



Increasing Continuous Engagement With Open Government Data: Learning From the Saudi Experience


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ABSTRACT

A number of countries are today implementing open government data (OGD) initiatives. Yet many of these initiatives are failing to attract the levels of continuous use they need to deliver an acceptable return on investment. This raises the obvious question of why this should be the case. To answer this question, it is important to understand the factors that most strongly influence user behaviour in OGD adoption. Qualitative data were used to identify the factors that play a key role in influencing the intention to engage with OGD. A quantitative approach was then used to evaluate the extent to which these factors drive/limit behaviour. The study's findings showed that there are four factors that play a significant role in intention to use OGD. It is also believed that the findings will be useful in helping policymakers in all jurisdictions formulate and implement strategies that successfully drive up continuous OGD engagement.

KEYWORDS

Open Data Adoption, Open Data Portals, Open Data Usage, Open Government Data, Saudi Arabia

INTRODUCTION

In recent years, improvements in IT have driven significant growth in the use of Open Government Data (OGD). OGD consists of data that are either provided or endorsed by governments for unrestricted use or distribution by private individuals or companies (Abu-Shanab, 2015; Gascó-Hernández et al.,

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2018; Jiang et al., 2022). OGD offers a wide variety of benefits, ranging from driving innovation (Janssen et al., 2012; Jiang et al., 2022) and national economic development (Janssen et al., 2012, 2017) to increasing governmental transparency (Harrison & Sayogo, 2014) and empowering citizens (Janssen et al., 2012). Additional evidence shows that OGD can help improve government services while reducing costs (Harrison & Sayogo, 2014).

For these and other reasons, many national governments have promoted the benefits of OGD to their publics, with the aim of encouraging use (Mutambik et al., 2021). To this end, they have also made significant efforts to ensure that datasets are accessible and easy to use, through specifically designed OGD portals (Abu-Shanab, 2015). Despite these efforts, however, studies have shown that, while large amounts of data are made available, only a relatively small proportion of this data is downloaded for the purpose of creating value (Solar et al., 2013). One of the main reasons for this seems to be insufficient focus on how data can be used for this purpose. Instead, OGD promotion has been focused on the availability of data (Zuiderwijk & Janssen, 2014). In order to drive public OGD usage to higher levels, a promotional model needs to be developed that effectively increases engagement and participation in OGD initiatives over the longer term (Safarov et al., 2017).

There have been several approaches to achieving long-term engagement and participation. Many data providers, for example, have attempted to improve engagement and encourage innovation with activities such as hackathons and conferences (Mutambik et al., 2021). While this approach has had some success in driving intermittent uptake of OGD, it has failed to produce the level of understanding of OGD required to drive continuous use. Some bodies, such as the World Bank Group (WBG), have proposed that the current model of open data usage, which does not support interactive processes, is not conducive to optimising the benefits of OGD (World Bank Group, 2015). Instead, this model needs to be replaced with a one that encourages interaction between users and data producers to ensure that the benefits of open data can be maximised (Zuiderwijk & Janssen, 2014).

In order to develop an effective strategy for improving OGD usage, it is important to understand the factors that most affect the realisation of successful OGD implementation. Recent studies have explored this issue from a variety of perspectives, such as technology, processes, and business (Zuiderwijk & Janssen, 2014). However, there are some factors that have not been adequately investigated, such as user perspectives. Exploring these areas will be useful for gaining a fuller picture of how to best drive OGD initiatives.

While the potential value of OGD has been made clear from previous studies, it is also clear that the realisation of this value is often limited by government involvement (Janssen et al., 2012; Mutambik, et al., 2021). This can and often does significantly affect the quality of data, as well how and how often data is used (Haverila et al., 2022; Liu et al., 2023). Recent research has emphasised the need to understand the factors at play in encouraging the public to use open data and has tried to identify measures that could effectively improve data use. However, most of this research has focused on the processes of provision of open data, as opposed to how it can be best used (Ham et al., 2019; Mutambik et al., 2022). Yet the repeated use of OGD is critical to the realisation of its value. This paper therefore seeks to address the following research questions:

- **Research Question 1:** What user perceptions (of OGD) most significantly impact user engagement with OGD?
- **Research Question 2:** To what extent do these factors (user perceptions) affect the intention to use OGD on a continuing basis?

To answer these questions, a study of OGD usage in Saudi was undertaken, using a mixed-methods (qualitative and quantitative) approach. Developing a better understanding of what drives OGD usage makes it possible to construct strategies that will optimise usage of OGD initiatives by various stakeholders.

LITERATURE REVIEW

Open Government

Over the course of recent decades, technology—especially the Internet—has played an ever-greater role in governmental processes. In particular, it has helped to facilitate higher levels of accountability and transparency in government (Carr & Lassiter, 2017). This has led to the concept of open government, which seeks to develop a closer and more collaborative relationship with citizens, with the intention of building trust and participation (McDermott, 2010). Although still in relatively early stages of development, OGD is playing an increasingly important role in building this relationship.

The concept of OGD emerged early in the new millennium, as various nations sought to generate value from their data by publishing it and encouraging private organisations to use it to drive business innovation and other initiatives. The first official OGD portal was developed and launched by the US in 2009 (Evans & Campos, 2013) with the mission of making data freely accessible for unrestricted use (Saxena & Janssen, 2017). In the words of President Obama’s memorandum on Transparency and Open Government, the initiative would “strengthen our democracy and promote efficiency and effectiveness in government” (OBAMA, n.d.).

In the years following this development, many other countries followed America’s lead and the idea of OGD began to enter the mainstream. By 2016, civil society was using or planning to use government data in 93% of countries surveyed by the World Wide Web Foundation, including many developing nations such as Ecuador, Nepal, Thailand, Botswana, Ethiopia, Rwanda, and Uganda (Barometer, 2022; World Wide Web Foundation, 2018). Much of this uptake of OGD initiatives was driven by the increasing sophistication of enabling technology. Initially, a portal consisted only of a Web-based mechanism for accessing datasets, but this rapidly evolved into the availability of a more comprehensive platform, providing a range of guidance, analytics, and support services.

However, although notable progress has been made, some significant challenges remain. While many countries are claiming to offer OGD, for example, only 10% of datasets are truly open, and many of these are of poor quality, making it difficult for potential data users to access, process, and work with it effectively (World Wide Web Foundation, 2018). If the full benefits of OGD are to be realised, it will also be necessary to resolve issues of data ownership and improve levels of user support (Ham et al., 2019).

Despite these challenges, the potential social, political, economic, and environmental benefits of OGD are likely to continue to drive uptake across the world. Some of these benefits are summarised in Table 1.

Promoting Continued Use

Clearly, if OGD initiatives are to be successful, they must attract widespread and continuous use. As open data is currently a relatively new concept, it is perceived as an innovation. Initiatives are,

Table 1.
Some of the principal applications of OGD

Sector	Example Uses
Business	Registers, patents, trademarks, public tenders.
Legal	National legislation and treaties, court decisions.
Meteorological	Climate data and modelling, weather forecasts.
Societal	Statistics on employment, health, population, and public administration.
Transport	Traffic, roadwork, public transport, vehicle ownership, accidents.
Geographical	Addresses, construction, geodetic networks, geology, topographic data.

therefore, likely to attract “experimental” (i.e., single-instance) use, which is usually short-term. The challenge for OGD authorities is ensuring that initiatives continue to be used over the longer term, which requires a perception that OGD initiatives have clear practical value to users. To ensure this, it is necessary to have a clear understanding of the factors which underpin repeat or continuing OGD usage. Such an understanding will play a critical role in helping decision-makers develop effective policies for encouraging continuous and ongoing OGD usage. These policies will, ultimately, be key to achieving long-term objectives such as transparency, government-citizen collaboration, and citizen empowerment (Zuiderwijk et al., 2015). Any research, therefore, which adds to our understanding of factors that encourage repeated and frequent OGD usage has great value.

Although currently such research is relatively rare, there exist studies that shed light on some of the factors influencing users’ intention to use government-created resources such as OGD. In one recent meta study of papers related to the use of OGD, Khurshid et al. (2018) found that several factors influence a user’s motivation for deploying open data resources. These factors, together with the studies in which they were identified, appear in Table 2. It is interesting to note that, while the general attribute of “perceived usefulness” is noted by several researchers, there is no explicit measure of OGD value (to the user), particularly in terms of sustainability benefits. While it might be argued that this is because sustainability benefits are deemed to accrue mainly to the state (not directly to the user), such an argument is undermined by research showing that citizens and application developers are strongly motivated by sustainability implications of OGD, perceiving such implications as having a significant practical and ethical benefits (Koczanski & Sabou, 2015). Additional research shows that, in terms of sustainability, users perceive OGD to have indirect value by making processes more efficient and transparent (Jetzek et al., 2019).

The principal factors which underpin the intention to use OGD seems to be trust in the government and perceived ease of use (Wang & Lo, 2013). Other research has shown that gender can have a significant influence on the purpose behind usage of open data. Men, for example, are (according to research) more likely to use a government website for professional reasons, while women are more likely to be motivated by personal interests. Furthermore, acceptance and use of OGD is higher, overall, among younger demographics (Khurshid et al., 2018).

For some aspects of OGD, existing studies show conflicting results. Dataset quality is one example of this. While Haverila et al. (2022) reported that data quality was an important consideration in Afghanistan, Khan et al.’s (2012) study in Indonesia found that low-quality data did not affect engagement levels (Purwanto et al., 2018). The current study, however, is less concerned with how factors such as data quality affect user engagement. Instead, it focuses on key usage determinants which center on user perceptions. These determinants were identified using thematic analysis.

RESEARCH METHOD

This study uses a mixed methods approach, which combines elements of quantitative and qualitative research (Johnson & Onwuegbuzie, 2004). By integrating elements of both individual approaches, it is possible to gain a more complete analysis of the research questions than is possible with either approach alone. In particular, the use of both quantitative and qualitative methods will add validity and contextualisation to the study’s findings (Johnson & Onwuegbuzie, 2004).

The first stage of the study used a qualitative method (face-to-face interviews) to explore the factors that most significantly affect user perceptions of OGD and the intention to use it on a continuous basis. A quantitative approach (questionnaire) was then used to validate the results of the first stage.

During the study, best practice for privacy and confidentiality was followed at all times. All participants were informed of the purpose of the study and advised that all information provided would be fully anonymised and used only for research purposes. Participants could withdraw from the study at any time, and any data provided would be destroyed. Any participant that contributed to the study would receive a full copy of the findings and analysis. All participants signed a consent form to indicate that they had been informed of and agreed with all conditions of the study.

Table 2. OGD influencing factors identified by previous research

Authors Factors	Khurshid et al., 2022	Souza et al., 2022	Purwanto et al., 2018	Islam et al., 2021	Talukder et al., 2019	Wirtz et al., 2018	Lněnička et al., 2022	Wirtz et al., 2021
Compatibility	√							
Competence		√				√		
Complexity								
Data Quality			√				√	
Effort Required				√	√		√	
Motivation		√				√		
Facilitating conditions				√	√		√	
Information Quality					√		√	
Innovation awareness	√							
Speed of internet		√						
Perceived Ease of Use	√	√				√		√
Perceived interactivity								√
Perceived security								√
Perceived Usefulness	√	√				√		√
Performance				√	√		√	
Demonstrable Results	√							
Satisfaction		√						
Service Quality			√	√				
Social Approval	√			√	√		√	
Systems Quality			√		√		√	
Trust		√	√				√	
Regulated Use	√						√	

THE QUALITATIVE STAGE

Developing the Interview Questions

The intention of the interviews was to explore the views and perceptions of participants concerning the various factors that could significantly affect readiness or intention to use open data. Prior to carrying out the interviews, an interview format was developed which employed a range of open-

ended questions that would act as the basis for further discussion of each area. Care was taken to create questions in a way that did not ‘lead’ the participant and therefore create the potential for bias. The areas covered included:

- Attitudes that could lead to resistance to using OGD.
- Aspects of organisational culture that could inhibit the use of OGD.
- Aspects of external/societal culture that could inhibit the use of OGD.
- Practical challenges that could deter individuals or organisations from using OGD on a repeated/continuing basis.
- Legal or ethical concerns that could deter individuals or organisations from using OGD on a repeated/continuing basis.

To ensure that the question format covered all these areas of investigation, two pilot interviews were conducted. These interviews showed that the proposed format adequately covered the defined areas, and therefore provided a good basis for data collection from the full sample.

Interview Sample

The sample used for interviews was created using a snowball technique. The resulting sample included participants with a wide range of different OGD experiences and who originate from different organisations/sectors related to Saudi OGD; this maximises the probability that the data collected would be representative, meaningful, and valid (Ritchie & Lewis, 2003). All participation was entirely voluntary, and no incentives—financial or otherwise—were offered to interviewees.

According to Bryman (2004), saturation is the most important factor in determining sample size. Although this can lead to very small sample sizes (<10), this is acceptable if the data obtained from each participant is sufficient for the design of the study (Ritchie & Lewis, 2003). In this study, beyond n=12, answers were showing a high level of repetition and no new insights were emerging concerning either motivations for or resistance to using OGD. It was therefore assumed that further interviews would prove redundant in terms of data value for the study. The sample size was therefore 12 and comprised professionals with a diverse range of experience and expertise (See Table 3).

Table 3. Summary of participant profiles

Participant No.	Organisation/Sector	Areas of Expertise	Experience
1	Public services	Weather and public transport	1 to 5 years
2	Private company	Climate and weather forecasts	10+ years
3	Municipality	Traffic and transportation	10+ years
4	Education	Employment, health, and construction	5 to 10 years
5	Health	Health in general	5 to 10 years
6	Social	Population and demographic	Less than 1 year
7	Private company	Marketing and population	1 to 5 years
8	Education	Academic related	10 + years
9	Municipality	Traffic, transportation, and population	Less than 1 year
10	Health	Health in general	5 to 10 years
11	Meteorology	Climate, weather, traffic, transportation	10+ years
12	Economic	Business information and public tenders	5 to 10 years

Conducting the Interviews

Each interview was conducted in accordance with privacy and confidentiality best practice, as described in the previous section. It was also emphasised to each interviewee that all answers were valid and all input was valuable. Interviews were between 45 minutes and 1 hour in length and were conducted and transcribed in Arabic (they have been translated into English only for the purpose of this report). The established practice of taking field notes was also followed. Descriptive notes were taken during each session, and reflective notes were made immediately afterwards.

Data Analysis

Each interview transcript was analysed using a standard thematic analysis technique (Bryman, 2004). This approach was considered appropriate for achieving the objectives of this research—namely, gaining a fuller understanding of the factors which significantly influence readiness/intention to use OGD). The following describes the analysis in further detail.

To facilitate the coding of each interviewee's contribution, a complete transcript was made immediately following each interview. For the purposes of accuracy and consistency, each transcript was compared with field notes and the process was repeated by a second researcher. This was followed by the coding phase of analysis. This (manual) process was based on work by Braun and Clarke (2006) and had four key stages, following work on Grounded Theory by Charmaz (2006). These stages were:

1. **Initial (Open) Coding:** All interview transcripts were closely compared in order to identify similarities, differences, and patterns. All transcript elements that had a clear connection with the research questions were noted. This resulted in a set of initial codes.
2. **Focused Coding:** The set of initial codes was narrowed down by identifying codes that occurred frequently or that seemed to be related or of particular significance. Each final code was carefully defined to ensure clarity and consistency in the analysis process.
3. **Searching for Themes (Factors):** In this stage, the final (focused) codes were organised on a spreadsheet and analysed for common ideas. This allowed the identification of sub-themes which were then categorised to form main themes. These were then grouped into major themes, related to the research questions.
4. **Theme Identification and Naming:** This was carried out using dual criteria, according to the recommendations of Patton (2002).

Results of the Qualitative Stage

The results of the thematic analysis revealed four primary factors that significantly affect the intention to use open data. These are:

- **Awareness:** The recognition that the concept of OGD exists, and that it is free for use by private individuals/organisations.
- **Value:** The understanding that, if appropriately used, OGD can deliver significant benefits to a business or personal enterprise, without (financial) cost.
- **Usability:** The recognition that OGD portals have been specifically designed for private and open use, and therefore do not require advanced technical skills.
- **Governmental Support:** Appreciation that OGD is a government-backed concept and that the authorities offer high levels of support to users.

Examples of the views of participants concerning each of these primary factors that significantly affect the intention to use open data can be seen in Table 4.

Table 4. Example participant quotes relating to each primary factor affecting OGD usage

Factors	Participant Statements
Awareness	<p>“Most people simply have no idea that open data exists. Unless governments address this issue, they’ll struggle to implement it effectively. The problem is exacerbated by the fact that awareness takes different forms in different countries, so producing a standard usage framework is not easy. But it’s a key issue if open data initiatives are to see mass adoption.”</p> <p>“It [open data] is a relatively new idea, of course, so it’s reasonable that the public is generally ignorant of its existence and potential benefits. But unless awareness increases rapidly, OGD is unlikely to take-off.”</p> <p>“Personally, I find it hard to see how OGD can be of use to society, and I think much of the public feel the same. Otherwise, the concept would have occurred to people independently, and there would be a demand for such a service. As it is, no-one knows that it exists, and no-one cares, either.”</p>
Value	<p>“We sometimes hear the claim that OGD increases national economic health, or can benefit private businesses, but I’m personally very sceptical. Unless OGD clearly benefits my organisation, in terms of issues such as competitiveness, time-to-market, differentiation and sustainability, I’ll be reluctant to use it. I think that will be true of most people – without a clear value, there’s no incentive to use it.”</p> <p>“It often seems to me that OGD delivers value to people or organisations outside of the country where the data originates. If it can be clearly and conclusively shown that the idea benefits the government, or departments, of the data-providing country itself, I would be more supportive of the idea.”</p> <p>“I can see that the idea has potential, but – right now – it seems to me that a lot of effort and technical skills are required to use OGD, but with a relatively small return. However, I would certainly be prepared to use OGD for my business when I can see that it delivers real sustainable value.”</p>
Usability	<p>“I think usability is a key issue for increasing OGD adoption. Many people don’t realise that OGD exists, and those who do are often reluctant to use it because they think it is extremely technical, or difficult to use. We need to promote the idea that OGD is designed to be used by the public and doesn’t require specialist skills.”</p> <p>“Portals have come a long way in the past few years, but they mostly still fail to deliver the levels of usability required. If the public are to see OGD as a go-to method of creating value, portals will have to do more than just provide static user information – they will have made the process of searching for and identifying datasets much easier and clearer.”</p> <p>“Of all the issues currently affecting open data adoption, I’d say usability is right at the top. There is no point in making expensive and powerful OGD platforms available to private individuals and businesses if no-one uses them. And few people will use them if they require a training course or special tech skills.”</p>
Governmental Support	<p>“Even if people start to use OGD, they will soon give up if they don’t have proper support. This would need to cover several aspects, from technical support on using the portal, to advice on how to get maximum value from OGD use.”</p> <p>“Governments say they want people to use the open data services on offer, but then often fail to provide even a minimal level of support. Whether this is a cost issue or a political issue, I’m not sure, but whatever the reason, attitudes need to change if OGD is to be successful.”</p> <p>“To increase usage levels of OGD, users will have to be convinced of several things. They need to be sure, for example, that the system offers value, and that it’s easy to use. It’s also important to reassure users that they’ll get the support they need, as and when they need it. A reputation for providing good support could significantly increase enthusiasm for using OGD among the public.”</p>

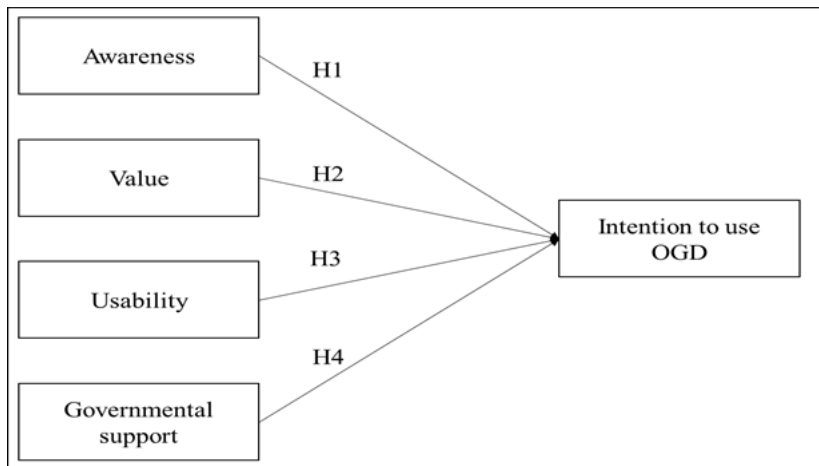
The Research Model and Hypotheses

The behavioural model proposed by this research was also developed from the theory of reasoned action (TRA) (Fishbein & Ajzen, 1975). As can be seen from Figure 1, the four identified attitudinal factors (awareness, value, usability, governmental support) are expected to feed into the user’s behavioural intention (i.e., to use OGD). To measure the extent to which this is the case, the values of each participant were analysed and correlated with that user’s intentions towards the use of OGD. The following sections look more closely at the influence of the four factors and a hypothesis is constructed for each. The evidence for these hypotheses is then examined.

Awareness

Specific behavioural intentions depend critically on awareness (Carter & Belanger, 2004). This is because, before users can recognise and subsequently realise the benefits of open data, it is first necessary to be aware of its existence. Once awareness is established, several other behaviours can follow, including engagement with the government to improve the system (Rehman et al., 2016).

Figure 1. Research model



Currently, governments vary in the level to which they play a proactive role in promoting the use of OGD (OECD, 2019), but the need for public and private sector mechanisms to encourage OGD use is increasingly recognised. This is reflected in the content of the International Open Data Charter (ODC, 2022) originally created in 2015, which includes data promotion initiatives and partnerships as one of its foundational pillars. The Charter also (in principle 5) recommends the promotion of OGD to “let citizens (and others in government) have a better idea of what officials and politicians are doing.”

However, an awareness of OGD existence is not enough, in itself, to drive effective OGD use. It is also necessary for users to understand the “rules of the game.” In other words, they also need to be aware of OGD policies and legislation, specifically the Right of Access to Information Act (Rehman et al., 2016): (a) awareness of the OGD portal, and (b) awareness of OGD policy. Based on the evidence, we propose the following hypothesis:

- **Hypothesis 1:** Intention to use OGD will be positively influenced by awareness of OGD resources and policy.

Value

In almost any sphere of life, the value of any new solution or method is usually evaluated by critically comparing the positives against the negatives of using that solution. In the technological arena, it has been shown that value is a key determinant of the speed with which an innovation is adopted by a given population and how likely it is to become established in the longer term (Hsu et al., 2007; Pannell et al., 2006; Shih, 2008). The literature contains many examples where value has been proven to have a measurable impact on behavioural intention concerning the use of specific technology (Shih, 2008). In the case of OGD, a number of benefits are well-established and clear value propositions have been framed in terms of OGD’s ability to support private business growth, as well as its potential contribution to greater national productivity through increased government efficiency and the creation of new enterprises and services.

The full range of potential OGD benefits, of course, has not yet been defined. In fact, it is conceivable that all benefits can never be fully defined, as OGD value is not based solely on the efforts of a single organisation but is a result of complex and dynamic exchanges between groups of individuals and organisations (Shih, 2008). This is known as a value network. This study proposes

that perceived value can be treated as an independent variable and will affect OGD usage. This leads to the following hypothesis:

- **Hypothesis 2:** Intention to use OGD will be positively influenced by perceived (OGD) value.

Usability

The positive impact of perceived ease of use on the intention to use a product/service has been demonstrated by many studies, such as those by Rogers (Czaja et al., 2006) and Venkash et al. (2003). These studies are supported by other research, which shows that products/services which are complex and hard to understand will not attract users, independent of their potential for delivering value (Davis, 1989; Foulonneau et al., 2014). These findings have particular significance in the context of the current study, as there is evidence that private individuals and organisations have had poor experiences of OGD portals. These poor experiences have included problems with accessing datasets and government failure to provide accurate supporting information. There also seems to be a clear lack of structure relating to datasets, which are often uploaded without definition or advice on usage. The general conclusion is that OGD portals often lack the required level of usability (Foulonneau et al., 2014), and therefore have relatively few users, as they often find it hard to make effective use of the data available. Given these findings, it is logical to suppose that OGD portals which are simple to understand and easy to use will attract higher levels of user engagement. The following hypothesis is therefore proposed:

- **Hypothesis 3:** Intention to use OGD will be positively influenced by perceived (OGD) usability.

Governmental Support

Societal acceptance and approval of a government service often depends on the level to which the government concerned provides free support for the service (Ali & Imran, 2021; Zuiderwijk et al., 2015). If government support is provided, but at a cost to the user, this can also deter people from engaging with the system (Zuiderwijk et al., 2015). Currently, the levels of support provided to OGD users is a significant weakness in many countries. This is particularly notable in Saudi where several support issues have been reported, such as the failure to provide clear instructions and documentation for use of the portal, as well failure to provide a mechanism for technical support and user questions. The issue of feedback is also important, as it can facilitate portal improvement and therefore perceived value. However, few countries offer even a basic feedback facility. This is likely to lead to sub-optimal portals, which fail to engage users over the longer term (Zuiderwijk et al., 2015). There are relatively few studies that examine the role of governmental support in OGD usage. This study will do so by evaluating the following hypothesis:

- **Hypothesis 4:** Intention to use OGD will be positively influenced by perceived governmental support.

QUANTITATIVE STAGE

Questionnaire Development

Depending on their purpose, questionnaires can be designed in any one of many different ways (Greene, 2007; Straub & Gefen, 2004). For the purposes of the current study, the questionnaire was designed to cover each of the four factors identified by thematic analysis as a possible influence on intention to use OGD. On a small number of occasions, questions were adapted from previous research, such as that by Saxena and Janssen (2017) and Fishbein and Ajzen (1975), but most questions were designed

specifically for the current study. In total, the proposed questionnaire included 20 questions, using a 5-point Likert scale to measure response.

Before collecting primary data, two preliminary steps were taken to maximise the internal consistency, clarity, reliability, and relevance of the proposed questionnaire. These were a validity assessment by experts, and a pilot phase.

Validity Assessment by Experts

In this phase, seven experts (four OGD specialists and three academics) were selected based on their experience, reputation, and research activity and asked to review the proposed questionnaire. In particular, these experts were briefed to assess the questionnaire for inconsistencies and ambiguities and to recommend changes or clarifications. As a result of this exercise, two questions were removed from the questionnaire, leaving a total of 17. Other than this, the questionnaire was approved by the group of experts.

Pilot Phase

Following the expert assessment, a pilot exercise was carried out using 14 participants (9 academics, 5 OGD specialists). The feedback from this exercise showed that the questionnaire was generally acceptable for use in the actual study, though it indicated a need for slight changes to the wording of some questions and a change in the order of questions. Table 6 lists the questions and the literature sources for each of the four influencing factors.

Quantitative Sample and Data Collection

The aim of this element of the study was to gain insights into the views of Saudi users of OGD. To achieve this, a questionnaire was created using standard online software (Google Forms) and distributed by email. The email described the purpose of the research and explained all aspects of participation, such as confidentiality, right to withdraw, and access to results. A representative sample of Saudi OGD users was selected using a mix of convenience and snowball sampling (Lynn, 1986). A basic qualifying criterion for participation was that an individual should have used an OGD portal on more than one occasion, as this would help to maximise the validity and relevance of the resulting data (Lynn, 1986). The final sample comprised 290 people, of which 271 completed the questionnaire. Table 5 summarises the experience profiles of the participants.

Data Analysis

Data analysis began with the use of a statistical package (SPSS version 21) for data coding and cleaning. This stage was followed by a data assessment, as recommended by Hair et al. (2011). Hypothesis testing was conducted with a software package (AMOS version 26) using structural equation modelling.

Testing the Measurement Model

To assess the extent to which the research model was measuring what it set out to measure, construct validity confirmation was carried out for each of the four constructs (influencing factors) (Stangor, 2007). Threshold values were set at: factor loading > 0.6 ; Cronbach's alpha (CA) and composite reliability (CR) > 0.7 ; and average variance extracted (AVE) > 0.5 (Hair et al., 2011). As can be seen in Table 7 and Table 8, the values for all these metrics across all constructs exceeded the set threshold. It was therefore concluded that the consistency, reliability, and construct validity of the model was satisfactory.

Common Method Variance (CMV)

The use of bespoke (self-constructed) questionnaires introduces the possibility of common method variance—variance in responses due to the method of measurement, as opposed to the views of the

Table 5. Participant characteristic distribution for the questionnaire

Participant		No. Participants
Frequency of use	Very frequently	99
	Frequently	73
	Occasionally	80
	Rarely	19
OGD experience	> 1 year	29
	Between 1 to 5	111
	Between 5 to 10	97
	< 10	34
Areas of expertise (data related)	Business	31
	Legal	14
	Meteorological	22
	Societal	20
	Transport	27
	Geographical	19
	Mixed	133
	Other	5
Academic level	PhD	45
	Masters	135
	Bachelor	89
	Other	2

actual participants. This could affect the decision to reject or accept a hypothesis (Simmering et al., 2015; Wang et al., 2020). To assess whether this was the case, the Harman single factor test method (Wang et al., 2020) was used. This showed that CMV was not present at a significant level and did not impact on the conclusions of the study.

Structural Model Evaluation

Hypothesis testing was carried out using AMOS. The results (Figure 2) showed that all four hypotheses (H1, H2, H3, H4) were supported and that, therefore, (OGD) awareness, usability, value, and governmental support all have a significant impact on an individual’s behaviour (intention to use) concerning OGD. Table 8 also shows detailed information on the standardized path coefficients and t-values for hypotheses H1–H4, which were all supported.

DISCUSSION

Although the concept of OGD has been around for some time, it is still an early-stage technology, relatively speaking. This is unsurprising to some extent, as there have been several studies identifying major barriers that need to be overcome before the concept can begin to mature. Zuiderwijk and Janssen (2014), for example, concluded that OGD would not mature until a culture was created in which interorganisational collaboration was normalised and publicising data became an everyday practice. In another study, Heimstädt et al. (2014) arrived at similar conclusions, arguing that, while

Table 6. Factors, items with factor loadings, and sources

Factors	Items	Loading	Source
Awareness	I am aware of open government data usage.	0.87	Adapted from (Saxena & Janssen, 2017; Weerakkody et al., 2017)
	I am aware of open government data policies.	0.85	
	I am aware of open government data licence.	0.89	
Value	Open government data is useful to my business.	0.90	Adapted from (Saxena & Janssen, 2017; Weerakkody et al., 2017)
	Open government data is useful in my daily life.	0.88	
	Open government data provides me with a lot of valuable information.	0.87	
	Open government data helps me to make decisions.	0.86	
Usability	Using open government data portal is easy for me.	0.91	Adapted from (Saxena & Janssen, 2017; Weerakkody et al., 2017)
	Open government data portal is clear and easy to understand.	0.87	
	I can easily find the data I need on the platform of OGD.	0.82	
	I find it easy to access and use OGD.	0.79	
Governmental support	I have the necessary support to use open government data portal.	0.78	Self-developed based on the qualitative data
	I have the promised support via open government data portal.	0.75	
	I get the information needed via open government data portal.	0.82	
Intention	I intend to use open government data.	0.86	Adapted from (Saxena & Janssen, 2017; Weerakkody et al., 2017)
	I will continue using open government data.	0.72	
	I am interested in using open government data.	0.76	

Table 7. Correlations, Cronbach's alpha (CA), composite reliability (CR), and average variance extracted (AVE)

Factors					Correlations			
	CA	CR	AVE	Awareness	Value	Usability	Governmental Support	Intention
Awareness	0.82	0.85	0.72	0.85				
Value	0.80	0.81	0.65	0.62	0.81			
Usability	0.83	0.89	0.75	0.67	0.56	0.87		
Governmental support	0.84	0.88	0.71	0.66	0.69	0.72	0.84	
Intention	0.85	0.84	0.72	0.55	0.51	0.68	0.57	0.85

Note: Square root of AVE shown in bold as the diagonal

OGD was an “adolescent” on course to become a “full-fledged adult,” its growth and usage levels would not fulfil their potential until there was full dependence between suppliers, intermediaries, and users. During the years since, governments around the world have been increasingly recognising the benefits of OGD and are beginning to roll out initiatives. However, adoption by private individuals and organisations remains relatively low. This raises the question of how take-up can be increased. The purpose of the present study was to explore the factors that affect or influence public readiness or intention to use OGD.

As a starting point in this study, four factors were identified that could have a significant impact on an individual’s intention to use open data. These factors were: (OGD) awareness, value, usability, and government support. A model was then constructed to test the hypothesis that each individual factor significantly impacts behavioural intention to use OGD. Unlike most studies to date (Khurshid et al.,

Figure 2. Results of structural model evaluation

Note: * $p < 0.01$

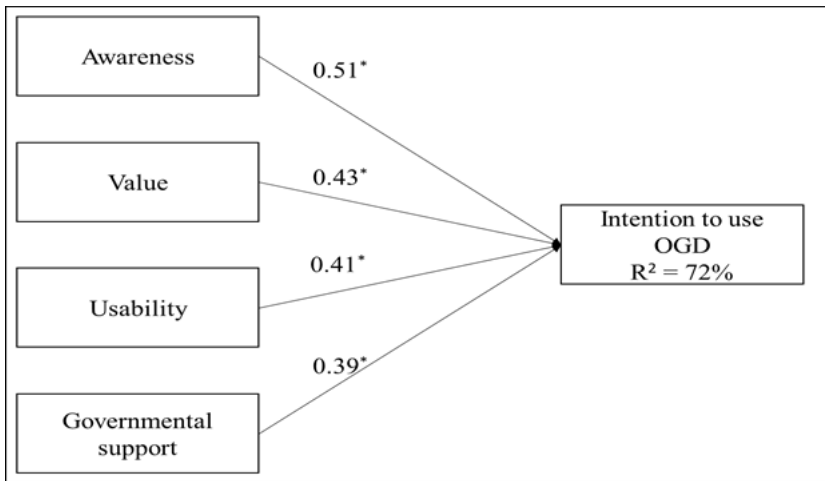


Table 8. Path coefficients and t-values for the whole sample

Hypothesis	Standardized Path Coefficient	t-Value	Support?
H1: Awareness → Intention to use OGD	0.51	5.9***	YES
H2: Value → Intention to use OGD	0.43	5.31***	YES
H3: Usability → Intention to use OGD	0.41	5.21***	YES
H4: Governmental support → Intention to use OGD	0.39	5.16***	YES

Note: ***: 0.001 significance

2018; Mallat et al., 2006; Ozaki, 2011; Schierz et al., 2010), the current study used a combination of face-to-face interviews, questionnaires, and relevant recent literature as the source of data, in order to gain more detailed and accurate insights into the critical factors that affect OGD adoption.

As pointed out by Khurshid et al. (2018), one of the identified factors in this study—OGD awareness—has been well-researched in recent years, and it is clear that awareness is growing among certain sections of society. A 2017 survey by Science et al. of 2,300 respondents showed that 82% were aware of open data, a result which reflects the findings of other studies. However, the samples of such studies are often comprised of industry experts and professionals. Research by Chokki et al. (2022) reported that few “ordinary” citizens are aware of the existence of OGD and that significantly more promotion is required to raise awareness at the citizen level. This study reflected these findings.

Another factor identified in this research is perceived value. The relationship between perceived value and intention to use OGD has not been widely researched, so it is interesting that the results of this study show clearly that perceived value has a real and positive impact on the intention of individuals to use OGD. This finding is consistent with the conclusions of the few earlier studies which have examined the impact of value on intention to use other technologies (Liaw & Huang, 2013; Purnawirawan et al., 2012). It is also consistent with recent studies, which have shown that users in specific sectors, such as academia and Operations and Supply Chain Management (OSCM), attach high value to OGD and, consequently, intend to adopt the technology (Khurshid et al., 2018).

It is also interesting that this study found evidence that the concept of “value” is increasingly associated, at a user level, with the generation of sustainable value. This supports the findings of

other research, such as a study by Jetzek et al. (2014), who argued that OGD can build sustainable value by encouraging transparency and empowering new ways of producing value in a sharing society, and a study by Koczanski and Sabou (2015), who found that OGD supports all three pillars of sustainability (economic, social, environmental) and that users are motivated by the sustainability implications of OGD.

However, the study also suggested that there is a strong correlation between perceived simplicity and perceived value. In other words, a system which is seen to be simple and easy to understand is more likely to be used. The implications for government and data providers, therefore, is clear: OGD portals must not present major challenges to users; they must be simple to access and easy to understand (Janssen et al., 2012; Nugroho et al., 2015). Governments must also ensure that the value of OGD is clear. Users should be guided toward the perception that OGD can not only help them achieve personal or business goals but can also improve government transparency and facilitate involvement in policy-making and other decisions that affect their quality of life (Janssen et al., 2012).

The third factor (OGD usability) was also shown by the study to have a positive impact on behavioural intention. This result is not only intuitively expected but is in line with the findings of many other studies on the relationship between usability and acceptance. The proven correlation between perceived usability and IT acceptance is just one example of this relationship (Igarria et al., 1997; Kassen, 2013; Kim et al., 2009). It is therefore clear that government departments that want to encourage user engagement with OGD must ensure that their systems require minimal technical skills to operate them. In fact, the significance of this finding extends considerably beyond OGD, as it can reasonably be extended to apply to other (digital) services. If public sector bodies want to address the (growing) lack of user engagement with other digital services, usability should be considered a high-priority item in the design strategy. Doing so will not only help to increase return on investment but will make continued innovation more viable. Further research is needed to provide more evidence for such an extrapolation of this study's findings. It is worth noting, however, that designing and implementing OGD portals which have high usability presents a major challenge for several reasons. One of these reasons is that increasing usability often requires a need to decrease complexity. Yet, as mentioned previously, open data can be inherently complex and, therefore, difficult to understand (Igarria et al., 1997; Kassen, 2013). However, these datasets are necessary for the development of many creative and innovative applications, such as improving supply chains (Kim et al., 2009) and designing tools that will benefit civic society (Kassen, 2013; Kim et al., 2009). Simplifying them may reduce their value in this regard.

Another factor which can influence user intention to use OGD is government support. The impact of higher government support has not been widely studied as a specific research topic, but it is known that user engagement (of other resources) increases in situations where high levels of technical and information support, as well as usage advice, are provided by governments and data providers. The critical importance of management and external support in encouraging the adoption of new technology applications has been demonstrated by a number of studies. Particularly pertinent to the aims of this study are the findings of Igarria et al. (1997), who deployed a technology acceptance model to investigate the effects of technical support on the intention to use the (then) relatively new concept of electronic human resources management (eHRM). It was found that support was a crucial factor in minimising fear of change, and maximising adoption, for eHRM as well as any technological innovation. One of the key findings of this study was that governmental support was also shown to be a strong indicator of behavioural intention to use OGD.

While the findings of this study support all four hypotheses, it is important to note that there are factors in the methodology that limit the generalisability of the conclusions. The technique for generating participants (snowballing), for example, has an inherent possibility of introducing bias, while the relatively narrow breadth of backgrounds and expertise of the participants could also limit the relevance of the results. The use of participants from only technical backgrounds could restrict perspectives, while the use of participants from a solely Saudi background could introduce elements

of socio-political bias. There is potential for a future study, which takes account of views from a broader range of participant backgrounds, to add to the findings of the current research.

CONCLUSION

Today, the concept of Open Government Data has been around for several years, and the governments of a growing number of countries are recognising the benefits of implementing OGD initiatives. However, while adoption levels vary from jurisdiction to jurisdiction, they remain relatively low. This influences users' intention to adopt OGD and the extent to which they use it on a continuous basis. In order to improve adoption and use, this project recruited Saudi residents and professionals as participants in a study of factors affecting user behaviours .

The first (qualitative) phase of the research identified four key parameters (awareness, usability, value, and governmental support) which could influence behaviour in an OGD context, while the second (quantitative) phase supported the hypotheses that all four of these factors have a significant and positive affect on intention to use the technology, in terms of the strength of influence, as well as the presence of some qualifying factors. User awareness of OGD, for example, is obviously a precondition of adoption, but the study also showed the importance of specific aspects of awareness (e.g., awareness and understanding of the relevant legislation).

Usability is another key influencer of behaviour, and the study showed that not only are many users unconvinced of ease-of-use, but many hold negative perceptions of OGD, having had poor experiences in the past. Whereas it is believed that the present study provides many valuable insights on OGD portal usability, it also has some limitations. It may not have enabled a full understanding of user attitudes and may limit the generalisability of the study's findings and conclusions. In order for findings to be more generalisable, future studies should employ a more varied pool of participants.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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