

教育資料與圖書館學

Journal of Educational Media & Library Sciences

<http://joemls.dils.tku.edu.tw/>

Vol. 59 , no. 2 (2022) : 101-135

我國政府開放資料使用者之
資料使用意願影響因素探討：
以商業使用者為例

To Use or Not to Use? Exploring the
Factors Influencing Professional Reusers'
Intention to Adopt and Utilize
Governmental Open Data in Taiwan

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To Use or Not to Use? Exploring the Factors Influencing Professional Reusers' Intention to Adopt and Utilize Governmental Open Data in Taiwan

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Abstract

In recent years, open government data has become one of the prevailing policy implementations among government administrations around the world. Researchers maintain that open data providers and users play critical roles in forming a sound open data ecosystem. However, recent studies have found that open data use has not kept up with expectations, with the number of open data applications increasing slowly. Therefore, using a qualitative research approach to focus on professional reusers, this study explores the determinants that influence professional reusers' intention to use governmental open data. With qualitative empirical data support, the identified determinants include perceived usefulness, perceived effort, external influence, facilitating condition, legislation and license, self-efficacy, and perceived risk. In addition, the determinants are incorporated into the theory of planned behavior to investigate how the determinants act as behavioral, normative, and control beliefs in influencing professional reusers' intentions. Further, this study discusses related suggestions that can strengthen the sustainability of an open data ecosystem. The discussion and practical implications of this study are expected to provide insights to both practitioners and policymakers for further developing open data policies and enriching the current open data-related literature.

Keywords: *Open data, Open government data, Open data use, Open data users, Influential factors, Taiwan*

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Introduction

Government agencies are perceived as entities possessing various resources that can be shared and utilized across the boundary of the public and private sectors. In particular, while government agencies are usually considered the largest data creators and collectors across a nation's different domains, open government data in recent years has gradually become an important policy implementation adopted by government administrations around the world (World Wide Web Foundation, 2018). The number of countries with open data portals has increased significantly from 46 in 2014 to 153 in 2020 (United Nations Department of Economic and Social Affairs, 2020). Open data refers to the concept in which datasets are published online in electronic forms that are machine-readable and with a non-proprietary format, and the datasets can be freely accessed, used, modified, and shared by anyone at any place for any purpose (The World Bank, n.d.). The goal of open government data is to enhance the fundamental principles of open government, including transparency, participation, and collaboration, by ensuring public engagement in using governmental open data. The public is expected to utilize governmental open data to generate innovative data usage and applications, spur economic growth, and bring positive impacts to society (Attard et al., 2015; Janssen et al., 2012; Janssen & Zuiderwijk, 2014). A common belief maintains that when government agencies publish more datasets on open data platforms, the public will be motivated to reuse the datasets. However, recent research indicates that open data use has not kept up with expectations, although related infrastructure, such as open data platforms, has been available online to provide services (Najafabadi & Luna-Reyes, 2017; Zuiderwijk et al., 2016). In addition, there are difficulties in obtaining people's participation in using governmental open data. The public seems to agree with an open data movement but does not necessarily engage in reusing the published datasets (Hellberg & Hedström, 2015). While open data users play a critical role in forming a sound open data ecosystem, if the projected data users do not use the published datasets, the objective of open data initiatives can be futile (Attard et al., 2015; Hivon & Titah, 2017). Therefore, it is necessary to understand the factors that influence people's engagement in using governmental open data.

Researchers have recently classified open data users into two categories: direct reusers and end users (Abella et al., 2019). Direct reusers can be professional reusers and social reusers. Professional reusers refer to entrepreneurs and private companies that use open data to innovate and create for-profit products and services. Social reusers represent non-profit organizations such as NGOs providing services to others. On the other hand, end users mean entities, organizations, or citizens consuming open data-related products and

services provided by direct reusers. In addition, researchers have suggested that there should be more open data studies conducted in different contexts, such as sources, areas, and countries, to explore the use of governmental open data and how related open data policies can be further developed (Magalhães & Roseira, 2016; Susha et al., 2015; Zuiderwijk & Hinnant, 2019). Even to this day, there is still limited research on open data use focusing on professional reusers in the context of Taiwan's open government data. Therefore, this research explores and discusses open data use from the perspective of Taiwan's professional reusers using governmental open data to develop for-profit business applications. Specifically, the following research questions are investigated in this exploratory study: 1. What are the critical factors influencing professional reusers' intention to use governmental open data? 2. What is the nature of the impact of these factors? 3. What strategies can be employed to sustain an open data ecosystem based on the perspective of professional reusers?

The rest of the paper is organized as follows. In the following section, the global open data movement is first briefly introduced. Then, the recent literature on open data research and open data use is reviewed, and the proposed research is subsequently presented. Next, the paper describes the research design and methods of this study, in which the employed case, data collection, and data analysis are presented. Then, the paper discusses the findings and implications of the empirical data analysis. Lastly, the conclusion section expounds on the contribution and limitations of the current study. Future research directions are also suggested.

Literature Review

The Movement of Open Government Data

In this global movement, the U.S. government first established its open data portal in 2009 to provide data access to its federal government agencies. Open government data became an important pillar in supporting the information-centric strategy of the U.S. digital government (Digital Government, n.d.). The OPEN Government Data Act (Open, Public, Electronic, and Necessary Government Data Act) was further enacted, requiring U.S. federal agencies to make datasets open online by default in a form that is machine-readable and freely reusable (H.R.4174 –115th Congress [2017-2018]: Foundations for Evidence-Based Policymaking Act of 2018, 2019). Similarly, in 2010 the U.K. government initiated its open data portal to release datasets of its central and local government agencies. A government report, the Open Data White Paper, was published in 2012 by the U.K. government to emphasize the potential of publishing governmental open data to achieve transparency and accountability (UK Minister of State for the Cabinet

Office, 2012). By the end of 2012, The European Union (EU) also established its open data portal, allowing the public to access data released from EU agencies and institutions. An Open Data Charter was signed in 2013 by the Group of Eight (G8) leaders to promote the principles of open government data, including open data by default, quality and quantity, usable by all, improving governance, and enhancing innovation. In 2014, the leaders of the largest G20 industrial economies agreed to use governmental open data as a tool against corruption. The Open Government Partnership, dedicated to making government administrations more open, accountable, and responsive to citizens, also enacted its Open Data Charter by the end of 2015 to provide open data principles to its member countries. Notably, the Charter has been adopted by 79 national and local governments from around the world (Open Data Charter, 2021). According to the 2020 United Nations E-Government Survey, the number of countries implementing open government data policies has been growing steadily, and 153 countries have established their respective open data portals (United Nations Department of Economic and Social Affairs, 2020). Likewise, intergovernmental organizations such as the United Nations, OECD, and World Bank have initiated open data sites and projects to provide the public access to their datasets.

The Recent Research on Open Government Data

Researchers from different disciplines, such as information science, information management, public administration, computer science, and law, have explored the complexity of open government data from various perspectives and knowledge areas (Hossain et al., 2016; Zuiderwijk & Hinnant, 2019). Government agencies appear to have a risk-averse culture and act conservatively in opening their datasets (Peled, 2011). As the World Wide Web Foundation (2018) indicates in its Open Data Barometer report, the vast majority of governmental datasets remain closed to the public. The progress of embedding open data policies is slow, and governments still treat open data as a side project. Another recent study also indicates that most of the published government resources on open data sites are informational data rather than granular data, and only a small number of the datasets advertised as open data are actually open (V. Wang & Shepherd, 2020).

Therefore, from the perspectives of technology, organization, legislation and policy, and environment, researchers have studied and discussed related social and technical enablers and impediments that have an impact on government agencies in implementing open data policies (Barry & Bannister, 2014; Conradie & Choenni, 2014; Janssen et al., 2012; Yang et al., 2015). It is indicated that the reuse of governmental data can be an obscure policy domain, and the interrelation between open data and other policy areas is complicated (Bates, 2014).

Meanwhile, government agencies tend to lack clear guidelines for publishing open data to external parties. Researchers suggest that it is important to create a system and enact policies to promote the release of open data by reducing the social, economic, and political impacts that government agencies may encounter (Gerunov, 2017; Nugroho et al., 2015). For instance, Zuiderwijk and Janssen (2014) proposed a framework to improve the development of both new and existing open data policies by taking in perspectives of environment, policy content, and performance evaluation. Dawes et al. (2016) developed a general model for planning open data programs using an ecosystem approach to address various perspectives of open data initiatives, including policy and strategy, data publication and use, feedback and communication, and stakeholder interactions.

In addition, researchers investigated the emerging open data business models to understand their characteristics, patterns, and strategies used to create economic opportunities (Zeleti et al., 2014). Different types of infomediary business models driven by governmental datasets were identified (Janssen & Zuiderwijk, 2014). In terms of open data assessment, measurement frameworks were developed to evaluate the maturity and progress of open data initiatives in government administrations (Chu & Tseng, 2016; Solar et al., 2012; Yang & Wu, 2019; Zhu & Freeman, 2019). Further, related indexes were also developed for the evaluation and categorization of open data portals and their metadata qualities (Kubler et al., 2018; Thorsby et al., 2017). Similarly, the Open Knowledge Foundation and World Wide Web Foundation also built their own benchmarks—the Global Open Data Index and the Open Data Barometer—to evaluate the open data developments of global government administrations.

The Use of Governmental Open Data

Researchers have indicated that publishing data alone is not enough to enable the life cycle of open government open (Attard et al., 2015). After data publication, data users must be able to discover and access data for data consumption. Likewise, according to Dawes et al.'s (2016) open data ecosystem model, one of the key stakeholders are users who utilize open data in conducting analyses and developing applications. In addition to government agencies acting as data providers, data users play a critical role in the success of open data initiatives. Therefore, there is a need to better understand the interaction between government agencies and open data users, considering its sustainability is crucial to the development of an open data ecosystem (Hivon & Titah, 2017).

A recent study has identified five major motives for open data use, including exploring creativity, creating business value, enabling local citizen value, addressing global societal challenges, and advocating the open data agenda (Lassinanti et al., 2019). It is indicated that individuals' open data use can be

influenced by policies, processes, and infrastructure used to provide open data (Susha et al., 2015). In particular, impediments may exist while users attempt to access and use datasets (Zuiderwijk et al., 2012). A recent investigation points out that many open data portals are still in a very early stage of development, and a great deal of work is needed to help the public understand and use data (Thorsby et al., 2017). While open data use includes activities to search, identify, and download datasets, open data portals should also make the related processes easier to facilitate users in obtaining datasets (Dawes et al., 2016). In particular, a machine-readable and non-proprietary format is essential to enable easier access and unrestricted use (Attard et al., 2016).

Researchers have indicated that users' trust in the quality of open data weighs on whether the users would engage in using datasets (Purwanto et al., 2020; Zhu & Freeman, 2019; Zuiderwijk et al., 2016). Open data without proper quality control may jeopardize dataset reuse and bring negative impacts on civic participation (Weerakkody et al., 2017). Thus, the importance of metadata of published datasets is also emphasized; it is expected to help in the use of open data by enhancing user experience (Zuiderwijk et al., 2016).

It is suggested that open data infrastructure should maintain mechanisms to respond to the questions, problems, and suggestions raised by open data users (Purwanto et al., 2020; Zhu & Freeman, 2019; Zuiderwijk et al., 2016). Communication channels allow open data users to request datasets and report errors for government agencies to improve the quality of the released datasets (Yang et al., 2015; Zuiderwijk et al., 2016).

Researchers have further argued that outdated laws and policies could prevent data from being used to create value. For instance, the inexistence or inconsistency of licensing in the datasets across different jurisdictions could have an impact on open data use (Attard et al., 2016; Magalhães & Roseira, 2016). Thus, detailed information should be provided for users to understand how open data can be used in compliance with related licenses and regulations (Kaasenbrood et al., 2015).

It is also found that the availability of citizens' resources matters in open data use (Purwanto et al., 2020). The lack of fundamental skills and expertise for processing and analyzing data could act as an impediment to utilizing open data for generating values (Magalhães & Roseira, 2016; Safarov et al., 2017). In order to promote the public adoption of open data, it is suggested that required skills and expertise be made available to help open data users participate further (Safarov et al., 2017; Susha et al., 2015).

Conceptualizing the Adoption of Open Data Use

Open government data can be considered an innovative e-government service that allows the public to adopt and use open data for respective purposes

without restriction. The public using open data needs to go through the processes of data discovery, data exploration, and data exploitation (Attard et al., 2015). When accessing and utilizing open data, users have to adapt to various open data technologies within an open data infrastructure, including open data portals, related application programming interfaces, various data formats, linked data vocabularies, and metadata elements (Zuiderwijk et al., 2015). Accordingly, as an emerging innovative service in the public sector, open government data must obtain the public's participation and collaboration in forming a sound open data ecosystem; the public's adoption of using governmental open data can be conceptualized as a process of innovation acceptance. Specifically, the unified theory of acceptance and use of technology (UTAUT) is a commonly utilized framework that helps discuss technology and innovation acceptance. Its four constructs are performance expectancy, effort expectancy, social influence, and facilitating condition (Venkatesh et al., 2003). The four constructs are suggested to influence a user's intention to accept an innovative system or technology. Performance expectancy refers to the degree to which an individual believes that using a system or technology will help achieve gains in performance. Effort expectancy refers to a system or technology's degree of ease to use. Further, social influence means the degree to which an individual thinks that important others suggest them to use a system or technology. Facilitating condition refers to the degree to which an individual believes that an organizational and technical infrastructure or related resources are there to support the use of a system or technology.

As aforementioned, researchers suggest that while open government data is a complex phenomenon, investigations should also take into account the environment and legal context in which related stakeholders reside (Zuiderwijk & Hinnant, 2019). In addition, derived from the perspective of behavioral psychology, self-efficacy refers to an individual's perception of their ability to plan and execute certain actions to produce specific performance and reach a particular goal (Bandura, 1977). In the e-government literature, researchers have suggested that a user's self-efficacy matters in the adoption and use of e-government services (Hung et al., 2013; Rana et al., 2015). They emphasized that users could consider their capabilities, which is expected to affect whether or not they adopt and use innovative e-government services.

Furthermore, based on the field of social psychology, the theory of planned behavior represents a well-established framework that embraces and discusses various factors that affect an individual's intention to perform a certain behavior (Ajzen, 1991). In particular, the theory of planned behavior has also been extensively adopted by e-governance researchers in discussing users' intention

toward the adoption and use of innovative government services (Hung et al., 2013; Ozkan & Kanat, 2011; Rana et al., 2015, 2016; H.-J. Wang & Lo, 2013). For instance, Hung et al. (2013) used the theory of planned behavior to identify the factors determining users' intention to use governmental mobile services. Rana et al. (2015, 2016) utilized the theory's concepts to explore how influential factors affect citizens' adoption of e-government systems. H.-J. Wang and Lo (2013) also used the theory as a theoretical framework to investigate the factors influencing citizens' intention to use government websites. According to Ajzen (1991), the framework suggests that an individual's behavioral intention is a function comprising three antecedent constructs: attitude toward the behavior, subjective norm, and perceived behavioral control. Specifically, attitude toward the behavior refers to the degree to which the performance of a behavior is either positively or negatively evaluated. In addition, it can be determined by an individual's behavioral beliefs. A behavioral belief refers to the subjective probability that a given outcome or experience can be generated by performing a behavior. On the other hand, subjective norm means the perceived social pressure to engage or not to engage in a behavior. It is pointed out that subjective norms can be determined by an individual's normative beliefs. A normative belief is defined as the reflection of an individual's perceived expectations from other individuals, groups, and organizations to engage in a particular behavior. Lastly, perceived behavioral control refers to an individual's perception of their capability to engage in a given behavior. It is suggested to be determined by control beliefs, which are the perceived presence of factors that may help or hinder an individual's ability to perform a behavior.

The Proposed Research

While the number of governmental datasets that have been opened to the public keeps growing, the number of applications using open data also increases slowly (Najafabadi & Luna-Reyes, 2017; Zuiderwijk et al., 2016). Researchers point out that there are difficulties in obtaining people's interests in using open data. Although the public seems to like the idea of open government data policies, they do not actively participate in the process of data use (Hellberg & Hedström, 2015). The lack of users exploiting open data resources indicates the need to understand what factors influence open data use and what strategies attract and stimulate users to participate (Attard et al., 2015; Zuiderwijk et al., 2016). Researchers also suggest that there should be more studies that explore open data adoption in different contexts, such as areas, sources, and countries, to understand the various factors that influence open data usage of different types of data reusers (Magalhães & Roseira, 2016; Susha et al., 2015). Findings within different socio-technical contexts can help extend the knowledge of how open

data policies could be further developed and implemented (Zuiderwijk & Hinnant, 2019). Therefore, this research explores the influential factors of open data use from users' perspectives in the context of Taiwan's open government data. The aforementioned frameworks are expected to help conceptualize the factors that explain the phenomenon of interest with empirical data support. In particular, while one of the major motives of open data use is to create business value, this study focuses on professional reusers who utilize governmental open data to develop innovative applications for business services.

Research Design and Method

Since the inception of the Freedom of Government Information Law in Taiwan, the Taiwan government has gradually institutionalized related practices for the public to access government information and data. In particular, the open government data movement has received significant attention from both public and private sectors in Taiwan. Taiwan's central and local government agencies have implemented open data policies and established open data infrastructure, such as open data sites, to open their datasets. In November 2011, the Taipei City government established Taiwan's first open data website (<https://data.taipei>). On the other hand, New Taipei City also made the debut of its open data portal (<https://data.ntpc.gov.tw>) in December 2012. While recognizing the critical role and value of an open government, at the end of 2012, the Prime Minister of Taiwan required the Research, Development, and Evaluation Commission to devise and enact open data policies at the central government level. Subsequently, Data.gov.tw made its debut in April 2013 and acted as the open data portal for the central government agencies of Taiwan. Under an executive order from the Prime Minister, each central government agency of Taiwan was required to open at least fifty datasets by the end of 2013. The number of total datasets available on Data.gov.tw is currently 57,275 (as of June 12, 2022), which has grown significantly compared to the number of datasets several years ago (3,187 datasets as of December 10, 2014). Meanwhile, the other four city governments of the six major municipalities of Taiwan, including Taoyuan City, Taichung City, Tainan City, and Kaohsiung City, have enabled their respective open data portals to provide services. Most of the other local governments have also participated in the open data policy implementation. Noteworthily, the Taiwan government has received high rankings in the Global Open Data index for two consecutive years in 2016 and 2017—proof of the Taiwan government's efforts in implementing open data policies. Further, in forming a sound open data ecosystem, the Taiwan government has also engaged in promoting open data use through various activities, such as workshops, hackathons, and open data contests. Hence, given

its efforts and commitment to implementing open data policies and promoting the use of open data, the context of Taiwan's open government data presents one of the good cases for conducting this exploratory research.

In addition, regarding open data user studies in the context of Taiwan's open government data, Lo et al. (2014) first employed a survey approach to explore data users' perceptions of related legislations and policies, sharing approaches, technological standards and data formats, open data scopes, and open data promotion. Similarly, other researchers utilized the survey approach to investigate the factors that may influence data users' satisfaction and intention of open data adoption—that is, information quality, user interface quality, computer self-efficacy, and social influence (Chen, 2015; H.-J. Wang, 2020). H.-J. Wang and Lo (2019) also used a survey approach and indicated the importance of top management support and competitive pressure for firms' adoption of governmental open data. However, there is still limited research focusing on professional open data reusers in the context of Taiwan's open government data using a semi-structured interview approach to discuss in-depth qualitative findings. Accordingly, as previously mentioned, this study is expected to fill this research gap.

The major challenge in this research is the difficulty in identifying and connecting open data users. According to the open data principles, governmental open data sites can be accessed by anyone from any place at any time without registration. Therefore, the researchers of the study found it relatively difficult to identify and approach professional reusers who use governmental open data to develop for-profit business applications. Consequently, a purposive sampling approach was applied to locate relevant candidates for conducting interviews. Notably, purposive sampling is usually employed for selecting information-rich cases to conduct in-depth qualitative studies (Wengraf, 2001).

In promoting open data use, the Industrial Development Bureau of the Ministry of Economic Affairs (the IDB of MOEA) has been the responsible central government agency for holding an annual event for an open data contest. Held by the agency for several years, this contest is one of the major government-held events for promoting open data use, attracting professional reusers who use open data for conducting various business applications. The major aim of the contest is to invite and encourage entrepreneurs and private companies to develop innovative business applications using governmental open data. The award-winning companies of the contest receive high prizes and consultations from the government to support their business models and applications. Venture capital firms are also invited to the event to invest in the companies they are interested in.

Therefore, the researchers of this study considered this event a great opportunity to approach professional reusers for conducting interviews. After directly contacting the IDB of MOEA, the researchers had the opportunity to attend the convention of the annual contest held on December 6, 2019. The award-winning entrepreneurs and private companies were invited during the convention to present their applications using governmental open data. Thus, the researchers interacted with those award-winning contest participants to recruit interviewees for this study. There were a total of fourteen contest participants who agreed to participate in this study as interviewees.

All recruited interviewees had extensive experience using governmental open data in developing business applications. In their respective companies, they held key positions, such as product manager, chief executive officer, chief technology officer, chief operating officer, technical director, general manager, and vice president. Particularly, the interviewees were from various business industries and used a variety of open government data, such as geographic data, custom data, health, and medical data, weather data, economic data, traffic data, transportation data, tourism data, and legal case data. With various professional backgrounds and experience in using governmental open data, the interviewees provided rich information to the researchers in this exploratory research. In addition, while the interviewees of this study were recruited from private companies of different business industries, it also helped achieve the goal of multiple sources of evidence to enhance the quality of the obtained qualitative empirical data.

Subsequently, the interviews were conducted between March and April 2020. This study employed a semi-structured interview to collect qualitative empirical data, given its flexibility to follow up on new information and explore new findings (Bryman, 2004). The interview questions were designed to lead the interviewees toward helping the researchers identify the answers to the research questions. The interviews were recorded using digital recorders and field notes and were transcribed for later data analysis and report writing. The average duration of interviews was about one hour and thirty minutes.

During data analysis, the researchers adopted qualitative data analytic techniques to analyze data and identify common patterns. The utilized techniques were open coding, axial coding, and selective coding (Strauss & Corbin, 1998). The interview data were reviewed and analyzed line by line during the open coding process. The initial codes were associated with the text segments extracted from the interview data, representing the concepts derived from the data. Subsequently, axial coding refined, aligned and classified the initial codes generated in open coding. Conceptually similar codes were then grouped to

form categories. Lastly, selective coding was employed to select and interpret the relationships of the categories of concepts from axial coding and confirm whether the elaborations and interpretations were inherent in and comply with the observed phenomena of this study. Atlas.ti was utilized in this study to analyze the qualitative data.

Findings

Based on the empirical data analysis, seven influential factors were identified in this study: perceived usefulness, perceived effort, external influence, facilitating condition, legislation and license, self-efficacy, and perceived risk, which are in line with the concepts in the aforementioned literature for conceptualizing the adoption of open data use. With qualitative empirical data support, the seven identified factors are discussed in the following subsections.

Perceived Usefulness

The interviewees indicated that perceived usefulness is important when first adopting and using governmental open data. They expected that the obtained open datasets could benefit their existing business operations by reducing cost and increasing efficiency. In particular, open data is free for all to access, and the published datasets may include a variety of fields, such as weather data and geographic data, which can be extremely costly and difficult for small businesses or entrepreneurs to collect by themselves. For instance, an interviewee (Chief Executive Officer, P4_04) explained:

...The most important help is that governmental open data helps us reduce significant operational costs. It was fairly difficult for us to obtain geographic data. For instance, it is impossible for my company to investigate the geographic distribution of fault lines by itself. We have to admit that we don't have the capability and resources to collect such data....
(Chief Executive Officer, P4_04)

Some interviewees further pointed out that, for some datasets, such as legal cases involving car accidents, ridership of subway stations, and company registrations, the government is the public authority to collect and generate the datasets and is usually the only data source that the interviewees claim they have to rely on.

While one of the major goals of open government data is to unleash the potential of governmental datasets to spur innovations and economic growth, some interviewees also pointed out that open data use could act as a core catalyst that drives innovative business models. They expected that open data could be integrated with their own datasets to generate applications through dataset mashups. For instance, an interviewee (Chief Technology Officer, P24_06) stated:

...Open data usually represents raw datasets, which means there are plenty of opportunities that you can dig or mine some things from the datasets by combining other datasets or resources that you might already have at hand. For instance, we use the open data of xxx government agency to predict the trend of material supply and demand that can be very valuable information to our clients.... (Chief Technology Officer, P24_06)

However, many interviewees indicated that government agencies had not opened their needed datasets. A significant gap remains between what the government agencies have opened and what the open data users expect to use. For instance, the interviewees said that some government agencies do not provide their datasets through open data approach. Instead, those agencies provide web information systems for the public to check governmental datasets online. Nevertheless, those systems need human operations to input search criteria by hand, and only limited data records can be retrieved at each query.

In addition, some interviewees pointed out that their perceived usefulness of open data gradually decreases as they gain more experience using some of the published datasets. The interviewees also claimed they were not satisfied with the data quality. It is indicated that the current data quality of some datasets, such as accuracy, completeness, granularity, and timeliness, could not meet data users' expectations. For instance, some datasets might quickly become obsolete and contain erroneous data, while their update frequencies remain relatively low. The interviewees said that using the datasets, they could generate wrong data analysis results or provide inaccurate services to their clients. The interviewees also pointed out that they need raw rather than processed datasets. Some interviewees even argued that they would decide not to use governmental open data and turn to look for other alternatives by themselves. For instance, some interviewees stated the following:

...We have been thinking whether we can use xxx agency's open data to drive innovation and enhance our business operation. However, it is a pity that the current datasets opened by the agency are really trivial. Honestly, the datasets are not useful to fit our need.... (Chief Technology Officer, P24_06)

...In my opinion, the data update frequency seriously matters. If the datasets are updated on a daily basis, the data can be very useful to fit our needs. Nevertheless, if it takes two or three months to update the datasets just once, well, I don't see we can benefit from using the datasets.... (Chief Executive Officer, P3_03)

...Government agencies have opened many datasets, which cover a variety of different areas such as transportation, health, weather, and tourism. However, the depths of most of the datasets are relatively shallow and do not really fit our needs. What we need may be just a specific area of data; nevertheless, we care much more about the depth of data such as its details and comprehensiveness.... (Chief Executive Officer, P2_02)

Perceived Effort

The interviewees suggested perceived effort as another important factor that must be considered. They mentioned that they have to evaluate whether they can afford the needed time and resources for using open data. As the interviewees claimed, the process of data access and data cleaning can be time-consuming, making it challenging for them to obtain and use the datasets they need. Governmental open datasets could be scattered in different places rather than on a single portal, so the interviewees had to spend significant time on searching government websites to look for datasets. For instance, an interviewee (Chief Executive Officer, P2_02) explained:

...We attempt to retrieve the datasets from the unified open data portal, data.gov.tw. However, some government agencies may just have their datasets published on other open data-related sites or just on somewhere of their respective agencies' websites. Therefore, we have to spend lots of effort on finding those datasets from different channels, and sometimes we even need to develop web crawlers to parse data from agencies' websites or their online databases.... (Chief Executive Officer, P2_02)

In addition, the interviewees suggested that most of the datasets in the open data portals are static data in open formats, such as CSV, JSON, or XML, which meets the three-star requirement of the open data schema. They also mentioned encountering the problem of determining when the datasets may be updated. Further, they pointed out that having no notification mechanism is relatively inconvenient, requiring them to revisit the sites frequently for possible updates. This situation also poses a challenge for the interviewees in obtaining up-to-date datasets. For instance, an interviewee (General Manager, P5_07) stated:

...We retrieve many different datasets from the open data sites. However, we have no idea when the datasets may be updated. It doesn't really make sense for us to designate someone to frequently check the sites to see whether new datasets are available. In the industry, we are more used to connecting API for real-time data exchange rather than a traditional file downloading.... (General Manager, P5_07)

Furthermore, the interviewees pointed out that government agencies opened their datasets with inconsistent formats and fields, a tremendous challenge in developing business applications that require processing and integrating open data of different central and local government agencies with the same core businesses. Some interviewees explained:

...According to our experience in processing transportation datasets of different local government agencies, we notice that some datasets have more data fields and some have very limited data fields. What is worse is that two datasets may contain data fields having the same names but with totally different definitions. Another problem is that the datasets may adopt different character encodings. Therefore, humans checking to view through the datasets become inevitable, and this process is very labor intensive. It is difficult for us to clean and integrate datasets through automatic machine processing.... (Vice President, P23_05)

...We try to enhance our tourism application by using governmental open data. However, the tourism datasets actually come from agencies of different local governments, and the datasets have different formats and fields. I would say those datasets are really fragmented and fairly difficult for us to integrate. We are frustrated, and it is unrealistic for us to apply the datasets to develop application functions that could be available only in some cities. What if our app users plan to travel across cities?.... (General Manager, P5_07)

Moreover, some interviewees pointed out that even an agency may open a dataset that has inconsistent data representations among the data records. An interviewee (Product Manager, P7_09) gave an example:

...Even within the same dataset, a data field may have different representations. For instance, in the address data field, some records may use traditional Chinese characters to represent floor and address numbers, and some records may use English characters such as 'f' or 'F' and Arabic numerals. The address field also contains different symbols, punctuation marks, and abbreviations, which can be very confusing. There is no authority control.... (Product Manager, P7_09)

External Influence

External influences can be conceptualized as the driver derived from the professional reusers' surrounding environment, emphasizing the importance of open data policy and encouraging open data usage to establish a sound open data ecosystem. The interviewees indicated that external influences could foster their

perception of the importance of open data and draw their intention toward using open data. In particular, it was determined that external influences could be in the forms of international open data trends, social groups, government promotions, and peer organizations. Some interviewees pointed out that they have been following the international movement of open government data, which initially raised their interest in considering using governmental open data. An interviewee (Chief Technology Officer, P24_06) said:

...We have been observing the international trend of open data development. For instance, we notice that the U.S. has done a very good job in opening some datasets that are related to our business, which then becomes a driver that we start observing the related development in Taiwan and attempting to initiate the following adoption and use.... (Chief Technology Officer, P24_06)

The interviewees also pointed out that in the past few years, Taiwan non-governmental organizations and social groups have been promoting the transparency of government information and the use of open data through civic activities such as hackathons that attract both IT professionals and non-IT individuals. This trend forms a positive atmosphere that encourages business and non-profit organizations to adopt open data for innovative usage and social good. While most interviewees are from the software and information technology industries, they indicated they are influenced by related non-profit organizations and social groups through shared ideology and expectation to consider using governmental open data. An interviewee (Director, P8_10) explained:

...We are indeed influenced by social communities. Particularly, as software engineers, we do like the ideas of an open system, open source, and open data that promote the principles of transparency and sharing. When we need to look for datasets to use, open data then becomes one of the options that draw our attention, and we would take it into consideration.... (Director, P8_10)

Similarly, the Taiwan government has designated agencies to promote open data use through various activities such as workshops, international forums, and open data contests. While the interviewees are within the information technology industry, they indicated that they could be influenced by government policies and would attempt to see whether they could meet the expectations of the policies. Accordingly, some interviewees admitted that they are influenced by the government in evaluating the feasibility of using governmental open data in their business operations. An interviewee (Chief Executive Officer, P9_11) stated:

...I would say that the promotion and encouragement from the government raised our initial interests toward open data use. Then, we became interested in knowing open data further. Nevertheless, it still takes time to see whether open data can really fit into our business model.... (Chief Executive Officer, P9_11)

Some interviewees suggested that they can also be influenced by their peer group. It is indicated that when they know that other individuals or companies in their industries have been utilizing open data to enhance operation and productivity or develop innovative applications, they tend to act more seriously in considering whether they should use open data further.

Facilitating Condition

Furthermore, the interviewees claimed that it would have a positive influence if they received resources and facilitation from others in their surrounding environment to support their open data use. It is indicated that the obtained resources and facilitation can help reduce the interviewees' perceived cost of using governmental open data. Accordingly, they become motivated to set higher priorities for using open data in developing business applications. An interviewee (Vice President, P23_05) described:

...Well, for a company, using governmental open data can be viewed as a kind of trial and investment, and there is a cost for using open data. Through the contest, we are fortunate to receive monetary reward and consultation from the government, which becomes a driver for us to consider using open data further.... (Vice President, P23_05)

Interviewees also explained that they would like to use open data further in their business applications. However, while one of the core parts of business applications relies on rich data sources, the interviewees pointed out that they looked forward to obtaining more facilitation from the government in terms of interacting with government agencies to access more open data that fit their needs.

Legislation and License

As professional reusers, the interviewees indicated that their major purpose in using open data is to develop business applications. Therefore, the interviewees asserted that they needed to carefully review whether related regulations and licenses were clear and appropriate to guide their open data usage in their respective business domains. An interviewee (Chief Executive Officer, P3_03) explained:

...Practically, when we apply any third-party dataset to our business application, we have to study its license carefully. We need to figure out to

what extent we can legally use the dataset for business purposes without any violation of regulations.... (Chief Executive Officer, P3_03)

Furthermore, the interviewees suggested that the Taiwan government has gradually developed its open data license by following the principles of Creative Commons 4.0. Noteworthy, the license has been widely adopted by both central and local government agencies in open data initiatives. However, some interviewees pointed out that the Taiwan government has not yet enacted specific open data law. Government agencies are encouraged but not necessarily required to open their datasets. Without specific open data law, the interviewees claimed that when they attempted to request more open data from certain government agencies, they encountered challenges resulting from the complex bureaucratic system and other existing legislations, such as the Personal Data Protection Act and the Charges and Fees Act. The existing legislations and regulations became barriers, hindering their intentions to use open data further. An interviewee (Product Manager, P7_09) gave an example:

...We have been requesting a dataset regarding the information of the nationally registered physicians and the clinics and hospitals where the physicians currently practice. However, the responsible government agency keeps turning down our request and asserts that this dataset could violate Personal Data Protection Act. However, clinics and hospitals usually publicly publish the information of their affiliated physicians on websites. Patients also need to know the information when they want to make appointments. We are really puzzled and still can't obtain the dataset to develop our application.... (Product Manager, P7_09)

Self-Efficacy

The interviewees suggested that not everyone has the capability to access and use open data directly. In addition to the commonly seen open formats such as CSV, XML, and JSON, open data can consist of other specialized formats and structures, and domain expertise is usually needed to clean, integrate, and interpret datasets. Accordingly, the interviewees pointed out that in order to use governmental open data, they must possess sufficient abilities in terms of data analysis and software engineering in their respective domains. In particular, as professional reusers running business services, the interviewees maintained that they are proficient IT developers and maintain high-level domain knowledge in their respective fields, implying their confidence in possessing the required capability to obtain governmental open data for developing business applications. Some of the interviewees stated the following:

...Running a data processing company, we would say that domain expertise and technical skills all have very important influences on our company's open data adoption. It can be directly related to our confidence in using open data..... (Chief Technology Officer, P24_06)

...Well, because of our domain knowledge, we know how to interpret the datasets and apply them to our software applications. Without sufficient domain knowledge, we will have difficulty using open datasets. Similarly, if we don't have coding ability, we will not be able to analyze the datasets and don't know how to use the datasets for value-added purposes.... (Vice President, P23_05)

Perceived Risk

As professional reusers, the interviewees indicated that it could pose a great risk if they solely rely on open data as the only one or the major data source to develop business applications. The interviewees pointed out that their current open data had quality issues. In particular, the interviewees mentioned that using the database could provide inaccurate services to their clients that might incur consumer complaints and damage their companies' reputations. Similarly, using the datasets to develop strategic business plans may lead to wrong analyses and predictions and result in potential operational losses. The interviewees described the phenomenon:

...There is a very high possibility that inaccurate data records exist in the open datasets that we adopt to develop applications. Our company could suffer loss and receive complaints from the application users. Our clients can become less confident in using our applications, and our intention to use open data further is negatively influenced.... (Chief Executive Officer, P2_02)

...Government agencies may update their internal databases at any time to reflect their daily operations. However, some datasets on the open data portals are not frequently updated, and those datasets can become outdated. By using the datasets, our system could generate poor services and inaccurate results to our app users.... (Product Manager, P7_09)

Although one of the common purposes of open data is to promote innovative applications expected to spur economic growth, some interviewees claimed that they act hesitantly and have serious concerns about applying open data to develop their core business applications. They mentioned that they were uncertain whether their adopted datasets could be continually opened by government agencies. The interviewees further argued that it is possible that some datasets might stop being

opened, which could bring fatal impacts on startups and businesses if they solely rely on using open data to develop their core products. In addition, they pointed out that the potential risk exists, which they are not willing to take. Some of the interviewees stated the following:

...I personally have many questions regarding a company using governmental open data in its core business model even though the data could be used in a very innovative approach. I think it is extremely risky to do so. Open data can be applied to develop some added features of an application but should not become the core part of the application. If the data is stopped being opened, your business will be severely impacted..... (Director, P9_11)

...Honestly, I am not sure whether the datasets can be continually opened and frequently updated. It will be a serious issue if the datasets are no longer opened. You can use open data as a supplement to your application. However, you should not use open data to develop the core part of your business model. Your business could be in jeopardy if the datasets become not opened.... (Chief Executive Officer, P3_03)

Discussion

The Identified Factors and Their Influences

With empirical data support, seven factors were identified through the interviews with professional reusers. Perceived usefulness and perceived effort were found to have the most important influences when professional reusers evaluate whether they would adopt and use governmental open data. By using governmental open data, professional reusers expect to increase the efficiency and reduce the cost of developing business services and applications. Particularly, some open data are derived from the domains that private companies are not permitted to or are not capable of collecting by themselves. Therefore, professional reusers tend to have high expectations toward using governmental open data and expect to use the datasets to drive and develop new business models or enhance their existing business services. Still, a significant gap remains between what government agencies have opened and what professional reusers look for. It was found that professional reusers' perceived usefulness toward open data use could gradually decrease. At the same time, they remain unsatisfied with the quality of the retrieved datasets in terms of accuracy, completeness, granularity, and timeliness, which are critical data criteria that professional reusers must obtain to provide applications of high business value.

Similarly, perceived effort weighs when professional reusers find that they indeed have to spend considerable time and resources on the processes of data access, data cleaning, and data integration, which seriously contradicts their original expectation of increasing efficiency and reducing operational costs using governmental open data. As identified in this study, different central and local government agencies of the same core business usually open datasets with inconsistent data formats, data fields, and metadata information, which poses a huge challenge for professional reusers in integrating the published datasets of various government agencies for developing business applications. This issue in data inconsistency can greatly increase professional reusers' perceived efforts of using governmental open data. However, automatic and machine-operated data processing becomes very difficult to practice.

Furthermore, it was also found that professional reusers are still evaluating the long-term feasibility of using governmental open data in their business services. They are also concerned about its potential risks, which can further hinder the government's expectation of unleashing the potential of governmental datasets to spur business and economic growth. In the short term, professional reusers are afraid of creating inaccurate and flawed services resulting from data quality issues, which may negatively impact their companies' reputations. In the long term, professional reusers expect to use governmental open data to develop applications for long-lasting business services rather than just for a one-time side project. Therefore, professional reusers act hesitantly and are concerned about applying governmental open data to the core part of their business models and applications, as they are uncertain whether their current datasets can be continually opened in the foreseeable future.

Due to professional reusers' surrounding environment, external influences were also found to come from international open data trends, social groups, government promotions, and peer organizations to influence professional reusers' intention toward open data use. Nevertheless, external influences tend to act as catalysts for professional reusers' initial interest and intention toward using governmental open data. The strength of external influences can gradually decrease as professional reusers begin using the datasets. Then, their perceived usefulness, perceived effort, and perceived risk would weigh more.

In addition, facilitation from professional reusers' surrounding environment can help reduce costs and motivate their open data use. In particular, for professional reusers running startup companies, monetary reward and consultation from the government and experience-sharing from other organizations can encourage them to use governmental open data. Professional reusers expect more facilitation from government agencies to help them obtain more open datasets that meet their needs in developing business applications.

Furthermore, professional reusers also need to verify whether their open data usage complies with related legislations and licenses because their major purpose of using open data is to develop commercial applications. However, this study found that a complex bureaucratic system and existing legislations and regulations can sometimes become barriers that restrain professional reusers from requesting more open data from government agencies.

Moreover, professional reusers were found to maintain a high level of self-efficacy. In particular, they showed confidence in possessing sufficient domain expertise and technical skills for using governmental open data. This result may contradict the argument in some open data studies that technical skills and expertise should be available to facilitate and promote open data use. In fact, the general public represents end users, who usually do not directly utilize governmental open data. End users usually rely on the services and applications provided by professional reusers, who are the direct reusers and have the sufficient capability to use governmental open data. Therefore, for professional reusers, it is still more important to focus on enhancing their perceived usefulness and alleviating their perceived effort and perceived risk to promote the use of governmental open data.

The Implications and an Integrated View of the Factors

Among the identified factors, perceived usefulness, perceived effort, external influences, and facilitating conditions correspond to the concepts of the UTAUT, a technology acceptance model. Particularly, according to the qualitative empirical data, the two most commonly discussed concepts of the technology acceptance model—perceived usefulness and perceived effort—were found to have the most important influences on professional reusers' intention to use governmental open data. Therefore, exploring the antecedent factors that may influence perceived usefulness and perceived effort is worth pursuing. As discussed in the literature review, professional reusers' use of governmental open data can be conceptualized as a process of innovation acceptance by adapting to the open data infrastructure. Accordingly, the quality aspects, such as data quality and system quality, of the utilized open data portals and related information systems can be considered the potential antecedent factors influencing professional reusers' perceived usefulness and perceived effort. The quality factors are also expected to affect professional reusers' perceived risk of using governmental open data—another factor identified in this study but not originally discussed in the technology acceptance model.

In addition, according to the empirical data analysis, professional reusers' perceived usefulness of using open data tends to decrease after using the obtained datasets. External influences also tend to act as an initial catalyst, and the strength of the factor gradually decreases after professional reusers use the datasets.

Therefore, it is assumed that the influences of the identified factors are expected to vary as the time of professional reusers' open data usage proceeds and the related using experience accumulates. Accordingly, a longitudinal study can be another potential research strategy that can be applied to study the phenomenon further.

Similarly, as discussed in the literature, other types of open data users still exist, such as social reusers and end users (Abella et al., 2019). It is also possible that the identified factors can have different influences on the other types of users. It is assumed that open data users—impelled by different motivations, such as exploring creativity, creating business value, enabling local citizen value, addressing global societal challenges, and advocating the open data agenda as described by Lassinantti et al. (2019)—may assign different weights to the identified influential factors. For instance, among the different types of open data users, professional reusers may tend to maintain higher self-efficacy toward their open data use than other users, such as social reusers and end users.

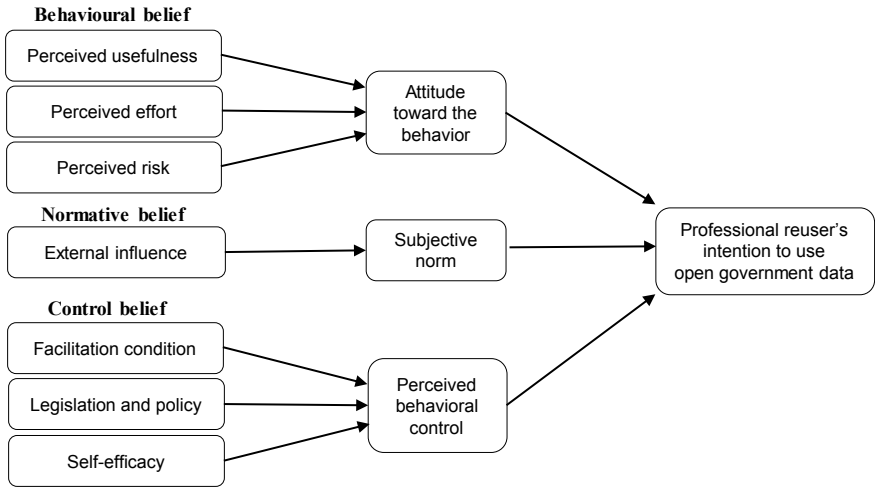
From an integrated view, the identified factors can be further incorporated with Ajzen's (1991) theory of planned behavior to represent behavioral beliefs, normative beliefs, and control beliefs that determine professional reusers' attitudes, subjective norms, and perceived behavioral control toward governmental open data use (see Figure 1). According to the theory of planned behavior, professional reusers' attitudes can be determined by different behavioral beliefs, which represent the subjective probabilities that given outcomes can be produced by the behavior. In this study, perceived usefulness, perceived effort, and perceived risk are conceptualized as the outcomes resulting from professional reusers' engagement in using governmental open data. The three factors can represent either positive or negative outcomes of performing the behavior. Accordingly, the three factors can act as professional reusers' behavioral beliefs in determining their attitude toward open data use.

In addition, subjective norms are determined by normative beliefs, which refer to the perceived behavioral expectations from other individuals, groups, or organizations. In this study, the identified external influences result from social groups and the government. As the interviewees indicated that they could be influenced by social groups' ideology and the government's open data policies, they would consider meeting their expectations. Therefore, external influences from social groups and the government can be related to professional reusers' perceived behavioral expectations and act as the normative belief that determines their subjective norms toward open data use.

Furthermore, perceived behavioral control is determined by different control beliefs, which refer to the factors that may either facilitate or hinder the behavior. In this study, facilitating conditions, existing legislations and regulations, and self-

efficacy can either benefit or impede professional reusers’ use of governmental open data. Therefore, the three factors are assumed to act as professional reusers’ control beliefs determining their perceived behavioral control over open data adoption. As shown in Figure 1, incorporating the theory of planned behavior, a synthesized view is presented to see how the identified factors act as behavioral, normative, and control beliefs that influence professional reusers’ intention toward using governmental open data. This synthesized view of the identified factors is expected to provide a foundation for later survey-based quantitative research.

Figure 1. A Synthesized View Integrated with the Theory of Planned Behavior



Moreover, the findings suggest that there is still a significant gap between what government agencies have opened and professional reusers’ expectations. Apparently, there are blurred areas that must be addressed further. Meanwhile, ambiguities and conflicts might exist between the concept of an open government, hindering the publication of more datasets to achieve transparency, participation and collaboration, and the concept of traditional stewardship in which government agencies are required to govern their datasets strictly. It is indicated in the literature that governmental open data is defined as non-privacy-restricted and non-confidential data, generated using public money and made available for the public to access without restrictions (Janssen et al., 2012). However, when different open datasets are merged to provide integrated information, information could infringe privacy and confidentiality (Yang et al., 2015). Researchers also suggest that it is critical to find a balance and resolve the potential contradictions between open government data policies and other public values, such as trust, transparency, privacy, and security (Meijer et al., 2014). Similarly, as Dawes (2010) has pointed out, stewardship and usefulness should be two broad and

complementary information principles. The principle of stewardship protects government information from damage, loss, or misuse and is concerned with the assurance of responsibility, validity, and legitimacy. On the other hand, the principle of usefulness encourages exploration, application, and innovation. It makes government information more accessible and easier to obtain and be used by various public and private users. It is suggested that the two principles should be considered to help balance the many considerations critical for achieving greater government transparency and realizing the public value of government information (Dawes, 2010).

The Practical Implications of This Study

According to the empirical findings, government agencies may have dedicated efforts to open datasets. However, many of the opened datasets do not meet professional reusers' needs for developing business applications, and many datasets professional reusers expect to use are still not opened by government agencies. Therefore, there is a need to bridge the gap by enhancing professional reusers' perceived usefulness of using governmental open data. The following list presents the practical implications of this research:

- Government agencies should maintain appropriate communication channels for obtaining comments and feedback from professional reusers regarding their data usage experiences and expectations. For instance, government agencies of different business domains should hold public workshops, meetings, and forums to provide professional reusers with the opportunities to interact with the agencies and express their data needs. Through this approach, government agencies can also benefit from having a clearer direction in terms of what datasets to open with higher priority.
- According to the Pareto principle (the 80/20 rule; Koch, 1999), 20% of the opened datasets may represent those most professional reusers are interested in using. Therefore, government agencies can investigate what datasets are most frequently downloaded and utilized by open data users. Then, government agencies can explore whether those datasets meet data users' expectations and whether more related datasets can be opened further.
- There is a need to reduce professional reusers' perceived effort of using governmental open data. Government agencies should be continually encouraged to use the unified open data portal to publish their open data information, which can help simplify professional reusers' processes of data search and data access. In addition, a vertical coordination mechanism can be established among the central and local government agencies with the same core businesses. For each business domain, a responsible central government

agency can coordinate to create a standardized template that other government agencies may adopt in opening their related datasets. Through standardization, the barriers to open data use resulting from inconsistent data formats, data fields, and metadata information can be reduced when professional reusers use open datasets of different central and local government agencies with the same core businesses. Similarly, for some central government agencies that could open similar datasets, a horizontal coordination mechanism may be enabled to set up a unified window for opening datasets. Consequently, professional reusers' uncertainty regarding which datasets they should use can be decreased, while those similar datasets usually come with inconsistent data content and have different update frequencies.

- When opening their datasets, many government agencies merely put the links of their published datasets on open data platforms for users to download. However, this approach is still inconvenient for professional reusers because a manual operation is needed to download data files. This approach also poses difficulty in obtaining up-to-date data. Thus, it is preferred that government agencies consider using open API to open their datasets. In this way, professional reusers can automate the process of connecting their information systems to open API and assign customized query parameters to retrieve up-to-date data, which can help professional reusers create high business value applications. It is expected that the approach of an open API can greatly increase professional reusers' perceived usefulness and reduce their perceived effort in using governmental open data.
- Government agencies should continue improving the quality of their published datasets, which is critical to enhancing professional reusers' perceived usefulness of open data use. A collaborative data feedback model can also be established, which allows professional reusers to collaborate with government agencies to improve open data quality. In some data domains, professional reusers may be willing to clean, refine and supplement their retrieved open data to generate more comprehensive datasets with better data quality in terms of accuracy, completeness, and timeliness. The data feedback model allows professional reusers to provide enhanced datasets back to government agencies with some open licenses or subscription fees. Meanwhile, government agencies can benefit from obtaining better quality datasets and re-releasing the datasets to the general public. Further, this approach can encourage private sectors, such as entrepreneurs and startups, to participate in the process of open data preparation and refinement through the existing infrastructure and foundation of open government data.

- Another similar approach suggests that the government should facilitate the formation of a data market while professional reusers act as the role of data intermediary in their respective business domains, as some literature has also suggested (Mercado-Lara & Gil-Garcia, 2014; Schrock & Shaffer, 2017; Van Schalkwyk et al., 2016). Based on the foundation of open government data, professional reusers can directly provide their refined datasets to the general public and other businesses as a free public service or commercial service with fees. Through this approach, professional reusers acting as data intermediaries can help improve the quality of governmental open data with added values and make it easier for others to use open data.

While data intermediaries are capable of providing data services with enhanced data quality and guaranteed sustainability based on the existing infrastructure of open government data, this approach could be an alternative for direct data reusers who are willing to subscribe to the service, particularly for those who tend to have high perceived risks of directly using governmental open data. Data intermediaries can dedicate their efforts to interacting with the data reusers to assist their data usage requirements and problems. This strategy also helps reduce the loading that government agencies might have to deal with. Particularly, in addition to the current free open data service, it is also worth exploring whether government agencies can consider offering service contracts with reasonable fee charges as an alternative for professional reusers seeking government agencies to provide dedicated data services such as large volume and specialized data access.

- This study found that external influences and facilitation conditions matter. Thus, the government should continue promoting open data use through various activities, including workshops, forums, hackathons, and contests, which can spur professional reusers' initial interest in using governmental open data. Through the activities, government agencies can also provide more facilitation to professional reusers such as entrepreneurs and startups to assist their open data use. Furthermore, as aforementioned, while professional reusers usually maintain a high level of self-efficacy in their domain knowledge and technical skills, a well-established mechanism that professional reusers can interact with the agencies to express their feedback and data needs is the "true facilitation" that professional reusers look forward to receiving.
- In terms of legislation and policy, a designated open data law should be enacted. Such a law not only provides clearer guidance and acts as the foundation for government agencies to implement open data policies but also helps professional reusers reduce their perceived risk and retain their confidence

in using governmental open data concerning its long-term sustainability and that government agencies will commit themselves to continually open datasets. Enacting open data law can also help professional reusers counter the institutional barriers resulting from a complex bureaucratic system and other existing legislations and regulations when attempting to interact with government agencies to request more open datasets.

- Public and private collaboration is another approach that government agencies can consider to encourage professional reusers to use open data (Susha et al., 2017, 2019). Specifically, government agencies can invite professional reusers to help resolve the pressing challenges using governmental open data. Government agencies can also collaborate with professional reusers to open more datasets during the process. In this way, professional reusers can have the opportunity to develop solutions that meet the needs of government agencies. If government agencies are satisfied with the developed solutions, this public and private collaboration can also present an opportunity, allowing professional reusers to later market the developed solutions as business services to other government agencies or companies in the industry.
- While governmental open data should not include datasets that may infringe personal privacy and national security, another approach to bridging the gap between what government agencies have opened and what professional reusers expect to obtain is the help from open data committees, which have been set up in most central government agencies in Taiwan. The composition of open data committees can include representatives of government agencies, private and public sectors, social groups, academia, and individual citizens. The committees are expected to help determine whether some governmental datasets that professional reusers request should be opened. Therefore, the designated function of open data committees in respective government agencies should be well exercised in considering the principles of stewardship and usefulness—the two aforementioned complementary information principles proposed by Dawes (2010).

Conclusion

A sound open government data ecosystem should include both open data providers and users. Meanwhile, this research explores and discusses the factors determining professional reusers' intention to use governmental open data. With qualitative empirical data support, the identified factors are perceived usefulness, perceived effort, external influence, facilitating condition, legislation and license, self-efficacy, and perceived risk. Particularly, perceived usefulness and

perceived effort are the two major factors derived from professional reusers' data usage experience. Professional reusers also consider the perceived risk of using governmental open data for developing business applications in terms of long-term data sustainability. As proficient IT developers in their respective domains, professional reusers maintain a high level of self-efficacy toward open data use. However, external influences and facilitation conditions from their surrounding environment must also be taken into consideration. Similarly, existing legislations and regulations within the bureaucratic system affect professional reusers when attempting to interact with government agencies to request more open data. In addition, the identified factors are integrated with the theory of planned behavior to present how the factors determine professional reusers' intention of using governmental open data through behavioral, normative, and control beliefs. Furthermore, the discussion and implications of this study can provide insights to researchers, practitioners, and policymakers regarding potential research directions and how open data policies can be further developed and implemented to attract open data users. This study conducted in the context of Taiwan's open government data is expected to enrich the current open data-related literature.

However, there are limitations in the current research. This study uses a qualitative approach, in which potential research biases could occur while some parts of the interview data may be emphasized more and some could be neglected. Similarly, this research uses a purposive sampling approach to recruit relevant interviewees for conducting interviews, through which potential sampling bias might also occur. Accordingly, there should be more research for exploring the complexity of open data use in different data areas, social contexts, and countries. In addition, as aforementioned, future research can explore the factors influencing different types of open data users, such as social reusers and end users. Furthermore, it would be interesting to investigate whether the factors may have different levels of impact on different types of open data users. Moreover, quantitative research can also be employed to evaluate the strengths of the factors identified in this study.

Acknowledgements

The authors are grateful to the editors and the three anonymous reviewers for providing thoughtful comments to help the authors revise and improve the paper. The authors also thank all the interviewees for participating in this research and offering valuable qualitative empirical data to help the authors finish this research project. This study was financially supported by the Ministry of Science and Technology, Taiwan (107-2410-H-002-165-MY2) and by the Universities and Colleges Humanities and Social Sciences Benchmarking Project (Grant no. 111L9A002).

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我國政府開放資料使用者之 資料使用意願影響因素探討： 以商業使用者為例

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摘要

開放資料於近年來已成為國內外政府機關施政的重要方針之一，期以達到政府透明化與公眾參與之目標外，也鼓勵公眾進行資料創新應用，以促進經濟與新創產業之發展。然當政府機關已經逐步開放資料集之後，開放資料的使用端上卻有不如預期之情形。因此，本研究是以我國政府開放資料的推行現況作為研究場域，嘗試探究哪些因素會影響商業與新創等公司業者於政府開放資料的使用意願，經由質化實證資料分析所得之影響因素為預期有用性、預期投入、外部影響、協助情況、法令政策、自我效能與預期風險。此研究結果與實務討論可以做為我國相關政策研擬與推行之參考，以期增進資料使用者的持續參與，並可對於他國分享我國政府開放資料的推行經驗。

關鍵詞：開放資料，政府開放資料，開放資料使用，開放資料使用者，影響因素，台灣

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