From Open Data to Open Innovation Strategies: 
Creating e-Services Using Open Government Data

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Abstract

Noting the need to extend the corpus of knowledge on open government data initiatives, especially on the strategies to facilitate and attract businesses and citizens to participate, collaborate and re-use open government data, this paper presents a research-in-progress case study on an open data initiative by the Singapore Government. Preliminary findings indicate that open innovation can be gainfully employed to realize the underlying motivation of open data initiatives. This research also builds upon existing study in open innovation strategies. It posits a set of considerations to develop the open government data portal into an open innovation platform. It also establishes a set of considerations for enticing businesses and citizens to create e-services that leverage on the datasets available from the portal. Implications to both research and practice of open government data initiatives are presented. The paper concludes with a discussion on the future research direction of this study.

1. Introduction

Many government agencies have embarked on open data initiatives in making their data available for public consumption [1, 2]. These data are made accessible online and in machine-readable format where businesses as well as citizens can access and re-use these data to create innovative value-added products and services [2].

Recent studies revealed that such open data initiatives are gaining traction in the US and in Europe, where many agencies already have in place open data portal to upload data for public sharing [2, 3]. While open data initiatives serve as a form of catalytic basis for citizen participation and collaboration to happen [1, 4], there is no assurance that such initiatives actually result in any purposeful or beneficial participation and collaboration.

This paper identifies the need for a more interventionist approach whereby intentional strategies are established to ensure that desired participation and collaboration actually results from such initiatives. This paper proceeds to address this need by presenting a research-in-progress case study on the data.gov.sg portal where open innovation strategies are adopted to create e-services. The research question is hence “What are the strategies to foster participation and collaboration in open data initiatives?”

The next section reviews the development of open data. The subsequent section then describes open innovation within the government context. After presenting the research method, the background and preliminary analysis of the case study are presented to reveal two key elements in the open innovation strategies. Before presenting the conclusion, a discussion on the implications of this paper to both research and practice is offered.

2. Open data within governments

According to the European Commission, “Open data policies have usually materialized with public sector datasets becoming easily accessible and re-usable by the general public through governmental web portals.” [5] While the implementation of open data initiatives seem similar across governments (i.e. chiefly through a centralized web portal where datasets can be downloaded by the public), governments may have different motivations for embarking on open data initiatives. Two key motivations have been noted [2]. The first motivation is rooted in the ethos of democracy and freedom of information, where open data initiatives serve as a vehicle for governments to become more open and transparent as opposed to being shielded behind a veil of secrecy. The data.gov portal in the US is an
example of this. The “Open Government Directive”, from which the open data initiative (i.e. the data.gov portal) derives legitimacy as the central clearing house for government datasets, is based on the three pillars of transparency, citizen participation and collaboration to strengthen democracy [1, 3, 6, 7].

The second motivation is rooted in economics, whereby the sharing of government-held data is to spur the growth of the information market. Governments are known to hold a vast amount of low or non-sensitive data, some of which may have economic value to businesses and individuals but are rarely leveraged upon by the government. Examples include meteorological data, macro-economical statistics, geographical data, community or municipality-based event calendars, and road traffic information. By making these data publicly available, it provides opportunities for individuals and businesses to utilize the data to create value-added products and services either for commercial gain or as a public good. Such activities can lead to improvement in e-government service provision, creation of jobs and work opportunities, and ultimately contribute to economic growth. Europe’s PSI Directive is one such example [2, 8]. “The directive is built on two main objectives: on the one hand, enabling the availability of public sector data to third parties at low process and unrestricted conditions, and on the other hand, ensuring a level playing field between public bodies that operate in the information market in competition with the private information industry.” [2, p.447]

Whether the motivation is democratic, economic or both, a key measure of success in such open data initiatives should consider the actual usage of the portal for its intended purposes [9, 10]. In fact, the UK government, who is among the earliest adopters of the PSI Directive, has realized that the mere existence of centralized data portal is insufficient to realize the desired democratic and economic motivations [2]. What is needed is the participation and collaboration of citizens and businesses in using the centralized data portal. This study hence explores the strategies involved in facilitating and attracting participation and usage of these data portals by focusing on the open data initiative of the Singapore government that ostensibly aligns with the economic motivation. As open innovation strategies are adopted in the Singapore government’s open data initiative, a review of open innovation and its usage in the public sector thus follows.

3. Open innovation

In contrast to traditional closed innovation approaches where the locus of innovative endeavours lies within the boundary of an organisation, open innovation advocates an open boundary between an organisation and its surrounding environment such that innovative endeavours can interweave across the boundary [11]. The underlying thesis is that closed innovation is no longer sufficient for organisations operating in contemporary dynamic environment where customers are becoming more sophisticated and demanding. Most organisations do not have a monopoly of knowledge to generate all the desirable innovations nor can they innovate fast enough to catch up with changing societal trends. Such predicaments certainly apply to government agencies, where despite having the requisite technological infrastructure for e-government such as open data portals, most agencies do not possess the innovativeness to fully exploit them [9, 12, 13]. Scholars have also indicated that government agencies produce better quality e-government sites when partnered with private sector IT firms [14].

While open innovation is often associated with the research and development of tangible products, it is also applicable in the research and development of intangible services [15, 16]. Chesbrough [15] described two complementary kinds of processes in service innovation. The first kind is outside-in, where organisations leverage on external innovations, which can exist as ideas, processes, or technologies. This allows organisations to make use of external knowledge and innovation components in developing services. The second kind is inside-out, where organisations allow external parties to leverage on their knowledge and innovation components to develop services.

There has been a surge in interest among researchers and practitioners on the application of open innovation in e-government in the recent years. Government initiatives that adopt an open innovation approach are being launched in different countries [4, 17]. Burgeoning interest among researchers can be discerned from the “Open Innovation in e-Government” theme of the recent 2011 e-Gov SIG pre-ICIS workshop in Shanghai. Scholarly publication in this area is also emerging [e.g. 17, 18, 19, 20].

3.1 Open innovation strategies

Conventional approaches to strategy have to be re-evaluated with the adoption of open innovation [21]. Assumptions and issues that are usually taken
for granted or even ignored will have to be re-examined. For example, issues “such as attracting the participation of individual volunteers, the role of community participation, the construction of innovation networks, and the notion of innovation ecosystems all lay beyond the explanatory power of current notions of strategy” [22, p. 62]. What is perhaps worrisome is that some government agencies are jumping onto the open innovation bandwagon to develop e-services, with little knowledge of the strategies to effect participation from desirable external partners. Hence, there is a risk that a previously-observed conundrum where government agencies failed to appropriately exploit innovative initiatives “due to the one-sidedness or internal orientation of the ICT-driven public sector innovation agenda” [12, p.103] may again be repeated.

Chesbrough and Appleyard [22] posited a couple of considerations when developing open innovation strategies. First, there should be some underlying architecture or platform to connect different pieces of knowledge or innovation components. Without this, it will be challenging for open innovation to thrive. In addition, the strategy should also consider the value proposition for different partners to participate in the open innovation initiatives. When it comes to open government data initiatives, such value propositions may not necessarily be just pure financial profit, but it could also be driven by political or social agenda (e.g. well-being of the visually challenged), hobby (e.g. open source programming), academic exercise (e.g. academic assignments), or pure altruism to advance public good.

4. Research method

This research attempts to explore “What are the strategies to foster participation and collaboration in open data initiatives?” through a case study on the open data initiatives of the Singapore government, (i.e. the data.gov.sg portal) which adopts an open innovation approach to create new e-services with the open data. The employment of open innovation approaches to develop e-services is still nascent, with the data.gov.sg portal being one of the pioneering initiatives in the world [17]. Given that exploratory case study research is appropriate for the sense making of contemporary and novel phenomena [23, 24], it is thus adopted as the research method in this study.

The entire study is divided into two phases, and this paper only presents the first phase. The first phase is centred on the collection and analysis of data related to the data.gov.sg portal from published sources such as Government portal websites, online databases, press and periodical articles, official press releases and statements, official speeches, and official documents. These are then analysed against the open innovation, open data and e-government literature to “make sense” [25] of the strategies that are employed. Such an approach of leveraging on published data enables researchers to gain a better grasp of the phenomenon of interest, as well as enrich subsequent analysis of primary data [26] to be collected in phase two.

Phase two of this study will focus on the collection and analysis of primary data, predominantly sourced through interviewing “actors” involved in the phenomenon of interest [27], i.e. strategies employed to foster participation and collaboration via the data.gov.sg portal. These data will be corroborated with the result from the first phase to derive a set of consistent and cogent theoretical conception to answer “What are the strategies to foster participation and collaboration in open data initiatives?”

5. data.gov.sg: case background

The data.gov.sg portal (See Figure 1 for a screenshot) was launched by the Infocomm Development Authority (IDA) of Singapore on 20 June 2011 to serve as a first-stop portal where publicly accessible government data can be found. For a start, over 5,000 datasets from across 50 government agencies were made available through the portal to be used for research or development of applications. By late 2011, the number of datasets grew to over 6,000. Some of these datasets were available free of charge while others required a fee. Information contained in these datasets includes locations of hospitals and medical clinics, census data, weather information and real-time road traffic information. Although some of these data were previously available from the website of various government agencies, the data.gov.sg portal provides a centralised platform to search and access these data. Moreover, the portal also aimed to make these datasets available in machine-readable format to facilitate application developers to tap on these data to develop innovative government e-services that can be made available over the World Wide Web or as mobile applications. Once an e-service was developed, the developer can register with the portal to have their e-service listed on the portal’s “Application Showcase” to enable easy discovery and access by users.
At the launch of the portal, the Deputy Prime Minister of Singapore explained the motivation for the portal: “Today, Apple does not design and build its application in-house, but provides the platform and tools for the highly talented and motivated developer community to create great applications for its customers... Government can take a leaf from Apple’s successful AppStore concept...innovative individuals and companies outside of government can come up with good solutions that create value for citizens...this portal will encourage innovative individuals and businesses to stretch their imagination on how government data can be used together with other private (sector) data to create new services for citizens.”

On a separate occasion, the Assistant Chief Executive of the IDA (who heads the Government Chief Information Office) also commented on the underlying assumptions of the eGovernment Master Plan in Singapore, and how the data.gov.sg portal fits within this Master Plan: “government cannot resolve all the challenges and neither should it because other stakeholders including the private sector and civil society organisations do some things better than the government. So the role of the public sector becomes one of a facilitator that harnesses the strength of various parts of the society to meeting the needs of the individual citizens. The new eGovernment Master Plan is all about the government adopting an enabling and facilitating role enabled by technology to deliver public value. It’s about viewing data as a strategic infrastructure and using it effectively... [The portal provides] opportunities for the Government to collaborate with the people and private sector to co-create new e-services and approaches to service delivery.”

Such motivation that spurred the development of the data.gov.sg portal revealed it to be an open data initiative that used an open innovation approach to develop e-services. Moreover, since its launched, the initiative also achieved some degree of success. As of November 2011, more than 30 e-service applications
have been developed by education institutions, companies and individuals, using datasets from the portal. Hence, it provided an opportunity to examine “What are the strategies to foster participation and collaboration in open data initiatives?".

6. Preliminary analysis

The preliminary case data analysis centered on the open innovation strategies employed in the data.gov.sg portal. In particular, the case data revealed the presence of the open innovation considerations highlighted by Chesbrough and Appleyard [22], i.e. (i) creating an open innovation platform, and (ii) enticing the participation of potential partners. The preliminary findings are summarized in Table 1 and described below.

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<td>Measures that ease the open innovation process as well as measures that lower the entry-barrier and attract more partners onboard should be taken into account when designing the platform.</td>
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Table 1: Summary of Preliminary Findings

6.1 Creating an open innovation platform

The data.gov.sg portal served as the open innovation platform. The portal contained 5,000 datasets from 50 government agencies, hence congregating different sources of knowledge and innovation components. The terms and conditions for using these datasets were spelt out in the portal. If payment or specific request for use was required, this would also be made known on the portal. In some instances, entire datasets in machine-readable format could be freely downloaded from the portal. One application developer noted that the portal enabled developers to search and use the data directly without needing to seek out which agencies owned the data and request for approval to use the data. He noted: “Developers don’t need to jump through all these hoops now.”

The director of an academic institution which developed an e-service for public park users to locate amenities and attractions in the park using data from the portal commented: “The data.gov.sg initiative will provide software developers with a convenient channel and increased accessibility to non-sensitive government data. It has opened up a whole new window of opportunities for software and mobile applications that need integration with timely data. With this consolidated platform, it enables our staff and students to create useful and innovative IT solutions that will benefit the general public and the industry.”

In creating the data.gov.sg portal, the focus was on making as much non-sensitive data available as possible. This helped in overcoming legal and policy concerns among government agencies in openly sharing their data on the portal. To further facilitate the use of these data by potential partners, a senior government official shared that: “(Government) Data owners need to spell out their terms of use. We have done our part. We hope that when private data is mashed with government data, something of value can be developed.”

In addition to the datasets, there was also a resource page where developers could download relevant APIs to expedite application development. For instance, if developers wanted to develop applications that leverage on ‘live’ road traffic related data, they could download relevant APIs to achieve this instead of writing their own codes from scratch.

Hence, the data.gov.sg portal served as the underlying architecture or platform which connected different sources of knowledge and innovation components together and became a location to congregate and identify open innovation partnership opportunities [22].

As an open innovation platform, it was observed that the data.gov.sg portal was not just a mere listing of data. The corresponding cost, terms and condition of use were also stated on the platform. Considering that legislature and policy restriction had often been cited as an impediment to data sharing in the government [28, 29, 30, 31], it might be necessary to
present such information up-front in order to avoid frustrating potential partners in having them realize that the data cannot be used only after investing substantial time, energy and money. This also explained why only non-sensitive data were selected to be placed on the portal. Apart from security and confidentiality concerns, not having such data available would also helped to avoid frustrating potential partners as it is unlikely for such data to be released for use. This was quite unlike private sector practices where the sale of most knowledge and innovation sources (e.g. intellectual properties) could be negotiated as long as the price was right. Hence, to foster participation and collaboration in open data initiatives, it was a good practice to lay out the cost, terms and condition in using the datasets.

The data.gov.sg portal also made available relevant APIs that partners could use to integrate with the government systems and tap on ‘live’ data from government agencies. This served to expedite the development of e-services and ease the entry-barrier for more potential partners to participate. Hence, to foster participation and collaboration in open data initiatives, measures that ease the open innovation process as well as measures that lower the entry-barrier and attract more partners onboard should be taken into account when designing the platform.

Moreover, it is observed that apart from serving as a platform to identify open innovation partnership opportunities, the data.gov.sg portal also served as a platform to promote the resultant e-services. This was illustrated by the “Application Showcase” page of the portal, which eased the discovery and usage of the e-services. The saliency of this observation was heightened with the understanding that promotional activities could help to boost the adoption and use of e-services [32]. As such, to foster participation and collaboration in open data initiatives, it was good to explore using the platform to promote the resultant e-services.

6.2 Enticing participation

Interventions were also taken to entice partners’ participation. The first intervention involved conducting a competition to encourage e-service development. In 2011, IDA supported a mobile application competition organized by the Mobile Alliance, a mobile industry interest group made up mainly of mobile solutions entrepreneurs and developers. The competition, called the AppVenture Challenge, was conceived to cultivate and encourage students, developers and start-ups to develop mobile applications for various mobile platforms (e.g. Android and iPhone platforms). To encourage participants to develop mobile e-services using government datasets, IDA supported special prizes known as the “Most Innovative Gov Data App” for the “Student/Individual” category and the “Company” category. Winners of the prizes were awarded S$1000 each and their mobile e-services were featured in the data.gov.sg portal collaterals.

A similar competition to seek ideas for innovative e-services using the data from the data.gov.sg portal from the general public was initiated in early 2012 through the ideas4apps Challenge competition. The top three e-services were awarded S$500 prize money and the subsequent ten e-services were awarded with S$150 each. In total, this second competition generated a total of 500 new e-service ideas.

Such competitions attracted the participation of mainly novices rather than professionals. The bulk of the e-services created also tended to be amateurish. While the mediocre prize money might have deterred professionals from joining the competition, the fact remains that the government had little direct control over the nature and quality of e-services created through such open competition. Such competitions appeared to be conducive for creating awareness and enticing broad participation but were weak in assuring the creation of specific high quality e-services. Hence, it might be advisable to use competition to create awareness and entice broad-based participation.

Besides the competitions, IDA also issued a “Call-For-Collaboration” (CFC) inviting companies to submit proposals to develop and deploy specific e-services. For example, a CFC for the creation of geospatial applications that use datasets from the data.gov.sg portal was issued in 2011. Essentially, this CFC aimed to identify and fund high potential industry-driven proposals to develop geospatial business application that ‘mash-up’ geospatial and textual information from the Government and private sector. A conceptual schematic of the desired e-service taken from the CFC document is shown in Figure 2. Moreover, a clause in the CFC explicitly stated for the data.gov.sg portal to be used as a data source, and specified certain requirements that the resultant e-services must meet. Thus, the finding to use formal “Call-For-Collaboration” (CFC) to attract participation in creating specific e-services.
7. Discussion

This paper has implications to both research and practice and these are discussed as follows.

7.1 Implications to research

While the concept of open data is not new [2], it is only recently that this concept is garnering attention. This rise in attention is in tandem with the surge of interest in open government among both practitioners and researchers [3, 6]. It is therefore unsurprising that most published research to date has focused on the democratic motivation of open data initiatives due to its propinquity to the concerns of open government [e.g. 9, 33], especially on transparency and citizen participation. Hence, this paper contributes to growing the corpus of open data literature with an economic motivation.

Furthermore, given the existing dearth of publication on open data initiative outside of Americas and Europe, this paper can also be deem to address such imbalances as it is based on an open data initiative from an Asian nation.

More significantly, this paper serves as a harbinger for more research to examine the interventions and strategies for fostering participation and collaboration in open data initiatives. Like other e-government initiatives, successful open data initiatives cannot go by the assumption of “if you build it, they will come” [28, 32, 34, 35]. This is in accordance with the realization that the key to successful open data initiatives is not in the creation of the centralized data portal but the actual usage of the data [2, 9, 10]. Notwithstanding this realization, there is a dearth of literature that examines “What are the strategies to foster participation and collaboration in open data initiatives?”. Even associated literature on citizen-sourcing and collaboration have largely focused on the technologies and the associated processes of how these technologies facilitate citizen participation and collaboration [e.g. 4, 36]. There is hence an urgent need for research in this area.

The findings showed open innovation strategies to be a fruitful approach for catalyzing participation and collaboration in open government data initiatives. More specifically, it showed how open innovation strategies could be synergistically employed in conjunction with open data initiatives to create e-services.

Future research can build upon this study by developing more flourished open innovation strategies to foster greater citizen participation and collaboration in open data initiatives. This will not only contribute to a body of knowledge in this area, but will also advance the fulfillment of the
democratic and/or economic motivations behind open data initiatives.

7.2 Implications to practice

The preliminary findings have implications to practice as well. Apart from reaffirming the understanding that success in such initiatives is as much about engaging stakeholders as it is about constructing the technical infrastructure [28, 32, 34], this study built upon the open innovation strategies highlighted by Chesbrough and Appleyard [22], to propose (i) a set of considerations on developing the open government data portal into an open innovation platform, and (ii) a set of considerations on enticing businesses and citizens to use the datasets to create e-services.

In terms of the considerations in developing the open government data portal into an open innovation platform, the preliminary findings suggested that it is a good practice to layout the cost, terms and condition in using the datasets on the open government data portal. In addition, other measures that ease the open innovation process as well as measures that lower the entry-barrier and attract more partners onboard should be taken into account when designing the platform. Moreover, in creating and designing the open government data portal, the emphasis should move beyond just using the portal to share government datasets to also explore using the portal to promote the created e-services.

In terms of enticing businesses and citizens to use the datasets to create e-services, the preliminary findings suggested that competition could be used to create greater awareness and entice broad-based participation among businesses and citizens. Nevertheless, it is noted that although competition could generate a broad spectrum of e-services, it afforded little control on the type and quality of e-services created. Thus, to entice the creation of specific type of e-services, the preliminary findings indicated that the government could issue formal "Call-For-Collaboration".

8. Conclusion

Noting the need to extend the corpus of knowledge on open data, especially on the strategies to facilitate or even attract the participation of businesses and citizens to re-use open government data, this paper presented a research-in-progress case study on an open government data initiative by the Singapore government. Building upon the open innovation strategies posited by Chesbrough and Appleyard [22], a set of considerations for developing the open government data portal into an open innovation platform, and a set of considerations on enticing businesses and citizens to use the datasets to create e-services are inductively established. Implications of these findings to both the research and practice of open government data initiatives are discussed.

As the findings are engendered through analysis of secondary data, further research is underway to address this limitation. Specifically, primary data will be collected and corroborated with the existing findings to generate a set of consistent and cogent theoretical conception. Attempts will be made to study the open innovation ecosystem, which refers to the collaborative arrangements through which organizations combine their respective offerings into a coherent, customer-facing solution [21, 37]. Such an understanding of the open innovation ecosystem in open government data initiatives does not only help in realizing the motivation underlying open data initiatives (be it democratic, economic or both), but it will also address the existing conundrum where government agencies have often failed in exploiting innovative initiatives [12, 18]. This is especially significant as open innovation cannot achieve its full potential if it is merely executed as once-off affair. “Unless these initiatives demonstrate the ability to prosper and endure, they could become flashes in the pan that, while interesting, ultimately make little impact on technology and society.” [22, p. 67]

9. References


