2012). Social media networks, such as Facebook™, Twitter™, and Reddit™ generate funding through advertising, which allows marketers to specifically target individuals based on their behavior on a particular social network platform, which makes it an ideal platform for crowdsourcing campaigns.

Successful campaigns garner social media networks' ability to go viral, which is defined as a piece of information that is rapidly circulated on the internet (Leskovec, Adamic, & Huberman, 2007). The advantages of viral content, from a marketing perspective, has led to the rise of viral marketing, which is defined as “diffusion of information about the product and its adoption over the network” (Leskovec et al., 2007, p.4). Social media networks are the ideal medium for viral marketing, as social media networks are user driven and marketers can reach a larger and more active audience at lower advertising costs (Miller & Lammas, 2010). Due to the nature of viral marketing on social media networks, a paradigm shift has occurred in which the solicited target group plays an active role in the dissemination of product information, which has lead to the adoption of affiliate marketing or “co-creation,” which is when a company offers an incentive to existing customers to refer their products to new potential customers (Miller & Lammas, 2010)(Leskovec et al., 2007). Since crowdsourcing relies on the spread of information, viral marketing can play a large role in the dissemination of information across social media networks.

Facebook™ is the largest social media network, with 1.4 billion active users as of 2014 (“Social Networking Statistics | Statistic Brain,” n.d.). Facebook™ has pioneered the ability for marketers to specifically target individuals for carefully placed ads; based on the fan pages an individuals “likes,” their activities on these fan pages, the frequency of which they visit a fan page, their age, geographical location, relationship status, etc. (Lee, Hosanagar, & Nair, 2013). This provides marketers the ability to create highly targeted advertisements that appear on the targeted
individual’s Facebook™ page that, when clicked, redirect the user to their website. In addition to the ability to target individuals based on specific criteria and redirect them to an external website, Facebook™ allows marketers multiple options for engaging with their audience, such as fan page likes, which is where a marketer creates a fan page for a product, social cause, company, etc., and publishes ads that appear in the targeted individual’s “news feed” in an attempt to get the user to “like” the page. A marketer has the option to pay per page like or to pay per click (PPC).

Once an individual has “liked” a marketer’s fan page, all posts that are made from the marketer’s fan page will appear in all every individuals’, who liked the marketer’s fan page, news feed, which allows the marketer to directly engage with their audience. Generally, when a marketer creates an advertisement, the marketer must submit a monetary value for the cost of a specific action, such as pay per click, pay per impression, pay per page like, etc, but Facebook™ allows the user to “optimize bid for clicks,” in which Facebook™ utilizes an algorithm that increases the amount of clicks per impression, so that the marketer pays the smallest amount per click, in relation to other advertisements, which target the same individuals.

Twitter™ is a large social media network and consists of 645,750,000 active registered users as of 2014 (“Twitter Statistics | Statistic Brain,” n.d.). Twitter™ allows users to create a brief public profile and limits users to posting “tweets,” which are messages have a maximum character count of 140 characters.

Twitter’s™ advertising model consists of “promoted tweets” and “promoted accounts.” Promoted tweets are “ordinary Tweets purchased by advertisers who want to reach a wider group of users or to spark engagement from their existing followers” (“Twitter Help Center | What are Promoted Tweets?” n.d.). Promoted tweets allow a marketer to reach a much larger audience, users with specific interests in relation to the markers’ products or agenda, in comparison with their followers. The ability for a marketer to send a message or tweet to users beyond their organic audience greatly accelerates the dissemination of their product and/or agenda. Promoted accounts are “one of the quickest ways to build an active community of advocates and influencers for your business” (“Twitter Help Center | Promoted Accounts” n.d.). Twitter™ accounts are symbolized by the “at symbol,” or @, followed by the user’s user name. Promoted accounts are a means of artificially increasing a marker’s “followers” or organic audience in order to increase the reach of their tweets, beyond the normal means of a hashtag, to other Twitter™ users with specific interests in relation to the marketer’s interests. A hashtag is defined as “The # symbol, called a hashtag, is used to mark keywords or topics in a Tweet” (“Twitter Help Center | Using hashtags on Twitter” n.d.). For instance,
if a marketer is looking to promote a sustainable brand of clothing, they might use the hashtag, #sustainable, in their tweets to actively engage with an audience that has an interest in sustainability. Twitter’s™ advertising model is based off Cost Per Action (CPA), which is when a targeted user performs an action, either by “following” a promoted account or by clicking a tweet, which depends on the advertising campaign of the marketer.

Reddit™ is a large social media network that consisted of roughly 114,943,104 unique visitors for the month of March in 2013. Reddit™ is an open source social media network as it consists of an enormous amount of “subreddits,” which are independent Reddit™ pages that are created and moderated by a team of volunteers of a particular subject (Reddit Inc., 2014b). Reddit™ operates as a decentralized network of subreddits and users, who submit website links or text, while other users who view the link can “up vote” or “down vote” a submission based on whether or not users like, acknowledge significance, relevancy, etc (Reddit Inc., 2014b). A Reddit™ submission’s rank, as it appears in a particular subreddit, is calculated by the difference in up votes and down votes. In addition to “up voting” or “down voting” a submission, users can also comment on a particular submission, with the “up vote” and “down vote” system implemented for each comment. Reddit™ acts as a massive web of subreddits and users are free to submit website links or text, up vote or down vote, and comment in any subreddit (Reddit Inc., 2014a). Users are rewarded by submitting relevant links and comments that benefit the Reddit™ community with Karma, which is a numerical point value for a particular user, which doesn’t necessarily represent anything other than the user’s success in submitting relevant website links (Reddit Inc., 2014a). As of April, 2014, there are 19,440 subreddits, ranging from humorous images, pornography, news, cryptocurrencies, television series, politics, etc. (“Subreddit Listing - Page 156 | RedditList.com - Tracking the top 5000 subreddits,” 2014).

Reddit’s™ advertising model is based on the promotion of a submission in one or more subreddits, with the advantage that the submission appears at the very top of the subreddit or subreddits. The advertised submission is subject to up votes or down votes and user’s can still comment on the advertised submission. Reddit’s™ advertising model is not based on CPC or CPA, but rather by Cost Per Mille (CPM), which is the cost of the ad appearing, but not clicked, on the targeted audience’s computer screen, which is defined as an impression. This model of advertising is different than CPC or CPA, as the advertiser is not charged for the targeted users’ actions, but in the amount of times the advertised submission appears on the screen. Reddit’s™ advertising model allows marketers to quickly disseminate information about their products or agendas as well as direct feedback from the
user base. Reddit’s™ advertising platform provides the possibility for an advertised submission to go viral, if there is enough support from the Reddit™ community.

All of the major social media networks possess the ability for marketers to greatly increase the dissemination of information about their products, but each social media network is unique in how advertisers conduct their marketing strategies and some social media networks cater to specific campaigns than others.

### 2.2.3 Search Engine Optimization

Search Engine Optimization (SEO) is an important aspect to crowdsourcing campaigns because it increases the diffusion of innovation process by organic search engine traffic. SEO is defined as “the process which improves the volume and quality of traffic to a website from search engines via natural search results for targeted keywords” (Swati, Pawar, & Ajay, 2013, p.10). Search engine ranking algorithms are consistently revised, which makes SEO a dynamic field of study. SEO consists of two parts, on-site SEO and off-site SEO. On-site SEO is the process of optimizing a website for specific keywords and to format the internal source code so that a search engine’s algorithms can determine the content of the website (Saberi, Saberi, & Mohd, 2013). Off-site SEO consists of the accumulation of a variety of backlinks, which are outgoing links from other relevant websites to the original website.

The type of backlinks that link to the original website play a critical role in how a search engine will rank a specific website. The relevancy of the website, which contains an outgoing backlink to a specific website, influences the ranking, because it indicates that the original website’s content is relevant and related to a outgoing backlink website (Swati et al., 2013). The reputation of the outgoing backlink website also influences the search engine ranking of a particular keyword because it suggests that the backlinked website must be of some importance if a much more reputable and authoritative website has a backlink to the original website. Page Rank is an algorithm that contributes to the overall search engine ranking algorithm and it assigns a numerical weight to a specific website in relation to the importance of the website itself (Swati et al., 2013). The numerical value of a Page Rank is from 0 to 10, with 10 being the highest and 0 being the lowest. High Page Rank backlinks are important as the greater amount of high Page Rank backlinks to a specific website, the higher that website will rank for a specific keyword. There are other factors that play into off-site SEO, such as backlink click popularity and in-bound links, but as of 2014, social media has started to play an increased role in the search engine rankings. Social signals are backlinks that are
submitted on social media sites and are beginning to be utilized in search engine algorithms to
determine the popularity of a particular website. In order for a website to increase in the search
engine rankings, in terms of off-site SEO, a variety of backlinks must be present.

Due to the nature of backlinks and other aspects of SEO, there is an enormous market for SEO.
Because of the competitive nature of individuals’ and organizations’ attempts to rank higher in
competitive keywords, there are two different types of methods for gaining backlinks, which are
white hat SEO and black hat SEO. White hat SEO is a term used to describe SEO services that are
intended by search engines (Wang, Savage, & Voelker, n.d.). White hat SEO is the practice of
manually submitting backlinks, press releases, immaculate on-page SEO, etc, whereas black hat SEO
is regarded as “techniques that explicitly seek to manipulate the search engine’s algorithms with
little interest in improving some objective notion of search quality (e.g, link farms, keyword stuffing,
cloaking, and so on)” (Wang et al., n.d., p.1). Black hat SEO techniques often utilize automation
software to submit backlinks, as well as the use of private botnets, which are a collection of high
Page Rank websites that have been compromised and used for backlinks, by installing black hat SEO
software, without the website operator’s knowledge (Wang et al., n.d.). Black hat backlink
automation software is highly customizable and allows for website, blog, social media profile
creation in order to automate the backlink submission process. Backlinks are generally submitted to
the comment section of a blog or website as they may not be regulated and the backlinks will not be
removed.

While there are some malicious practices used to boost a websites search ranking, the importance of
SEO for the dissemination of information process remains crucial and is becoming increasingly
intertwined with social media networks.

2.2.4 The Kvasir Project

The Kvasir Project is a small-scale sustainable energy project that aims to develop localized
sustainable energy production methods at the local level. The Kvasir Project began in October 2013
with the development of the Kvasir I prototype, which is a device that generates electricity from
rainwater in storm drains. In November of 2013, the Kvasir I (Figure 1) prototype had been
constructed and is designed to produce 100 watts of energy, as a proof of concept, with moderate to
heavy rainfall without producing greenhouse gas emissions. Given that the generation of 100 watts is
merely a proof of concept, the aim is to scale up the generation to 200 watts through design
revisions and optimizations.
The Kvasir I prototype works by utilizing the force of gravity on rainwater, which falls down a storm drain pipe, to spin a turbine, which then spins a low rotation per minute (RPM) alternator, which then generates energy. The Kvasir I prototype is designed to be implemented in existing structures and possesses the ability to generate a portion of a structures energy demands or it would be used to generate energy for structures in remote areas with wet climates.

While 100 watts is seemingly an insignificant amount of energy to produce, the implementation of multiple Kvasir I devices along a single storm drainpipe greatly increases the energy output, when the storm drainpipe is greater than one story. Figure 2 is a visual representation of the Kvasir I prototype when implemented on a storm drainpipe, which is greater than one story tall.
The Kvasir Project’s roots lie in social innovation, as the Kvasir Project aims to address the issues of greenhouse gas emissions from conventional and centralized energy production methods. The initial development costs associated with the Kvasir I were 8,000 SEK, of which the alternator cost 2,000 SEK and the construction of the turbine and housing cost 4,000 SEK. The costs of the continued development of the Kvasir I and subsequent prototypes are far greater and require substantial capital investments. Additional capital investments for the Kvasir I’s continued development range between 50,000 SEK, which includes the equipment needed for testing the Kvasir I and small revisions to the design, to 120,000 SEK, which would include the procurement of intellectual property rights in addition to the testing equipment and design revisions.

Given the scope of the Kvasir I’s potential for generating energy from rainwater, there are some potential problematic areas that need to be addressed. Once potential issue is debris that would get inside the system, such as leaves and dirt could clog up the system. Initial revisions of a filter have been designed to combat this system, but more capital is needed to construct and test the filtration system. Another potential issue is that the Kvasir I is not designed for temperatures below 0 degrees Celsius, given that water molecules expand in freezing temperatures which would possibly destroy the mechanical bearing inside the alternator. Due to this issue, additional research is being conducted in an attempt to devise a solution, such as a customized mechanical bearing that is
designed to operate in temperatures below 0 degrees Celsius, but currently, the Kvasir I’s scope is that of areas without freezing temperatures.

3 Methodology

Crowdsourcing, and its required information diffusion process, is an primarily quantitative study of research in that the analysis of website traffic data is quantitative in nature, which leads to the adoption of the epistemological assumptions of positivism. Positivism is described as having the assumptions that objective reality “can be systematically and rationally investigated through empirical investigation” (Shanks & Parr, 2003, p. 3), that the investigator and the phenomena are independent, being that the researcher is objective, and that empirical testing is replicable (Shanks & Parr, 2003). While the Kvasir Project was created and ran by the author of this thesis, the challenges of bias are roughly the same as in independent researcher, in that all the analytical tools and website access would be available to an independent researcher. The only potential issue that may arise would be the personal feelings associated with negative comments from users of social media about the Kvasir Project, but everything else is unbiased and replicable. The assumptions of positivism reflect the empirical study done on the Kvasir Project crowdsourcing case study in that the Kvasir Project case study is composed of quantitative data that is composed of website visitor statistics.

3.1 Research Design

In order to evaluate the viability of crowdsourcing for funding research and design for renewable energy innovations, a case study will be conducted with the Kvasir Project. The empirical case study will be comprised of visitors that reach the Kvasir Project website or the Kvasir Project Indiegogo™ crowdsourcing campaign (Appendix 2). The participants are not aware that they are an active part of the case study as the results of the case study might differ the participants were actively aware of their involvement. The case study sample size is dynamic and is determined by the amount of visitors that reach the Kvasir Project website or the Kvasir Project Indiegogo™ webpage.

3.2 Methods

Quantitative analysis for the Indiegogo™ crowdsourcing campaign utilizes Google™ Analytics, which is a method of tracking the amount of visits; bounce rate, visitor behavior, etc. The Kvasir Project Indiegogo™ campaign tracks donations internally, but with the limitation of not knowing which traffic source a particular donation came from. In addition to the Kvasir Project Indiegogo™
crowdsourcing campaign, a crowdsourcing campaign for the Kvasir Project website will occur in conjunction. The Kvasir Project website crowdsourcing campaign consists of a cross-reference between Google™ Analytics and a custom website statistical backend, which is similar to Google™ Analytics, but with the added advantage of assessing whether or not a visitor submits a donation and where that visitor came from.

In order to assess the viability of crowdsourcing for small-scale renewable energy innovations, a viral media marketing campaign will be launched on Facebook™, Twitter™, and Reddit™. The advertising model that will be used for Facebook™ is CPC traffic to the Kvasir Project website, which is Kvasirproject.com. Twitter™ viral media marketing will consist of tweets with sustainability-oriented hashtags. Reddit™ viral media marketing will consist of submitting both the Kvasir Project website and the Kvasir Project Indiegogo™ campaign website links to various content appropriate subreddits. The results of each traffic referral will be collected by both Google™ Analytics and the Kvasir Project website statistical backend. In addition to an evaluation of traffic sources, an evaluation of the bounce rate will be conducted as well. A bounce rate is the percentage of visitors that immediately left the websites after visiting them (Google, n.d.). The bounce rate is a particularly important, as it is a quantitative means to determine a visitors behavior on a webpage, which ultimately determines the visitors interest in a website’s content.

In order to assess the viability of SEO, in terms of both increasing keyword ranking and organic traffic from the keyword ranking, two SEO campaigns will be conducted. The first campaign consists of black hat backlinks, while the other consists of white hat press release, which is aimed to list the Kvasir Project website on Google™ News. The results of increased keyword rankings and Page Rank increase will be assessed by Serpbook.com, while the organic traffic that comes from increased keyword rankings will be assessed by Google™ Analytics. The targeted keywords are the following keywords; energy project, clean energy, sustainable energy, sustainable energy solutions, localized energy production.

4 Results and Analysis

4.1 Kvasir Project Crowdsourcing Traffic

The Kvasir Project crowdsourcing case study aims to address whether or not crowdsourcing is a viable alternative funding model for small-scale renewable energy innovations. The results of the Kvasir Project crowdsourcing case study are extremely insignificant with regard to raising any sort of
capital. Table 2 illustrates the Google™ Analytics figure for the Kvasir Project website, while Table 3 illustrates the Kvasir Project's statistics backend. Table 4 illustrates Google™ Analytics for the Indiegogo™ webpage. Ultimately, the Kvasir Project did not receive a single donation through the Kvasir Project website or through the Kvasir Project Indiegogo™ campaign.

Table 2 – Google™ Analytics: Kvasir Project Website 1/24/2014 – 4/22/2014

<table>
<thead>
<tr>
<th>Traffic Source</th>
<th>Number of Visits</th>
<th>Bounce Rate</th>
<th>Donations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Traffic</td>
<td>468</td>
<td>76.89%</td>
<td>$0</td>
</tr>
<tr>
<td>Social Media</td>
<td>419</td>
<td>76.85%</td>
<td>$0</td>
</tr>
<tr>
<td>Referral</td>
<td>30</td>
<td>60.00%</td>
<td>$0</td>
</tr>
<tr>
<td>Organic Search (SEO)</td>
<td>23</td>
<td>43.48%</td>
<td>$0</td>
</tr>
<tr>
<td>Total</td>
<td>935</td>
<td>75.51%</td>
<td>$0</td>
</tr>
</tbody>
</table>

Given that no donations were submitted, additional information from the statistics must be analyzed. This provides insight into the type of traffic that visited both the Kvasir Project website and the Kvasir Project Indiegogo™ campaign. The most notable variable in the visitor's behavior per each traffic source is the bounce rate. The overall bounce rate of 75.51% indicates that visitors were not interested in the website's content. With regard to the overall traffic sources of the Kvasir Project website, visitors who arrived through Organic Search, which is through a keyword search from a search engine, were more interested in the Kvasir Project's content than though Social Media networks or Direct Traffic Referrals.

Table 3 – Kvasir Project Website Analytics Backend Statistics 1/24/2014 – 4/22/2014

<table>
<thead>
<tr>
<th>Traffic Source</th>
<th>Number of Visits</th>
<th>Bounce Rate</th>
<th>Donations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Traffic</td>
<td>19,016</td>
<td>N/A</td>
<td>$0</td>
</tr>
<tr>
<td>Social Media</td>
<td>919</td>
<td>N/A</td>
<td>$0</td>
</tr>
<tr>
<td>Referral</td>
<td>292</td>
<td>N/A</td>
<td>$0</td>
</tr>
<tr>
<td>Organic Search</td>
<td>28</td>
<td>N/A</td>
<td>$0</td>
</tr>
<tr>
<td>Total</td>
<td>20,187</td>
<td>N/A</td>
<td>$0</td>
</tr>
</tbody>
</table>

There is an extremely large discrepancy between the Google™ Analytics statistics and the Kvasir Project website statistics backend. This is probably due to the fact that Google™ Analytics automatically filters out "web crawlers," which are programs that methodically visit websites throughout the Internet to gather information and/or the content of websites. Because of this
discrepancy, the statistics relating traffic sources to the Kvasir Project are from Google™ Analytics, since it is more reliable.

Table 4 – Kvasir Project Indiegogo Webpage Statistics From Google™ Analytics 2/16/2014 – 4/22/2014

<table>
<thead>
<tr>
<th>Traffic Source</th>
<th>Number of Visits</th>
<th>Bounce Rate</th>
<th>Donations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Traffic</td>
<td>115</td>
<td>89.57%</td>
<td>$0</td>
</tr>
<tr>
<td>Social Media</td>
<td>182</td>
<td>97.80%</td>
<td>$0</td>
</tr>
<tr>
<td>Referral</td>
<td>21</td>
<td>85.71%</td>
<td>$0</td>
</tr>
<tr>
<td>Organic Search</td>
<td>24</td>
<td>95.83%</td>
<td>$0</td>
</tr>
<tr>
<td>Total</td>
<td>342</td>
<td>94.15%</td>
<td>$0</td>
</tr>
</tbody>
</table>

When comparing the bounce rate of the Kvasir Project Website and the Kvasir Project Indiegogo™ campaign, the Kvasir Project website has a noticeably smaller bounce rate than the Indiegogo™ campaign. This is ultimately implies that the visitors that visited the Indiegogo™ campaign page were less interested in the content of the Indiegogo™ campaign than the Kvasir Project website. The high bounce rate calculation of the Indiegogo™ campaign is also attributed to the nature of the Indiegogo™ platform, in which a visitor does not interact with the website itself, outside of submitting a donation, whereas the Kvasir Project website has many different pages for a user to interact with, thus lowering the bounce rate.

Table 5 – Kvasir Project Website Social Media Referrals from Google™ Analytics 1/24/2014 – 4/22/2014

<table>
<thead>
<tr>
<th>Traffic Source</th>
<th>Number of Visits</th>
<th>Bounce Rate</th>
<th>Donations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reddit</td>
<td>221</td>
<td>80.54%</td>
<td>$0</td>
</tr>
<tr>
<td>Facebook</td>
<td>161</td>
<td>76.40%</td>
<td>$0</td>
</tr>
<tr>
<td>Twitter</td>
<td>17</td>
<td>29.41%</td>
<td>$0</td>
</tr>
<tr>
<td>StumbleUpon</td>
<td>7</td>
<td>85.71%</td>
<td>$0</td>
</tr>
<tr>
<td>Slashdot</td>
<td>3</td>
<td>33.33%</td>
<td>$0</td>
</tr>
<tr>
<td>Taringa</td>
<td>3</td>
<td>100.00%</td>
<td>$0</td>
</tr>
<tr>
<td>Pinterest</td>
<td>2</td>
<td>100.00%</td>
<td>$0</td>
</tr>
<tr>
<td>Hi5</td>
<td>1</td>
<td>100.00%</td>
<td>$0</td>
</tr>
<tr>
<td>Instapaper</td>
<td>1</td>
<td>0.00%</td>
<td>$0</td>
</tr>
<tr>
<td>Pocket</td>
<td>1</td>
<td>100.00%</td>
<td>$0</td>
</tr>
<tr>
<td>Tagged</td>
<td>1</td>
<td>100.00%</td>
<td>$0</td>
</tr>
<tr>
<td>Tumblr</td>
<td>1</td>
<td>100.00%</td>
<td>$0</td>
</tr>
<tr>
<td>Total</td>
<td>419</td>
<td>76.85%</td>
<td>$0</td>
</tr>
</tbody>
</table>

Social media network interactions with the Kvasir Project website are particularly notable when evaluating the bounce rate per each source. While Reddit™ visitors comprised 52.7% of the overall social media traffic, the bounce rate is extremely high, which implies that the visitors from Reddit™ were not particularly interested in the content of the Kvasir Project website. Traffic stemming from
Facebook™, which were primarily directed to the website through CPC Facebook™ advertising, comprised of 27.7% of the overall social media traffic had a similarly high bounce rate of 76.40%, which also implies that Facebook™ Traffic was not interested in the Kvasir Project’s content. Twitter™ had the lowest bounce rate of all of the social media traffic sources with more than one visitor, but Twitter™ traffic only accounted for 4.05% of the overall social media traffic.

Table 6 – Kvasir Project Indiegogo™ Social Media Referrals from Google™ Analytics 2/16/2014 – 4/22/2014

<table>
<thead>
<tr>
<th>Traffic Source</th>
<th>Number of Visits</th>
<th>Bounce Rate</th>
<th>Donations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reddit</td>
<td>171</td>
<td>98.25%</td>
<td>$0</td>
</tr>
<tr>
<td>Facebook</td>
<td>6</td>
<td>100.00%</td>
<td>$0</td>
</tr>
<tr>
<td>Twitter</td>
<td>3</td>
<td>66.67%</td>
<td>$0</td>
</tr>
<tr>
<td>Vimeo</td>
<td>1</td>
<td>100.00%</td>
<td>$0</td>
</tr>
<tr>
<td>Youtube</td>
<td>1</td>
<td>100.00%</td>
<td>$0</td>
</tr>
<tr>
<td>Total</td>
<td>182</td>
<td>97.80%</td>
<td>$0</td>
</tr>
</tbody>
</table>

In comparison with the Kvasir Project website’s social media referrals, the Kvasir Project Indiegogo™ social media traffic had an incredibly high bounce rate, with the overall bounce rate of 97.80%, which implies that visitors were not interested at all with the contents of the Indiegogo™ campaign and/or did not have an Indiegogo™ account or were not interested in donating to the Kvasir Project Indiegogo™ campaign. The majority of the social media traffic to the Indiegogo™ campaign came from Reddit™, which accounted for 93.95% of the overall social media traffic, but the bounce rate of the Reddit™ visitors was 98.25%, which means that only 3 out of 171 visitors from Reddit™ clicked on an element of the Kvasir Project Indiegogo™ webpage.

Table 7 – Kvasir Project Website Page Views from Google™ Analytics 1/24/2014 – 4/22/2014

<table>
<thead>
<tr>
<th>Website Page</th>
<th>Page Views</th>
<th>Bounce Rate</th>
<th>Donations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home</td>
<td>1,152</td>
<td>77.79%</td>
<td>$0</td>
</tr>
<tr>
<td>The Project</td>
<td>155</td>
<td>69.23%</td>
<td>$0</td>
</tr>
<tr>
<td>Donate</td>
<td>104</td>
<td>46.67%</td>
<td>$0</td>
</tr>
<tr>
<td>Background Information</td>
<td>62</td>
<td>0.00%</td>
<td>$0</td>
</tr>
<tr>
<td>About Us</td>
<td>48</td>
<td>62.50%</td>
<td>$0</td>
</tr>
<tr>
<td>Latest News</td>
<td>47</td>
<td>0.00%</td>
<td>$0</td>
</tr>
<tr>
<td>Contact Us</td>
<td>28</td>
<td>0.00%</td>
<td>$0</td>
</tr>
<tr>
<td>Blog Post 2</td>
<td>18</td>
<td>0.00%</td>
<td>$0</td>
</tr>
<tr>
<td>Supporters</td>
<td>9</td>
<td>0.00%</td>
<td>$0</td>
</tr>
<tr>
<td>Blog Post 3</td>
<td>4</td>
<td>0.00%</td>
<td>$0</td>
</tr>
<tr>
<td>Total</td>
<td>1,627</td>
<td>76.49%</td>
<td>$0</td>
</tr>
</tbody>
</table>
Given that the overall bounce rate was extremely high for all the traffic sources for the Kvasir Project website, the pages that were viewed by the visitors provides insight as to the behavior of the visitors that did not immediately leave the initial landing page. The vast majority of the page views were attributed to the home page or landing page, which is what one would expect, as all of the SEO backlinks were directed to the home page, but the bounce rate of the home page is extremely high, which means that the visitors were not interested in the content of the home page or that the home page was not optimized for encouraging visitors to interact with the website. Improvements to on-site SEO, given the current nature of on-site SEO, would include more content relating to each of the keywords, such as blog entries and additional content, as search engines rank content higher by the amount of content, as well as the quantity of the keywords within the website’s content.

Table 8 – Kvasir Project Website Organic Search Traffic from Google™ Analytics 1/24/2014 – 4/22/2014

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Number of Visits</th>
<th>Bounce Rate</th>
<th>Donations</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Not Provided)</td>
<td>21</td>
<td>42.86%</td>
<td>$0</td>
</tr>
<tr>
<td>Alternative Energy Solutions Project</td>
<td>1</td>
<td>100.00%</td>
<td>$0</td>
</tr>
<tr>
<td>Sustainable Alternative Energy</td>
<td>1</td>
<td>0.00%</td>
<td>$0</td>
</tr>
<tr>
<td>Total</td>
<td>23</td>
<td>43.48%</td>
<td>$0</td>
</tr>
</tbody>
</table>

The Facebook advertising campaign were split into two different campaigns, one to get Facebook page likes and the other to send visitors to the Kvasir Project website. The Facebook page like campaign targeted active users from the facebook page “1,000,000 against offshore drilling,” which resulted in 83 page likes with a cost of 20.72 USD or roughly 0.25 USD per page like from February 6th, 2014 to February 10th, but were stopped due to very little traffic going to the Kvasir Project website. The Facebook clicks to the Kvasir Project website advertising campaign received 252 clicks with a cost of 69.24 USD or roughly 0.27 USD per click from February 10th, 2014 to March 6th, 2014.

The results of the two SEO campaigns are also rather insignificant with regard to organic traffic and with ranking in Google™ for the desired keywords. When evaluating the statistics from Google™ Analytics, 23 visitors visited the Kvasir Project website by means of search engine terms, which is 2.46% of all of the traffic. As Table 7 illustrates, the vast majority of the keywords that were searched in search engines were not provided to Google™ Analytics, thus these keywords are unknown. It is also noted that organic traffic had a much lower bounce rate, with an overall bounce rate of 42.86%, when compared to every other traffic source, which had an overall bounce rate of 75.51%. The lower
bounce rate from organic traffic suggests that users who visited the Kvasir Project website through organic search engines were far more interested in the content than through other means of reaching the site.

The two SEO campaigns, with regard to keyword ranking, were extremely insignificant and the Kvasir Project website did not rank for the majority of the keywords. Out of the targeted keywords; energy project, clean energy, sustainable energy, sustainable energy solutions, localized energy production, two of the five keywords ranked in one of the major search engines, but the two keywords that did rank, which were sustainable energy solutions and localized energy production, had an extremely low monthly search volume, which is the approximate amount of times the particular keyword is searched in one month.

Table 9 – Kvasir Project Keyword Rankings from Serpbook.com as of April 22nd, 2014

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Google</th>
<th>MS</th>
</tr>
</thead>
<tbody>
<tr>
<td>sustainable energy</td>
<td>-</td>
<td>9900</td>
</tr>
<tr>
<td>kvasir project</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>alternative energy production</td>
<td>-</td>
<td>70</td>
</tr>
<tr>
<td>clean energy</td>
<td>-</td>
<td>12100</td>
</tr>
<tr>
<td>kvasir</td>
<td>105</td>
<td>33100</td>
</tr>
<tr>
<td>localized energy production</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>sustainable alternative energy</td>
<td>107</td>
<td>20</td>
</tr>
<tr>
<td>energy project</td>
<td>-</td>
<td>1300</td>
</tr>
<tr>
<td>alternative energy</td>
<td>-</td>
<td>22200</td>
</tr>
<tr>
<td>sustainable transition</td>
<td>-</td>
<td>20</td>
</tr>
<tr>
<td>local energy</td>
<td>-</td>
<td>210</td>
</tr>
<tr>
<td>storm drains</td>
<td>-</td>
<td>880</td>
</tr>
<tr>
<td>clean energy production</td>
<td>-</td>
<td>30</td>
</tr>
<tr>
<td>sustainable alternative energy sour.</td>
<td>183</td>
<td>10</td>
</tr>
<tr>
<td>sustainable energy project</td>
<td>-</td>
<td>20</td>
</tr>
<tr>
<td>energy production</td>
<td>-</td>
<td>1900</td>
</tr>
<tr>
<td>sustainable energy solutions</td>
<td>225</td>
<td>590</td>
</tr>
</tbody>
</table>

The keyword “sustainable energy solutions” ranked 225th in Google™ for the search results of that specific keyword, but the monthly search volume is only 590, while the keyword “localized energy
production” ranked 5th in Google™ for that specific keyword with a monthly search volume of 0. The Kvasir Project website did rank for a few other keywords that were not necessarily targeted, such as kvasir project and kvasir, which is understandable as these keywords are reflected in the projects name and the site is inadvertently optimized for these keywords. The most sought after keywords, which are energy project, clean energy, sustainable energy, and energy project did not rank at all, even though SEO is dynamic, which is probably due to the fact that these keywords have a high monthly search volume and the competition for these are primarily energy companies, who have a large SEO budget and rely on SEO for corporate social responsibility (CSR) marketing purposes, since energy companies utilize SEO to improve their companies image and to brand less environmentally destructive methods of energy production in a sustainable manner.

Figure 3 – Kvasir Project “Sustainable Energy Solutions” Keyword Ranking Over Time from SerpBook 1/27/2014 – 4/22/2014

As SEO keyword ranking is dynamic, given that search engines’ algorithms constantly change to counter SEO manipulation, the rankings for a particular keyword will change over time. Figure 3 illustrates the dynamic nature of keyword rankings with the keyword “sustainable energy solutions” on the Kvasir Project website. Interestingly, there is a gap between March 14th, 2014 and April 5th, 2014, where the keyword did not rank at all, which may be explained by a small update in Google’s™ search engine algorithm on March 24th, 2014.

5 Discussion

The Kvasir Project crowdsourcing campaigns, being on the website itself and on the Indiegogo™ crowdsourcing platform, were not successful, since not a single visitor to either website had submitted a donation, even though the websites had 1,277 visits in total. Although these crowdsourcing campaigns were extremely unsuccessful, a wealth of information can be derived from the case study about crowdsourcing that is useful for small-scale alternative energy innovations and the organizations behind these technological innovations.

5.1 Crowdsourcing and Sustainable Energy Innovations
Intuitively, it would seem as though crowdsourcing and small-scale alternative energy innovations, which roots lie in social innovation, would be a perfect match in terms of raising capital for addition research and development, but it is quite the contrary, when evaluating the Kvasir Project case study.

Successful crowdsourcing campaigns require a rather high amount of initial capital, as evidence by a simple search of successful crowdsourcing campaigns on Indiegogo™ and the GravityLite™ crowdsourcing campaign. In order to provide “perks,” which is something either tangible or intangible that a donor receives in return for their donation. The Kvasir Project Indiegogo™ campaign did not have the capital, as the initial capital was tied into the development of the Kvasir I prototype, needed in order to provide a tangible item for prospective donors to receive in return for their donation. Instead of providing a tangible item as a “perk,” the Kvasir Project offered recognition for donations by either posting the donor’s name on the Kvasir Project website, with a $10 donation, or by a personalized e-mail, with a $25 donation. As the results suggest, this was highly unsuccessful and when evaluating other successful Indiegogo™ crowdsourcing campaigns, the successful Indiegogo™ campaigns offered tangible “perks,” which is not necessarily good for a small-scale renewable energy organization, as it requires additional capital for “perks,” which may or may not be a successful leverage of initial capital. It is also counter-intuitive for a small company to utilize its monetary resources for anything other than marketing and research and development. Not only are “perks” seemingly counter-intuitive for a small company for utilize it’s resources, but it is just a manifestation of a neo-liberal capitalistic market, which further promotes materialism as a form of gratification, rather than an ethical gratification of providing a donation for an organization that is attempting to provide a solution to a societal and environmental problem.

In addition to the costs associated with providing “perks,” a crowdsourcing campaign needs to be heavily marketed via viral marketing techniques, which requires additional capital investments. The majority of successful crowdsourcing campaigns on Indiegogo™ require crowdfund-specific SEO, which is called “go go factor.” The “go go factor” is Indiegogo’s™ algorithm that decides which campaigns are featured on their front page, which is determined by a combination of how active the users are, the amount of donations, and the activity of the campaign creator (“The gogofactor & How to Get Featured on Our Homepage | Indiegogo Blog,” n.d.). The requirement of a high “go go factor” that determines the success of an Indiegogo™ campaign is analogous to SEO with search engines and it is seemingly an engagement tactic used by Indiegogo™ to engage its users for the benefit of Indiegogo™ itself.
In addition to the necessary “go go factor,” investments must be made into viral media marketing in order to generate additional targeted traffic that might submit a donation, but this has a severe limitation. The major limitation of viral marketing for an Indiegogo™ campaign is due to the fact that a visitor must first create an Indiegogo™ account in order to submit a donation. This practice does not have an advantage over a local website based crowdsourcing website, such as the Kvasir Project website, because a visitor to a local crowsource oriented website does not have to create an account in order to submit a donation.

The Kvasir Project website crowdsourcing platform, there were multiple donation methods available, including Paypal, Credit Card, and Bitcoin, which was intended to provide a convince of donation method for a prospective donor. The analytics backend was set up in order to track donation type, donation amount, and from which traffic source the donor visited from, which would have provided insight into the means of which a donor preferred to submit a donation. The option of Bitcoin donations was deliberately implemented in order to track the adoption and willingness for Bitcoin users to submit donations through the cryptocurrency than through a fiat, or government issued currency, donation. Unfortunately, the Kvasir Project did not receive a donation of any medium, thus the results are inconclusive as to whether or not the Bitcoin community or Bitcoin users would be more willing to submit donations for a small-scale renewable energy innovation.

An important aspect of a donor’s willingness to submit a donation for a small-scale renewable energy innovation lies on whether or not the donor cares enough, which is illustrated by whether or not a person would submit a donation, of about the issue of sustainable energy production. In addition, potential donors may not have an interest in the innovation as well. Social media presents itself as a means to gauge the willingness and interest of prospective donors in terms of small-scale renewable energy innovations and submitting a donation.

5.2 Social Media and the Kvasir Project

The reception of the Kvasir Project website on social media was mixed in terms of acclaim and criticism. Interestingly, there was a major difference in the overall attitude towards the Kvasir Project website and Indiegogo™ campaign between the two major social media networks, which are Facebook™ and Reddit™. Visitors from Facebook™ were much more receptive towards the Kvasir Project website and Indiegogo™ campaign than Reddit™, which is also reflected by the bounce rate between the two social media networks.
Because Facebook’s™ CPC model allows Facebook™ users to comment, like, and share posts from an advertisement, the advertisements appear as a normal post for users within a targeted Facebook™ fan page, which is illustrated by Figure 4. The comments on each Facebook™ advertisement were generally positive and expressed interest in the project, yet the users that “liked” the Kvasir Project Facebook™ page did not interact with the Facebook™ fan page at all, outside of a few “likes” on the posts. The lack of engagement with the Kvasir Project Facebook™ fan page is reflected by the traffic statistics reported by Google™ Analytics. Although Facebook™ users generally liked the Kvasir Project, there was not enough interest generated to submit a donation on the Kvasir Project website, which either has to do with the general layout of the Kvasir Project website, the content of the Kvasir Project website, or the lack of interest in submitting a donation that would go towards further developing a small-scale renewable energy innovation.

Figure 4 – Kvasir Project Facebook™ Advertisement
Due to the initial lack of interest and donations from the Facebook™ advertising CPC campaigns, the Facebook™ advertisements were cancelled earlier than anticipated as a return on the investment for the advertisements did not appear probable, which may have hindered the results of the Facebook™ advertising campaign.

In contrast with the positive reception from Facebook™ users, the users of Reddit™ were generally extremely critical towards the Kvasir Project website and the Kvasir Project Indiegogo™ campaign. The Kvasir Project website was submitted to the Renewable Energy subreddit, Envirotech subreddit, and the Bitcoin subreddit. In addition to the Kvasir Project website Reddit™ submissions, the Kvasir Project Indiegogo™ campaign was submitted to the kickstarter subreddit. The comments from these submissions ranged from “this is a scam,” “this product is not cost effective,” “the product will never recover the energy costs,” to “durability concerns” (for submission links, see Appendix 2). While some of the comments from the Reddit™ submissions were valid concerns, many users misinterpreted the Kvasir I as a commercially manufactured product and not as a prototype, which was still in development. Because virtually all of the Reddit™ user comments were extremely adverse and critical of the Kvasir Project, users who were reading the comments would have a predetermined opinion of the Kvasir Project website and Indiegogo™ campaign and would feel less inclined to submit a donation. The sentiment from Reddit™ is also reflected in the extremely high bounce rate from Google™ Analytics, as the vast majority of visitors from Reddit™ did not interact with the Kvasir Project website and Indiegogo™ webpage at all.

Interestingly, Reddit™ users’ concerns had to do with the economic viability aspect of the Kvasir Project, which echoes a neo-liberal economic sentiment that alternative energy production must directly compete with conventional energy production economically. This sentiment was not shared by Facebook™ users, who expressed the sentiment that the Kvasir Project would be beneficial for the environment or for structures that are located off the grid. The difference in sentiment may be due to the fact that Reddit™ users are more technologically savvy or that Reddit™ users are generally located in the United States, while Facebook™ users are located around the globe, in which case perhaps Americans may be more predisposed to neo-liberal capitalism than the rest of the world.

In order for viral media marketing to be successful in terms of information dissemination for crowdsourcing purposes, a lot of financial resources would have to be utilized and it is unclear as to whether or not this would be viable for small-scale renewable energy innovations. As for the Kvasir Project, viral media marketing was not a good utilization of financial resources.
5.3 SEO and the Kvasir Project

The results of SEO campaigns for the Kvasir Project website were unsatisfactory, as the desired targeted keywords did not rank high enough or at all, which produced dismal results in terms of organic search traffic. The combination of both white hat and black hat SEO techniques did not seem to make a difference in terms of one type of SEO being advantageous over the other. Interestingly, during the SEO campaign rankings, a Google™ search engine algorithm occurred and the update did not significantly affect the rankings. Because the Google™ search engine algorithm update did not affect the rankings of the black hat SEO technique campaign, it can be deduced that the techniques utilized by the black hat SEO operator were rather sound enough not to be affected by the algorithm update.

Unfortunately, the Page Rank of the Kvasir Project website did not change at all during the SEO campaigns, which was one of the goals of the SEO campaigns, as it plays a part of the search engine ranking system. While the results of the SEO campaigns were dismal at best, the issue did not lie within the SEO techniques or the ability of the SEO campaign operators, but rather with the high competitiveness of the desired keywords, which are extremely relevant for CSR marketing for oil and energy companies. In order to effectively rank for keywords such as “sustainable energy” and “renewable energy,” one must invest much more capital into SEO campaigns in order to rank highly for these highly competitive keywords.

Within the field of SEO, there are ethical concerns for the use of black hat SEO techniques, which are a manipulation of search engine algorithms in order to rank highly for a specific keyword. While these concerns are valid for those within the SEO industry, one could argue that the ethical concerns of the environment and sustainable energy far outweigh the ethical concerns of black hat SEO techniques, which roughly echoes a Utilitarian-Machiavelli sentiment in that “the ends justify the means” if, and only if, it will benefit the greater good of the majority of the population. For the instance of the Kvasir Project and all sustainable energy oriented projects, the ethical concerns of black hat SEO manipulation will generally outweigh the ethical concerns of the corresponding sustainability oriented projects. While the use of hacked high page rank websites have been utilized for black hat SEO purposes, this practice does not encompass all blackhat SEO techniques, whereas the use of building high PR websites from expired high page rank website domains is the general practice for building a black hat high page rank website network, but the practice depends entirely on the black hat SEO operator.
5.4 Transition Theory and the Kvasir Project

Transition theory and power dynamics provides insight into the Kvasir Project case study. Given transition theory, crowdsourcing constitutes transformative power as crowdsourcing redistributes resources, which are individuals. Crowdsourcing is a niche, within the landscape of globalization, as the societal infrastructure implemented for crowdsourcing to occur is the interconnectedness of globalization. In addition the landscape of globalization, the regime is traditional investment means, which dominates the globalization landscape. While there is a power struggle between traditional investment opportunities and crowdsourcing, crowdsourcing does not have enough power to overtake conventional investment means in order to become a regime, but it is seemingly getting closer, but not within the context of alternative energy innovations such as the Kvasir Project. Although crowdsourcing has not overcome conventional means of investment, within the context of alternative energy innovations, crowdsourcing can be considered a regime within other contexts, where conventional investment opportunities are not present, such as the Indiegogo campaign to fund the building of a satanic monument at the Oklahoma Courthouse in order to highlight religious diversity in Oklahoma (Indiegogo, 2014).

Crowdsourcing is heavily reliant on Internet marketing innovations. Marketing innovations, such as viral media marketing and SEO, play an important role on the dissemination of information, which in itself can be framed by transition theory.

When evaluating crowdsourcing in the context of transition theory, the components of crowdsourcing itself exhibit different types of power, which are viral media marketing and SEO. Viral media marketing is a means of transformative power, as it redistributes resources, which is information, given that viral media marketing generally includes the engagement of an active audience in order to disseminate information through social media networks. The active engagement of the resources within viral media marketing is the strongest power that crowdsourcing can excise, given that crowdsourcing itself is entirely reliant on an engaged targeted audience. SEO is another form of transformative power, but the power relations for SEO are different than that of viral media marketing. SEO, within itself, is extremely competitive and there is a constant and dynamic power struggle to rank specific keywords higher than competitors and SEO can be considered a regime within the landscape of Information Technology and niches of different methods of gaining traffic. Other regimes within this context are social media networks and the utilization of viral marketing techniques.
5.5 Limitations

The Kvasir Project case study had several limitations, which may have hampered the results of the case study. The first limitation is the lack of initial capital needed to efficiently test and broaden the scope of viral marketing techniques that are needed in order to promote the Kvasir Project website crowdsourcing platform and the Indiegogo™ crowdsourcing platform. The initial cost of the Kvasir Project was 8,000 SEK, which was the majority of the capital that could be allocated to the project, which left minimal residual capital available for viral marketing campaigns and SEO.

Another issue was the promotion of Twitter™. Promoting on Twitter™ is extremely tedious and requires numerous tweets per day in order to gain a following. While the social media marketing campaigns were in progress, the focus on Facebook™ and Reddit™ had been extremely time consuming and Twitter™ was essentially forgotten, which explains why Twitter™ traffic was extremely low, but when evaluating the results, Twitter™ traffic had a relatively low bounce rate, which indicates that Twitter™ users were somewhat interested in the content of the Kvasir Project website.

Incidentally, there was an extremely large discrepancy between the Google™ Analytics website statistics and the Kvasir Project backend statistics. As previously stated in the Results section, this is most likely due to “internet crawlers,” but there could be more reasons as to the enormous discrepancy in statistics. In order to ensure some level of accuracy and consistency, Google™ Analytics’ statistics were referenced when establishing correlations between the data and behavioral inferences made about the visitors, which is illustrated by the bounce rate.

On-site SEO was performed on the Kvasir Project website for the desired keywords, but it is unclear as to whether or not the website was entirely optimized for on-page SEO. Given that the website was designed in Wordpress™ and the Wordpress™ plugin “SEO by Yoast” was used for on-page SEO, but there may have been some issues with on-page SEO, but it is hard to confirm this, as the targeted keywords had a large monthly search volume and were rather competitive. An issue with on-page SEO would have a negative impact on the Kvasir Project’s websites ability to be ranked in high competition keywords.
5.6 Recommendations

Given the results of the Kvasir Project case study, it is probably not a good utilization of capital resources to try fund small-scale renewable energy innovations or sustainability-oriented innovations through crowdsourcing, viral media marketing, and SEO, but this is entirely contextual. It is impossible to speculate on specific reasons why the Kvasir Project’s crowdsourcing campaign failed, since there are generally a multitude of variables to consider and there is a level of ambiguity. One potential marketing hindrance might have been that the Kvasir Project’s product did not have an emotional appeal to it, but this is just based off speculation. For instance, the GravityLight™, which is what the Kvasir Project modeled its Indiegogo™ crowdsourcing campaign after, had an emotional appeal because people in rural Africa did not have access to light, due to a lack of electrical infrastructure, and the emotional appeal seemed to have played a major part in the success of the Indiegogo™ crowdsourcing campaign, or perhaps they had a high “go go factor.”

It is also recommended that if a renewable energy innovation pursues crowdsourcing as a funding model, there are a multitude of variables that will attest to the successful or failure of a crowdsourcing campaign, but due to the ambiguous nature of marketing appeal and crowdsourcing, it might be unclear as to what they are. But if a renewable energy innovation will pursue funding through crowdsourcing, it is recommended to have a large budget in place for tangible “perks” as donators will want something in return for their donation.

6 Conclusion

The current socio-economic atmosphere for developing renewable energy innovations requires funding either through conventional investment means or through crowdsourcing. The aim is to determine the extent of which crowdsourcing can provide the monetary funding needed for renewable energy innovation research and development and to which extent the mechanisms of information dissemination within crowdsourcing, such as viral media marketing in social media and SEO, can promote the small-scale renewable energy innovations through a crowdsourcing platform.

In order to determine the viability of crowdsourcing and the associated mechanisms, two crowdsourcing campaigns were created for the Kvasir Project, the first being the Kvasir Project website and the second being the Kvasir Project Indiegogo™ campaign. Each crowdsourcing campaign was promoted through viral media marketing techniques on Facebook™, Twitter™, and Reddit™. In addition to viral media marketing techniques, two SEO campaigns were utilized to rank
the Kvasir Project website for strategic keywords. Ultimately, a total of 1,272 page views had occurred over both of the crowdsourcing campaigns without a single donation.

Given the results of the Kvasir Project crowdsourcing case study, it is recommended that renewable energy innovations should be funded through conventional investments. Future research on the topic of funding renewable energy innovations through crowdsourcing should include an investigation into how to increase the engagement of social media participants within the renewable energy field.
7 References


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8 Appendices

8.1 Appendix 1: Power Dynamics in Transition Theory

Given the types of power, or exercise of power, power dynamics within transition theory can be understood. Each different exercise of power can disrupt or interfere with another type of power, while different exercise of power can also enable another. The exercise of a particular type of power from one actor to another, while the other resists or tries to combat the exercised is described as a power struggle.

Power dynamics within transition theory are relational with respect to the type of power exercised, since power relates with mobilizing resources. The relational aspect means the resources itself can be a measure of power, by either the amount or by mobilizing different resources (Avelino & Rotmans, 2009). Because power relations between two different entities are dynamic and dependent on the ability to mobilize resources, a balance can be attained, which represents stability between the exercises of power between two entities. Entities can have power ‘over,’ ‘more or less power,’ and/or ‘different power’ over another entity (Avelino & Rotmans, 2009).

As a transition process occurs, being that a niche challenges the regime by exercising a type of power that disrupts the regimes dominance of a landscape, there are four phases of power transition, being the pre-development, take off phase, acceleration phase, and stabilization phase. The pre-development phase is when “changes occur in the ‘background’ at landscape and niche level, which are resisted by the regime” (Avelino & Rotmans, 2009, p.545) The take off stage is when an event or issue occurs that the regime cannot deal with, which results in a weakened power dynamic or a collapse (Avelino & Rotmans, 2009). The acceleration stage occurs after the take off stage in which “by transformative power; resources are redistributed among actors, and old resources are replaced by new ones” (Avelino & Rotmans, 2009, p.561). The acceleration stage allows a challenging niche’s resistance to the regime to become weakened and allows the niche to increase it’s power and transforming it into a niche-regime. The stabilization stage is the final stage in the transition process where the niche-regime becomes a regime by exercising constitutive power in order to establish a new distribution of resources. Essentially, the transition of power between a niche-regime and regime occurs when the regime cannot deal with a contingency, whether it be external or internal, while the niche-regime is resistant or can cope with the contingency, which results in a change of power within a specific landscape.
8.2 Appendix 2: Website Links

Kvasir Project Website: http://kvasirproject.com
Kvasir Project Facebook Page: https://www.facebook.com/kvasirproject
Kvasir Project Twitter Page: https://twitter.com/KvasirProject
Kvasir Project Youtube Channel: http://www.youtube.com/channel/UCrmBhqgpW6ya5DKC14Z6Ang
Kvasir Project Reddit Submissions:
http://www.reddit.com/r/Bitcoin/comments/1xivef/developer_accepts_bitcoin_for_developing_a/
http://www.reddit.com/r/envirotech/comments/1xds1m/the_kvasir_project_developed_a_device_that/
http://www.reddit.com/r/RenewableEnergy/comments/1wzkov/researcher_has_developed_a_prototype_to_generate/
http://www.reddit.com/r/kickstarter/comments/1y8aq9/innovative_device_that_generates_electricity_from/

Kvasir Project in Google News:
https://www.google.com/search?hl=en&gl=ph&tbm=nws&authuser=0&q=The+Kvasir+Project+Creates+Crowd+Funding+For+Clean+Energy+Development&oq=The+Kvasir+Project+Creates+Crowd+Funding+For+Clean+Energy+Development&gs_l=news-cc.12..43j43i53.17282.17282.0.18025.1.1.0.0.0.0.223.223.2-1.1.0...0...1ac.1.uFgvfv8DxKI