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# Factors Influencing Citizens' Intention to Use Open Government Data—A Case Study of Pakistan

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**Abstract:** Open government data (OGD) has gained much attention worldwide; however, there is still an increasing demand for exploring research from the perspective of its adoption and diffusion. Policymakers expect that OGD will be used on a large scale by the public, which will result in a range of benefits, such as: faith and trust in governments, innovation and development, and participatory governance. However, not much is known about which factors influence the citizens' intention to use OGD. Therefore, this research aims at empirically investigating the factors that influence citizens' intention to use OGD in a developing country using information systems theory. Improved knowledge and understanding of the influencing factors can assist policymakers in determining which policy initiatives they can take to increase the intention to widely use OGD. Upon conducting a survey and performing analysis, findings reveal that perceived usefulness, social approval, and enjoyment positively influences intention, whereas voluntariness of use negatively influences OGD use. Further, perceived usefulness is significantly affected by perceived ease of use, and OGD use is significantly affected by OGD use intention. However, surprisingly, the intention to use OGD is not significantly affected by perceived ease of use. The policymakers suggest increasing the intention to use OGD by considering significant factors.

**Keywords:** open data; open government data; determinants; intention to use; adoption; developing country



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## 1. Introduction

Open data is an idea or policy that allows the publication of nonperson-specific data on web portals for future advances. The data are then freely accessible by all the stakeholders through the relevant technologies [1,2]. Scholars argue that the public service stakeholders are some of the largest creators, collectors, and users of public data [3,4]. The data from these governmental entities are argued to be set free provided that it will not breach any data protection law or other regulations [5]. Thus, all the government-related data, such as budget, population, or geographical, owned by public administrations indirectly, such as disaster and transportation, and made open to the public are called open government data (OGD) [6].

OGD enables value creation not only by primary but also by secondary stakeholders. Value in the OGD context for secondary actors, such as citizens, means it allows for a better

understanding of government activities directly affecting citizens, better decision-making in matters of routine life, and creating and developing new things by analyzing data after performing extraction and transformation [7,8]. For instance, they can decide to purchase houses in societies, particularly in private housing societies, by checking their status as approved, not approved, and illegal or under-process [9]. They can also check statistics about the availability or presence of teachers and students in schools, assess the literacy rate, and observe readily available geo-spatial data for building trust in public investments [9]. Further, the citizens can write scholarly articles, make new reporting, and link different datasets available online [2]. Overall, OGD can add value by offering opportunities of data-driven innovations through the availability and access of data provided by public entities [10].

Policymakers expect that OGD will be adopted widely by the citizens, resulting in a series of advantages described above. Indeed, although developed countries are investing in publicizing government data to the public openly and establishing technical standards, there exist several barriers on the citizens' side in extracting value. Therefore, if the government wants citizens to widely use OGD, the government needs to understand under which conditions citizens would largely use OGD. Obtaining an improved knowledge and understanding of the conditions or barriers (in terms of factors) of intention to use OGD can contribute to better exploitation of its full potential and recognize its benefits. Therefore, this research makes an effort to fill up knowledge and practice gaps by empirically investigating the influencing factors of citizens' intention to use OGD. Considering the potential benefits of OGD discussed above, public entities would expect that citizens would widely use OGD. However, there is a lack of understanding about the factors influencing the adoption of open government data by the citizens in developing countries, particularly in Pakistan. Understanding the influential factors is indispensable to escalating OGD adoption on a large scale. Earlier studies accounted for factors having an influence on OGD platforms [11,12] and technologies [2], whereas this study examines the factors from the OGD use perspective in the developing country. Moreover, this study took the factors from the original TAM and extended them. Although TAM is not fully and completely developed for measuring intention to use OGD, it has been used and modified according to the studied context.

This study contains six (6) sections. In Section 2, a conceptual background, containing a literature review and selection of theory after explaining several theoretical models, is provided. In Section 3, the research model is developed along with hypotheses. In Section 4, a method to conduct this study is explained. A comprehensive description of results and a decision on the hypothesis is presented in Section 5. Discussion on results, implications (theoretically and practically), limitations, and directions for further research in the future are opened in Section 6, whereas the study is concluded in Section 7.

## 2. Conceptual Background

### 2.1. OGD Initiative and Citizens' Intention to Use

In the past few decades, governments of developed and developing economies launched open data initiatives to access and use their data by the public and organizations to generate value from the published data. The United States (U.S.), being the leader in opening data, started the initiative in the form of launching the data.gov portal in 2009. Following the U.S. federal government initiative, 94 nations developed at least one open data portal. In this respect, a few studies have investigated the influencing factors that affect the individuals' or organizations' intention to use OGD (Table 1). Our research focuses on empirical studies only in OGD's use intention by the individuals or organizations. It should be noted that other studies used similar notions, such as usability [12], acceptance [2,10], engagement [13], continuance intention [14], and adoption [15,16].

**Table 1.** A brief overview of studies on OGD intention to use.

Study	Year	Type, Method	Summary
Wirtz, Weyerer [17]	2017	Empirical, Quantitative Survey	Identified the factors of OGD's usage intention by the citizens in Germany.
Talukder, Shen [18]	2019		Proposed and validated OGD acceptance and use model in Bangladesh.
Wirtz, Weyerer [19]	2017		Examined word-of-mouth intention related to OGD among Germans.
Purwanto, Zuiderwijk [20]	2020		Examined citizens' trust in OGD using three quality constructs (information, system, and service) of IS Success model.
Wang and Lo [15]	2019		Developed an understanding of factors of OGD adoption from the user innovators' perspective.
Wang [16]	2020		Firm-level OGD adoption factors were empirically investigated in Taiwan.
Harper and Kim [21]	2017		Examined different attitude factors and open data badge adoption among psychologists in U.S. research institutions.
Islam, Talukder [14]	2021		Conducted an empirical study of continuance usage intention of 370 respondents in Bangladesh.
Srimuang, Cooharajanane [22]	2017		Studied the usage intention of OGD assessment application by the public sector organizations in Thailand employing TAM.
Khurshid, Zakaria [23]	2018		Conducted a study on OGD usability from the academicians' perspective in Pakistan.
Fitriani, Hidayanto [24]	2017		Users of open data websites of the Indonesian government.
Zuiderwijk and Cligge [25]	2016		Accomplished the purpose of investigating continuance use factors of open data infrastructures by researchers in The Netherlands.
Weerakkody, Irani [12]	2017		Address the gap of examining factors that affect the behavioral intentions of OSCM users towards open data in the United Kingdom (UK).
Weerakkody, Kapoor [10]	2017	Carried out an empirical investigation on OGD usability from the citizens' perspective in the UK.	
Souza, d'Angelo [26]	2022	Studied the effects of eight factors on Brazilian citizens' attitudes for the open government as well as for Government 2.0.	

The behavioral intention of citizens to use OGD has been investigated by Talukder and Shen [18] in the Bangladesh context. The two theories are employed to develop theoretical model. These theories include UTAUT and IS success models. A total number of ten hypotheses have been developed using these models. The factors that are included in the proposed theoretical model are information quality and system quality from the IS success model, whereas performance expectancy (PE), effort expectancy (EE), social influence (SI), and facilitating conditions (FC) are from the UTAUT model. The results demonstrate that all the hypotheses are supported except one, which is facilitating conditions → behavioral intention to use OGD. This study has only tested the linear associations between exogenous and endogenous variables using the PLS technique in SmartPLS.

Three factors (perceived usefulness, perceived ease of use, and social approval) are examined to address the gap of analyzing factors that affect the behavioral intention of OSCM users towards using open data [10]. They discussed the effect of these three variables on behavioral intention (BI) to use open data. They found OSCM users' doubts about transparency in the UK's open data and corruption in government functions. Their study found that all three factors, including PU, PEoU, and SA, positively and significantly influenced BI to use open data. Moreover, they also reveal that PEoU does also have an impact on the PU of using open data.

Wirtz and Weyerer [19] developed the model integrating the two theories: the Technology Acceptance Model (TAM) and the motivation theory. A total number of five hypotheses were tested. The variables that are included in the model are (1) ease of use (EoU), (2) usefulness, (3) Internet competence, (4) intrinsic motivation, and (5) extrinsic motivation. In their study, usefulness is considered as a mediating variable in this study [19]. Moreover,

different biases in result analyses have been well-catered and explained, such as social desirability bias, common source bias, late response bias, and non-responsive bias.

Weerakkody and Irani [25] proposed a framework for evaluating the open data platforms' usability using the DOI theory from the citizens' perspective. First, a range of varied benefits of open data use is elaborated, including the growth of the economy, the interaction of citizens with government, reduction in costs and improving efficiencies, improvement in quality of datasets, and stimulating the developers to contribute to innovations. Then different challenges of open data use are explained, including an increase in the public interest, cost occurring in releasing data, legislation, data ownership issues, privacy violation, and data quality challenges. A total number of eight (8) factors have been combined into four categories, including (1) stereotype perceptions (SA and visibility), (2) open data usability (result demonstrability (RD) and compatibility), (3) functional value (PU and EoU), and (4) security concerns (trust and risk) [11].

## 2.2. Technology Acceptance Model (TAM) Frameworks and Models Related to OGD

Acceptance and usage of new technology are referred to as technology adoption. Adoption research focuses on identifying, forecasting, and determining the factors that influence adoption at organizational and individual levels. The creation of frameworks and models to measure the usage and effect of technology acceptance criteria was aided by such research. Among others, five (5) information system theories are popular and widely used to study the individual's intention to adopt innovative IT systems: Theory of Reasoned Action (TRA) [27], Theory of Planned Behavior (TPB) [28], Technology Acceptance Model (TAM) [29], Unified Theory of Acceptance and Use of Technology (UTAUT) [30], and Diffusion of Innovation (DOI) [31].

The TPB states that a person's willingness to do something is determined by their attitude toward the action and perceived behavioral control and subjective norms. The TPB is a psychological model that can be used to study behavior. According to the study, individuals have improved control over habits that involve less work and resources than activities that demand more effort. Perceived behavioral control is used as a metaphor to show how difficult or easy it is to do a specific activity [28]. The UTAUT combines eight models to predict behavioral intents to utilize technology, including TAM, TRA, and a Combined TAM and DOI. It is also a popular theory, as it incorporates components from other theories. Venkatesh et al. [15] have altered it because it has several flaws. FC, SI, PI, EE, BI, and use behavior are the seven constructs of this theory. Rogers and York [9] developed the DOI. The DOI is based on the idea that innovation diffusion factors are innovation qualities. Observability, complexity, compatibility, trialability, and relative advantage are among the theory's constructs [31]. Fishbein and Ajzen [12] developed the TRA, which is a social theory used in a variety of settings. The concept is used to discover correlations between attitude and behavior in human activity. It assesses a person's behavior about their earlier intentions and attitudes. The attitude toward the act of behavior and the subject norm is a TRA construct. Behavioral intentions are influenced by attitude and behavior, while actual behavior is influenced by behavioral intentions [12].

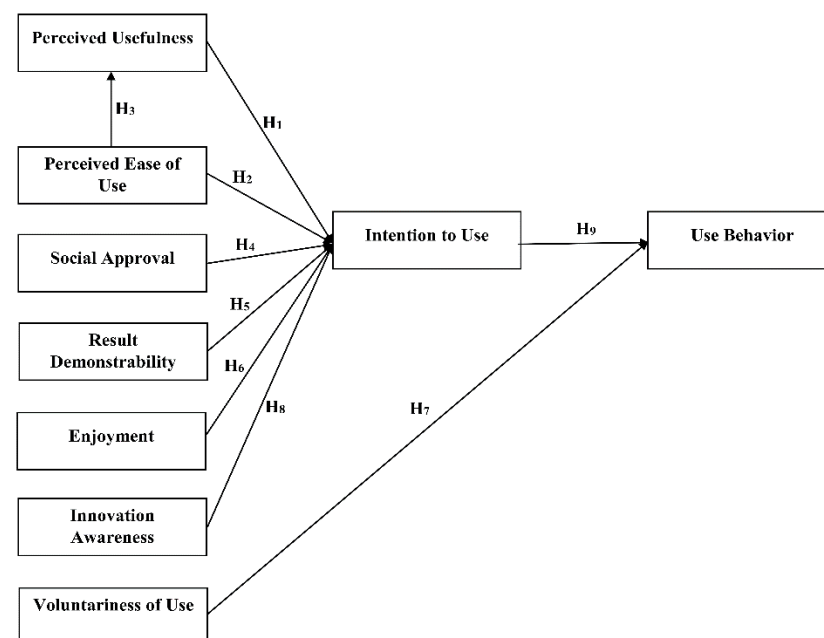
However, the choice to employ TAM for this study is determined by the pieces of evidence that (1) TAM has made notable contributions in satisfactorily getting knowledge and managing technological innovation using two significant factors, which are PU and PEoU, (2) it explains between 40% to 60% variance in the behavioral intention, (3) several other information system theories have been developed with the help of TAM and proliferated in the IS research including, for example, the UTAUT [30] and the UMEGA [32], since the first publication of TAM, (4) the newly developed models adopting or customizing the TAM's constructs or their underlying attributes for measuring technology adoption [10], and (5) extensive empirical pieces of evidence of the TAM in marketing research. As of February 2022, Google Scholars listed over 65,600 citations of TAM, (6) past scholarships have demonstrated TAM to be a superior model over other models in the OGD context as

well—for instance, in studies conducted by Wirtz and Weyerer [19], Wirtz and Weyerer [17], Weerakkody and Kapoor [10], Fitriani and Hidayanto [24], and Jurisch and Kautz [33].

There is extensive support in literature to use constructs of TAM in measuring essential solutions that attract consumers' acceptance and use based on effortless use of new technological innovation and concerning its usefulness. However, the most miniature research model in quantitatively measuring open data usability was explored by Weerakkody and Irani [10] by adding one variable, social approval. In addition, it is suggested that additional constructs must also be analyzed to determine their effects on OGD adoption [10,12] because it is constrained by the fact that it considers few variables as determinants of adopting new technology. Therefore, TAM has been extended to a reasonable extent in this study, including five variables: innovation awareness, result demonstrability, social approval, enjoyment, and voluntariness of use.

### 3. Research Model and Hypothesis Development

In the information systems literature, innovation is referred to as all ideas, objects, or practices that are viewed as new by an individual or other unit of adoption [31]. In contrast, adoption of an innovation is referred to as whether a person or an organization is an adopter or a non-adopter of that innovation [34]. For academic and practical reasons, it is useful to understand what drives the adoption of open government data by various stakeholders, including citizens. We view adoption as the intention to use OGD, where higher levels of OGD use intention can lead to OGD usage [35]. Davis [8] developed TAM, the most extensively used acceptance model. It discusses how attitude, intention, and behavior play a part in deciding whether or not to adopt or reject innovations. External influences, according to TAM, impact PeoU, PU, and attitude. BI is influenced by one's own attitude. Actual usage is influenced by behavioral intention, as shown in Figure 1. The TAM constructs are explained in subsections.



**Figure 1.** Research model.

#### 3.1. Perceived Usefulness (PU)

Usefulness refers to the extent to which users think that using an information technology system enhances their performance [19,29]. In the context of OGD, perception is assessed in evaluating the extent to which individuals consider the available raw information online as public government data to be comparatively better than identical material accessible through other platforms, such as visiting offices personally. Users

prefer to examine the advantages of a new solution seriously by using that solution or new knowledge. The eventual rate of most invention adoptions is known to be perceived to be useful [10]. This characteristic has effectively measured BI to use or adopt various technologies (such as big data acceptance [36], the measurement of citizens' satisfaction through e-government [37], and so on) according to the literature. Positive assessments of open government information's usefulness are rare unless people see a specific practical benefit in it. This study suggests that perceived utility has a significant and positive influence on individuals' intentions to use publicly available data, consistent with the TAM model's theoretical guidelines. As a result, the following hypothesis was proposed:

**Hypothesis 1 (H1).** *Perceived usefulness will positively affect the intention to use OGD.*

### 3.2. Perceived Ease of Use (PEoU)

Ease of use refers to the degree of effort that users believe is required to be able to use the technology [17,38]. Even if an application may be believed as useful by the actual and potential users, at the same time, the available applications may be believed to be hard to use because performance benefits attained by their usage cannot be more significant than the efforts incurred of its usage [17,38]. The release of datasets is in a large quantity and different formats [39]. Thus, it becomes sometimes hard to discover real values from the data [40]. As data are published by different organizations complying with varied technological infrastructures, citizens can find difficulty in locating OGD datasets. It may also become difficult for the interested parties to download datasets from OGD platforms if clear definitions or suggested interpretations are not present [40]. The participation of the public in different policy-making and other ordinary governmental operations is projected to be enhanced through simple OGD platforms with easily accessible information [41–43].

Manipulator knowledge about a product or service is frequently recognized to determine the level of simplicity associated with its use by individuals. Rogers [31] emphasized that the easier a technological innovation is to grasp and implement, the quicker the target consumers would embrace it. While numerous researchers have demonstrated that this feature has a favorable effect on BI (for instance, [10,24]), the link between PeoU and PU has also been extremely important. Many studies, including [35,44], show that easy service usage is typically considered an important benefit of this service, increasing its overall usefulness. This research examines the ease of use of the OGD platform in the optimal user experience element. The literature indicates that citizens and organizations, based on their unfair experience with the OGD platform, refuse to rely on open data from the public sector; for example, the failure of government to regularly actualize data on these sites; and accessing available government data [45]. Martin [46] finds that OGD platforms are not user-friendly, resulting in a small user base. Based on the above, two hypotheses were proposed:

**Hypothesis 2 (H2).** *Perceived ease of using OGD will positively affect the intention to use OGD.*

**Hypothesis 3 (H3).** *Perceived ease of using OGD will positively affect perceived usefulness.*

### 3.3. Social Approval (SA)

Social approval often refers to the degree to which members of a social system approve the usage of a specific product, system, or service without having monetary/non-financial rewards or gains [10,47]. Applying innovations when a person bears social or economic losses will prevent other users from adopting those innovations, as the people are interconnected in a social system [2]. Therefore, when listening to positive words from others, a member within a social group will get encouragement towards acceptance and use of that innovation. Thus, it is deemed necessary to examine if the use behavior of OGD is independent of the approval of members in a social system. Therefore, in this study, social approval refers to the degree to which the members of social system approve or recommend to others the usage of a certain product, service, or an innovation.

OGD in its raw format may create difficulties for the users in accurately interpreting the results [48]. The possibilities of human errors also exist while linking one dataset to another dataset to create value [49]. Such anxieties can lead to social circle members not recommending the OGD usage. However, early adopters who have tried and tested OGD or have a good experience in using OGD do have the potential to recommend its usefulness [10]. Such approval will support, encourage, and influence citizens to accept and use OGD. Thus, these facts have led us to formulate the below hypothesis:

**Hypothesis 4 (H4).** *Social approval will positively affect the intention to use OGD.*

#### 3.4. Result Demonstrability (RD)

Result demonstrability is conceptualized as the tangibility of using an innovation [50,51]. The more discernable or apparent the advantages of innovation are, the more there is a possibility of adopting that innovation [52]. A user's decision to use open data is influenced by their perception of achieving apparent and tangible results by using open data innovation. For instance, healthcare professionals track individuals' health patterns or predict the transmission of a disease and its potential cures. Thus, the OGD initiative cannot only disseminate data itself openly but also provide demonstrations of uses of data, such as case studies of data usage on YouTube or research articles representing the data reuse examples [53]. Such practical and palpable exemplifications of OGD use can shape citizens' intention to use it.

Citizens perceive OGD as useful if there is no variation between its usage and the apparent positive results. In this context, a study conducted by Zuiderwijk and Shinde [54] has recognized the demonstration of data use-value as an important driver of OGD use behavior. In another study, result demonstrability is hypothesized [11], empirically investigated, and found an insignificant predictor of OGD usability [23]. Accordingly, the following hypothesis is proposed:

**Hypothesis 5 (H5).** *Result demonstrability will positively affect the intention to use OGD.*

#### 3.5. Enjoyment (ENJ)

Perceived enjoyment is defined as the extent to which "the activity of using a specific system is perceived to be enjoyable in its own right, aside from any performance consequences resulting from system use" [35]. With the increase of pleasant experiences in using technology, the citizens are more attracted; otherwise, the technology usage will be diminished. We assert that the technical characteristics of technology and the individuals' intrinsic motivations, as the actions are also committed for enjoyment, play an important role in the acceptance and adoption of technologies. The assertion is made based on the study of Venkatesh and Thong [55], where consumers look for innate gratification while using certain technologies. Thus, users' perceptions about enjoyment with the technology influence and shape their behavioral intention to use that technology.

Similarly, the citizens intend to use OGD based on their intrinsic motivations, as it has appeared as a strong causal determinant of OGD use intention [19]. Personal drivers are also pointed out to use open data [54], as this study has themed that fun to explore data by the researchers is an important driver to use open research data. Thus, the following hypothesis has been formulated:

**Hypothesis 6 (H6).** *Enjoyment will positively affect the intention to use OGD.*

#### 3.6. Voluntariness of Use (VOL)

Voluntariness of use refers to "the degree to which use of the innovation is perceived as being voluntary, or of free will" [30,51]. The construct voluntariness has been added to the model, which was not validated and tested in the original TAM [38], TAM2 [50], and TAM3 [35]. However, its effect has been observed as a moderator between social

influence and behavioral intention in the UTAUT [30]. Moreover, in the individual adoption models, this construct was also not included in the UTAUT [30], UMEGA [32], TRA [27], and TPB [28] as an independent variable. However, voluntariness has been empirically examined to affect behavioral intention to use OGD in the study [23] using DOI theory and in [2,56] using UTAUT and found significant. However, we hypothesized that voluntariness of use directly affects OGD usage. The idea behind voluntariness is that citizens will be using OGD more and more by feeling or observing any pressure from the internal or external environment to create value. Thus, the more voluntarily a person uses publicly available data, the less their use of that data.

Further, the use of OGD may be less required for some individuals, while it may be more required for others. For instance, it may be mandatory for data science graduates to use openly available datasets to develop algorithms, perform statistical analysis, or use visualization. The obligatory use of data may increase individuals' actual use of OGD [2]. In the result, the premises lead to the formulation of the below hypothesis:

**Hypothesis 7 (H7).** *Voluntariness of use will have a negative effect on OGD usage.*

### 3.7. Innovation Awareness (AW)

Through awareness, innovation users develop subjective thoughts about their intentions towards specific behavior [57]. Users' awareness about the existence of innovation opens the doors to recognizing and realizing its benefits. Moreover, awareness also encourages the public engagement process with the government for better policy formulation, administration, and service delivery [58]. In this study, awareness is operationalized with two dimensions, including users' awareness of the Open Government Data portal that they use for their benefits daily [37,59] and awareness about Open Government Data policies of the Government of Pakistan. Therefore, in this study, innovation awareness is defined as "the degree to which an individual is aware of the existence of innovation and related policies".

Public use OGD when they are aware of the existence of the OGD platform and related Right of Access to Information Act [60] because data and information are being released on portals by the governments under the RTI Act. Knowledge about the OGD policy reveals the policy of opened and closed datasets, as all the data cannot be opened for security reasons [60]. Furthermore, users can also know the stated benefits by reading the policy document.

No study in the OGD domain, to the best of our knowledge, has studied innovation awareness as an independent variable. However, evidence is there where awareness is used as an independent variable in other domains, such as [61,62]. Weerakkody and Irani [12] conducted a study on citizens' adoption of open data and took an overview of their level of awareness in the UK context as a categorical variable. Javaid and Arfeen [37] included awareness in terms of e-readiness in the e-government context. Rehman and Kamal [59] included awareness as a continuous variable and found it significant to influence an e-government transaction adoption. Herman and Yee-Lee [63] indicated that awareness positively influences users' intention to use the mobile government service as a moderator. Pugh [62] also stated awareness as a moderator in person-to-person payment adoption. Given the facts and evidence, we formulate innovation awareness to influence the perceived ease of using open government data.

**Hypothesis 8 (H8).** *Innovation awareness will positively affect the intention to use OGD.*

### 3.8. Intention to Use (BI)

According to the TPB theory presented by Ajzen [28], behavioral intention is an imperative indication to determine an individual's likelihood or willingness to execute certain behavior and is treated as an instantaneous precursor of the following action of behavior. Current OGD research also highlights that this variable is a significant factor in



positively influencing the researcher's action to open research datasets [64]. However, its effect on behavior has not been observed in other OGD related studies, such as a study that determines the influencing factors of big open data [10] and determining the acceptance and use predictors of open data technologies [2]. Thus, intention to use has been less empirically investigated in OGD studies to observe its effect on OGD adoption or use behavior, even though theorists modeled intention as the significant predecessor of action or behavior, such as technology acceptance models, including TPB, TAM, or UTAUT. Although some researchers argue that measuring the actual usage of a technology or system is problematic because it is difficult to define, we objectively measure OGD use behavior based on daily use and frequency of use [65]. Further, based on the premise that the higher the intention of citizens toward using OGD, the more they will be using open government data, the following hypothesis has been formulated:

**Hypothesis 9 (H9).** *The citizens' use intention will positively affect the use behavior of OGD.*

#### 4. Research Methodology

The OGD initiative and citizens of Pakistan (as population) are selected for validating the developed theoretical model. Driven by the Federal and Provincial Right to Information Acts, different OGD initiatives are launched, such as the Punjab Open Data Portal, Open Data Pakistan, Open Data Initiative (Government of Punjab), National Spatial Data Infrastructure Pakistan [9,66,67], and National Statistical System [68]. To date, structured and non-structured data in small quantities have been provided on these governmental portals. Unfortunately, a centralized portal from the Government of Pakistan (GoP), similarly to the OGD initiative of the USA and the UK, has not been developed thus far. The context of Pakistan is appropriate because it is considered one of the early cases of OGD. Pakistan has declared OGD policy publicly with a vision of free availability of data and information under Pakistan's RATI Act, 2013 [69].

Moreover, Pakistan also joined the international Open Government Partnership in 2016 to promote transparency, innovation, public participation in governance, reduce corruption, and achieve social impacts [70,71]. The OGD policy is further matured and updated as Pakistan's RATI Act, 2017 [60]. Thus, government legislation on the rights of access to public sector information led the public sector bodies to open their datasets on web portals. OGD portals for citizens enabled public engagement in government policy-making, innovation, and better decision making through the use of government datasets. However, the factors influencing the intention to use OGD by the citizens of Pakistan have been less explored.

We used the partial least squares (PLS) method of variance-based structure equation modeling (VB-SEM) to evaluate the measurement and a structural model. For this purpose, we utilized SmartPLS 3.3.3 statistical program for data analysis. We also used the IBM SPSS Statistics (Version 24) for descriptive analysis and analysis of missing values [72]. The gathered data for response rate, missing cases, and any outliers were reviewed before performing SEM. A random test (MCAR) was performed to detect the missing instances, potential outliers, and the nature of the missing cases to ensure their effective performance.

Considering the main objective of this research, a reliable and valid measurement was required to evaluate the proposed hypotheses and the relationship among independent and dependent variables. A survey research method is designed to produce statistical estimates of the studied population. A closed-ended survey questionnaire was created to evaluate the study issue by modifying scales from prior studies. A close-ended questionnaire was adopted (see Appendix A), as this type of questionnaire contains answer choices, and respondents can only select from the available options corresponding to each question. The questionnaire items were constructed on earlier research in which they were already utilized and assessed. The items of innovation awareness and behavioral intention were taken from the study conducted by Weerakkody and Irani [12], items of PU, PEoU, and SA from Weerakkody and Kapoor [10], items of voluntariness of use from Zuiderwijk and

Janssen [2], and items of result demonstrability from Khurshid and Zakaria [23], whereas items and scale of usage behavior were taken from Tarhini and Hone [73] and Igbaria and Maragahh [65]. The scale of usage behavior was specifically adopted considering the studies of Tarhini and Hone [73], and Igbaria and Maragahh [65]; we intended to assess the outcome variable objectively, as the self-reported surveys may suffer from self-assessment bias [3]. A survey was conducted to identify the variables impacting the intention to use OGD. The procedure of collecting data is not outsourced, but the data were obtained exclusively through an online questionnaire. A simple random sampling technique was applied to collect the data from the citizens. This questionnaire questioned whether the respondents were OGD users. This was a primary dichotomous question. The remaining of the questionnaire could only be continued by the responders replying 'yes'. A total of 600 questionnaires were distributed out of which 267 respondents attempted to fill in the questionnaire. Out of 267, 127 responses were deleted due to missing values. A total of 8 questionnaires were further deleted since we found patterns in responses. Thus, the total number of valid questionnaires was 132, bearing a response rate of 22%.

All constructs had at least three questions except awareness and OGD use constructs, and the citizens were asked to indicate their degree of agreement for each question. All the constructs, including AW, PU, PEoU, SA, ENJ, VOL, RD, and BI, were measured on a seven-point Likert scale, ranging from extremely disagree to extremely agree. In contrast, the usage behavior (UB) was assessed in the six-point Likert scale considering the studies conducted outside the domain of OGD, as the dependent variable was measured objectively to reflect citizens' actual participation. Before starting the survey, citizens were given a brief introduction to OGD and conveyed the purpose of the study. In addition, examples of OGD were presented, including Punjab Open Data Portal (<http://open.punjab.gov.pk/>, accessed on 1 March 2018), Open Data Pakistan (<https://opendata.com.pk>, accessed on 14 May 2020), Open Data Initiative, Government of Punjab (<http://odi.itu.edu.pk/>, accessed on 1 March 2018), and National Spatial Data Infrastructure Pakistan (<http://nsdi.gov.pk>, accessed on 19 July 2019).

After completing the process of determining measures, data for each variable in the formulated hypotheses were obtained from the citizens of Pakistan. However, the data collection process did not go directly; instead, the pilot study was performed first, according to the recommendation of Zikmund and Babin [74]. The pilot study was conducted to get a clear picture of the understanding of questions by the citizens and to remove the discrepancies in the questionnaire items. The data were vital and required for the data analysis stage. Without having the data, the data analysis stage could not be completed. The pilot study allowed us to conduct further data collection and analysis after meeting threshold values of consistencies and validities of the instrument, according to the guidelines of Hair and Hult [75].

## 5. Data Analysis and Results

A total number of 140 respondents filled out the questionnaire containing all items. However, 132 cases (Supplementary Materials) out of 140 were declared as 'free of missing values'. The filtered data were checked for distribution, whether normal or non-normal. A standard test for normality is to run descriptive statistics to get Skewness and Kurtosis. The range was set to +2 to -2 for Skewness, whereas the range was set to +3 to -3 for Kurtosis. All items for the attributes showed Skewness and Kurtosis values within the range [76,77]. Data analysis was performed after removing missing data values, checking for outliers, and observing for normal distribution of data. However, before performing data analysis and finding significance and non-significance, participants' different characteristics were analyzed.

### 5.1. Demographics

There were 33 female and 99 male participants who filled out the questionnaire. Concerning their age distribution, nine participants belonged to the 18–24 age group, and

55 were falling within the 25–34 years and 35–44 years of age group. A major chunk of participants was well qualified, as the number of graduates was 91 and undergraduates were 38. All the demographics of the respondents are presented in Table 2.

**Table 2.** Demographics of the respondents.

Categories	Values	Frequency	Percent
Gender	Female	33	25.00
	Male	99	75.00
Age in Years	18 to 24	09	6.80
	25 to 34	55	41.70
	35 to 44	55	41.70
	45 to 54	08	6.10
	55 to 64	05	3.80
	65 to 74	00	00
	Above 75 years	00	00
Education	Diploma/Intermediate	01	0.80
	Graduation	15	11.4
	Masters	23	17.4
	MS/MPhil	43	32.6
	PhD	48	36.4
	Other	02	1.5

### 5.2. Measurement Model

We assessed all the constructs' reliability, convergent validity, and discriminant validity. Further, we evaluated construct reliability by checking whether the construct composite reliability and indicator loadings were above the threshold of 0.71. The construct reliability of PEoU is 0.675, and the VOL is 0.649, near the suggested threshold value of 0.71. The constructs are retained because they do not affect the AVE and composite reliability [75]. The composite reliabilities of each of the constructs fall between 0.838 and 0.933. The indicator loadings range from 0.701 to 0.939 (Table 3).

**Table 3.** Reliability and validities of constructs.

Constructs	Item Code	Factor Loadings	Cronbach's Alpha	Composite Reliability	AVE
Perceived usefulness	PU1	0.893	0.882	0.927	0.810
	PU2	0.920			
	PU3	0.887			
Perceived ease of use	PEoU1	0.896	0.675	0.860	0.753
	PEoU2 *	−0.195			
	PEoU3	0.839			
Social approval	SA1	0.806	0.829	0.897	0.739
	SA2	0.869			
	SA3	0.901			
Result demonstrability	RD1	0.701	0.767	0.863	0.675
	RD2	0.749			
	RD3	0.806			
	RD4 *	−0.458			
Enjoyment	ENJ1	0.914	0.893	0.933	0.823
	ENJ2	0.911			
	ENJ3	0.897			
Voluntariness of use	VOL1	−0.029	0.649	0.838	0.724
	VOL2	0.753			
	VOL3	0.939			

**Table 3.** *Cont.*

Constructs	Item Code	Factor Loadings	Cronbach's Alpha	Composite Reliability	AVE
Innovation awareness	AW1	0.910	0.718	0.876	0.778
	AW2	0.853			
Intention to use	BI1	0.751	0.798	0.883	0.717
	BI2 *	−0.109			
	BI3	0.908			
	BI4	0.873			
Use behavior	UB1	0.932	0.790	0.904	0.824
	UB2	0.884			

\* Items removed.

There are three criteria to test the convergent validity of the constructs. These criteria include Fornell-Larcker, cross-loadings, and Heterotrait-Monotrait Ratio (HTMT). In this study, instead of the first two criteria, a third criterion named HTMT has been used. Table 4 presents the evaluation results for discriminant validity [75]. This test does not detect any anomalies. Overall, all the criteria, namely factor loadings, Cronbach's Alpha, composite reliability, average variance extracted, and discriminant validity using HTMT, are found within acceptable limits, which leads to further testing of the hypothesis.

**Table 4.** Discriminant validity (HTMT).

Constructs	AW	BI	ENJ	PEoU	PU	RD	SA	UB
BI	0.375							
ENJ	0.330	0.510						
PEoU	0.848	0.610	0.726					
PU	0.575	0.630	0.507	0.769				
RD	0.430	0.451	0.619	0.880	0.514			
SA	0.605	0.585	0.546	0.765	0.700	0.628		
UB	0.630	0.264	0.285	0.611	0.465	0.362	0.522	
VOL	0.283	0.062	0.283	0.051	0.113	0.311	0.219	0.285

### 5.3. Structural Model

First, the TAM model is ultimately observed, that is, (1) the effect of PU on BI and onward UB, (2) the effect of PEoU on BI and onward UB, (3) the effect of PEoU on PU and onward BI. In the TAM model, PU serves as a mediating role between the relationship of PEoU and BI. The results show that BI is influenced by PEoU through PU, whereas PU influences UB through BI. Thus, the results validate the TAM model. Table 5 shows specific indirect effects of the TAM model.

**Table 5.** Specific indirect effects.

Paths	Path Coefficient	Standard Deviation	t-Statistics	p Values	R <sup>2</sup>
PEoU -> PU -> BI	0.242	0.057	4.213	0.000	
PEoU -> PU -> BI -> UB	0.054	0.024	2.280	0.011	
PEoU -> BI -> UB	0.047	0.027	1.726	0.042	
PU -> BI -> UB	0.090	0.037	2.458	0.007	
PU		0.072	4.820	0.000	0.359
BI		0.089	3.544	0.000	0.308
UB		0.032	1.504	0.067	0.050

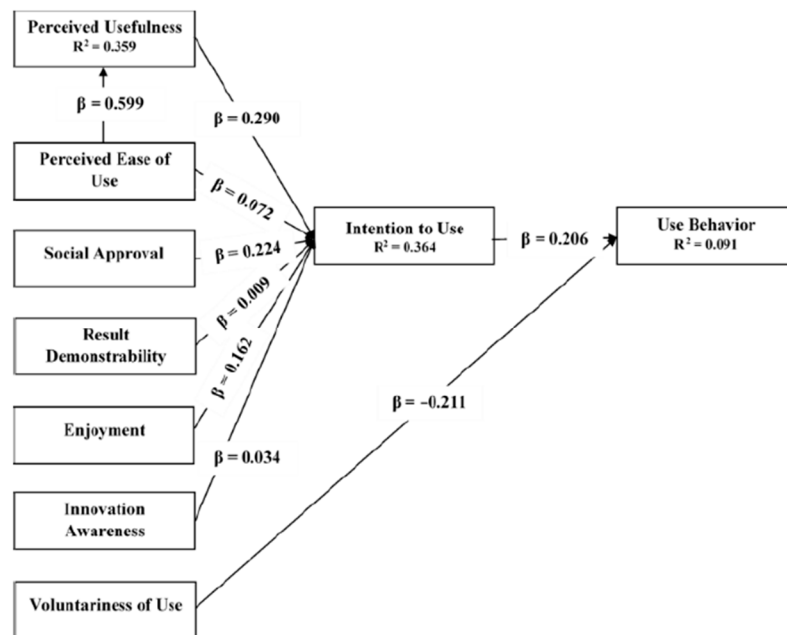
Further, after measuring reliabilities and validities in the first phase of SEM using SmartPLS 3.3.3, hypotheses are tested by evaluating the structural model and employing the bootstrapping technique on 5000 samples. There are nine (9) hypotheses in this study to evaluate the influencing factors of OGD. We find that six (6) out of nine (9) hypotheses

are accepted, including H1 (relationship between PU and BI), H3 (relationship between PEOU and PU), H4 (relationship between SA and BI), H6 (relationship between ENJ and BI), H7 (relationship between VOL and UB), and H9 (relationship between BI and UB). On the contrary, three (3) hypotheses are not accepted, including H2 (relationship between PEOU and BI), H5 (relationship between RD and BI), and H8 (relationship between AW and BI). Table 6 depicts complete results, such as path coefficients, *p*-values, and remarks on the hypothesis, whether it is accepted or not. A *p*-value of less than 0.05 represents that a hypothesis is accepted, otherwise it is not accepted. Further, the complete model is presented in Figure 2.

**Table 6.** Path coefficients and decision on hypothesis.

Paths	Path Coefficient	Standard Deviation	<i>t</i> -Statistics	<i>p</i> Values	Remarks
H1: PU -> BI	0.290	0.103	2.808	0.002	Accepted
H2: PEOU -> BI	0.072	0.122	0.587	0.279	Not-accepted
H3: PEOU -> PU	0.599	0.061	9.839	0.000	Accepted
H4: SA -> BI	0.224	0.108	2.065	0.019	Accepted
H5: RD -> BI	0.009	0.100	0.087	0.465	Not-accepted
H6: ENJ -> BI	0.162	0.073	2.237	0.013	Accepted
H7: VOL -> UB	-0.211	0.089	2.377	0.009	Accepted
H8: AW -> BI	0.034	0.099	0.347	0.364	Not-accepted
H9: BI -> UB	0.206	0.076	2.708	0.003	Accepted

It can be observed in Table 4 that the PEOU and PU are significant influencing factors of BI and onward UB.



**Figure 2.** Validated research model.

The R<sup>2</sup> values that explain the variance in the dependent variable are 0.359, 0.308, and 0.050 for PU, BI, and UB, respectively. Thus, the TAM model is found validated. However, surprisingly, the effect of PEOU on BI becomes insignificant in the structural model, including the influence of other variables on the dependent variables in the developed model. BI's variance (R<sup>2</sup>) also increases from 0.308 to 0.364 and onward in UB from 0.050 to 0.091.

## 6. Discussion and Implications

The primary objective of this study was to empirically investigate the influencing factors of citizens' intention to use OGD. OGD is considered an innovation that is still in the infancy stage and evolving daily, not only in developed countries (such as European countries) but also in developing countries. A well-known and well-established information system theory, TAM, was applied to understand and explain factors that influence citizens' intention to use OGD. It has been revealed from the results that OGD use is influenced by intention, which is positively influenced by PU, PEOU, SA, and enjoyment. In contrast, it is negatively influenced by the voluntariness of use. Based on the data analysis, our findings can help policymakers or practitioners develop guiding principles to improve the intention and use of OGD.

### 6.1. Discussion on Findings

Perceived usefulness drives citizens' intention to use OGD, which positively leads to wide usage. For instance, OGD use enhances the decision of citizens to choose health facilities in their area or to understand government actions, such as punishments awarded to government personnel upon violating the rules and regulations. The results are correlated with OGD adoption studies, such as OGD use intention by the academicians [23] and behavioral intention to use big OGD by OSCM users [10]. This empirical study also revealed that the more the users get ease in using OGD, the more they perceive OGD useful. The quality of an information system contributes to using and understanding OGD [20]. Therefore, the system, an open data platform provided by the government, must not be challenging or frustrating. An easy system can be developed by incorporating global navigation schemes, searching datasets category-wise, providing data publishers' contacts, and site analytics [8]. Thus, easy-to-use OGD platforms facilitate users to download quickly, upload, query, and process data, which ultimately becomes beneficial in performing day-to-day operations, making better decisions, and keeping an eye on government activities. However, unexpectedly, no significant role of PEOU in increasing citizens' intention to use OGD was found according to the results, which contradicted earlier OGD adoption studies such as [10,23].

An underrepresented construct of social approval is empirically investigated in this study. The original TAM has been extended with social approval as a predictor of behavioral intention to use OGD. This construct is a self-instruction about approval of a social circle and does mean that information about OGD use intention is obtained primarily from the approved messages received from others. Previous studies on OGD showed social approval as a direct and significant factor of BI to use big open data [10]. This construct has also been framed to evaluate the citizens' intention to use open data platform [11] and a factor to determine the adoption-implementation of an innovation [47]. This study demonstrates that users in a social circle approve and recommend others to use OGD.

Enjoyment has not been empirically investigated in the context of OGD. In this study, enjoyment is found to positively influence citizens' use intention. Pieces of evidence are also found in other technologies, such as evaluating users' intention to buy online [78] and the adoption of mobile social network games [79]. Therefore, this research has refined our understanding that intrinsic motivation, that is, enjoyment, is a valid determinant of OGD use intention and onward for its actual use.

Voluntariness of use is less hypothesized and empirically investigated as a significant predictor and negatively influences the citizens' use behavior of OGD. This construct was reasonably included as a predictor of use behavior instead of behavioral intention [80]. Therefore, the original TAM has been extended, including VOL as a predictor of use behavior. In this study, VOL is hypothesized to negatively influence the citizens' use behavior of OGD, which is acceptable according to the findings. Therefore, it is concluded that the more voluntary the use of OGD is, the lower the use behavior of citizens. It is also deduced that citizens' use of OGD is not compulsory for their research or other activities, whereas making the mandatory use will enhance the use of OGD by ordinary

people. However, in an earlier study on OGD usability, this construct has been found a significant predictor of behavioral intention [23]. In another study, voluntariness is a significant predictor of behavioral intention to use open data technologies [2].

Much empirical support has found the intention construct to be an immediate and robust predictor of acceptance and use of technologies [29,30,35,55]. Accordingly, the empirical results also support the influence of citizens' behavioral intention towards using OGD, which indicates that citizens' intention toward OGD use indeed serves as a strong and immediate predictor to determine OGD use.

### 6.2. Contribution to Research

This research contributes by examining the citizens' perceptions of acceptance and use of OGD in Pakistan. It bridges the gap in OGD literature by studying influencing factors of OGD intention and use, which has not been investigated in so much detail in a developing country's perspective up to this date. Moreover, this research provides a detailed explanation and understanding of factors that influence citizens' acceptance and use of OGD by employing and extending the TAM, a widely used model in acceptance and use of technologies [38]. Besides TAM, another construct, named the voluntariness of use, has been used to examine its influence negatively over citizens' use behavior of OGD. Moreover, some other underrepresented and under-investigated variables, called innovation awareness, enjoyment, and social approval, are used as ancestors in measuring intention to use. Inclusion of innovation awareness, social approval, and voluntariness of use can reasonably contribute to the TAM model. They have been proved to significantly influence BI and UB. Hence, this study has developed the application of TAM in the context of Pakistan, with an innovation named OGD, as well as with new variables and new relationships. After that, through applying structural equation modeling using SmartPLS 3, we focused on examining the factors, statistically, that have an impact on the use of OGD in Pakistan.

### 6.3. Practical Implications

Practically, this finding directs policymakers and decision makers to take such initiatives, increasing citizens' enjoyment of using the OGD platform. Citizens would find the OGD platform enjoyable, pleasant, and fun when they find some additional functionalities in the OGD platform, such as the usability of the OGD platform using mobile (particular version), so that users can also use the OGD platform from their mobiles easily. Introducing interactive icons, animations, and pleasant color schemes in the OGD platform enhances the enjoyment, which leads to ease of use [81]. Critiquing design and aesthetics is not just about a look. It is about the feel of the OGD platform—the entire presentation.

The findings of this study suggest that intention to use OGD can be improved and increased by concentrating on social factors, which have significant importance. Considering the socio-technical perspective is more important than just taking the technical or social view. Policymakers should focus on making social strategies to increase users' approval of OGD use. The culture of telling successful stories electronically and sharing the data usage experience can provide social approval from the people using OGD [82]. Alternatively, options, such as dedicated area to use-cases or showcases, may be provided on the OGD portal that have proved very successful in many cases, as many European countries (20 out of 28 countries) are already providing such features on their portals along with mapping between datasets and use cases [83].

It is found that the voluntariness of using OGD negatively influences citizens' use behavior. The more citizens feel it compulsory to use OGD, the more they use it. Although governments cannot force the citizens directly to use OGD, this may be conducted by some influential people, such as academicians and managers, such that (1) teachers may integrate government data in their courses, (2) education programs can be used for data processing, and (3) make such policies that can achieve their citizens' use widely. Further, we found that citizens' perception of using OGD to make day-to-day and better decisions

and the understanding of government decisions had a direct positive influence on intention, leading to the wide use of OGD.

The ease of use is an important determinant of usefulness. It demonstrates that an increase in ease of use of OGD will increase its usefulness, leading to increasing intention and use of OGD. Therefore, governments should focus on taking away barriers [11,12] to use the OGD platform rather than just focusing on opening data and information. When the government provides citizens training and education to use OGD, the potential users will recognize the ease in its use. User-friendly interfaces and techniques to use open government data should be the central and key-focusing area in OGD policies [84]. Further, the intention directly affects the use behavior, which indicates that the citizens' intention will act as a strong antecedent to predict the citizens' activities of OGD usage. Citizens' perceptions about the use of OGD demonstrate that quite a few users use data frequently in a week or a day. The reasons, among others, are the unavailability or not-up-to-date data on the government platforms or the links to access data are broken [37,68,71,85], which ultimately leads to low usage of OGD.

As the OGD movement is in the infancy stage in developing countries [16,86–88], and particularly in Pakistan because few datasets are being published in the machine-readable format during the infancy stage [89,90], in this connection, government data comes up with many barriers and challenges [40,91,92], and the government needs to realize different levels of OGD so that they can be categorized accordingly. Therefore, serious efforts should be made to help citizens avail their datasets required from the relevant platforms. For instance, in the disaster domain, hydrologists, meteorologists, geologists, and relevant scientists need weather data to make modeling, visualizations, and efficient prediction of disaster occurrence. The weather data would be more effective and usable to target users under the domain of disaster instead of ordinary people.

#### *6.4. Limitations and Future Directions*

The limitation of this research study is that no respondents were asked for what purpose they use OGD. They were not asked what kind of data, such as population, disaster, transportation, assembly proceedings, and so on, they use. Moreover, they were not asked about which OGD platform they mostly used/visited to fetch the data. These perspectives can also give an in-depth spectrum of using OGD, which this study has not covered. Second, respondents were limited to OGD users in Pakistan only, and care should be exercised when generalizing these results to other countries. However, realizing consistent results with other studies and theories enhances our confidence in the findings obtained. Third, this study applies only TAM as a theoretical model to explain the user's intention to use OGD. This study did not cover the other factors, such as computer self-efficacy, external control, objective usability, and the moderating effect of experience, gender, or age. Therefore, this study provides an opportunity for further understanding into the OGD adoption and diffusion and offers an impetus for future research. Fourth, the results of this study should be interpreted with caution that statistical analysis only provides numerical relationships, and the interpretation of these results is subject to the authors' subjective appraisal. Therefore, care should be exercised when generalizing these results to other settings. Fifth, as the usage of OGD can consist of different steps to be involved and often requires the discovery, routinization, processing, visualization, and evaluation using technology, this study does not consider other aspects of OGD use, such as the capabilities and skills of OGD users, and the quality of data. These aspects might also play an important role in determining and widely understanding its usage.

Future researchers should evaluate each OGD platform's quality evaluation using an experiment (an actual experiment or a quasi-experiment) in which an intervention is deliberately introduced to observe its effects. Trust, security, and privacy concerns may also be the predictors of intention and use of OGD; therefore, they can also be investigated from citizens' perspectives [37]. As different OGD platforms may have different functionalities and features, their evaluation is also a big area for future research in Pakistan. It is pretty



evident that TAM was not mainly developed for OGD, yet it was found suitable and valuable in this study to determine the factors of intention to use OGD. However, a low OGD usage by Pakistani citizens requires more specific adoption theories to account for the context and particular conditions. Lastly, the sample size, the number of participants in the survey, is very small. One of the rationales of being low sample size may be that the governments' datasets are not available in large quantities for users to meet their needs and requirements [71,85]. Thus, the study can be fairly extended on large sample size and investigates the factors of trust, satisfaction, and continuous intention of OGD usage.

## 7. Conclusions

This research investigates the influencing factors of citizens' intention to use OGD in the Pakistani context by employing the TAM and extending it with innovation awareness, social approval, result demonstrability, enjoyment, and voluntariness use. Although the sample size is small, several notable findings have been achieved. Our conclusion concerning the role of perceived usefulness in increasing behavioral intention to use OGD was generally consistent with earlier studies in the OGD domain [10,23,56]. We also found that perceived ease of use has a vital role in increasing the usefulness of OGD. Social approval, enjoyment, and voluntariness of use are also revealed as significant predictors of intention to use and for onward OGD usage.

On the contrary, perceived ease of use, result demonstrability, and innovation awareness are not discovered upon analyzing the collected data as the significant predictors of intention to use OGD. In the understudied context, the extended TAM can explain 35% of the variance in perceived usefulness, 36% of the variance in intention to use, and only 9% of the variance in open government data use behavior (the lowest) by the citizens. Overall, the extended model contributes to building the theory within the spheres of OGD and offers guidance to different cohorts, such as governments, practitioners, and organizations in promoting intention to use OGD.

**Supplementary Materials:** The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/bdcc6010031/s1>, File S1: OGD Adoption Survey Responses (132)—Data File.

**Author Contributions:** M.M.K. formulated the whole idea (from conceptualization to writing—original draft, reviewing, and editing) of this research study. N.H.Z., M.I.A. and A.R. played supervisory and project administration roles. Moreover, M.I.A. and A.R. were also involved in acquiring funds. S.U.N. was engaged in obtaining funds and writing—review and editing. H.M.F.S. contributed in performing formal analysis, acquisition of funds, writing theoretical background and methodology, validating the results, and writing (review and editing). All authors have read and agreed to the published version of the manuscript.

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**Institutional Review Board Statement:** Ethical review and approval were waived for this study due to anonymization of questionnaire survey.

**Informed Consent Statement:** Informed consent was obtained from all subjects involved in the study.

**Data Availability Statement:** Data supporting reported results can be found in the manuscript. However, the dataset (responses to the questionnaire survey) can be found in the supplementary material section. Further, dataset can be available and accessible according to the MDPI Research Data Policies.

**Conflicts of Interest:** The authors declare no conflict of interest.

## Appendix A. Survey Questionnaire

What's your gender?

- Male                       Female

How old are you?

- 18–24 years
- 25–34 years
- 35–44 years
- 45–54 years
- 55–64 years
- 65–74 years
- Above 75 years

What is your level of education?

- Intermediate or Equivalent
- Graduation or Equivalent
- Masters or Equivalent
- MS/Mphil or Equivalent
- PhD or Equivalent
- Others...

Different level of agreements (7-point Likert scale).

Strongly Disagree<sup>1</sup>; Disagree<sup>2</sup>; Somewhat Disagree<sup>3</sup>; Neutral<sup>4</sup>; Somewhat Agree<sup>5</sup>; Agree<sup>6</sup>; Strongly Agree<sup>7</sup>

### Innovation Awareness (AW)

AW1: I am aware of Open Government Data. (R) 1 2 3 4 5 6 7

AW2: I am aware of open data policies of Government of Pakistan. (R) 1 2 3 4 5 6 7

Reference: Weerakkody, Irani [12]

### Perceived Usefulness (PU)

PU1: I find open government data useful in making day-to-day decisions. 1 2 3 4 5 6 7

PU2: Using Open Government Data helps me make better decisions. 1 2 3 4 5 6 7

PU3: Open Government Data helps me better understand government actions that directly affect me as a citizen. 1 2 3 4 5 6 7

Reference: Weerakkody, Kapoor [10]

### Perceived Ease of Use (PEoU)

PEoU1: Open Government Data is easy to use for me. 1 2 3 4 5 6 7

PEoU2: I believe that using Open Government Data websites is challenging and frustrating. 1 2 3 4 5 6 7

PEoU3: My understanding of Open Government Data is very clear. 1 2 3 4 5 6 7

Reference: Weerakkody, Kapoor [10]

### Social approval (SA)

SA1: People important to me think I should use Open Government Data. 1 2 3 4 5 6 7

SA2: My family, friends and colleagues support the use of Open Government Data. 1 2 3 4 5 6 7

SA3: People who influence my behavior think I should use Open Government Data. 1 2 3 4 5 6 7

Reference: Weerakkody, Kapoor [10]

### Perceived Enjoyment (ENJ)

ENJ1: I find using open government data to be enjoyable. 1 2 3 4 5 6 7

ENJ2: The actual process of using open government data is pleasant. 1 2 3 4 5 6 7

ENJ3: I have fun using open government data. 1 2 3 4 5 6 7

Reference: Venkatesh and Bala [35]

<b>Voluntariness of Use (VOL)</b>							
VOL1: My use of open government data is voluntary.	1	2	3	4	5	6	7
VOL2: No person does require me to use open government data.	1	2	3	4	5	6	7
VOL3: Although it might be helpful, using open government data is certainly not compulsory in my job.	1	2	3	4	5	6	7
Reference: Zuiderwijk, Janssen [2], Venkatesh and Bala [35]							
<b>Result Demonstrability (RD)</b>							
RD1: I have no difficulty telling others about the results of using open government data.	1	2	3	4	5	6	7
RD2: I believe I could communicate to others the consequences of using open government data.	1	2	3	4	5	6	7
RD3: The results of using open government data are apparent to me.	1	2	3	4	5	6	7
RD4: I would have difficulty explaining why using open government data may or may not be beneficial.	1	2	3	4	5	6	7
Reference: Khurshid, Zakaria [23], Venkatesh and Bala [35]							
<b>Behavioral Intention (BI)</b>							
BI1: I plan to use Open Government Data, as the central idea of Open Government Data is to create transparency within a democracy.	1	2	3	4	5	6	7
BI2: Despite the known benefits of Open Government Data, my personal willingness to use Open Government Data is not high.	1	2	3	4	5	6	7
BI3: I predict I would use open government data in the future.	1	2	3	4	5	6	7
BI4: I plan to use open government data in the future.	1	2	3	4	5	6	7
Reference: Weerakkody, Kapoor [10], Venkatesh and Bala [35]							
<b>Use Behavior (UB)</b>							
UB1: On average, how frequently do you use open government data?							
Less than once a month <sup>1</sup> ; once a month <sup>2</sup> ; a few times a month <sup>3</sup> ; a few times a week <sup>4</sup> ; about once a day <sup>5</sup> ; several times a day <sup>6</sup>							
UB2: On the average working day, how much time do you spend on using open government data?							
Almost never <sup>1</sup> ; less than 30 min <sup>2</sup> ; from 30 min to 1 h <sup>3</sup> ; From 1 to 2 h <sup>4</sup> ; from 2 to 3 h <sup>5</sup> ; more than 3 h <sup>6</sup>							
Reference: Venkatesh and Bala [35], Venkatesh, Brown [93], Tarhini, Hone [73], Igbaria and Maragahh [65]							
Each statement or question was given a code, referring to the TAM construct. The items labeled “(R)” are reverse-coded.							

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