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Open Government Data Intention-Adoption Behavioural Model for Public Sector Organisations: A Technological Innovation Perspective

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Abstract

The objective of this research is to examine an open government data (OGD) intention-adoption behavioural model for the public sector organisations (PSOs), since examining the model is expected to lead to a better understanding of how to realise this technological innovation among PSOs on a large scale to excavate its innovative value. In this respect, we proposed a theoretical model to explore the factors that affect OGD adoption behaviour based on three dimensions of the TOE (technology, organisation, and environment) framework. The model was then analysed after collecting the survey data from 249 PSOs in Pakistan using a purposive sampling technique. The findings unfolded that the factors, except centralisation and civil society participation, framed in technology dimension (data resource, dataset quality, perceived benefits), organisation dimension (data-driven culture, digitisation capacity, need for transparency), and environment dimension (compliance pressure, political leadership commitment) affect the PSOs' OGD adoption intention. Cumulatively, the intention to adopt OGD was found to have a significant positive impact on OGD adoption behaviour. Based on the TOE framework, the model, with the addition of adoption intention as a significant positive factor in adoption behaviour, bears a crucial theoretical and practical contribution in the context of OGD.

Keywords:

Open Data;
Open Government Data;
Intention; Adoption;
Public Sector Organization;
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1- Introduction

Open Government Data (OGD) is defined as data that is made available by entities, typically public sector organisations (PSOs), in a manner that is accessible, usable, and redistributable by anyone without restriction to facilitate its exploitation for various purposes [1, 2]. OGD plays a crucial role in fulfilling various social, economic, operational, political, and technical objectives, offering a new approach to achieving these goals [3]. The OGD has the potential to significantly propel the digital transformation of enterprises [4]. By making data more accessible, businesses can reduce their operating costs through more efficient resource allocation and streamlined processes. OGD supports institutional accountability and helps build public trust in government [5-7]. OGD policy improves firm performance [8]. It is anticipated to drive economic growth through job creation, new business markets, and cost savings in government operations [9]. It is crucial as it offers new insights and creates knowledge aiming to develop new services from openly shared government data [9]. Therefore, OGD is a groundbreaking initiative in electronic government centred on technology, data, and people.

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Despite several advantages of this groundbreaking initiative, a noteworthy percentage (90%) of government data is private globally [10]. They also argue that different PSOs, even within the same government or administrative region, may differ in opening the data collected by the public funds [11, 12]. While several countries have developed robust OGD infrastructures and shifted their emphasis towards public servants to share data openly [13], several other countries (especially developing countries) are still in the phase of deciding to adopt OGD. Notably, the prominent role of PSOs in opening government data has been limited [13], particularly in developing countries [14]. Similarly, despite being major data creators and collectors, many public sector entities unnecessarily keep a significant amount of data hidden from the public [10]. Accordingly, fostering PSOs' role in opening government data bears a critical concern for all stakeholders. Moreover, few studies investigate the factors that influence OGD adoption within the public sector of a developing country. Therefore, this study examines the factors that affect OGD adoption from the PSOs' perspective in Pakistan.

As Tornatzky & Fleischer (1990) proposed, organisational adoption of technological innovation depends on the three dimensions of technology, organisation, and environment (TOE). Therefore, we propose a research model based on the TOE framework. This is a widely adopted framework in the field of information systems (IS) in theorising and consolidating IS adoption and implementation issues, and its selection as a framework is continuously increasing in OGD adoption and implementation [10, 15-17]. Upon reviewing the OGD literature and employing the TOE framework, ten (10) factors have been framed in the three dimensions of the TOE framework (Figure 1). These factors have been hypothesised to examine (using a partial least squares structural equation modelling approach) their effects on OGD adoption among PSOs in Pakistan. The unit of analysis is organisations since the adoption and implementation of technological innovation is an organisation's phenomenon rather than an individual's decision [18]. However, decision-makers with sufficient knowledge and authority to decide the implementation of the OGD initiative are the respondents representing the organisations.

Theoretically, our study adopts a comprehensive perspective on OGD by developing and empirically testing a theoretical model of OGD adoption. Empirical studies that investigate context-specific factors of OGD rather than generic IS variables like performance expectancy and effort expectancy are relatively rare. Thus, this study broadens our understanding of OGD by exploring these unique factors. Unlike previous research that primarily examined the intention, we focus on the factors influencing the OGD adoption decision by evaluating the intention first. Our study introduces and investigates less-explored variables of previous studies, including data resources, data-driven culture, the need for transparency, and political leadership commitment. Further, a theoretical gap is also covered by introducing new conceptualisations like dataset quality, digitisation capacity, compliance pressure, and civil society participation (in terms of external pressures). Moreover, this study was also conducted because previously developed models on measuring intention to adopt OGD needed to be revised in their explanatory power and applicability in organisational settings.

From a practical standpoint, opening government data in machine-readable formats poses significant challenges for governments, especially in developing countries, due to their inherently closed nature and the tendency of PSOs towards secrecy. Therefore, investigating the factors that impact the availability of data by the PSOs in Pakistan is crucial and serves as the foundation of this research. Failure to thoroughly examine and address the reasons (i.e., influencing factors) behind the uptake of OGD development could result in Pakistan's risk of falling out of the global picture. Government, PSOs, and policy experts must take necessary actions to avoid this scenario. Without understanding what influences OGD adoption within PSOs in Pakistan and without guidance for widespread implementation, OGD will remain an unrealised goal rather than a tangible reality.

2- OGD Adoption: A Technological Innovation Perspective

According to Tornatzky & Fleischer [18], *"technological innovation is a situationally new development through which people extend their control over the environment. It is information organised in a new way."* In this study, based on the conceptualisation of Tornatzky & Fleischer [18], OGD is considered a technological innovation of making data and information available to the public in open formats [19] that require startup costs of resources and outlay [20] and a significant change from the traditional system [21]. This is why OGD is considered a new technological innovation for potential adopters, such as PSOs, in this study's context.

Adopting innovation is choosing between two or more innovations or between innovation and the option of not changing [18]. Based on the conceptualisation that the adoption decision inherently involves a choice, adopting OGD is a behaviour to choose it or not. Adoption of innovation fundamentally differs from and is a pre-phase of implementation because implementation is action. Implementation is simple and easily accomplished and automatically begins after the adoption decision [18]. Similarly, the adoption phase decides whether to adopt an innovation, whereas the implementation phase is the extent to which an innovation is taken into actual use [22].

The reports that correspond to or are analogous to the term OGD adoption are mainly covered since this study focuses on the antecedents of OGD adoption. For instance, studies conducted by Wang & Lo [23] and Haini et al. [24] are the

OGD adoption studies. In contrast, analogous terms or studies are numerous such as, to mention a few, open data adoption, degree of data openness [25], OGD adoption motivations [26], open data publication [27], OGD participation [28], OGD capacity [29], complexity in open data initiatives [30], open data adoption conditions [31], resistance to open government factors, open government openness [32], online transparency [33], and nonreporting of data publicly [34].

3- Theoretical Background

Considering the study's objective, which is to investigate the influencing factors on adopting OGD within PSOs of Pakistan, it is essential to have such theoretical frameworks/models that are comprehensive, holistic, integrated and developed to adopt an innovation at the organisation's level. The TOE (technology, organisation, environment) is the framework that presents a holistic view of how the firm's context influences the adoption of innovation [18]. A combination of different characteristics is operationalised in three different contexts (listed as a dimension of technology, dimension of the organisation, and dimension of the environment) within the TOE framework adopted at the organisation's level to investigate their influences on the adoption of OGD. A few studies on open publication of government data in the public sector have been presented in Table 1.

Table 1. OGD Adoption Studies and Their Brief Description

Studies	Brief Description
Alexopoulos, & Saxena [35]	Developed an understanding of the government's OGD adoption using Quantum Physics theories.
Bernot et al. [36]	Explored institutional factors (using Discursive Institutionalism theory) regarding implementing OGD in Indonesia.
Wang et al. [15]	Modelled the factors, drawing on TOE theory, and explored the factors affecting OGD-driven innovation capacity in Chinese organisations.
Çaldağ & Gökalp [37]	Employed TOE framework to understand the OGD publication and use barriers.
Mustapa et al. [16]	Explored the post-adoption phase of OGD, using the TOE Framework, in Malaysian public sector data providers. Moreover, for further reference, a comprehensive lens on the data providers' perspective may be discovered in the previous studies.

The technological context in which an organisation performs its operations plays a prominent role in determining that organisation's adoption [38]. Adopting technological innovation depends on the available technologies and how these technologies may fit with the organisation's current technology [18]. Data is the strategic resource [39] and tangible assets collected and generated at the organisation level [17, 29]. Organisations increasingly depend on data and information [2, 40] as they result in evidence-based policy-making within organisations [41]. Thus, an organisation's existing technological base constrains or drives its new technology choices [18, 37]. The data and metadata quality come in as the concept of a data resource arises since the quality is not automatically guaranteed [42] with its collection and generation in the organisations. Data quality, as is the quality of metadata, is typically related to the technical attributes of data [43]. The uncertain quality of data is a threat [44], affecting the quality of decisions and generating value from data [34]. Thus, the adopters would develop perceptions of whether it should be opened. It is further distinguished that metadata quality fundamentally differs from information quality [44, 45]. The previous study suggests that poor data/dataset quality is a barrier to adopting open government data by the public sector organisations, as they would need significant investments to cleanse the data [10, 46].

Organisational context typically refers to numerous descriptive measures like the organisation's size, decision-making complexity, human resources quality, and availability of resources within the organisation [18, 38]. It also includes formal and informal linking structures and processes related to intra-firm communication [47]. Indeed, organisations in place boundary-spanning structures are lateral relations to connect with individuals, groups, and managers. Lateral relations also include the creation of liaisons and integrating roles, constructing temporary task forces, and holding meetings to provide opportunities for individuals to share information and ideas [18]. Several informal linkages are the agents external to the organisation, as a connection with the suppliers, knowledge procedures, gatekeepers, and product champions in influencing adoption decisions of technological innovation.

In the current study, there are also several essential ways organisational context influences adopting OGD innovation within organisations. The perceptions about the organisation's data-driven culture, a structure based on central decision-making, the capacity of personnel for OGD tasks, and the need for transparency are operationalised as four different factors in the technological dimension of the TOE framework. These factors may constrain or drive organisations to adopt open government data. The OGD concept revolves around government data from public sector organisations. They must develop a data-driven culture to realise their full potential [48] instead of making decisions based on a manager's experience or intuition. It is perceived that the culture of decision-making based on individuals' titles or managers' intuition is unlikely to result in any return on investment. Thus, the data-based decision-making culture may help realise the full potential of data, and organisations may be induced to adopt the OGD. Centralisation is the bureaucratic system where decision-making, reporting mechanisms, and control over decisions or processes are centralised with high

authority [49]. The centralised structure of the organisation makes its processes highly difficult and limits the autonomy of the organisation's members [29]. These studies pointed out that centralisation in public sector organisations hinders OGD adoption [29, 49]. An organisation may have sufficient financial resources but lack personnel [18].

Access to adequate resources is critical to taking policy initiatives in the public sector [23]. Digitisation capacity is a unique and precious organisational asset because it is a productive service that members of an organisation offer to that organisation in terms of skills, knowledge, and experience [29, 46]. The data in public sector organisations may require significant efforts to process due to security, privacy, and different formats and standards [29]. These open government data issues can be avoided or overcome through skilled human resources and training, particularly because the open government data is at an initial stage [10]. Thus, digitisation capacity is operationalised as an essential factor in the technological context of the TOE framework. Another cited reason behind the adoption of OGD is the organisational need to enhance transparency in government operations [46] and to assess the government's decision-making by the public [49]. The public sector organisations obtain certain benefits through data provision, such as public trust, the ability to reuse data, and ease of access and discovery of data [3]. Therefore, it is expected that the rising need for data provision to the public will influence the adoption of OGD among the PSOs and, thus, operationalise the need for data provision to the public in the TOE framework.

The environmental dimension is well-familiarised in that organisations are pretentious by their environments [50]. It is the realm within which an organisation carries out its business activities—its industry, competitors, access to resources supplied by others, and dealing with the government [38]. The environment presents constrictions and openings for technological innovation [18, 47]. The organisations' decisions are driven by cultural and social types and legitimacy concerns [38]. This is similar to the institutional theory, which claims that isomorphic and legitimacy pressures motivate organisations to copy other institutions that are leaders in the industry [38]. Studies observed that organisations adopting OGD respond to their rational needs, such as human resources and transparency, and respond to institutional pressures [51].

First, public sector organisations do not adhere as uniformly to some historically established organisational norms or regulations [52]. Thus, they may have mandates or pressures from higher authorities [10], such as state directions [26] or ministries-in-charge [46], to conform to or reproduce existing open government policies [53]. For instance, public-funded institutions are increasingly pressured to release experimental data [19]. Under this kind of situation, public sector organisations may adopt OGD to conform to formal and informal demands [46] from higher-level institutions [2, 23, 51]. Based on these studies, compliance pressure is an antecedent of public sector organisations adopting OGD. Second, external stakeholders like advocacy groups, community and business organisations, media, and individuals who use or are using such online tools that facilitate interaction with the government, participation in decision-making, or monitoring government actions prominently exert pressures on public sector organisations to adopt open government [49]. On the one hand, the studies suggested and evidenced that civil society participation influences website openness [50] and open online government [49]. Another side is that it has not found a momentous influencing factor on public sector organisations' likelihood of sharing data [54]. However, the ideas and understanding of civil society participation have begun to spread in developed countries like Spanish municipalities by making a separate unit for citizen participation [53] and the United States [50], which might not be started or less prevalent in developing countries. Thus, pressure or demand from external stakeholders regarding the degree of their participation is framed in the environmental dimension of the TOE framework.

4- Model and Hypothesis Development

In this section, a model is developed by including ten (10) factors proposed to affect the adoption of OGD by evaluating their impacts on the adoption intention of OGD and then evaluating the effect of adoption intention on OGD adoption. These factors are extracted upon (1) reviewing the literature, (2) conducting a preliminary study from the top-notch officials in public sector organisations in Pakistan, (3) mapping these factors with the terms/concepts used in OGD adoption studies, and (4) expecting to be impactful on the OGD intention and adoption behaviour in the government entities. The proposed model explicitly considers variables by integrating these four approaches to have their effect on the OGD adoption within the PSOs. Integrating such steps to develop a model by including factors is based on the fact that the factors are not chosen by just adopting the "pick and choose" technique; instead, a rigorous method of four approaches has been adopted.

There are two measures for the dependent variable (OGD adoption). The first measure is the intention to adopt OGD. This measure is commonly used in OGD adoption research. The second measure is the OGD adoption. The rationale for including adoption intention before the OGD adoption is that intention has been considered a significant influencing factor of open data publication [28, 55]. After that, the theoretical research model is developed, depicted in Figure 1. The operational definition of each variable was first arrived at from the literature in the OGD domain. Second, where the definition of a variable is not found, it is taken from previous IT/IS or technology adoption studies.

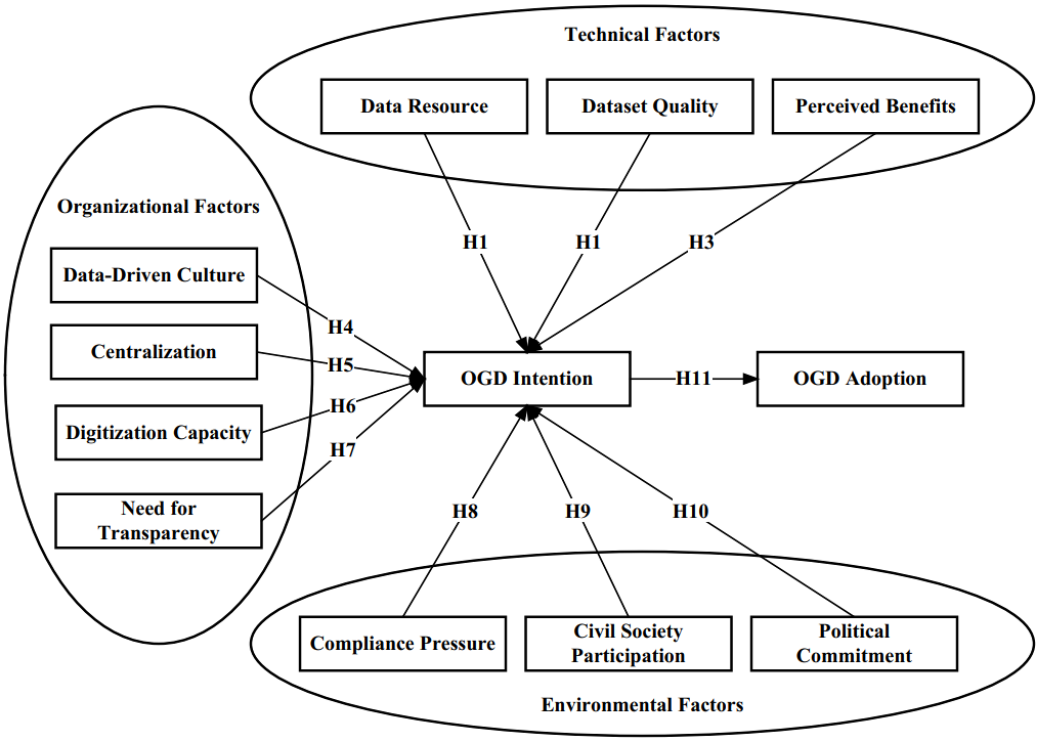

Figure 1. OGD Intention-Adoption Behavioural Model

4-1- Data Resource (DR)

Data resource refers to data gathered and produced in organisations to accomplish numerous tasks in their day-to-day operations" [29]. Data are the crucial resource, property, or means of organisations that will produce value via its use [56]. The data resources are not published due to the possibility of unavailability of the digitised recording of data [34]. Data are treated as fuel or new gold for organisations to innovate and economic growth [57]. Data are also the raw material for business decisions. Data are a natural resource and are treated as a problem in specific departments and organisations [58]. An organisation's decision to adopt OGD is expected to be potently influenced by whether that organisation has understood data as a core strategic asset that will enable the organisation to make decisions successfully. In this respect, the availability of data resources is perceived to be a central antecedent to openly making the data available to the public [17, 34]. PSOs are the principal originators, collectors, and holders of data in several areas [46], which is treated as a strategic source of the organisations [59].

Public sector organisations generate a large amount of data in their daily operations to complete various tasks. To publicise the publicly funded data in open formats, the data must be available/accessible and reside in diverse databases of different PSOs, such as ministries, divisions, attached departments, and organisations under provincial, local, or municipal governments [60]. The data detained by public sector organisations are the foundation and the central resource for attaining the potential value of OGD. Building an understanding of the value chain of OGD requires data generation as the first phase or step, which is performed in the public sector units, which they then collect aggregate and process for its onwards distribution and delivery openly so that final data users can use these resources for different objectives [39]. Synonymously, the creation of data resources is the first phase of the OGD life-cycle, which starts with data opening or publishing by the PSOs as data are part of organisations' daily procedures [61]. PSOs need to assimilate internal data and figure out the boundary and form of datasets before their implementation. The variances in quantity, type, and formation of data detained by diverse public sector organisations influence their business scope and functions [29]. The amount, kind, and formation of data resources, which are data as the organisation's building block and strategic resources, can affect the PSO's intention to adopt OGD. Given all these concepts, it has been proposed that:

H1: *There is a positive relationship between data resources and public sector organisations' intention to adopt OGD.*

4-2- Dataset Quality (DQ)

To grasp the concept of dataset quality, it is imperative to know three different ideas: information quality, metadata quality, and information quality. In the information system success model, the quality of information measures an information system's output, precisely, the quality of information generated by the system, mainly in report format [62]. Information quality is concerned with a non-technical issue [43, 63]. The metadata (information about data or description of data itself or descriptive metadata [64]) positively affects the OGD for its ease of use, speed to search, find, analyse, visualise, interact, and quality analysis [10, 65].

Information quality is concerned with non-technical, while the quality of data concerns technical attributes of data. Both the data and information quality are synonymously used in open data research because, on one side, the concept is used as data quality [46], and on the other side, it is used as information quality [42, 66]. Similarly, the attributes are commonly shared for their measurements [46, 67]. To avoid complexity, make this concept simpler and prevent their measurements separately. The term dataset quality is preferred for this study. Therefore, the data quality and metadata quality are operationalised as dataset quality. The rationales behind considering dataset quality instead of considering only data quality, metadata quality, and information quality separately are (1) the data requires complex processing for its transformation into comma-separated values (.csv), resource description format (.rdf), general transit specification format (GTFS) [58], or linked data [68] if it is in pure raw format and, thus, should be in machine-readable format whereas information may not be perceived in a machine-readable format, (2) even information is the output of an IS, it may be easily findable/searchable, referable/usable through metadata, (3) since metadata is the description of data, it helps in data discovery, (4) the attributes of data quality, metadata quality, and information quality may be used interchangeably for their measurements, (5) one might perceive the quality of data and information without perceiving the quality of metadata. In this study, the concept of dataset quality is adapted from the broader definition of data quality. It can be defined as the "degree to which the characteristics of data satisfy stated and implied needs when used under specified conditions" [69].

The information (metadata) quality is the leading factor in evaluating cross-boundary information-sharing effectiveness among public sector organisations [70]. The improved the quality of shared information, the better the efficiency of a public sector organisation [70]. The quality of metadata issues could severely interrupt the open data success [10]. Janssen et al. [42] supposed that with data generation, it might not be guaranteed that the metadata quality will also be automatically high. With incorrect data, indispensable information about the datasets might also be absent, like the time stamp [42]. Information (metadata) quality might differ or be low [42]. Further, data providers need more metadata consistency, non-documentation, unstructuredness, and incompleteness, resulting in slow data openness [71].

The data quality determinant was found to be the most frequently addressed factor in open data studies [10, 37, 72, 73] and it can be argued that a study will be incomplete if we will not include dataset quality to investigate its effect on OGD adoption. Further, it is proposed that datasets of high quality produced by the public sector organisations will lead to an increase in their intention to adopt OGD and thus formulate the following hypothesis:

H2: *A positive relationship exists between dataset quality and the intention to adopt OGD among public sector organisations.*

4-3- Perceived Benefits (PB)

Perceived benefits refer to the anticipated advantages of innovation for an organisation [23]. The benefits of an innovation, as perceived by a unit of adoption, are measurable directly and indirectly. The adoption of OGD is influenced directly, including increased volume of transactions in the market, revenues of organisations, job volume in adopting that innovation, and saving costs [26]. The indirect benefits include quality increment in services, increased transparency, public participation in government decisions, and civic empowerment [42, 46]. The adoption of OGD is expected to result in several benefits of economic type (like external problem-solving capacity, service, and product improvement, entrepreneurship), innovation (social service innovation, development of knowledge and new insights), organisational (citizen satisfaction, use of crowd-wisdom), socio-political (sustainable society, transparency, public participation, public empowerment), technical and operational (easier access and discovery of data, data quality improvement, data reusability) [74-76].

Perceptions of an innovation's benefits are the starting point of a debate [23]. In a study conducted in the Netherlands' municipalities, researchers found that even smaller municipalities acknowledge the belief in OGD benefits to impact opening up their data [77]. Accordingly, perceptions of public sector organisations regarding the benefits of OGD primarily build their positive intentions of adopting it. Perceived benefits may be an essential factor and significant motivation for shaping the intentions of public sector organisations toward adopting OGD (Altayar, 2018; Zuiderwijk, Volten and further, realising government data's value to be opened by the public bodies influences their OGD adoption intentions. However, government agencies found no incentives to contribute to OGD developments. Hence, they could not realise the value of open data [30], which restricted them from publicly sharing their data and adopting OGD. In this regard, Wang & Lo [23] are also motivated that perceived benefits may be solid motivators for government data publication. Accordingly, they found them to be the highest factor influencing OGD adoption.

The unit of adoption may intend to share government data on OGD portals based on users' expectations of beneficial economic returns [55]. This implies that gaining economic benefits can motivate organisations to achieve mutual goals because they must allocate finances, perishable time, and dedicated trained staff to collect, process, or share data and information. Similarly, Sayogo & Pardo [78] indicated that monetary gains motivate decision-makers to share and publish datasets openly, and they mention this factor as an essential antecedent. Based on the background literature, we hypothesise that a higher level of public bodies' beliefs about perceived benefits may increase their OGD adoption intentions. Therefore, the hypothesis has been formulated, which is as follows:

H3: *There is a positive relationship between perceived benefits and the intention to adopt OGD among public sector organisations.*

4-4- Data-Driven Culture (DD)

Data-driven culture is defined as "the extent to which organisational members (including top-level executives, middle managers, and lower-level employees) make decisions based on the insights extracted from data" [48, 79]. Publicising data openly by a public sector organisation is expected to be influenced by its culture [16, 55]. Data resources can support app development and enhance sector reporting, analysis, and visualisation [80]. It is the data through which data-driven decisions can be taken in organisations [80], and thus, data are considered more important than technology [40]. It can be argued that an organisational culture that advocates a culture of decision- and policymaking based on insights extracted from data may influence the successful adoption of OGD.

The PSOs, on the one hand, are providing the datasets to the public to attain public wisdom [81] in the decision and policy-making process [3, 75, 82]. On the other hand, decision-making, which is based on evidence or data facts, can reduce uncertainty in opening the data and generate new insights on policy issues [41]. The decisions to launch a product and remove it from the market can better be made based on factual data instead of the decision-makers own gut feelings and emotions in the organisation [40]. Organisations can create policies for saving energy like estimates of the use of energy by the households, energy consumption patterns regionally, integrating data with other public sector organisations, and developing an analytics engine to inform and motivate households to save energy using government data [83]. Thus, it can be argued that this type of culture, where organisations make their decisions based on the data, would result in the realisation of data in making policies and decisions and thus would be adopting OGD. Moreover, designing policy can be leveraged, and complexities in policy-making can be unravelled based on data-driven pieces of evidence [84].

The culture of making policies and decisions in public entities is leveraged with the help of data. Organisational culture toward publicising government-related data can be a potential influencing determinant impacting OGD success [55]. The lack of a culture of using data-driven evidence for policymaking affects the public organisation's sharing of data openly. Therefore, it can be deduced that a high level of data-driven policy- and decision-making culture in the public sector influences a high level of OGD adoption. Moreover, the more data-driven the culture is, the more OGD is adopted in PSOs. Accordingly, the following hypothesis is put forward:

H4: *A positive relationship exists between data-driven culture and the intention to adopt OGD among public sector organisations.*

4-5- Centralization (CE)

A critical aspect of organisational structure is the degree of centralisation or decentralisation in decision-making. It directly impacts how an organisation apportions its present resources and provokes its policies and objectives. This study area has long been recognised as fundamental to understanding organisational dynamics [85]. They pointed out that excessive bureaucratic controls can lead frontline staff to spend excessive time bypassing established decision-making procedures, harming accountability. In a highly centralised organisation, decision-making authority is typically concentrated among a few individuals at the top, resulting in limited participation from lower-level staff in decisions regarding policies and resource allocation. Centralisation is often linked to various bureaucratic dysfunctions, including rigidity, excessive bureaucracy, and exploitations of monopolistic command [85].

Centralisation refers to the practice of centralised decision-making in organisations [49, 86]. The structure and design of an organisation significantly influence its ability to adopt innovations, with some structures being more conducive to innovation than others [29]. Organisational structure has been identified as a crucial factor affecting innovation [29], but its impact varies depending on whether the structure is organic or mechanistic, often referred to as bureaucratic [18, 87]. In organisations with centralisation and a strong bureaucratic culture, processes tend to be cumbersome and complex [29]. This bureaucratic structure can severely diminish the interest and willingness of officials to engage in innovative practices. The presence of a centralised, bureaucratic structure is a significant barrier to implementing OGD initiatives [49], similar to the risk-averse culture within the organisation [37].

Zhao & Fan [29] hypothesised that an organisation's structure negatively impacts the capacity of PSOs to share government data in open formats. Centralised organisations, defined by centralised reporting, processes, decision-making, and control, are expected to limit individual employees' contributions, as they must adhere to centralised procedures. Consequently, when decision-making is highly centralised, there is less opportunity for experimenting with new technologies that encourage participation. This makes it less likely for organisations with centralised systems to achieve accessibility and transparency. Furthermore, a study by Grimmelikhuijsen & Feeney [49] suggested that centralisation negatively correlates with open online government. Based on these findings, this study contends that centralisation adversely affects OGD adoption in public sector organisations. Thus, the following hypothesis is proposed:

H5: *A negative relationship exists between centralisation and the intention to adopt OGD among public sector organisations.*

4-6- Digitization Capacity (DC)

Digitisation capacity refers to the organisation's overall technical capacity and its employees' technical skills, which are essential aspects of human resources [29]. Public sector organisations create and collect data using sensors, information systems, or humans. In this connection, data is automatically created or manually created by a human by keying in or linking data [88]. The data publishing on the OGD portals contains different stages like data creation, pre-processing, transformation into a machine-readable format according to the publishing standards, refining, and daily updates and maintenance [88]. In this connection, data openness in machine-readable format on unified OGD portals puts technical expertise forward to the operations mentioned earlier for the organisations [29].

The study indicates that high-level technical capacity positively relates to the OGD capacity [2, 29]. Moreover, an organisation's technological expertise and capabilities might be crucial to furthering open government efforts [16, 37, 49]. The organisation's technical capacity is crucial in determining the extent and scope of OGD adoption, implementation, and overall capability. It serves as a critical factor that either limits or enables the depth and breadth of how effectively Open Government Data initiatives can be integrated and sustained within the organisation [29]. Technical capacity, a crucial prerequisite for government departments utilising information systems to enhance their operations' efficiency and effectiveness, significantly influences cross-boundary information sharing's success. It is also a key indicator of e-government service performance [89]. Previous studies have demonstrated that technological and organisational capacities positively correlate with the success of open government initiatives. These capacities enhance an organisation's ability to implement, manage, and sustain open data projects, ultimately contributing to the effectiveness and impact of such initiatives [15, 49]. Based on the facts, it is proposed that the greater the PSO digitisation capacity, the higher their adoption of OGD.

H6: *There is a positive relationship between digitization capacity and the adoption intention of OGD among public sector organisations.*

4-7- Need for Transparency (NT)

Transparency refers to the provision of public sector information about an organisation or actor to the public [49]. It may generate the need and importance of transparency and openness [77]. OGD is a strategic resource of public sector bodies; therefore, they are not expected to share it [59]. However, public sector bodies would need transparency to show their institutional behaviour towards opening data [59] to increase their reputation by showing that they are an open and transparent organisation. Indirectly, they are giving back what the public pays in taxes and generating strategic gains [59]. To obtain and maintain an excellent institutional image in terms of reliable and trusted sources of data [26], the need to be transparent arises. For some public sector bodies, disseminating knowledge can also be a key stated mission to show or obtain the strategic importance of data and information [90]. Usually, in developing countries, because OGD issues can be more severe and prevalent in developing countries [91], the public has less trust in government institutions, and the need to increase the confidence of the public generates the need to be transparent [26].

Open Data is a type of transparency policy [31]. Alex Ingrams [31] also pointed out the need for transparency for public sector organisations as there is an actual demand for such reform. The belief or need for transparency is also formulated to ensure the public that the internal activities of public sector bodies are transparent to the citizens and that institutions are accountable for their misdemeanours/minor wrongdoings [31, 92]. Therefore, the public sector bodies' need for transparency is the fundamental belief as the OGD idea rotates around it. Transparency is relevant to the principles of the United Nations' Freedom of Information (FOI) Act [39, 46]. Subsequently, the relevant legislation, that is, the Right of Access to Information (RATI) Act, has been introduced and enacted in Pakistan to ensure improved access to government records to the public, to promote the aims of being the Government accountable to its people, public engagement and participation in government policies, and to reduce corruption [61, 93]. Such legislations have been recognised as humans' fundamental rights [39, 46]. Meanwhile, public sector bodies collect and generate large amounts of data using different information systems like electronic ticketing, electronic banking, electronic commerce, and Health Management Information Systems, which are primarily closed. Therefore, it is argued that public sector bodies use the OGD initiative to open government data. As a result, public sector bodies fulfil their purposes and needs for transparency/accomplishes their transparency necessities. It is also vital for conservative and advocating municipalities in the Netherlands to be transparent and open [77]. Therefore, as the need for transparency increases, the adoption of OGD increases. Based on these arguments, it can be argued that the stronger the belief in or need for transparency/transparency essentialism in the public sector bodies, the larger the adoption of OGD. In the result, the hypothesis is formulated as:

H7: *There is a positive relationship between the need for transparency and the intention to adopt OGD among public sector organisations.*

4-8- Compliance Pressure (CP)

Compliance pressure refers to conscious obedience to or incorporation of values, norms, or institutional requirements [26]. Organisations comply to varying degrees by doing as the law asks [94]. Governments at local and national levels are the major players in the OGD initiative in introducing formal and informal policies that influence public sector bodies' behaviour in engaging in the OGD initiative [46]. This could be due to the RATI Act [93], presidential OGD initiative [92], or to achieve certain political, economic, or operational and technical benefits like public trust, encourage entrepreneurship and stimulate growth/innovation, and reduced government spending respectively [3]. Organisations in the public sector also respond to institutional pressures to fully or partially comply with pressures, which in turn influence them to OGD adopt a strategic response to institutional pressures/higher-level authorities or national OGD policies [37, 59]. This could be why provinces in the Netherlands comply with OGD standards and practices [59]. Similarly, stakeholders' pressure also influences innovation, as Alex Ingrams [31] stated. It was also suggested that compliance with recordkeeping policies is fundamental for OGD adoption [95]. Accordingly, it is recommended that higher authorities or government pressure to comply with OGD policies, regulations, guidelines, standard operating procedures, practices, and mandates will increase or form public sector bodies' intention to adopt OGD.

The structure of organisations is changed by higher authority enforcement and top-down pressures from other government institutions. The study conducted by Zhenbin et al. [46] also developed the relationship between conformity need (similar attribute to compliance pressure) and OGD participation of PSOs in the OGD initiative. Based on these rationales, we deduced that the higher the external or coercive pressure, the higher the adoption of publishing government data openly. Thus, the below hypothesis has been formulated as:

H8: *A positive relationship exists between compliance pressure and the intention to adopt OGD among public sector organisations.*

4-9- Civil Society Participation (CS)

In this study, civil society participation refers to the involvement of external stakeholders in an organisation's decision-making and policy formulation processes. Open government initiatives encourage citizen engagement in decision-making by utilising various feedback mechanisms, such as online deliberative methods and social media platforms [2, 96]. These tools enable a more interactive and inclusive approach, allowing citizens to actively participate and contribute their insights and opinions, thereby enhancing transparency and accountability within the government. External stakeholders, including citizens, civic society groups, business entities, and the media, are increasingly applying pressure on public organisations to improve their levels of accountability and transparency [97]. This pressure from external stakeholders can significantly influence the adoption of open data initiatives within PSOs [30, 37]. With the frequent participation of the public in formulating government policies and decision-making processes, there is a growing demand from the public and other stakeholders for easier access to government information [89]. The desire for greater transparency and accountability in government operations drives this demand. External stakeholders, particularly non-governmental organisations (NGOs), advocate for the government to publish extensive information about their policies, procedures, and activities. This transparency allows these stakeholders to participate more effectively in governmental affairs and hold public officials accountable [89]. Such pressures from civil society participation will induce the PSOs to adjust public demands to government data and stimulate their intentions to disclose public sector information. As a result, the active involvement of civil society in government decision-making processes plays a crucial role in driving the OGD initiative. This, in turn, facilitates a more participatory and transparent governance model that benefits both the government and its constituents.

OGD has transformed the traditional way of accessibility to government data and other public entities by the public, which results in more responsible citizens of the society in providing feedback to the government, allowing the public to exercise their duties and the right to participate [61]. This exerts pressure from civil society on public sector organisations to disclose public data freely. On the other hand, public sector organisations can access benefits by obtaining and using society's dispersed knowledge, information, and expertise. Thus, the quality of decisions and policies can be improved by soliciting and harnessing public feedback [92]. Hence, civil society participation helps learn and understand the open data users and community public sector organisations more broadly and receive specific issues on datasets [42, 98]. The culture of putting requests for datasets, reporting errors on the published datasets, and feedback on open data programs generally comes from the success of Open Government Data [98]. Such a feedback loop structure is less prevalent in Pakistan. Civil society participation or external public pressure is significant in open online government adoption [49]. Based on the arguments, it can be suggested that the public sector body's intention will be positively affected if their perceptions of civil society participation are stronger.

H9: *A positive relationship exists between civil society participation and the intention to adopt OGD among public sector organisations.*

4-10-Political Leadership Commitment (PL)

Political leadership commitment refers to the devotion of political leaders or government to institutionalise open government data within public sector organisations. Innovation or technology requires the commitment or strong will of political leaders and their exercised powers. Political leadership is the most significant driver for OGD implementation because the political will directed the public sector bodies to publish all non-classified datasets online [99]. The political leadership commitment provides the rise to the OGD institutionalised [37, 99]. In publishing data online, political leaders around the world issue directives for departments to act on them, championing open data policies, supporting costs for developing and maintaining infrastructure, preparing the open business environment, and thus making the public sector bodies adopt proper measures to OGD [99, 100].

The proactiveness of political leaders, like participation from the public through information and communication technologies, will advance the public sector organisations toward the OGD initiative [99]. Thus, it can be suggested that public sector organisations will move ahead towards OGD adoption when political leaders are promoters or supporters compared to those where leadership is less committed [17, 19]. The lack of political leadership willingness hinders open government policy adoption [53]. The earlier studies discussed that the commitment or will of political leadership is a strong driver for OGD adoption [101]. Based on these rationales, we deduced that the higher the commitment of political leaders, the higher the adoption of OGD. Thus, the below hypothesis has been formulated as:

H10: *There is a positive relationship between political leadership commitment and the adoption intention of OGD among public sector organisations.*

4-11-Adoption Intention (AI)

Adoption intention is the degree to which a PSO expects to implement OGD policy [28, 55]. Adoption intention gauges the likelihood of an entity engaging in a specific behaviour [102]. Research on open data highlights that individuals' intentions, including those of decision-makers, to share research datasets significantly influence their actual behaviour of openly sharing data [27].

The publication of open data by the PSOs is often driven by their adoption intentions [28, 55]. Research on OGD further indicates that not all organisations are eager to publish their data online. Even among those willing to share data, numerous barriers can impede the actual publication of data [103]. Generally, an organisation's willingness to release data increases when perceived barriers are reduced, and the benefits become more apparent. Consequently, the perceptions, knowledge, and awareness of open data benefits significantly impact an organisation's intention to release data. This intention, in turn, determines the extent to which they will adopt OGD initiatives. It may be argued that a higher level of public sector organisational intention would lead to adopting OGD. Hence, the below hypothesis is formulated as follows:

H11: *There is a positive relationship between adoption intention and the adoption of OGD among public sector organisations.*

5- Research Methodology

This study adopted quantitative methodology, and an instrument was designed to collect data on the predefined set of answer choices. Due to the quantitative methods of this research, the participants were asked closed questions. A nominal scale was used to get primary or categorical information about the participants. Participants were requested to furnish information about their gender, age, job position, and educational qualification. Moreover, participants were also asked to provide information about the organisation, including administration type, organisation size, ministry type, and OGD platform, and they were asked to use the third-party platform to publish the data if it did not have its own OGD platform. However, the ordinal scale was used to seek feedback on the construct's items or questions. They were asked to rate each item on a seven-point Likert scale ranging from 1 to 7, where 1 was denoting Strongly Disagree, 2 for Disagree, 3 for Somewhat Disagree, 4 for Neutral, 5 for Somewhat Agree, 6 for Agree, and 7 for Strongly Agree. In this respect, participants showed their level of agreement about a statement. Further, respondents are bound to show their level of agreement on the prescribed scale, which is fixed by a code so that researchers can quickly enter the data in a sheet for further analysis.

A non-probability sampling technique was adopted to collect data from the decision-makers of the PSOs in Pakistan. Specifically, judgment sampling, a purposive sampling technique [104], was applied to choose a sample from the population. Judgment sampling is used, and respondents are selected based on their expertise in the investigated subject. Accordingly, the data was collected from the decision-makers because they were expected to have experience or knowledge of open government data. Further, the organisational unit of analysis was adopted because "innovation adoption is not the act of individuals in isolation; rather, it is an organisational phenomenon" [18].

The instrument was developed by adapting and using items or statements from existing studies. Further, the complete instrument designed for data collection has been provided. This questionnaire included a key dichotomous question asking respondents if they had informed knowledge about OGD. Only those who answered 'yes' to this question were permitted to proceed with the remainder of the questionnaire. Informed consent was obtained from participants such that all the research participants voluntarily participated in this study, and all their rights and confidentialities were expressed and explained clearly before proceeding to the survey. Moreover, researchers applied the decision to determine the nature of formative (data resource, dataset quality) and reflective (all other except data resource and dataset quality) constructs using the guidelines by Rabaa'i [105] and Jarvis et al. [106]. Figure 2 depicts the complete research methodology.

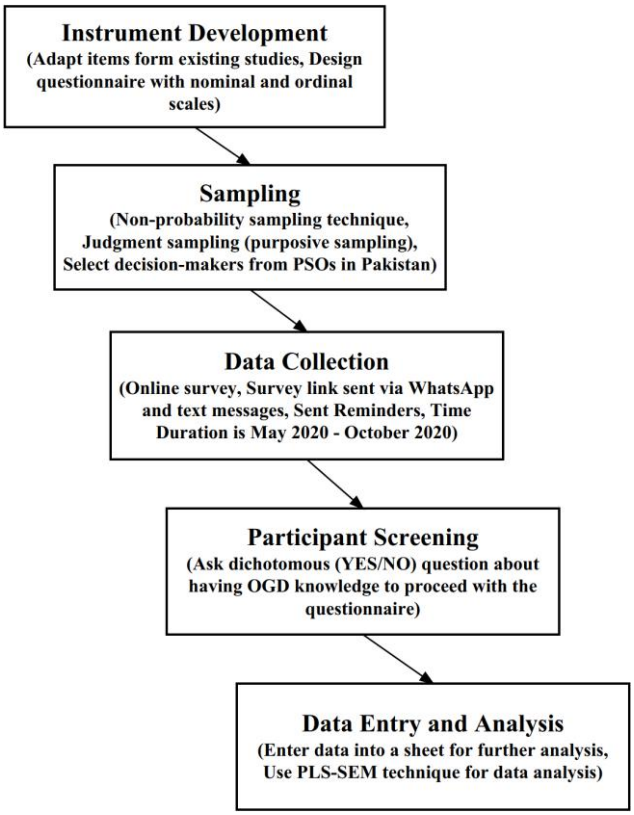

Figure 2. Pictorial Representation of Methodology

The data collection process was conducted using a widely recognised method known as a survey. Zikmund et al. [107] highlighted that the survey for data collection is the most frequently used method in explanatory research. The questionnaire method is flexible to administer individuals concurrently, which is inexpensive and time-saving compared to the interviewing method. Concerning the time horizon, the data was collected once, also known as cross-sectional or one-shot [104]. Statistical data was gathered from the decision-makers of PSOs in Pakistan because decision-makers are organisations' representations. The survey questionnaire was only in English. The survey questionnaire was not translated into Pakistan's national language, Urdu. The reason is that the decision-makers were well-educated and experienced officials, and it was no issue for them to understand English. However, the researcher managed the process of data collection personally. For this purpose, an online survey was designed, and a survey link was forwarded to decision-makers through WhatsApp and text messages. Two reminders to respond to the questionnaire through phone calls, WhatsApp, and text messages were sent to the decision-makers of the public sector organisations. It took six (6) months, from May 2020 to October 2020, to collect the data.

6- Data Analysis and Results

6-1- Respondents Profile

Table 2 demonstrates the demographic characteristics of the respondents' personnel and organisations. Considering the demographics of the personnel and regarding gender, males were leading in survey participation with a percentage of 83.1%, while the ratio of female respondents was 16.9%. There were 45.8% who were 31 to 40 years of age, followed by 32.9% who were falling between 21 to 30 years of age bracket, followed by 19.7% falling between 41 to 50 years of age bracket. Only four participants, 50 to 60 years of age, participated in a survey of this study. The maximum number of respondents (a total of 210) belonged to Masters/MS/MPhil degrees, bearing a percentage of 84.3%. Of 249 participants, 34 (13.7%) decision-makers belonged to a Bachelor's or equivalent degree program. In this survey, 190 respondents were the designated officials responsible for the OGD initiative, followed by information technology (IT) managers with 8%, whereas senior IT directors' ratio was equal to 4.8%.

Table 2. Respondents' Demographics

Demographics		Frequency	Percentage
Gender	Female	42	16.9%
	Male	207	83.1%
Age	21-30 years old	82	32.9%
	31-40 years old	114	45.8%
	41-50 years old	49	19.7%
	51-60 years old	4	1.6%
Educational Qualification	Intermediate or Equivalent	5	2.0%
	Bachelor or Equivalent	34	13.7%
	Masters/MS/Mphil/PhD	210	84.3%
	Others...	0	0%
Job Position	CIO / CEO / CTO / CDO or Equivalent	5	2.0%
	Senior IT Director or Equivalent	12	4.8%
	Assistant IT Director or Equivalent	8	3.2%
	Senior IT Manager or Equivalent	4	1.6%
	IT Manager or Equivalent	20	8.0%
	Assistant IT Manager or Equivalent	10	4.0%
	Designated Official responsible for Open Data initiative.	190	76.3%
	Others (decision-making role)	0	0%
Form of Government	Federal Government	159	58.2%
	Provincial Government	59	21.6%
	State Government	15	5.5%
	Local/City Government	11	4.0%
	Municipal Government	5	1.8%
Ministry Office	Yes	232	93.2%
	No	17	6.8%
Name of the Ministry	Cabinet Secretariat	5	2.0%
	Climate Change	39	15.7%
	Commerce and Textile	2	0.8%
	Communications	1	0.4%
	Defence	8	3.2%
	Energy	1	0.4%
	Federal Education and Professional Training	36	14.5%
	Finance, Revenue and Economic Affairs	2	0.8%
	Housing & Works	2	0.8%
	Human Rights	2	0.8%
	Industries and Production	3	1.2%
	Information, Broadcasting, National History and Literary Heritage	5	2.0%
	Information Technology and Telecommunication	15	6.0%
	Interior	3	1.2%
	Kashmir Affairs and Gilgit-Baltistan	1	0.4%
	National Health Services, Regulations and Coordination	3	1.2%
	Overseas Pakistanis and Human Resource Development	1	0.4%
	Planning, Development and Reform	3	1.2%
	Postal Services	6	2.4%
	Railways	1	0.4%
	Science and Technology	7	2.8%
	Statistics	11	4.4%
	Water Resources	1	0.4%

Own platform to publish the data	Yes	211	84.7%
	No	38	15.3%
Publishing data on the platform	Yes	52	20.9%
	No	197	79.1%
Officer appointed for OGD	Yes	218	87.6%
	No	31	12.4%
COVID-19	Yes – increased our willingness to a large extent	44	17.7%
	Yes – increased our willingness somewhat	53	21.3%
	Yes – increased our willingness to a small extent	35	14.1%
	Yes – decreased our willingness	28	11.2%
	No – has not influenced our willingness	89	35.7%
Organisation Size	1 to 50 Employees	49	19.7%
	51 to 500 Employees	80	32.1%
	501 to 5000 Employees	77	30.9%
	5001 to 50000 Employees	19	7.6%
	Above 50000 Employees	24	9.6%

The demographic characteristics of public sector organisations were also collected along with the personnel's profile. Public sector organisations of the Federal type of government were bearing the most considerable portion, having 159 with a percentage of 58.2%, followed by 59 of the provincial government organisations. Under the Federal government, data about ministries have also been collected. The most significant ministry in which public sector organisations participated was the Ministry of Climate Change, with a percentage of 15.7%. The Ministry of Federal Education and Professional Training was bearing a rate of 14.5%. Many public sector organisations (211 out of 249) had their platform to publish the data. In contrast, only 197 (79.1%) organisations were not publishing data independently or on a third-party platform. Concerning the appointment of designated officials by the organisations, 218 organisations have appointed officials who have been responsible for the OGD initiative. Moreover, during the COVID-19 crisis, more than fifty per cent, that is 53.1% of organisations, have shown their willingness to open government data. In this study, 80 organisations participated in the survey, 51 to 500 employees, and 77 had 501 to 5000 employees.

6-2- Reliability and Validity

The test of normality is done to check the distribution of collected data and whether it is normally distributed. To assess whether data is normally distributed, the researchers can examine two measures of distributing the Skewness and Kurtosis study. This allows for determining the extent to which the data deviates from normality [108]. Contended that the impact of normality can vary depending on the sample size, with larger samples, typically 200 or more, mitigating the adverse effects of "non-normality." For such sample sizes, the influence of non-normality may become insignificant. However, a widely accepted practice to assess normality involves running descriptive statistics to obtain Skewness and Kurtosis values. The acceptable range for Skewness was established between +2 and -2, while Kurtosis was set between +7 and -7. Normality concerns arise when univariate Skewness and Kurtosis values approach these thresholds [109]. In this study, all attributes exhibited Skewness and Kurtosis values within the acceptable range, as reported by Kuldeep & Samalia [109].

Biasness is a potential issue in the collected data, and employing the data collection method leads to erroneous outcomes [110]. Although procedural remedial measures were taken to reduce the common method bias (CMB), there were still chances of its occurrence, which could be detected using the statistical test. Therefore, the Harman single-factor test examined common method variance to catch the CMB. This test involved the inclusion of all the indicators in exploratory factor analysis. This test was conducted using SPSS 25.0 software, employing the principal component extraction method with none-rotation. The test operates on the assumption that if the total variance attributed to a single factor is below 50%, it indicates that CMB is unlikely to impact the collected data significantly. Over 50% of the variance for a single factor shows potential bias problems in the collected data. This test's assessment indicated that the maximum variance explained by a single factor is 37.794. Since the explanation by a single factor was far less than 50%, it was concluded that there was no threat of CMB. Furthermore, the results demonstrate that no single factor accounted for most of the covariance between the predictor and criterion constructs [111]. Consequently, it was suggested that CMB is not a significant issue in this context.

6-3- Measurement Model

Cronbach's Alpha and composite reliability tests assessed internal consistency's lower and upper bounds. The analysis found the test values within the range of threshold values. To assess Cronbach's Alpha, the value should not be less than 0.70, whereas the value must not be greater than 0.95 to determine the composite reliability [108]. Convergent validity

is assessed using the indicator's reliability and Average Variance Extracted (AVE) test. All the obtained values for reflective constructs were above 0.50; thus, the measurement model concerning AVE is acceptable for further analysis [108].

The procedure or criteria for assessing an indicator's reliability are dissimilar from the constructs of reflective and formative types. For the constructs of a reflective type, "outer loadings" are considered, whereas the "outer weights" parameter is assessed for the construct of formative type while using the PLS technique in the SmartPLS (version 3.3.3) software package for analysis [108]. Since this study contains both types of constructs, the indicator's reliabilities are demonstrated in Table 3 for formative and reflective constructs.

The indicator's reliability value for reflective constructs must be greater than 0.708. However, the values range between 0.40 and 0.70 are acceptable if the deletion of an indicator increases its AVE or composite reliability [108]. According to these guidelines, all the values are greater than 0.708, which is significant. Therefore, all the values are acceptable for further analysis.

Table 3. Loadings, Weights, Reliability, and AVE

Construct	Loadings	Weights	Cronbach's Alpha	CR & AVE
Data Resource				
DR1	0.850	0.360*	-	-
DR2	0.864	0.370*		
DR3	0.875	0.428*		
Dataset Quality				
DQ1	0.557	0.104	-	-
DQ2	0.634	0.275***		
DQ3	0.442	-0.006		
DQ4	0.562	0.060		
DQ5	0.747	0.267**		
DQ6	0.816	0.293**		
DQ7	0.747	0.141		
DQ8	0.707	0.273**		
Perceived Benefits				
PB1	0.841	-	0.892	CR = 0.925 AVE = 0.756
PB2	0.904	-		
PB3	0.893	-		
PB4	0.836	-		
Data-Driven Culture				
DD1	0.752	-	0.826	CR = 0.883 AVE = 0.655
DD2	0.865	-		
DD3	0.841	-		
DD4	0.775	-		
Centralization				
CE1	0.867	-	0.850	CR = 0.909 AVE = 0.769
CE2	0.886	-		
CE3	0.879	-		
Digitization Capacity				
DC1	0.768	-	0.875	CR = 0.915 AVE = 0.729
DC2	0.887	-		
DC3	0.869	-		
DC4	0.885	-		
Need for Transparency				
NT1	0.805	-	0.843	CR = 0.892 AVE = 0.673
NT2	0.795	-		
NT3	0.804	-		
NT4	0.875	-		

Compliance Pressure				
CP1	0.806	-	0.809	CR = 0.887 AVE = 0.724
CP2	0.880	-		
CP3	0.864	-		
Civil Society Participation				
CS1	0.856	-	0.887	CR = 0.922 AVE = 0.748
CS2	0.895	-		
CS3	0.878	-		
CS4	0.828	-		
Political Leadership Commitment				
PL1	0.861	-	0.907	CR = 0.935 AVE = 0.782
PL2	0.915	-		
PL3	0.907	-		
PL4	0.853	-		
Adoption Intention				
AI1	0.928	-	0.923	CR = 0.945 AVE = 0.812
AI2	0.891	-		
AI3	0.901	-		
AI4	0.883	-		
OGD Adoption				
AB1	0.852	-	0.879	CR = 0.917 AVE = 0.734
AB2	0.870	-		
AB3	0.886	-		
AB4	0.817	-		

* Significant at 0.01; ** Significant at 0.05; *** Significant at 0.10.

Discriminant validity was assessed using the recommended criterion, HTMT [108]. Although a value not more than 0.90 is recommended for conceptually similar constructs and a value not more than 0.85 is recommended for conceptually dissimilar constructs, an agreement must be established so far to reach an acceptable level globally using the HTMT criterion [112]. Moreover, Henseler et al. [112] describe that the deduction of standard HTMT value is subjective. Table 4 shows a slight discriminant validity issue between adoption intention and OGD adoption constructs, which is 0.860. The value is compromised above the threshold of 0.85 because these constructs are dissimilar.

Table 4. Heterotrait-Monotrait Ratio (HTMT)

	AI	**CE**	**CS**	**CP**	**DD**	**DC**	**NT**	**AB**	**PB**
CE	0.556								
CS	0.601	0.538							
CP	0.633	0.718	0.451						
DD	0.514	0.585	0.521	0.744					
DC	0.577	0.678	0.591	0.707	0.569				
NT	0.712	0.582	0.665	0.490	0.435	0.534			
AB	0.860	0.717	0.647	0.645	0.573	0.610	0.705		
PB	0.589	0.482	0.748	0.516	0.493	0.621	0.590	0.531	
PL	0.601	0.525	0.772	0.527	0.529	0.571	0.629	0.589	0.749

6-4- Testing of Hypothesis

After completing all tests and ensuring that threshold values in the measurement model are met, the next step involves evaluating the path coefficients within the structural model. This evaluation provides insights into the strength and significance of the relationships between different constructs. To determine these path coefficients, a bootstrapping procedure was conducted with 5,000 subsamples, as recommended by Hair et al. [108]. This procedure helps assess whether the relationships between independent and dependent variables are statistically significant. Subsequently, t-tests

for standardised path coefficients were conducted, and p-values were evaluated based on a one-tailed test with significance levels set at 0.10, 0.05, and 0.01. Table 5 presents the path coefficients, t-statistics, and p-values for each hypothesised relationship, offering a comprehensive view of the data's implications.

Table 5. Path Coefficients, T-Statistics and Significance Value

Description	Path	T Statistics	P Values	Remarks
H1: DR → AI	0.193	2.964	0.002**	Supported
H2: DQ → AI	0.266	3.097	0.001**	Supported
H3: PB → AI	0.132	1.852	0.032**	Supported
H4: DD → AI	0.090	1.445	0.074*	Supported
H5: CE → AI	-0.015	0.211	0.417	Not Supported
H6: DC → AI	0.112	1.450	0.074*	Supported
H7: NT → AI	0.430	5.240	0.000***	Supported
H8: CP → AI	0.176	2.408	0.008**	Supported
H9: CS → AI	0.101	1.140	0.127	Not Supported
H10: PL → AI	0.103	1.325	0.093*	Supported
H11: AI → AB	0.781	21.311	0.000***	Supported

* $p < 0.10$. | ** $p < 0.05$. | *** $p < 0.01$.

The measurement model result indicates a significant positive relationship between PSOs' data resources and adoption intention. The results (path coefficient (β) =0.193, t=2.964, p value=0.002) provided evidence to support this hypothesis. Thus, the adoption intention of OGD is significantly influenced by data resources, and H1 is supported. A significant positive relationship between the dataset quality and adoption intention is also found. The results (path coefficient (β) =0.266, t=3.097, p value=0.001) provided evidence to support this hypothesis. Thus, the intention to adopt OGD is significantly influenced by dataset quality, and H2 is supported. Hypothesis H3 is also supported since the result (path coefficient (β) =0.132, t=1.852, p value=0.032) indicates a significant positive relationship between the perceptions of OGD benefits and adoption intention. The data-driven culture within the PSOs significantly influences OGD adoption intention (H4), as a result, is found to be positive, being path coefficient (β) =0.090, t=1.445, and p value=0.074. Thus, the intention to adopt OGD is significantly influenced by data-driven culture. The result indicates a positive relationship between PSOs' digitisation capacity and adoption intention, and it is significant, having a path coefficient (β) =0.112, t=1.452, and p value=0.073. Thus, the adoption intention of OGD is significantly influenced by digitisation capacity, and H6 is supported. The result (path coefficient (β) =0.430, t=5.240, p value=0.000) also indicates a significant positive relationship between the need for transparency and the adoption intention of PSOs in Pakistan (H7). Being path coefficient (β) =0.176, t=2.408, and p value=0.008 as significant revealed the support of H8, which hypothesised a positive relationship between compliance pressure and adoption intention in Pakistan's public sector organisations. The relationship between political leadership support and PSO adoption intention is positive and significant because the path coefficient is 0.103, the t-value is 1.325, and the p-value is 0.093. Finally, the measurement model result indicates a significant positive relationship between adoption intention and OGD adoption of public sector organisations in Pakistan. The results (path coefficient (β) =0.781, t=21.311, p value=0.000) provided evidence to support this hypothesis. Thus, adopting OGD is significantly influenced by adoption intention, and H11 is supported. However, the adoption intention of OGD is not considerably influenced by centralisation (H5) and civil society participation (H9).

The relationship between centralisation and adoption intention was negatively hypothesised, while all other relationships were positively hypothesised. The bootstrapping results evidenced that the eight (8) relationships were found significant, along with the relationship between adoption intention and OGD adoption. However, the relationships between centralisation and civil society participation and the intention to adopt were found to be insignificant. Figure 3 depicts the complete analysed model.

Indeed, the complete research model is empirically significant. The contributing factors explain together a 59.5% (R^2 = 0.595) variation in the adoption intention and onward for its influence on the adoption of public sector organisations because the explained variance of adoption is 61% (R^2 = 0.610) (Table 6), which are acceptable findings. The results are permissible because the coefficient of determination (R^2) value should be greater than 30%, and it is considered adequate to explain the criterion or dependent variable [113]. The results are also more than the acceptable range because 40% or above variance by the predicting variables is desirable for explaining the dependent variable [114]. Thus, it is suggested that the developed model possesses a predictive ability of more than a moderate level.

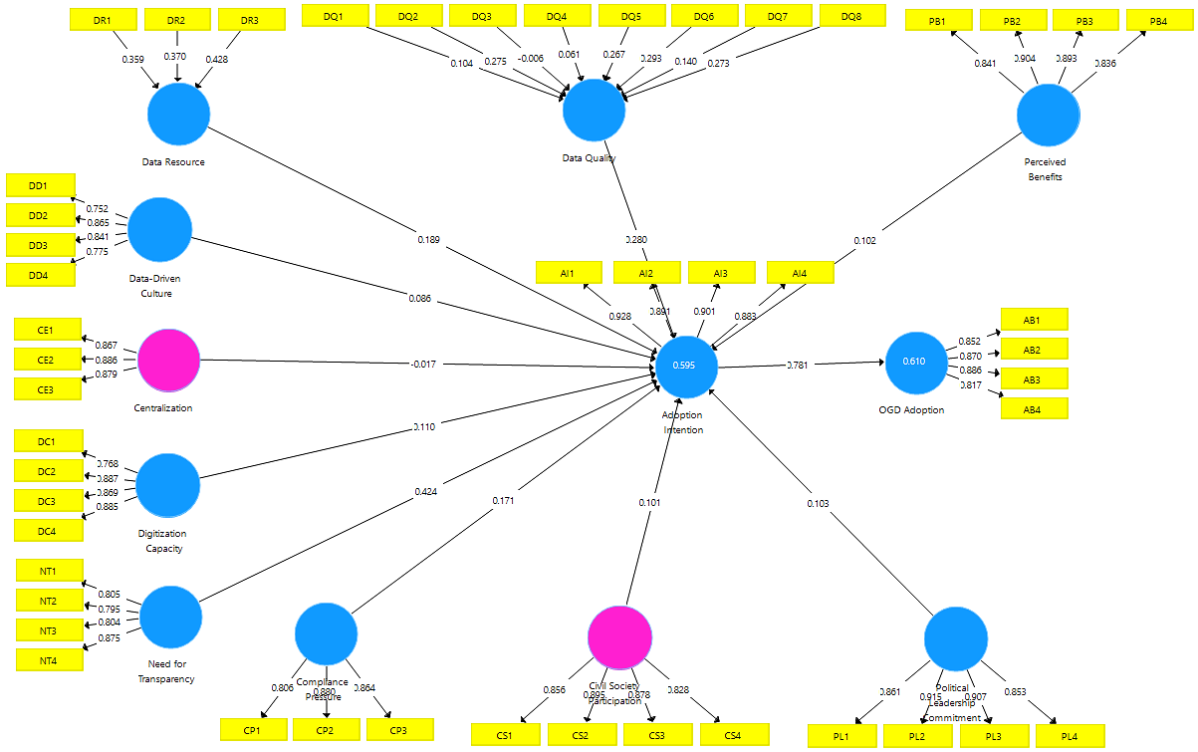

Figure 3. Validated Research Model

Table 6. R-square of Dependent Variable

Variables	R-Square Value	Standard Deviation	T Statistics	P Values
OGD Adoption	0.610	0.057	10.729	0.000
Adoption Intention	0.595	0.050	11.926	0.000

The predictive relevance (Q^2) was also calculated. This procedure was suggested by Hair et al. [108], and values are extracted using the blindfolding procedure in SmartPLS (Version 3.3.3).

Table 7 depicts the results of the Q^2 calculation using the blindfolding technique in SmartPLS. The model's predictive relevance is large, having a value of 0.465 for adoption intention and 0.440 for OGD adoption [108]. Therefore, the model has been found to predict the relevance of the observed phenomenon accurately.

Table 7. Assessment of Predictive Relevance (Q^2)

Endogenous Construct	Q^2	Remarks
OGD Adoption	0.440	Large
Adoption Intention	0.465	Large

7- Discussion and Implications

7-1- Discussion on Findings

This study's results support the hypothesised relationship between data resources and OGD adoption intention and provide evidence that data resources are the significant factor that positively influences the adoption intention of public sector organisations. This finding is consistent with a similar study conducted by Zhao & Fan [29], where data resources significantly influence OGD behaviour in terms of OGD capacity in China. Moreover, it is necessary to open up low-level OGD [17]. Dataset quality is a significant influencing factor in OGD adoption intention, as H2 is statistically significant. If the quality of datasets is high, then public sector organisations will intend to publicise data more. Otherwise, dataset quality will hinder the publication of data. The empirical finding of the current study is consistent with an earlier study [10]. Still, it is inconsistent with respect to having a significant impact on data quality on OGD sharing behaviour in the public sector of Singapore [46]. Other studies also reflect that data quality is a significant barrier to OGD initiatives [69, 115-117]. Moreover, the most impactful items in the adoption decision were the perceptions regarding accurate, complete, up-to-date, and rich information. For the third hypothesis (H3), the empirical results determine the positive and significant influence of the perceived benefits factor on the OGD adoption intention within

public sector organisations. This finding is also consistent with similar studies in investigating factors on open data participation of government agencies in Taiwan [28] and the post-adoption process of OGD in Malaysia [16]. Conversely, the lack of unclear OGD benefits restrains the wide publication of datasets in the public sector [37]. Although OGD is at an early stage and the experiment level, and there may be limited evidence, at this stage, for public sector organisations to obtain quantitatively- and qualitatively-measured benefits in terms of overall social, economic, and political benefits, organisations agree that the expected benefits of OGD are large.

The results of this study reinforce the proposed hypothesis, confirming a positive relationship between a data-driven culture and the intention to adopt OGD. This finding aligns with a previous study on OGD publication in PSOs in Taiwan [55]. The existing finding is consistent with similar research outlining that data-driven culture impacts performance through data analytics capabilities in the United States [48]. In adopting OGD, not only tangible but also intangible resources are required [29]. Business decisions based on data may be more concrete than those based on top management's past experiences, intuitions, or instincts. If the PSOs encourage the culture of making decisions based on the data, they would tend more positively towards sharing data openly and performing such actions. Data-driven culture amplifies the PSOs' ability to leverage the data [79] so as to increase the OGD adoption for tangible and intangible benefits.

Based on the assumptions that the degree to which the overall technical capacity of PSOs and the skills of its employees would positively influence their OGD adoption intention (H6), the results reveal that organisations believe the influence of digitisation capacity on the OGD adoption intention. The current findings complement the prior similar studies, which revealed that technical capacity has a positive and significant impact on OGD capacity [29] as well as organisational capability is associated with the opening of datasets to the public [10, 55]. The digitisation capacity has been considered as the contributing factor positively influencing OGD post-adoption Malaysian public sector data providers, whereas the empirical results do not support it [16]. An organisation without the necessary capacity can consider opening government-related data challenging. Without digitisation capacity, public sector organisations can feel uncertain about how to start and progress in participating in the OGD initiative.

The empirical findings unveil that H7 is supported (the relationship between the need for transparency and OGD adoption intention), which does not contradict the assumption developed from the literature. However, this finding is inconsistent with the previous similar study on organisations' open data-sharing behaviour in Singapore [46]. A possible reason for such a result could be due to the principal agreement of public sector organisations that opening data to the public cannot be denied and that they cannot straightforwardly say no to opening data, no need for transparency, or transparency is not essential. The empirical findings support the proposed hypothesis (H8). Moreover, the results of the proposed hypothesis are consistent with past studies on organisations' open data-sharing behaviour in Singapore [46]. The compliance pressure is also statistically significant in other studies in terms of its related variables like external pressure, external influence, and coercive pressures that have impact on OGD adoption in Taiwan [10, 23], on intention to publishing government data openly in Taiwan [28, 55], and open online government in United States respectively [49]. The culture of opening data in PSOs depends on data publication mandates [118], which may pressure organisations to comply with the mandates and open the data. As assumed that the regulative pillars such as regulative rules, digital transformation agendas, international organisations, and directions from state, federal or higher-level authorities exert pressures on public sector organisations to conform to open data initiatives [26, 51], such is the case with public sector organisations as they agree about compliance pressure to have its influence on OGD adoption intention which will then lead to perform actions on disclosing government data.

The results of this study confirm the hypothesised relationship between political leadership commitment and the adoption intention of OGD and provide evidence that political leadership commitment is a significant factor that positively influences the likelihood of PSOs adopting OGD. The results fit well and align with earlier studies on adopting open data in the Australian public sector, where it has been considered an influential factor in shaping adoption intention [99] and OGD performance [10]. Hossain et al. [10] underscore that nations with more democratic governance structures tend to collect and share more data than those with more autocratic regimes. All the laudable initiatives come to nothing if the political leadership does not lead them [119]. Adoption of OGD requires substantial resources such as finances, technologies, and human capital. The support from political leaders in providing such resources will show their commitment towards adopting OGD technological innovation.

The findings reveal that the fifth hypothesis (H5) is not supported by the significance test, even though there is an assumed negative relationship between centralisation and OGD adoption intention. This finding is in line with similar studies in prior OGD scholarship, where the centralised structure of an organisation is negatively associated with open government data capacity [29]. One possible explanation of such findings is that by adopting the reactive approach, organisations (represented by decision-makers) are directed to open the data they produce or process with specified exemptions to open, they may exercise some discretionary power and judgement to open the data [120] irrespective of whether there is centralised or decentralised structure. The empirical results determine the positive relationship for the tenth hypothesis (H10). However, the relationship is not significant. This finding is inconsistent with a similar study in that external public pressures make open government adoption more likely and positively associated with it [49] in the

context of the United States. It is also evident from earlier studies that the absence of external pressure on government entities reduces their motivations to actively engage in the OGD initiative [16, 121]. The empirical result of H10 is quite surprising in the Pakistani context because the results of the current study do not correspond to the history of open data development, in which the public acts as the pioneer and advocator to require public sector organisations to publicise datasets [55]. One possible explanation for this relationship (between civil society participation and OGD adoption intention) to be insignificant may be that there is less participation of civil society in government decision-making and policy-making through social media or e-government tools, which usually emerge in the public sector to impact public agendas and policies.

Finally, for the eleventh hypothesis (H11), the empirical results determine the adoption intention factor's positive and significant influence on the PSO's OGD adoption. This formulated hypothesis has previously been supported in studies, including open data publication behaviour in Taiwan [55] and exploring the factor of open data participation in Taiwanese government agencies [28]. There is little evidence found where it is applied to the data perspective covering both the individual [1, 27, 78] and the organisational side [28, 55, 122]. Accordingly, the same was hypothesised, empirically investigated, and found significant in this study, positively influencing OGD adoption behaviour.

Organisations should adopt suitable mechanisms to digitise and manage data resources in a database management system (DBMS). Moreover, public sector organisations also need to develop a DBMS because, often, there is no system to establish data and metadata for an OGD repository. Organisations should invest in and build quality information systems, as sensors and citizens are also gradually emerging beside the organisation's internal data resources [88] since the quality of the information system may hinder dataset quality. As there are more than 175 dimensions/characteristics for dataset quality [123], the dataset should be of high quality for them to be reused, especially for evidence-based decision-making. Thus, public sector organisations should take these concerns seriously. Public sector organisations should look forward more to both tangible and intangible benefits of OGD adoption instead of just developing the perceptions/predictions and recognising the benefits. Therefore, to promote the adoption of OGD among public sector organisations, policy practitioners should emphasise real-world success stories that demonstrate how these organisations can reap substantial rewards and achieve positive outcomes by releasing government-related data. Highlighting tangible benefits and successful examples can motivate organisations to embrace OGD initiatives more readily.

Regarding organisational dimensions, public sector organisations should develop an internal culture where business and policy decisions are made based on data. They should take the initiative to encourage a data-driven culture within the organisation. For instance, public sector organisations with low data-driven culture should empower and coach/train their staff at all levels (including operational, managerial, and executive) to make data-driven decisions. In contrast, organisations with a high level of data-driven culture should continue their efforts to remain data-driven [48] since preparing data and metadata for publishing data as a dataset requires specialised skills, which may not be available within the organisation or attached departments. Thus, organisations should provide awareness and training and facilitate seeking international certifications to make the staff a skilled resource and should take capacity-building initiatives. Organisations should also invite (like invitations to municipal office meetings) external stakeholders, including citizens, through social media or open data portals to access information, monitor, and seek public input, which, in turn, helps them seek legitimacy on the organisational/governmental decisions. In this way, they can satisfy their needs for transparency and intend to adopt OGD.

This study finds that compliance pressures from higher-level authorities/organisations can be an essential approach to increasing the intentions of public sector organisations toward OGD adoption. On one side, the government should issue directives and provide guidelines for the public sector organisations since the development of OGD directions by the government can guide public sector organisations on disclosing datasets, which, in turn, intend them to adopt OGD broadly. On the other hand, PSOs should adhere to and follow these guidelines because they must maintain good relationships with higher-level authorities that are of central importance to them. For instance, to comply with government mandates, public sector organisations may face difficulties in making investments to digitise and cleanse the data for its opening, and accordingly, they request resources for this purpose. Another factor of vital importance is political leadership commitment, which implies that PSOs believe in the commitment of political leadership to increase their intention toward publicising the data. As PSOs first look towards government/politicians for resources, government/political leadership should focus on removing public sector organisations' barriers to opening the data by raising the capacity and generating awareness on what can be done further with opening and using data.

The last factor that can influence the OGD adoption behaviour of PSOs is the OGD adoption intention, which implies that public sector organisations also recognise adoption intention as a significant and positively influencing factor on their adoption behaviour and should be given critical attention. Accelerating an organisation's intention to adopt OGD can significantly enhance its actual adoption behaviour, as adoption intention is the strongest and most immediate predictor of whether an organisation will engage in OGD practices. One way to increase PSOs is to change decision-makers behaviour through the Game Method [1, 124]. Organisational-level seminars and motivational talks can be arranged to communicate and expose OGD benefits and introduce risk reduction mechanisms.

7-2- Contribution to Research

Theoretically, this study contributes to information system theory in several ways. The factors modelled in the TOE framework effectively explain their influences on OGD adoption decisions among PSOs. The TOE framework is flexible and can embrace other factors contributing to determining OGD adoption intention and, subsequently, OGD adoption behaviour. This study reveals valuable theoretical insights integrating different factors within the TOE framework and hypothesises the relationship between several independent variables and OGD adoption intention. Including factors other than originally framed factors in the TOE framework implies that it is flexible to absorb other factors to measure adoption (both adoption intention and adoption behaviour) of complex technological innovations, which is OGD in the current scenario.

This study found that OGD adoption intention is an important information system variable in Pakistan's PSO setting because it has a practical, direct effect on OGD adoption. It places adoption intention in a new nomological network and demonstrates its worth. While studies link data resource, dataset quality, need for transparency and compliance pressure directly to open data-sharing behaviour in the public sector, it is a contribution that these factors influence OGD adoption behaviour through OGD adoption intention. Moreover, this study builds information system theory by examining the effects of perceived benefits, digitisation capacity, political leadership commitment and data-driven culture, which shows that organisations' perceptions of adopting OGD are significantly higher when the contribution of these factors is high. Placing adoption intention before adoption decision at the organisational level implies that researchers would find a new line of research using the TOE framework.

The causal relationships that have been discovered as significant offer new insights to make OGD adoption on a large scale among public sector organisations. Therefore, these are essential considerations in explaining the adoption of OGD among public sector organisations. However, the nonsignificant relationships, like the relationship between centralisation and civil society participation with the OGD behavioural intention, are not significant considerations of public sector organisations regarding increasing OGD adoption intention. This study adds knowledge to the vast body of literature in OGD adoption studies by developing a novel theoretical model with high variance.

This study reinforces earlier literature focusing on public sector organisations (represented by decision-makers) as the direct and most prominent data publishers. It offers insights into the roles of decision-makers as the representatives of public sector organisations in real-life OGD initiatives. This study contributes to essential considerations such as the quality and characteristics of OGD, the needs, abilities, resources, culture, and structure of organisations, and pressures or influences of stakeholders on an organisation for the publication of government data. There is a large variance in OGD, that is, 59.5% in adoption intention and 61% in OGD adoption, embedding and validating of new factors like data resource and need for transparency as well as new conceptualisations like digitisation capacity, dataset quality, and compliance pressure prove them as salient factors which influence the public sector organisation's OGD adoption intention and subsequently the OGD adoption in Pakistan. Further, the predictive ability of the OGD adoption model is also large, having a value of 0.467 (46.7%) for OGD adoption intention and a value of 0.440 (44%) for OGD adoption, which all other previous studies on OGD adoption had not observed. This implies that the constructs in the developed model accurately predict its relevance and further support the research model.

7-3- Practical Implications

The findings of this study may help the government, policy practitioners, and public sector organisations develop more effective strategies that encourage OGD adoption among public sector organisations while devising appropriate initiation strategies. Based on the present study's findings, public sector organisations' perceptions of technological characteristics are the factors that significantly influence their intentions to adopt OGD.

From a practical standpoint, all the cohorts need to understand the factors that can significantly contribute to OGD adoption on a large scale among Pakistan's PSOs. According to the findings of this study, the technological dimension is the dominating and superseding dimension among the TOE's three dimensions. This implies that the PSOs are giving more importance to the technological characteristics of OGD than institutional and environmental characteristics. Insights into the demographic characteristics of PSOs and the decision-makers can help all the cohorts design an OGD adoption initiative that attracts a particular type of organisation with a specific characteristic of decision-maker. External auditors (such as Performance Audit), important stakeholders of OGD programs, can also reap the benefits from this research because they have the mandates or objectives for improving the quality of information, transparency, accountability, good governance, management, and performance in PSOs.

The technology-related barriers to adopting OGD should be overcome in true letter and spirit. In this respect, public sector organisations can engage application developers or software engineers from private sector organisations to design and improve OGD publishing and solve technology-related problems. Moreover, institutional or organisational barriers can be tackled through legal and policy considerations and commitments from the Government of Pakistan (GoP) related to the involvement of all stakeholders. Further, the willingness of public sector organisations to adopt OGD also demands intense pressures or influences from higher-level authorities to comply with formal or informal GoP mandates. For instance, Pakistan's RATI Act, 2017 can be revisited and reshaped per all stakeholders' demands and requirements.

The proposed OGD adoption model and subsequent validation can help information technology practitioners in Pakistan's PSOs to learn the ways of using and managing information technologies to reinvigorate business processes, increase transparency and accountability, counteract corruption, validate the research and experiment results, and improve business decision making from the adoption of OGD. Further, the decision-makers can consult the validated OGD adoption model during the IT/IS development process within public sector organisations, reducing the possibility of unsuccessfully implementing information technologies. Moreover, this research's outcome may apply to other similar research in the public sector, such as the adoption of big data, geographical information systems, and information-sharing projects.

The results related to the technological characteristics of OGD indicate that data is a fundamental tangible resource, and public sector organisations consider it an essential factor in increasing their intention to adopt OGD. Moreover, it is an important factor having adequate potential for improving the performance of OGD adoption intention. It is the data resource the public, organisations, and their underlying departments need. Thus, data resources affect the purpose of OGD adoption. Accordingly, they should be in place or strive to enhance mechanisms to generate, collect, digitise, process, and integrate different data resources. For instance, public sector organisations can employ a state-of-the-art database management system to manage the data. Further, they can concentrate on including in their policies the objective of digitising data for public use, besides administrative or statistical use.

Dataset quality is a significant factor, implying that not only the characteristics of data but also the characteristics of metadata are essential considerations. Moreover, this factor is significant for the intention to adopt OGD but shows low performance. This implies that there is an exceptionally high potential for improving the performance of dataset quality along with its priority for performance improvement. Thus, investments in improving the performance of dataset quality would be logical since it would have a high impact on changing or improving the intention to adopt OGD. Investments can be made in quality improvement strategies and developing quality information systems since the quality of information systems may hinder dataset quality. In this respect, different data and metadata quality metrics or frameworks, such as data-driven and process-driven techniques, can be implemented to identify their quality and improve the OGD quality. Further, public sector organisations in Pakistan can implement portal platform technologies (such as OpenDataSoft, CKAN, DKAN, or Mangomap) to generate quality datasets quickly.

Perceived benefits as a significant factor implies that public sector organisations in Pakistan should look forward to both tangible and intangible benefits of OGD adoption instead of just developing perceptions or recognising the benefits. Accordingly, when encouraging OGD adoption among Pakistan's PSOs, policy practitioners can highlight practical success stories through social media and training sessions on how organisations exploit benefits from releasing government-related data.

As reported in the assessment of the OGD adoption model, a potential improvement in satisfying the needs for organisations' transparency exists. Organisations obligate themselves to provide government information more than that of internal or external pressures. Basically and practically, the public has the right to know about the workings of governments and public sector organisations since these organisations are publicly funded. Thus, the data belongs to the public instead of the government. This need can be accomplished by developing a centralised OGD portal to give the public the rights and satisfy their need for transparency.

This study reiterates the importance of environmental characteristics, that is, compliance pressure, and this can be a fundamental approach to increasing the intentions of public sector organisations in Pakistan toward OGD adoption because of its high priority and performance improvement. Although a directive from the GoP in the form of the RATI Act of 2017 has been issued, the GoP can provide guidelines and standard operating procedures (SOPs) to the PSOs to disclose datasets. On the other hand, public sector organisations can request resources from the government and other higher-level authorities and build relationships with them to comply with the mandates since public sector organisations in Pakistan face difficulties in making investments to digitise and cleanse the data for its opening.

Accelerating the adoption intention leads to an uplift in the adoption of OGD because adoption intention is validated after assessing the OGD adoption model as the antecedent of OGD adoption. It is also logical that individuals or organisations first make plans for technology adoption and then adopt that technology. In this respect, it is imperative to adopt strategies to accelerate adoption intention before adopting them for accelerating OGD adoption. For instance, public sector organisations can employ a physical game-related activity as an additional experience of OGD publishing.

8- Conclusion

This research investigates the factors that influence OGD adoption among PSOs in Pakistan. This was done by examining the factors of OGD adoption intention and then OGD adoption behaviour. The purpose of investigating the influencing factors of OGD adoption intention was based on the premise that increasing the adoption intention would lead to an increase in the OGD adoption behaviour because the intention to adopt is an important indication and significant factor in determining the adoption behaviour of PSOs. Moreover, this study was also conducted because

previously developed models on measuring intention to adopt OGD were falling short in their explanatory power and applicability in organisational settings. The factors framed in the developed model were observed as having ample explanatory power in OGD adoption (59.5% for OGD adoption intention and 61% for OGD adoption behaviour). Therefore, the recommendations are proposed based on results and are expected to help significantly increase the organisation's OGD adoption intention and adoption behaviour in PSOs. This study shows the added value of integrating the potential determinants of OGD innovation adoption behaviour in a framework integrating technological, organisational, and environmental perspectives.

8-1- Limitations and Future Directions

It is imperative to discuss an array of limitations of this research study, though some valuable theoretical and practical insights have been revealed. The first limiting element exercised in this study is that only the PSOs in Pakistan are part of the study. Thus, empirical investigation on OGD adoption research from the private or non-governmental organisations' viewpoint would be necessary. The study is conducted only on the OGD adoption from the context of data providers, and thus, the investigation should also be made from the data perspective. It is a one-time cross-sectional study. Therefore, longitudinal research may also be carried out to investigate the factors influencing the organisation's adoption of OGD. Further, this study only catered to one technology adoption theory, the TOE framework, without using any mediators and moderators. Future researchers may integrate multiple theories to explore more factors in OGD adoption. Moreover, in this study, only eleven factors are empirically investigated to influence OGD adoption among PSOs. In the future, more factors such as legislation and policy, security and privacy, economic/business value of OGD, and data/technical interoperability will need to be investigated.

In this research study, data was collected from the decision-makers of PSOs in Pakistan using a purposive sample technique, which affects the generalisation of this study. Regarding generalising, data collection using a random sampling technique may be adopted. Due to this study's small sample size (total of 249 respondents), further research should be conducted on a large sample considering the decision-makers of public sector organisations in Pakistan. A small portion of governments represented the state, local/city, and municipal governments. Moreover, many organisations were ministries or their attached departments/divisions. Regarding these limitations, an equal portion of each type or form of government may make the study's findings generalised.

Lastly, although some guidelines for the government, agencies, and policy practitioners have not been proposed to make the OGD adoption in Pakistan's PSOs on a large scale, no endorsement from the experts or policy practitioners has been given. Therefore, future scholars should propose recommendations by taking feedback from the experts. Further, future scholars may conduct a joint study to investigate the factors of data publication and use by municipalities only.

9- Declarations

9-1- Author Contributions

Conceptualization, M.M.K. and A.R.; methodology, S.Y.; software, R.W.A.; validation, H.M.F.S.; formal analysis, H.M.F.S.; investigation, R.W.A.; resources, A.R.; data curation, M.M.K.; writing—original draft preparation, M.M.K.; writing—review and editing, A.R.; visualization, A.R.; supervision, R.W.A.; project administration, A.R.; funding acquisition, A.R. All authors have read and agreed to the published version of the manuscript.

9-2- Data Availability Statement

The data presented in this study are available in the article.

9-3- Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

9-4- Institutional Review Board Statement

Not applicable.

9-5- Informed Consent Statement

Not applicable.

9-6- Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies have been completely observed by the authors.

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Appendix I: Instrument

What's your gender?

● Male ● Female

How old are you?

- 21-30 years old
- 31-40 years old
- 41-50 years old
- 51-60 years old

What is your level of education?

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

Please mention under which ministry your organization falls in?

- Cabinet Secretariat
- Climate Change
- Commerce and Textile
- Communications
- Defence
- Defence Production
- Energy
- Federal Education and Professional Training
- Finance, Revenue and Economic Affairs
- Foreign Affairs
- Housing & Works
- Human Rights
- Industries and Production
- Information, Broadcasting, National History and Literary Heritage
- Information Technology and Telecommunication
- Interior
- Inter-Provincial Coordination
- Kashmir Affairs and Gilgit-Baltistan
- Law and Justice
- Narcotics Control
- National Food Security and Research
- National Health Services, Regulations and Coordination
- Overseas Pakistanis and Human Resource Development
- Parliamentary Affairs
- Planning, Development and Reform
- Maritime Affairs
- Postal Services
- Privatization
- Railways
- Religious Affairs and Inter-faith Harmony
- Science and Technology
- States and Frontier Regions
- Statistics
- Water Resources

What is your position in the organization?

- CIO / CEO / CTO or equivalent
- Senior IT Director or equivalent
- Assistant IT Director or equivalent
- Senior IT Manager or equivalent
- IT Manager or equivalent
- Assistant IT Manager or equivalent
- Designated Official responsible for Open Data initiative.
- Other (decision-making role), please specify...

Does your organization have its own website or platform to publish the data?

● Yes ● No

Is your organization publishing data on its own or third-party website or platform (e.g. https://opendata.com.pk/**,** http://nsdi.gov.pk/**,** http://www.data.org.pk/**,** https://open.punjab.gov.pk/**,** http://odi.itu.edu.pk/**)?**

● Yes ● No

Has your organization appointed an officer who is responsible for Open Government Data initiative?

● Yes ● No

Under which type/form of government does your organization falls in?

- Federal Government
- Provincial Government
- State Government
- Local/City Government
- Municipal Government

Please provide the total number of employees in your organization.

- 1-50 employees
- 51-500 employees
- 501-5000 employees
- 5001-50000 employees
- Above 50000 employees

Please provide your organization's contact details (e.g. Email, Mobile, WhatsApp, or Landline).

Please indicate/tick the relevant number against each question, which corresponds to level of agreement. The levels of agreement are as follows:

Strongly Disagree ❶; Disagree ❷; Somewhat Disagree ❸; Neutral ❹; Somewhat Agree ❺; Agree ❻; Strongly Agree ❼

1: Data Resource

A large amount of data is generated in the daily operation of my organization.	❶	❷	❸	❹	❺	❻	❼
My organization integrates all data into database for ease of use.	❶	❷	❸	❹	❺	❻	❼
My organization obtains much data in the process of cooperation with other organizations.	❶	❷	❸	❹	❺	❻	❼

2: Dataset Quality

The data that my organization maintains is sufficient to meet our needs.	❶	❷	❸	❹	❺	❻	❼
The data that my organization maintains is accurate.	❶	❷	❸	❹	❺	❻	❼
My organization maintains data at an appropriate level of detail.	❶	❷	❸	❹	❺	❻	❼
The data that my organization has can be relied upon.	❶	❷	❸	❹	❺	❻	❼
The metadata (information about data) that my organization maintains is complete.	❶	❷	❸	❹	❺	❻	❼
The metadata (information about data) that my organization maintains is containing rich information to carry out tasks.	❶	❷	❸	❹	❺	❻	❼
The metadata (information about data) that my organization maintains is up to date (latest/not obsolete).	❶	❷	❸	❹	❺	❻	❼
The metadata (information about data) that my organization maintains is well-formatted.	❶	❷	❸	❹	❺	❻	❼

3: Perceived Benefits

My organization has sufficient incentives to participate in open government data.	❶	❷	❸	❹	❺	❻	❼
My organization can obtain rewards through open government data implementation.	❶	❷	❸	❹	❺	❻	❼
The agencies at higher levels provide my organization with sufficient rewards to implement OGD.	❶	❷	❸	❹	❺	❻	❼
My organization can receive positive feedback through open government data publication.	❶	❷	❸	❹	❺	❻	❼
Overall, the implementation of open government data has positive impacts on my organization.	❶	❷	❸	❹	❺	❻	❼

4: Data-Driven Culture

My organization considers data a valuable asset.	❶	❷	❸	❹	❺	❻	❼
My organization bases its decisions on data rather than on instinct.	❶	❷	❸	❹	❺	❻	❼
My organization is willing to override its own intuition when data contradict its viewpoints.	❶	❷	❸	❹	❺	❻	❼
My organization continuously assesses and improves the business rules in response to insights extracted from data.	❶	❷	❸	❹	❺	❻	❼
My organization continuously trains its employees to make decisions based on data.	❶	❷	❸	❹	❺	❻	❼

5: Centralization

There can be little action taken in my organization until a supervisor approves a decision.	❶	❷	❸	❹	❺	❻	❼
In general, a person who wants to make his own decisions would be quickly discouraged in my organization.	❶	❷	❸	❹	❺	❻	❼
Even small matters have to be referred to someone higher up for a final answer.	❶	❷	❸	❹	❺	❻	❼

6: Digitization Capacity

My organization provides related training on open government data.	❶	❷	❸	❹	❺	❻	❼
The person responsible for open government data have the ability to complete the task.	❶	❷	❸	❹	❺	❻	❼
The person responsible for open government data have sufficient education and knowledge.	❶	❷	❸	❹	❺	❻	❼
The person responsible for open government data have relevant working experience.	❶	❷	❸	❹	❺	❻	❼

7: Need for Transparency

It is important for us to provide any government data that the public wants.	❶	❷	❸	❹	❺	❻	❼
There is a need to share government data because the public have a right to know.	❶	❷	❸	❹	❺	❻	❼
There is a need to allow complete access to government data to the public.	❶	❷	❸	❹	❺	❻	❼
Government data belongs to the people, not to the government.	❶	❷	❸	❹	❺	❻	❼

8: Compliance Pressure

With regard to government guidelines on open data, my organization has to conform to the guidelines because our wellbeing depends on their resources.	❶	❷	❸	❹	❺	❻	❼
With regard to government guidelines on open data, my organization has to adhere to the guidelines because my organization must maintain good relationships with upper levels within the government.	❶	❷	❸	❹	❺	❻	❼
With regard to government guidelines on open data, my organization has to follow the guidelines because upper levels within the government are crucial to us.	❶	❷	❸	❹	❺	❻	❼

9: Civil Society Participation

Individual citizens are actively participating in my organization's decision and policymaking.	❶	❷	❸	❹	❺	❻	❼
Neighborhood associations are actively participating in my organization's decision and policymaking.	❶	❷	❸	❹	❺	❻	❼
News media are actively participating in my organization's decision and policymaking.	❶	❷	❸	❹	❺	❻	❼
Interest groups are actively participating in my organization's decision and policymaking.	❶	❷	❸	❹	❺	❻	❼

10: Political Leadership Commitment

Political leadership is committed to develop National Action Plans to adopt open government data.	❶	❷	❸	❹	❺	❻	❼
Political leadership is committed to provide technical and financial support to develop infrastructure for adopting open government data.	❶	❷	❸	❹	❺	❻	❼
Political leadership is committed to patronize workshops and experience-exchanging programs to adopt open government data.	❶	❷	❸	❹	❺	❻	❼
Political leadership is committed to establish the Digital Transformation Office to bring out change in public service culture.	❶	❷	❸	❹	❺	❻	❼

11: Adoption Intention

My organization plans to implement open government data policy.	❶	❷	❸	❹	❺	❻	❼
My organization intends to integrate open government data into the existing processes.	❶	❷	❸	❹	❺	❻	❼
My organization expects to have open government data become a part of the regular operation.	❶	❷	❸	❹	❺	❻	❼
My organization plans to develop an infrastructure for the opening of data.	❶	❷	❸	❹	❺	❻	❼

12: OGD Adoption

My organization actively prepares open datasets to the public.	❶	❷	❸	❹	❺	❻	❼
My organization actively increases more types of open datasets to the public.	❶	❷	❸	❹	❺	❻	❼
My organization actively encourages the use of open datasets to the public.	❶	❷	❸	❹	❺	❻	❼
My organization is engaged in adopting open data technologies.	❶	❷	❸	❹	❺	❻	❼

13: Has the COVID-19 crisis changed willingness to open the data?

1) Yes – increased my organization's willingness to a large extent
2) Yes – increased my organization's willingness somewhat
3) Yes – increased my organization's willingness to a small extent
4) Yes – decreased my organization's willingness
5) No – has not influenced my organization's willingness