Satisfaction with Open Government Data Portals: A User-Centric Configurational Perspective

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Abstract

Open Government Data (OGD) has become an important theme of digital transformation strategies as it promises data-driven innovation and greater transparency in government. Many governments have chosen to implement national data portals to grant access to large amounts of public sector datasets. However, the expected uptake by the economy and society has been slow, and criticism towards the basic idea of open government is growing. In this paper, we take an in-depth look at how the perceptions of the features of the portal lead to users' satisfaction with the OGD portal. Taking a user-centred perspective, we apply a fuzzy-set Qualitative Comparative Analysis methodology to identify different configurations which lead users to be satisfied with the OGD portal. Based on our empirical analysis, we formulate concrete recommendations on how the results can be used to define tailor-based strategies targeting the features of the OGD portals.

Keywords: Open Government Data, Qualitative Comparative Analysis, Data portals, users

Introduction

Governments produce, collect, and maintain large amounts of data to perform their tasks, but until recently, most of these data were only accessible through statistical reports or after long and official request processes (Nikiforova and McBride 2021). The emergence of policy debates claiming more transparency gave rise to open government data (OGD), providing a democratised and technological way to make government data more accessible (OECD 2022). OGD are data produced by state bodies made freely accessible to everyone for exploitation. While initially produced by public bodies for a specific purpose, government data are now open to the public for other purposes (Jetzek et al. 2019). Accordingly, OGD holds ambitious and promising expectations such as increasing transparency and accountability (Harrison and Sayogo 2014), empowering the citizens (Talukder et al. 2019), stimulating innovation (Janssen et al. 2012), promoting economic development (Talukder et al. 2019) and increasing participation as well as the collaboration of different stakeholders in government activities (McDermott 2010). To stimulate the publication of government-produced data and gain an advantage from OGD reuse, governments' most preferred strategy has been to develop OGD portals (Nikiforova and McBride 2021; Rivera Pérez and Emilsson 2020). The development of OGD portals sought to increase the accessibility of the OGD and facilitate the reuse of datasets by playing the intermediary role between the data producers and the data users.

However, although OGD portals are intended to increase the reuse of the datasets to exploit their full potential, they mainly do not achieve these aims (Nikiforova and Lněnička 2021; Wang and Shepherd 2020). As a result, while the total direct economic value of government-produced data is expected to increase from a baseline of €52 billion in 2018 for the 27 EU countries and the United Kingdom, to €194 billion in 2030 (European Commission 2021), the current reuse of OGD is falling behind expectations (Ruijer et al. 2017a). Yet, for the promising and ambitious expectations to be reached, government-produced data need to be exploited by various stakeholders, as the value from OGD can only be generated when open datasets are fully reused (Nikiforova and Lněnička 2021). Unfortunately, while datasets are being shared on OGD portals, assuming that they are meant to be reused, their actual reuse is still low in practice (Gascó-Hernández et al. 2018; Martin 2014; Ruijer et al. 2017b). This lack of reuse has brought OGD portals a subject of criticism (Máchová et al. 2018; Nikiforova and Lněnička 2021). The policy challenges for governments to enable OGD reuse have also been uncovered by the COVID-19 pandemic (OECD and GovLab 2021). While this extraordinary situation has brought the OGD policies on stage by emphasising the potential of OGD for crisis responses, the opportunities to use OGD to address the multidimensional implications of COVID-19 have been broadly missed (OECD and GovLab 2021). Given, on the one hand, the investments made by governments in developing the OGD portals and, on the other hand, the deficiencies revealed by the pandemic, the pressure on governments has augmented. Thus, governments have to assess whether the OGD portals meet the users' needs (OECD and GovLab 2021).

While the existing literature evaluated the development of the OGD portals, the evaluations have focused mainly on the usability aspects of the OGD portals or on the datasets provided without giving much attention to the experience of regular users (Máchová et al. 2018; Máchová and Lněnička 2017; Ruijer et al. 2017a). We aim to expand these research streams by gaining an in-depth appreciation of how the perceptions of the features of the OGD portal lead users to be satisfied, which provides an evaluative response to the OGD portal. Thus, using users' perceptions, the study addresses the following research question: What sets of features lead users to be satisfied with the OGD portal? We follow a fuzzy-set Qualitative Comparative Analysis (fsQCA) methodology, which allows to identify how the perceptions of multiple features can combine into distinct configurations for users to be satisfied. Using fsQCA allows to conceptualise, analyse, and determine how multiple conditions are combined into distinct configurations and ultimately produce an outcome of interest (Benbya et al. 2020; Berg-Schlosser et al. 2009; Park et al. 2020; Ragin 2000; Ragin 2014; Ragin and Rubinson 2009; Thomann 2020). In this sense, fsQCA allows to identify how the perceptions of multiple features can jointly lead users to be satisfied with the OGD portal. Accordingly, our findings show the relevance of fsQCA in providing empirically well-grounded information allowing for a better understanding of how multiple features' perceptions can combine into distinct configurations for users to be satisfied. We conclude by formulating some recommendations from fsQCA deterministic findings. Our study is structured as follows: we first outline the background of the paper, then present the research methodology before exposing the findings and drawing some conclusions.

Background

On the Diversity of OGD Users

The OGD environment is typically composed of multiple actors interacting through a common boundary object, such as a portal or directly through an application programming interface (API). But who are these actors? By definition, OGD producers are public administrations or organisations with a state mandate. To ensure that government-produced data are shared, the OGD portal acts as an intermediary between the OGD producers and the users. This intermediary role can be endorsed by a public institution or a private company orchestrating the datasets. While we concentrate on the OGD portal and not only on the API because the OGD portal covers the API as a way for users to access the datasets, the centre of attention in this study is OGD users, who basically can be anyone (Lassinantti et al. 2019; Safarov et al. 2017). For example, public-sector employees may use OGD to improve public service or decision-making processes (Gascó-Hernández et al. 2018; Safarov et al. 2017). Simultaneously, developers and entrepreneurs may use OGD to develop better customer services, make profits (Safarov et al. 2017), or innovate (Bria et al. 2015; Safarov et al. 2017). Other types of users, such as researchers, journalists, activists or employees from non-governmental organisations, may use OGD to understand a thematic better, influence policy, or create knowledge in a different format or inform citizens (Dawes et al. 2016; Gascó-Hernández et al. 2018; Ruijer et al. 2017b; Safarov et al. 2017). Finally, citizens can also benefit from OGD to evaluate or take a proactive role in the government's activities (Safarov et al. 2017).

The diversity of users implies various user types with respective capacities and interests (Lassinantti et al. 2019; Susha et al. 2015; Worthy 2015). As an illustrative example, technical users such as developers may not only, most likely, possess higher ICT skills than an average citizen but may also favour different features of the OGD portal. For instance, the developers would look for machine-readable data to be downloaded and processed on a computer using spreadsheets software. At the same time, an ordinary citizen may settle for simple visualisation from a CSV file. Another difference could come from the way to access the datasets. While ordinary citizens may access the datasets via the search engine and not care about the functionalities of the API because they cannot use it, entrepreneurs may only swear by the API functionalities allowing them to access the datasets more conveniently.

Given this diversity, we focus on individual-level users, which allows to gather their perceptions of the features of the OGD portal. While understanding users' needs is essential for OGD to reach its expectations (Lassinantti et al. 2019), finding out the needs of each type of user is challenging because they differ widely. Yet, understanding the diversity of users is needed, primarily as some critiques have been raised towards OGD and the OGD portal, which are not fully exploited or only convenient for a niche of users (Lassinantti et al. 2019; Nikiforova and McBride 2021). Therefore, to understand the features required for all kinds of users to be satisfied with the OGD portal, we aim to address the diversity of users by identifying subsets of the data thanks to fsQCA.

On the Importance of Users' Satisfaction

While user satisfaction tends to reinforce the users' intention to continue using the system and is identified as a surrogate measure of IS success (Bhattacherjee 2001; Bhattacherjee and Lin 2015; DeLone and McLean 2003; Deng et al. 2010; Vaezi et al. 2019; Vaezi et al. 2016; Venkatesh et al. 2011), examining user satisfaction as a sum of the users' interactive experience with the IS product or service also provides valuable insights on how users perceive the IS product or service and how it meets users' needs (Deng et al. 2010). We thus focus on user satisfaction because explaining user satisfaction provides some form of evaluative response to the IS product or service (Deng et al. 2010; Melone 1990). Understanding the relationship between satisfaction with the features and overall satisfaction with the IS product or service is needed to understand user experience (Vaezi et al. 2019).

Applied to our study, we understand satisfaction as a sum of interactive experiences with the OGD portal. Indeed, like any other IS service, the OGD portal cannot be considered successful until its users find it satisfying (Sullivan et al. 2009). We focus on satisfaction with the OGD portal, that is, the satisfaction deriving from user experience when reusing datasets provided on the OGD portal. The satisfaction is determined by the overall experience with the OGD portal, which cannot be dissociated from the reuse of the datasets as the rationale of the OGD portal is mainly to increase datasets' reuse by playing the

intermediary role between the data producers and the data users. There is, thus, some complexity, which lies in the fact that the OGD portal acts as an intermediary between the data producers and the data users while aiming to afford a wide diversity of users to reuse the datasets. Hence, the diversity of users implies various user types with respective capacities and interests, all relying on the OGD portal features to reuse the datasets. Accordingly, the overall user experience with the OGD portal is shaped not only by the features of the OGD portal but also by the user's capacities and interests, which alter their perceptions of the features and their possibilities of datasets' reuse.

To obtain alternative configurations of features' perceptions leading users to be satisfied, we use fsQCA as a methodology. Using fsQCA allows to identify how the perceptions of multiple features can jointly lead users to be satisfied with the OGD portal, which cannot be modelled by conventional regression techniques that are founded primarily on linear relationships not able to appraise for complex causality (Li et al. 2018; Liu et al. 2017). Indeed, in contrast to variance-based approaches, fsQCA enables the analysis of the interdependencies among perceived features by acknowledging that perceived features can be combined to form a configuration in realising the outcome rather than compete in explaining the outcome (Li et al. 2018; Woodside 2013).

Research Methodology

Fuzzy-Set Qualitative Comparative Analysis (fsQCA)

Developed by Ragin (1987)), Qualitative Comparative Analysis (QCA) is an asymmetric data analysis technique combining the logic of qualitative approaches with quantitative methods dealing with large numbers of cases, which are more generalisable. QCA rests on the premise that sets of conditions (i.e., configuration) rather than a single condition are deterministic of an outcome of interest (Fiss 2011). Hence, a configuration is a specific set of conditions that produces an outcome of interest (Liu et al. 2017; Rihoux and Ragin 2009). Accordingly, conditions are seen as potential causes of the outcome. Moreover, the conditions indicating the outcome are regarded as interrelated, which allows for analysing and determining how multiple conditions can be combined into distinct configurations (Ragin 2014). As for the cases, they must be selected purposefully rather than randomly so that cases are similar to delimitate an area of homogeneity. Yet, heterogeneous in terms of conditions and outcome (Pappas and Woodside 2021).

In this article, we use fsQCA, which is one of the main variations of QCA and integrates fuzzy-sets and fuzzy-logic principles with QCA principles (Rihoux and Ragin 2009). Unlike the reliance of correlation-based methods on matrix algebra, fsQCA uses Boolean algebra to specify and test sets of conditions for the outcome to occur (Ragin 2008). As a set-based approach, fsQCA offers an appropriate means to elicit multiple sets of conditions for the outcome of interest (Ragin 2008), which makes it particularly suitable to unfold complexity (Gerrits and Pagliarin 2021). Hence, conditions are rarely sufficient or necessary but exert causal power when combined (Gerrits and Pagliarin 2021). In addition, by examining asymmetric relationships, fsQCA can illustrate both the presence and absence of causal conditions necessary for an outcome of interest to emerge (Liu et al. 2017; Woodside 2013). By determining sets of conditions relevant to a given outcome, the methodology is especially relevant in environments where complex interactions among conditions are observed (Burton-Jones et al. 2015; Iannacci and Cornford 2017).

Building on configurational lens, fsQCA allows to address the challenges arising from the OGD portal and turn them into opportunities. Indeed, given that the OGD portal is composed of multiple features, its complexity cannot be understood by simply examining a single feature. Hence, considering that multiple features constitute the OGD portal, total congruence within the features cannot be assumed (Goldkuhl 2013; Goldkuhl and Donnellan 2013). Thus, perceiving a single feature (no matter how crucial) may not necessarily culminate in users' satisfaction. Using fsQCA allows disentangling users' perceptions of the OGD portal's features and analysing their interdependencies. This is made possible through QCA, where conditions are rarely self-sufficient or necessary but exert power when combined (Fainshmidt et al. 2020; Gerrits and Pagliarin 2021; Schneider and Wagemann 2012). We thus argue that using QCA allows analysing interdependencies by acknowledging that perceived features can be combined into distinct configurations for users to be satisfied. This is made possible by highlighting the multiple and conjunctural nature of causation and its respective three ramifications (Rihoux and Ragin 2009). First, fsQCA focuses on conjunctural causation, referring to the fact that it is the set of conditions rather than a single condition which jointly produces an outcome (Liu et al. 2017). Second, fsQCA addresses asymmetric causality,

referring to the fact that the configurations of causal conditions explaining the presence of the outcome are not necessarily the opposite of the explanation for its absence (Fiss 2011; Iannacci and Cornford 2017; Liu et al. 2017). Third, fsQCA addresses equifinality, which assumes multiple and equally effective pathways to a given outcome (Fiss 2011; Iannacci and Cornford 2017; Liu et al. 2017).

Selecting Conditions

As the OGD portal should afford users to reuse the datasets, we consider conditions as drivers and/or barriers that may shape users' satisfaction with the OGD portal through different configurations. Applied to our study, the perceived features of the OGD portal refer to conditions in fsQCA and the satisfaction with the OGD portal to the outcome. Accordingly, we aim to determine what sets of features the users perceive that lead them to be satisfied with the OGD portal.

For datasets to be reused and generate value, relevant datasets should be disclosed, and convenient features should be available on the OGD portal for different stakeholders (Nikiforova and Lněnička 2021). We selected five conditions to be included in our fsQCA model to explore users' satisfaction with the OGD portal. While there are different ways of identifying conditions in fsQCA, the key is articulating a configurational rationale around the chosen conditions and their combined effects on the outcome. Based on the literature (see Appendix), the selection of conditions was realised considering the primary role of the OGD portal. Hence, given that the primary role of the OGD portal is to offer a "one-stop-shop" for data exchange, the mainspring of the OGD portal is affording users to access and use the datasets (Attard et al. 2015; Ojo et al. 2016). Accordingly, we identified five key features of the OGD portal considered purposeful in assisting the users in accessing and using the datasets (Janssen et al. 2012; Nikiforova and Lněnička 2021; Nikiforova and McBride 2021).

First, given that the rationale behind the OGD portal is specifically to gather datasets for reuse, the OGD portal should ensure the datasets' quality (Attard et al. 2015; Nikiforova and McBride 2021; Vetrò et al. 2016). For instance, the datasets should be correct and accurate to be purposeful for the users, allowing them to rely on the datasets and fully exploit their potential. Secondly, the portal should have high-quality metadata because providing contextual information about the data improves traceability and favours further use by allowing the user to decide quickly whether the data fit its intended use (Attard et al. 2015; Kubler et al. 2018; Link et al. 2017). Moreover, to ensure accessibility, the OGD portal should possess an operational search engine providing keyword-based capabilities and operational API functionalities (Charalabidis et al. 2014; Lněnička and Nikiforova 2021; Lourenço 2015; Máchová and Lněnička 2017; Nikiforova and Lněnička 2021; Ojo et al. 2016; Petychakis et al. 2014; Ubaldi 2013). By facilitating the finding of datasets using keyword-based search capabilities, an operational search engine allows the users to discover relevant datasets while avoiding, at the same time, overloads of unnecessary information (Lourenço 2015; Máchová and Lněnička 2017). As for the API, it provides an entry point for direct access to data catalogues favouring datasets' accessibility and download possibilities (Kubler et al. 2018; Máchová et al. 2018). Finally, the OGD portal should possess convenient support tools such as extensive documentation, which can assist the users in their ability to use the OGD portal and in their reuse of the datasets (Máchová et al. 2018; Máchová and Lněnička 2017; Nikiforova and McBride 2021).

Data Collection

We developed an online survey questionnaire based on the five features identified. Adopting a five-point Likert scale ranging from 1 for "strongly disagree" to 5 for "strongly agree", with 3 being "I don't know", we measured the users' level of satisfaction with the OGD portal and the level of agreement with the five identified key features of the OGD portal. Accordingly, the questionnaire aimed at measuring the users' level of agreement with a set of questions comprehended as a proxy of the identified features based on the literature (see Appendix). We favoured single-item measures because we formulated the questions to be easily and uniformly imagined in the mind of the respondents (Bergkvist and Rossiter 2007). Concerning overall satisfaction, we asked a global single-item question so that respondents automatically consider all relevant aspects related to their situations (Fuchs and Diamantopoulos 2009).

We collected empirical data from actual and regular users of the national OGD portal of Switzerland. The questionnaire was delivered via mailing lists, social media channels, and newsletters. The data collection lasted for 16 weeks (between the end of May and the beginning of September 2021). From the 209

participants of the questionnaire, the final sample comprises 103 fully valid responses from regular users of the Swiss OGD portal, which provides variance in the data among a homogeneous group of respondents (Berg-Schlosser et al. 2009; Mattke et al. 2022). The sample comprises users from the public sector, private sector, and international or non-governmental organisations which regularly use the portal for commercial and/or non-commercial purposes. Moreover, the respondents are from all generations, from the baby boomers (i.e., 1946-1964) to the generation Y (i.e., 1981-1999), yet with a slight preponderance from the generation X (i.e., 1965-1980). As for the ICT skills of the respondents, they vary greatly from the ability to store information in digital form to writing code in a programming language. We were also able to have some diversity concerning the linguistic affiliation of Switzerland, with a slight majority of German speakers followed by French speakers and a minority of Italian speakers corresponding to the breakdown of the linguistic areas. We also have some English speakers' respondents. Given the diversity among the respondents, we gathered responses from various user types with respective capacities and interests.

Demographic Item	Categories	Percentage
Sector of activities	1. Public sector 2. Private sector 3. Other (i.e., international organisations, non-governmental organisations)	70.87 19.42 9.71
Generation	1. 1946-1964 2. 1965-1980 3. 1981-1999	11.65 50.49 37.86
ICT skills	1. Basic skills 2. Intermediate skills 3. Advanced skills	22.33 42.72 34.95
Linguistic affiliation	1. German 2. French 3. Italian 4. English	56.31 33.98 1.94 7.77

Table 1 Summary of Demographic Profile of Respondents

FsQCA Model

To analyse the relationship between the set of conditions and the outcome, we employ fsQCA through the fsQCA software program (Ragin and Davey 2016). To determine what conditions or sets of conditions are perceived as present or absent for users to be satisfied with the OGD portal, we test the following fsQCA model:

Users' satisfaction with the OGD portal = (High-quality datasets, High-quality metadata, Operational search engine functionalities, Operational API functionalities, Convenient support tools)

In fsQCA, the causal conditions and the outcome are represented using membership scores, requiring the calibration of the conditions and the outcome scales from 0.00 for full non-membership to 1.00 for full membership (Ragin 2008). We thus aim to conceptualise these conditions as sets and assign membership scores. We chose direct calibration because it leads to more rigorous studies by establishing three clear values for membership scores making the chosen thresholds transparent and the overall research easier to replicate and validate (Pappas and Woodside 2021). The three values correspond to full-set membership, full-set non-membership, and cross-over point. Degrees of membership show if and how much a case belongs to a specific set by computing the presence of a condition (i.e., full membership) or its opposite (i.e.,

full non-membership), while the cross-over point describes whether a case is more in or out of a set (Pappas and Woodside 2021; Ragin 2008). We proceeded to the data calibration in fsQCA software using the three thresholds suggested by the literature for the widely used Likert scales (i.e., 4, 3, and 2 for a five-point Likert scale) (Fiss 2011; Pappas and Woodside 2021; Ragin and Davey 2016).

Analysis

FsQCA uses the truth table algorithm to determine which configurations are sufficient for the outcome. We sorted the truth table by frequency and consistency (Pappas and Woodside 2021; Ragin 2008) and selected a frequency cut-off of 1, describing the number of observations for each possible set. This cut-off is deemed appropriate for less than 150 cases (Pappas et al. 2016; Ragin 2008). Moreover, we set the lowest acceptable consistency for solutions at 0.80, which is well-established and determines at which threshold a set of conditions is sufficient for an outcome of interest to emerge (Ragin 2008). Moreover, fsQCA calculates the proportional reduction in inconsistency (PRI), which is used to avoid simultaneous subset relations of configurations in both the outcome and its absence (Pappas and Woodside 2021). The fsQCA software program calculates the proportional reduction in inconsistency (PRI), which is used to avoid simultaneous subset relations of configurations in both the outcome and its absence (Pappas and Woodside 2021). We used a PRI threshold higher than 0.5 to ensure significant consistency (Pappas and Woodside 2021). FsQCA computes three solutions, namely complex, parsimonious, and intermediate (Pappas and Woodside 2021; Ragin 2008). While the complex solution presents all the possible sets of conditions, the parsimonious solution is a simplified version offering the most important conditions which cannot be left out (Pappas and Woodside 2021). The intermediate solution is obtained from the parsimonious and complex solutions through counterfactual analysis (Fiss 2011; Liu et al. 2017; Ragin 2008). Our baseline interpretation of the fsQCA findings is based on the intermediate solution, which strikes a balance between the extremes and is the most interpretable (Fiss 2011; Liu et al. 2017; Ragin 2008).

Findings

Table 2 reports the findings of the fsQCA analysis for users to be satisfied with the OGD portal. FsQCA allows to disentangle the features perceived by users of the OGD portal through four different configurations uncovering users' satisfaction with the OGD portal. The findings indicate an overall solution coverage of 0.693, suggesting that the four configurations cover a substantial proportion of the outcome. Moreover, the findings also reveal configurations in which features may be perceived or not depending on the combination with other features. Hence, the configurations show that no single perceived feature alone satisfies users. Instead, it is sets of perceived features that satisfy users with the OGD portal, which means that satisfaction with the OGD portal is a result of satisfaction with multiple features of the OGD portal that act in conjunction with each other.

Configurations of conditions	**1**	**2**	**3**	**4**
High-quality datasets	•		•	•
High-quality metadata		•	●	⊗
Operational search engine functionalities	•	•	⊗	●
Operational API functionalities			•	•
Convenient support tools	•	•		
Consistency	0.917	0.930	0.964	0.823
Unique coverage	0.042	0.036	0.082	0.024

Raw coverage	0.549	0.498	0.161	0.147
Overall solution consistency: 0.903 ***Overall solution coverage: 0.693*** ●/•: *Presence of core/peripheral condition* ⊗ *: Absence of a condition* *Blank space: Unspecified condition (i.e., the condition may be either present or absent)*				

Table 2 FsQCA Findings

To indicate how closely approximated a specific configuration and an outcome relationship is, fsQCA uses a consistency value ranging between 0 and 1. A configuration is said to be informative when consistency is above 0.74 and coverage between 0.25 and 0.65 (Ragin 2008) and is said to be useful and serve theory advancement if the consistency value is above 0.80 (Pappas and Woodside 2021). With a consistency of 0.917 and 0.930 and coverage of 0.549 and 0.498, respectively, configuration one and configuration two are deemed informative and serve theory advancement. Thanks to the raw coverage values, we can see that configurations one and two are the most empirically relevant, while configurations three and four are less central. Indeed, the raw coverage values of configurations three and four highlight their lower empirical relevance.

It is interesting to underline that configurations one and two are relatively similar except for the interchangeability of two features, either perceived as present or left unspecified (i.e., the condition may be perceived as present or absent). In configuration 1, users recognising "high-quality datasets", "operational search engine functionalities", and "convenient support tools" present a high level of satisfaction in 55% of the cases. In configuration 2, users recognising from the OGD portal "high-quality metadata", "operational search engine functionalities", and "convenient support tools" present a high level of satisfaction in 50% of the cases. Moreover, configurations three and four are relatively similar and present the same interchangeability aspect regarding two core conditions (i.e., high-quality metadata and operational search engine functionalities), which have a stronger causal relationship with the outcome (Fiss 2011). Although, in configuration three, recognising the presence of "high-quality datasets" and "operational API functionalities" is required, when users perceive the absence of "operational search functionalities", the presence of "high-quality metadata" also needs to be identified for users to be satisfied. Hence, although the search engine is not perceived as operational, it is still possible to experience satisfaction with the OGD portal if there is satisfaction with the quality of the datasets and the metadata as well as with the API functionalities. This can be explained by the fact that "high-quality metadata" provides structural information, facilitating the datasets' findings, which may offset the absence of fully operational search engine functionalities. We observe something similar in configuration 4, where the perceived absence of "high-quality metadata" seems to be offset by recognising the presence of "operational search engine functionalities", "high-quality datasets", and "operational API functionalities".

Discussion

The study contributes to OGD research in several ways. First, this study contributes to the extant literature on the OGD portal by deriving distinct configurations that culminate in users' satisfaction from a configurational standpoint. This enriches previous work concentrating on exploring the usability issues of the OGD portal. Secondly, by deriving four configurations accounting for the diversity of users to be satisfied with the OGD portal, our study illustrates that perceiving the presence of a single feature cannot guarantee users' satisfaction with the OGD portal and that sets of features must be recognised. As we can see from the results of the fsQCA, there are multiple ways through which users may experience satisfaction with the OGD portal. Finally, thanks to its deterministic results, fsQCA can be used to formulate policy recommendations based on the results obtained. Accordingly, our findings can be harnessed by practitioners and policymakers.

Using fsQCA allows to obtain alternative configurations and account for the wide diversity of users. By disentangling the features perceived from the OGD portal, the findings indicate that users may find the OGD portal satisfying if the right sets of features are recognised. In this sense, our results also explain how satisfaction with different features of the OGD portal configures to facilitate overall satisfaction with the OGD portal. By showing how different configurations can trigger a similar outcome, our study allows a representation close to reality and gives concrete insights into improving the OGD portal for users to be satisfied. In that sense, the findings offer possibilities for changes and improvements to serve users better. The configurations lens of fsQCA provides a fine-grained understanding for various types of users, which is relevant given that different types of users are likely to have different needs regarding the features of the OGD portal. Indeed, given the wide diversity of users, it is reasonable to assume that different sets of features must be perceived for various users to be satisfied. For this reason, identifying multiple configurations of features' perceptions helps to ensure that a wider diversity of users is satisfied with the OGD portal. For example, configurations one and two leave "operational API functionalities" unspecified but require the presence of "convenient support tools". In contrast, configurations three and four leave "convenient support tools" unspecified while requiring the presence of "operational API functionalities". This may be due to the empirical diversity in technological literacy or users' requirements and processes surrounding their use. Non-technical users, for example, may not care about API functionalities as they may not be able to use them but may favour the presence of convenient support tools as they may need assistance when using the OGD portal. On the other hand, users harnessing API functionalities may care less about convenient support tools as their technological literacy may make them more independent and allow them to use the most advanced functionalities of the portal without needing any specific assistance. Hence, by identifying subsets of the datasets, fsQCA allows covering the wide diversity of users by computing multiple configurations and not only the vast majority explained by the best solution of regression analysis. Moreover, while QCA can work with substantial sample sizes, it was initially designed for small sample sizes, far below those required for standard regression analysis (Fainshmidt et al. 2020). This favours a closer representation of the reality as targeting actual users of an IS product or service prevents relying on one population as a proxy for another, which is common in IS literature, for example, undergraduate students serving as a proxy for the general population of technology use or as a surrogate of managers (Davison and Martinsons 2016).

By taking a user-centred perspective using fsQCA, we identified the sets of features perceived by the users for them to be satisfied with the OGD portal. Using QCA to identify how the perceptions of multiple features can combine into distinct configurations to satisfy users offers new insights by considering complex causality, which provides concrete implications for IS design and practice. Our study exemplifies this as configurations three and four show how users recognising the absence of a specific feature can still result in overall satisfaction with the OGD portal if other features are perceived. In this sense, users may be satisfied with the OGD portal by perceiving different sets of features, meaning that some recognised features may be irrelevant alone but matter in respective configurations. These sets of perceived features can, in turn, shape policy processes, allowing them to target specific features when investing in developing OGD portals. Consequently, differentiated strategies could be pursued to satisfy OGD users. Specifically, knowing which features are perceived as more critical and which configuration explains user satisfaction can help settle tailor-based strategies (Pappas et al. 2016). Altogether, our findings may be used for the user-centred design of the OGD portal (Nikiforova and McBride 2021; Rivera Pérez and Emilsson 2020) and future articulation of policies regarding the successful implementation of OGD (Charalabidis et al. 2016; Dawes et al. 2016; Talukder et al. 2019). Conducting a regular evaluation of the OGD portal by taking a user-centred perspective through the configurational lens of QCA may allow to award users a central role and place their needs at the core of OGD policies. Moreover, by praising the interdependences and interconnections among the features, fsQCA can deal with complex causality. Hence, by considering complex causality, the method offers new insights to policymakers and practitioners.

Of particular interest in the findings is the role of "high-quality datasets" and "operational search engine functionalities", which are present in three out of four configurations. Indeed, while no single feature alone satisfies users, the findings also show that the perceptions of certain features are more relevant empirically. In this sense, priorities should be settled for developing the perceived features, which are most empirically relevant. Based on the findings, policymakers and practitioners should encourage the publication of "high-quality datasets" by implementing quality checks to reinforce the OGD portal's attractiveness. The focal point should thus be to favour datasets' quality over quantity. For instance, these quality checks could be

implemented by the OGD portal acting as an intermediary. For instance, the OGD portal should ensure that the published datasets are correct, accurate, complete, regularly updated, or provided in convenient, machine-readable formats. Furthermore, the OGD portal should also have "operational search engine functionalities" to help users search and access relevant datasets. The OGD portal should thus be fit for use and allow users to find the relevant datasets. Having operational search functionalities is key in affording OGD reuse because operational search functionalities can facilitate datasets reuse by providing strong search and finding capacity. Indeed, an OGD portal can contain the most fruitful datasets, but if the poor functioning of the search engine does not allow the user to find the datasets through keyword queries, the OGD reuse is held down. The interchangeability aspect of two core conditions in configurations three and four (i.e., high-quality metadata and operational search engine functionalities) provide insights into how "high-quality metadata" and "operational search engine functionalities" can operate. By providing structural information facilitating the finding of the datasets, "high-quality metadata" may offset the lack of satisfaction with the search engine functionalities. On the other hand, perceiving the absence of "high-quality metadata" may not jeopardise the overall satisfaction with the OGD portal, especially if the search engine is perceived as operational. Moreover, given the empirical relevance of configurations one and two, the focus should also be on improving the "high-quality metadata" and providing "convenient support tools" in general. In that sense, quality checks may also be implemented for the metadata, favouring datasets' reuse by allowing the potential users to determine if the datasets fit the intended reuse. This could imply that the OGD portal, acting as an intermediary, checks before publication that the datasets are accompanied by information about the context of the datasets, the spatial and temporal coverage, the last updates, the formats, or the language, to cite few examples. This could also be possible by requesting the OGD producers to complete mandatory metadata fields before publication. Indeed, while the intermediary is responsible for monitoring the datasets available on the OGD portal, the OGD producers should be responsible for making sure that the datasets provided respect specific requirements. Finally, the intermediary responsible for the OGD portal should also ensure that convenient support tools are provided on the OGD portals to assist the wide diversity of users in using the OGD portal and reusing the datasets. Support tools can be provided in various ways, such as documents gathering the most relevant information about general information related to the OGD portal or the responsible institutions and some contact possibilities.

In short, rather than increasing the number of datasets available on the OGD portal and disregarding their quality, investments should be targeted on the most empirically relevant sets of perceived features. While the opportunities to use OGD to address the multidimensional implications of COVID-19 have been broadly missed, the pandemic spotlighted the increasing importance of OGD. Indeed, the pandemic has underlined the role to be played by OGD, allowing new forms of data-driven assessment of public problems, and enabling engagement for interventions. Given the increasing natural and man-made crises, it is time to settle the right sets of features affording users to unlock the potential of OGD, which can be key in facilitating collective and informed crisis responses.

Conclusion

Given that what affects users' satisfaction is often difficult to isolate due to interdependencies and interconnections, this study inaugurates the use of fsQCA to shed light on configurations of features perceived by the users that lead them to be satisfied with the OGD portal.

The findings demonstrate that using fsQCA can provide new empirical insights into how the key features perceived by the users of the OGD portal combine for them to be satisfied. Thanks to its deterministic findings, our study can directly help to make targeted investments to develop the identified sets of features on the OGD portal for users to be satisfied and eventually unlock the potential of OGD. Moreover, our study offers new insights into understanding users' satisfaction. In particular, the configurations show how different configurations of perceived features lead to the same outcome and how users having negative perceptions of a particular feature can still be satisfied if they have positive perceptions of other features. Finally, our findings pave the ground for developing theories that explain users' satisfaction by showing how configurational thinking and related QCA techniques offer opportunities to discover multiple configurations leading users to be satisfied. This study also highlights the opportunities offered by fsQCA in evaluating the design of the OGD portal and, more generally, the design of purposeful IT artefacts. In that sense, our study also expands the research stream of design science by showing how the configurational lens of QCA can help settle tailor-based strategies for IS design.

Our research has some limitations that could be addressed in future research. First, the results are limited by focusing on a single national OGD portal. Further examination of different OGD portals would allow for broader generalizability of findings. Second, the sample offers a wide diversity among the respondents except for the distribution among the sector of activity, which presents a higher concentration in the public sector. While respondents are actual users of the OGD portal, we cannot exclude the possibility of them having a dual role and being involved in the publication of some datasets, which may generate some bias. Third, fsQCA does not allow the analysis of many conditions because analysing and interpreting the results would be hardly practicable (Navarro et al. 2016). However, further research may include more features of the OGD portal, which is possible but requires applying principal component analysis to extract latent components from a high number of initial conditions. These latent components could then be used as conditions in fsQCA. Other limitations of the method include the choice of conditions and outcomes relying on prior knowledge or the necessity to calibrate the data (Liu et al. 2017).

As a future research avenue, we encourage further empirical studies to assess the satisfaction judgment of the OGD portal and other IS services through the configurational lens of fsQCA. While evaluating the OGD portal is not new, research on combining different perceptions of the OGD portals' features to contribute to users' satisfaction is in its infancy. The empirical evidence presented in this study provides a starting point for future research in this direction. Moreover, we believe that identifying different paths to a given outcome is essential for researchers and practitioners alike. We thus encourage further empirical studies in IS to conduct a rigorous evaluation by taking the targeted-population perspective through the configurational lens of fsQCA. Moreover, given the increasing complexity of IS, it is relevant to analyse the set of conditions and stop ignoring potential interdependencies and interconnected configurations. It is thus appropriate to analyse the set of conditions to determine how their interaction can lead to the desired outcome. We also argue that using fsQCA to assess how the IS service yields the desired outcome is especially relevant as the results of fsQCA can directly be used to drive actionable insights. Accordingly, we argue that the results of fsQCA can directly be integrated into the specific design choices based on actual users. In this sense, the results enable to revisit the investments made in the OGD portal. Lastly, while fsQCA allowed identifying the features required for users' to be satisfied with the OGD portal, the method is not suitable for identifying the average effect size of the OGD portal. Hence, after more than a decade of OGD initiatives worldwide, we call for more practice-based research, such as developing assessment frameworks to provide better estimations related to OGD reuse quantifiably.

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Appendix

	References	Strongly disagree (1)	Disagree (2)	Agree (4)	Strongly agree (5)	Don't know (3)
[Users' satisfaction with the OGD portal] Overall, I am satisfied with the experience of using the OGD portal.		5.82%	16.50%	53.40%	17.48%	6.80%
[High-quality datasets] The datasets available on the OGD portal are correct and accurate.	(Attard et al. 2015; Charalabidis et al. 2014; Kučera et al. 2013; Martin et al. 2013; Nikiforova and McBride 2021; Reiche and Höfig 2013; Vetrò et al. 2016)	1.94%	5.82%	39.81%	20.39%	32.04%
[High-quality metadata] The description of the datasets and metadata enables me to interpret the datasets with respect to my needs.	(Attard et al. 2015; Charalabidis et al. 2014; Kubler et al. 2018; Kučera et al. 2013; Link et al. 2017; Máchová et al. 2018; Ubaldi 2013)	10.68%	24.27%	47.57%	9.71%	7.77%
[Operational search engine functionalities] The search engine provides strong datasets' search and finding capacity.	(Charalabidis et al. 2014; Lněnička and Nikiforova 2021; Lourenço 2015; Máchová and Lněnička 2017; Nikiforova and Lněnička 2021; Ojo et al. 2016; Petychakis et al. 2014; Ubaldi 2013)	9.71%	21.36%	52.43%	10.68%	5.82%
[Operational API functionalities] I find the API features suitable (e.g. download possibilities).	(Charalabidis et al. 2014; Kubler et al. 2018; Lněnička and Nikiforova 2021; Máchová et al. 2018; Máchová and Lněnička 2017; Nikiforova and Lněnička 2021; Ojo et al. 2016; Petychakis et al. 2014; Ubaldi 2013)	3.88%	5.82%	22.33%	1.94%	66.02%
[Convenient support tools] The documentation provided on the portal (e.g. handbook) helps in using it.	(Charalabidis et al. 2014; Máchová et al. 2018; Máchová and Lněnička 2017; Nikiforova and McBride 2021; Sayogo et al. 2014; Ubaldi 2013)	6.80%	6.80%	42.72%	9.71%	33.98%