Citizen engagement with open government data: Lessons learned from Indonesia's presidential election

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Title: **Citizen Engagement with Open Government Data: Lessons learned from Indonesia's Presidential Election**

Purpose: Citizen engagement is key to the success of many Open Government Data (OGD) initiatives. However, not much is known regarding how this type of engagement emerges. The objective of this study is twofold: 1) to investigate the necessary conditions for the emergence of citizen-led engagement with OGD and 2) to identify which factors stimulate this type of engagement.

Design/methodology/approach: First, we created a systematic overview of the literature to develop a conceptual model of conditions and factors of OGD citizen engagement at the societal, organizational, and individual levels. Second, we used the conceptual model to systematically study citizens' engagement in the case of a particular OGD initiative, namely the digitization of presidential election results data in Indonesia in 2014. We used multiple information sources, including interviews and documents, to explore the conditions and factors of OGD citizen-led engagement in this case.

Findings: From the literature we identified five conditions for the emergence of OGD citizen-led engagement: 1) the availability of a legal and political framework that grants mandate to open up government data, 2) sufficient budgetary resources allocated for OGD provision, 3) the availability of OGD feedback mechanisms, 4) citizens' perceived ease of engagement, and 5) motivated citizens. In the literature we found six factors contributing to OGD engagement: 1) democratic culture, 2) the availability of supporting institutional arrangements, 3) the technical factors of OGD provision, 4) the availability of citizens' resources, 5) the influence of social relationships, and 6) citizens' perceived data quality. Some of these conditions and factors were found to be less important in the studied case, namely citizens' perceived ease of engagement and citizens' perceived data quality. Moreover, we found several new conditions that were not mentioned in the studied literature, namely: 1) citizens' sense of urgency, 2) competition among citizen-led OGD engagement initiatives, 3) the diversity of citizens' skills and capabilities, and 4) the intensive use of social media. The difference between the conditions and factors that played an important role in our case and those derived from our literature review might be due to the type of OGD engagement that we studied, namely citizen-led engagement, without any government involvement.

Research limitations/implications: The findings are derived using a single case study approach. Future research can investigate multiple cases and compare the conditions and factors for citizen-led engagement with OGD in different contexts.

Practical implications: The conditions and factors for citizen-led engagement with OGD have been evaluated in practice and discussed with public managers and practitioners through interviews. Governmental organizations should prioritize and stimulate those conditions and factors that enhance OGD citizen engagement to create more value with OGD.

Originality/value: While some research on government-led engagement with OGD exists, there is hardly any research on citizen-led engagement with OGD. This study is the first to develop a conceptual model of necessary conditions and factors for citizen engagement with OGD. Furthermore, we applied the developed multilevel conceptual model to a case study and gathered empirical evidence of OGD engagement and its contributions to solving societal problems, rather than staying at the conceptual level. This research can be used to investigate citizen engagement with OGD in other cases and offers possibilities for systematic cross-case lesson-drawing.

Keywords: open data, open government data, engagement, citizens, conditions, factors, use

Article Type: Research paper

1. Introduction

Governments around the world are progressively opening up their non-personal and non-confidential data online (McDermott, 2010). One of the central motivations for providing this Open Government Data (OGD) is that citizens can engage with this data to create societal benefits, such as improving the quality of public policy (Obama, 2009). Citizen engagement is key to the successful and sustainable use of OGD (Dietrich, 2015) that enables collaborative actions (Sieber and Johnson, 2015, Susha et al., 2017), which in turn provides new insights that potentially contribute to solving societal issues (Susha et al., 2015).

Scholars in the field generally define user engagement as activities performed when using open data to produce different types of output (Susha et al., 2015). These activities are associated with specific tasks that have to be carried out by users, such as the discovery of specific facts in open datasets, the creation of an interactive interface for accessing and exploring datasets, or the provision of a service powered by open data (Davies, 2010). Each output requires different tasks and activities to be conducted (Susha et al., 2015). For instance, 'converting data to facts' involves data searching and browsing and fact extraction, whereas 'creating a service on top of open data' requires not only data processing but also computer programming.

Nevertheless, simply creating an OGD-based output is insufficient in solving societal issues because this output needs to be utilized by citizens to support their decision making or action to tackle a particular societal problem. For instance, a website that compares spending data opened by local governments (the OGD-based output) can be used by citizens to detect corruption (activity) and then based on the identification of fraud, citizens can voice out a law enforcement agenda to public and law apparatus (utilization). Therefore, we argue that citizen engagement is not limited merely to socio-technical activities for generating a particular OGD-based output as defined by Davies (2010) and Susha et al. (2015), but also concerned with citizens' political participation to solve societal problems utilizing the output of OGD use (Graft et al., 2016). Thus, in this particular study, engagement concerns the multidimensional, socio-technical and socio-political acts of citizens involving OGD.

Citizen engagement with OGD can take multiple forms. First, it can be led and organized by governments in the sense that governments determine when and where the engagement takes place and under which conditions citizens can engage (Sieber and Johnson, 2015). This *government-led citizen engagement* commonly manifests in events such as open data hackathons and innovation competitions sponsored by governments. However, researchers have shown that e-participation initiatives led by the government are sometimes not efficient (Hivon and Titah, 2017), while those led by citizens can be more effective (Porwol et al., 2013). The second form of citizen engagement concerns *citizen-led engagement*, in which citizens can organize themselves independently when engaging with OGD and in which the content and processes of engagement are determined by citizens themselves (Purwanto et al., 2018b).

Various government-led OGD engagement cases have already been investigated in the literature (for example, Khayyat and Bannister, 2017, Juell-Skielse et al., 2014, Hjalmarsson et al., 2015, Hartmann et al., 2016). For instance, Juell-Skielse et al. (2014) and Gama (2017) investigated the motivations that drive citizens to engage in open data hackathons. Another example concerns the organizations of open data hackathons (Hartmann et al., 2016) and barriers that constrain teams developing a service after open data-based innovation contests (Hjalmarsson et al., 2015). However, cases of citizen-led engagement have barely been studied. The few articles that focus on citizen-led engagement with OGD mainly concern quality assessment conducted by their authors (for example, Vetro et al., 2016,

Whitmore, 2014). Not much is known about this type of engagement and therefore, our study aims to fill this gap, particularly regarding how citizen-led engagement with OGD emerges.

The objective of this study is twofold: 1) to investigate the necessary conditions for the emergence of citizen-led engagement with OGD and 2) to identify which factors stimulate this type of engagement. Conditions are prerequisites that must be met for the emergence of OGD engagement, whereas factors concern variables that contribute to the advent of OGD engagement. We formulated the following research questions:

1) which conceptual model can be used to study how citizens engage with OGD themselves to solve societal problems?
2) what are the necessary conditions for citizen-led engagement with OGD?
3) which factors stimulate citizen-led engagement with OGD?

This paper is organized as follows. In the next section, we first develop a conceptual model of conditions and factors stimulating OGD citizen engagement using a systematic literature overview. Then, in section three we use the conceptual model as a framework for studying a case of self-organized citizen engagement in the digitization of Indonesia's 2014 presidential election data. Next, we analyze the identified conditions and factors and derive recommendations for OGD policymakers to enhance OGD engagement. Finally, we discuss our conclusions.

2. Literature review: a conceptual model for studying conditions and factors of OGD citizen engagement

In this section, we develop a conceptual model that can be used to study how citizens engage with OGD to solve societal problems. We first present the approach used to create the conceptual model and then we present the model itself.

2.1. Systematic Literature Review approach

We carried out a systematic literature review to develop the conceptual model of OGD citizen engagement. We searched the Scopus database for peer-reviewed journal articles and conference papers that contain relevant terms related to OGD citizen engagement in their title, abstract, and keywords (see Table 1). To obtain the most recent insights, we excluded papers from 2008 or older as well as papers in other languages than English.

Table 1. Overview of search terms used in the systematic literature review.

Construct	Search terms used in the systematic literature review
Engagement	engag*, participat*, involv*, use, usage
OGD	open government data, public sector information, open data, public data, public government data, open public sector data, open public data, big open public sector data, open public sector information, open government information
Condition	condition*, stipulation*, constraint*, prerequisite*, precondition*, requirement*
Factor	antecedent*, determinant*, predictor*, variable*, factor*

We combined the search terms from Table 1 and generated a list of publications relevant in the context of this research. This resulted in 311 publications. We assessed the identified articles in three stages: first, we evaluated the domain and title; then, we examined the abstract; and finally, we skimmed the content (see Figure 1). In the first stage, we excluded 278 publications from technical domains such as computer science, chemistry, and diseases which utilized open data as a component

of a system described by the authors. In the second stage, we excluded 7 publications which we deemed irrelevant to citizen engagement since they mostly contained the evaluation of open data websites. In the third stage, we excluded 11 irrelevant publications because they did not focus on OGD citizen engagement. We also applied forward and backward searching by examining the citations of selected articles and adding relevant articles (Webster and Watson, 2002) and added eight additional relevant publications. In the end, we included 23 articles that empirically investigated citizen engagement in existent open data initiatives to create a conceptual model for conducting our case study (see Appendix 1 for an overview). More information about the way that we analyzed the selected articles can be found at the 4TU.Centre for Research Data through [*link removed for blind peer review*]. This website also includes our underlying research data and more details of our research method.

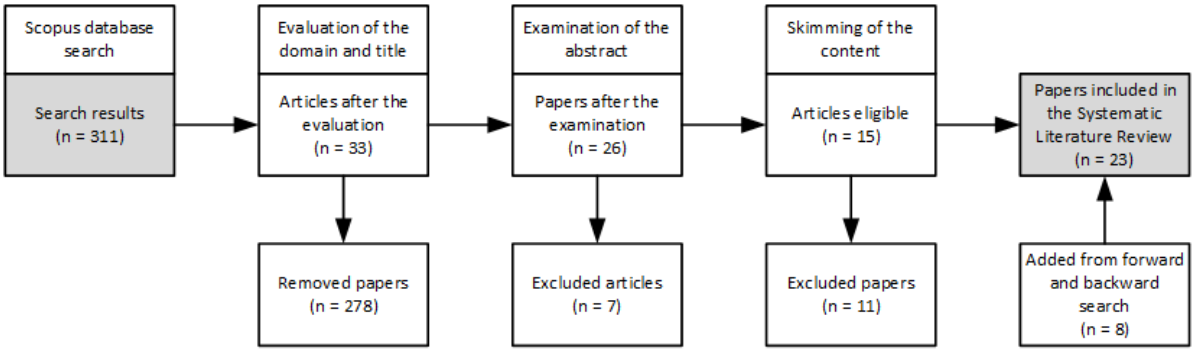

Figure 1. The inclusion and exclusion processes applied in the systematic literature review.

2.2. Findings from the Systematic Literature review: conditions and factors of OGD citizen engagement

We identified conditions and factors for the emergence of OGD engagement in the 23 reviewed articles and categorized them into individual, organizational, societal conditions and factors (see Table 2). We discuss each stream of conditions and factors below.

Table 2. A conceptual model of conditions and factors for OGD engagement synthesized from the literature.

LEVEL	CONDITIONS/ FACTORS	TYPE	DESCRIPTION	SOURCES
SOCIETAL	Conditions	Legal and political framework	Institutional arrangements of OGD provision in forms of legislation or state laws or regulations (e.g., Freedom of Information Act, Anti-Corruption Act)	Altayar (2018), Barry and Bannister (2014), Conradie and Choenni (2014), Janssen et al. (2012), Neuroni et al. (2013), Wirtz et al. (2016), Yang et al. (2015), Yang and Wu (2016)
	Factors	Democratic culture	Society may demand greater access to government data and information and transparency of governments	Altayar (2018), Wirtz et al. (2017)
ORGANIZATIONAL	Conditions	Resources	Budgetary resources needed for facilitating OGD provision (e.g., investment of OGD infrastructures)	Barry and Bannister (2014), Conradie and Choenni (2014), Svärd (2018), Yang et al. (2015), Yang and Wu (2016)
		Feedback mechanisms	Means for communicating data users' feedback on the opened data and OGD provider's follow-ups on users' feedback	Janssen et al. (2012), Máchová et al. (2018), Susha et al. (2015), Zuiderwijk et al. (2012)
	Factors	Institutional arrangements	Aspects of institutional arrangement related to the processes of OGD provision (e.g., culture, process, structure)	Altayar (2018), Hossain and Chan (2015), Janssen et al. (2012), Máchová et al. (2018), Neuroni et al. (2013), Sayogo and Yuli (2018), Susha et al. (2015), Wirtz et al. (2016), Yang et al. (2015), Yang and Wu (2016)
		Technical factors	Technological structures, facilities and features (e.g., portals, tools, data, network infrastructure) needed to make government data available and accessible online	Conradie and Choenni (2014), Hossain and Chan (2015), Janssen et al. (2012), Máchová et al. (2018), Neuroni et al. (2013), Parycek et al. (2014)
INDIVIDUAL	Conditions	Effort expectancy	The degree of ease associated with the efforts and skills needed to engage with OGD (e.g., programming, data manipulation and analysis, statistics)	Janssen et al. (2012), Saxena and Janssen (2017), Weerakkody et al. (2017b), Wirtz et al. (2017), Wirtz et al. (2018), Zuiderwijk et al. (2015)
		Motivations	Reasons that drive citizens to engage with OGD (i.e., intrinsic motivations, extrinsic motivations)	Kuk and Davies (2011), Purwanto et al. (2018a), Weerakkody et al. (2017a), Weerakkody et al. (2017b), Wirtz et al. (2017), Wirtz et al. (2018), Zuiderwijk et al. (2015)
	Factors	Resources	Facilitating conditions such as internet access, time, and money needed for engaging with OGD	Saxena and Janssen (2017)
		Social influence	Influence from the values and beliefs of important others (e.g., supervisor, colleague, partner, family, community, society) to engage with OGD	Purwanto et al. (2018a), Saxena and Janssen (2017), Weerakkody et al. (2017b), Zuiderwijk et al. (2015)
		Data quality	Perceived quality of the opened data (e.g., accuracy, completeness, timeliness)	Janssen et al. (2012), Zuiderwijk et al. (2012)

2.2.1. Societal conditions and factors

The first stream of studies (nine papers) is concerned with societal conditions and factors underlying open government which in turn enable the OGD provision. The conditions identified in this stream of literature include the establishment of laws and regulations surrounding government data and information publication. Laws and regulations, as well as policies (Yang et al., 2015), concerning the freedom of information as a robust legal and political framework, are required to regulate the continuous publication of government data (Neuroni et al., 2013, Nugroho et al., 2015, Altayar, 2018). Without the framework, governmental organizations are likely to experience uncertainty regarding their compliance with regulation (Barry and Bannister, 2014). This subsequently poses legal risks (Yang and Wu, 2016) such as false conclusions drawn from OGD (Conradie and Choenni, 2014) and results in legal barriers for OGD provision (Janssen et al., 2012, Wirtz et al., 2016).

The factors identified in this stream include the demands of society members (e.g., citizens, journalists, researchers, activists) for the improved access to government data and information (Altayar, 2018) and the increase of transparency (Wirtz et al., 2017). These expectations emerge as a result of a global trend towards a more informed society through the rapidly growing use of ICT, pervasive adoption of social media, and emergent innovations in technologies.

2.2.2. Organizational conditions and factors

Fifteen of the selected papers discuss organizational conditions and factors related to OGD engagement. We identified two main organizational conditions required for the emergence of OGD citizen engagement: the availability of resources for the publication of government data and feedback mechanism between citizens and the OGD provider (Svärd, 2018, Susha et al., 2015). Sufficient resources related to the government's budget allocation are a facilitating condition needed to enable OGD provision such as investment in infrastructures (e.g., platforms, software, tools) (Svärd, 2018, Yang and Wu, 2016). Resources also concern the financial effects of OGD (Conradie and Choenni, 2014) such as liabilities, benefits, losses, and efforts (Yang et al., 2015). Resource constraints (Barry and Bannister, 2014) may lead to insufficiency of budgetary allocation which may hinder governmental organizations from publishing their data or decrease the quality of the opened data (Svärd, 2018). Feedback mechanism, as a means for interaction between OGD provider and users, is also an important condition for communicating data users' evaluations of the opened data and follow-ups on feedback made by OGD provider (Susha et al., 2015, Máchová et al., 2018, Zuiderwijk et al., 2012).

The main factors identified in this stream of literature can be grouped into institutional and technical categories. Institutional factors include external and internal institutional pressure, committed executive leaders, organizational capability and culture, clear structure and definition of responsibilities, support and promotion, and evaluation (Janssen et al., 2012, Altayar, 2018, Hossain and Chan, 2015, Yang et al., 2015, Yang and Wu, 2016, Sayogo and Yuli, 2018, Neuroni et al., 2013, Wirtz et al., 2016, Máchová et al., 2018, Susha et al., 2015). Technical factors concern integration and interoperability with existing systems, interactive feature of OGD platforms, security and standardization, and the use of emergent technologies (Janssen et al., 2012, Máchová et al., 2018, Parycek et al., 2014, Conradie and Choenni, 2014, Hossain and Chan, 2015, Neuroni et al., 2013)

2.2.3. Individual conditions and factors

Research in the third stream (ten studies) gives emphasis to the perspective of individuals who engage with OGD. The main conditions identified in this research stream are effort expectancy and intrinsic and extrinsic motivations. *Effort expectancy* is related to the degree of ease associated with the efforts needed to engage with OGD and shares similar measures with ease of use and task complexity

(Venkatesh et al., 2003). It also concerns the required capabilities/skills possessed by individuals engaging with OGD such as programming, data analytics and statistics (Janssen et al., 2012) or other competence (Wirtz et al., 2018). The more citizens acquire and master capabilities needed to use complex and sophisticated data, the lesser efforts perceived by the citizens (effort expectancy) and the more positive the citizens' perceived ease of OGD use (Wirtz et al., 2018, Zuiderwijk et al., 2015, Saxena and Janssen, 2017, Wirtz et al., 2017, Weerakkody et al., 2017b). *Intrinsic motivation* concerns "doing something because it is inherently interesting or enjoyable" (Deci, 2004, p. 859), while *extrinsic motivation* can be defined as "doing something because it leads to a separate outcome" (Deci, 2004, p. 859). Both motivations can explain what drives an individual to engage with OGD in a particular behavior (Wirtz et al., 2018). Examples of intrinsic motivation include fun and enjoyment (Wirtz et al., 2018) and personal interests compatible with an individual's values (Weerakkody et al., 2017a) such as contributing to the benefits of society (Purwanto et al., 2018a, Kuk and Davies, 2011). Fun and enjoyment is an influential driver for hackers to engage with open data in Swedish hackathons (Juell-Skielse et al., 2014). Instances of extrinsic motivation include expectancy towards job performance (Zuiderwijk et al., 2015) or other advantage (Weerakkody et al., 2017a), usefulness for doing the tasks at hand (Wirtz et al., 2018, Wirtz et al., 2017, Weerakkody et al., 2017b), and prospects of financial gains or future employment (Kuk and Davies, 2011).

Regarding the individual factors influencing citizen engagement with OGD, we identified three main factors including resources, influence from citizens' social relationships, and the quality of the opened data. Citizens need resources, functioning as facilitating conditions such as internet access, time, and money, which they can access and use for engaging with OGD (Saxena and Janssen, 2017). Influence from social relationships particularly supervisors (Zuiderwijk et al., 2015) or social media friends (Purwanto et al., 2018a) or others (Weerakkody et al., 2017b, Saxena and Janssen, 2017) is found significantly affecting citizens' intention to use OGD. This indicates that the beliefs or values of other people or communities important to citizens may influence their decision on engaging with OGD. Poor quality of data may become a barrier that hinders citizens from engaging with OGD (Janssen et al., 2012, Zuiderwijk et al., 2012). Therefore, it is imperative for governmental organizations to not only release public data but also maintain data quality.

2.2.4 Conceptual model to analyze the case

Figure 2 depicts the conceptual model that we derived from our systematic literature review. We argue that the conditions are necessary for the emergence of OGD engagement and that the extent of the engagement is influenced by the factors. We will use this model to study a case of citizen-led engagement with OGD, as described in the following sections.

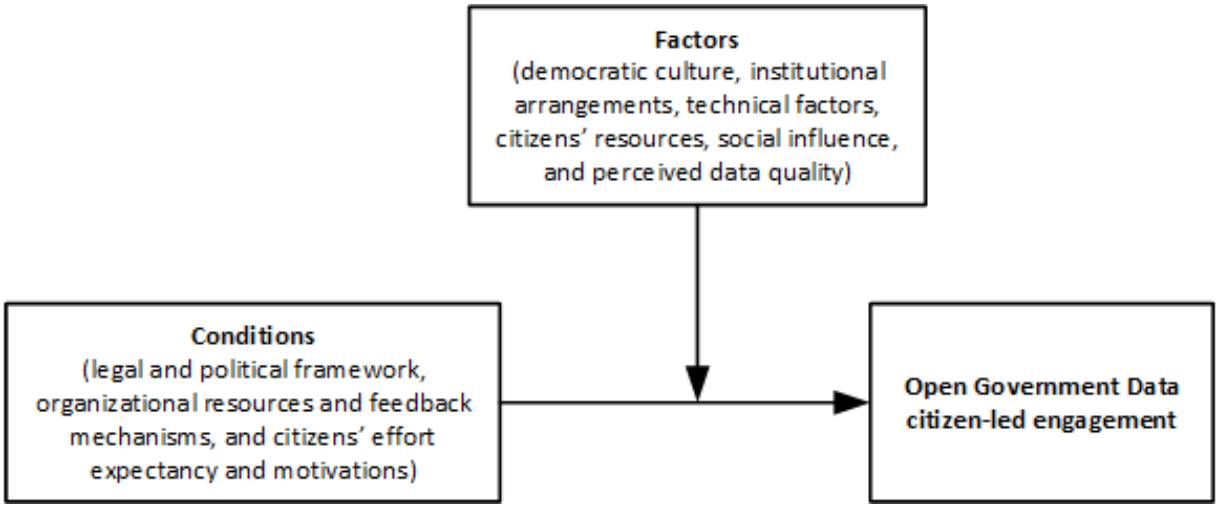

Figure 2. A conceptual model of conditions and factors of OGD citizen-led engagement.

3. Case study approach

In this section, we describe the approach used to conduct our case study. Case studies can be used to study a contemporary event that cannot be controlled by the researchers (Yin, 2014). As we study the contemporary and uncontrollable event of citizen-led engagement with OGD and aim to deduce the necessary conditions and factors that stimulate citizen-led engagement with OGD in its context, a case study research design was deemed appropriate for our study. We used the following case selection criteria.

- The case concerns the engagement with OGD.
- The case concerns a citizen-led engagement initiative, rather than a government-led engagement initiative (e.g. a hackathon). Brajawidagda and Chatfield (2014) created an overview of citizen-led engagement initiatives that we use to select our case.
- The case allows for investigating necessary conditions for the emergence of citizen-led engagement with OGD as well as factors stimulating this type of engagement.
- The case concerns OGD that can be used to solve societal problems.
- The involved researchers have access to the case and its information sources.

Applying our case study selection criteria, we selected the case of Kawal Pemilu (Guard the Election) from the list of citizen-led engagement initiatives provided by Brajawidagda and Chatfield (2014). This case has been regarded as the most successful electoral monitoring initiative in the 2014 presidential election (Postill and Saputro, 2017, Graft et al., 2016). It was also selected because the first author had access to the case and volunteered in the above-mentioned initiative so that in-depth insights could be obtained.

According to Yin (2014), a single case study design is acceptable under specific situations where the research represents a common case, a critical case, an extreme or unusual case, a longitudinal case, or a revelatory case. A revelatory case refers to a case that reveals a phenomenon previously inaccessible to the research community and hitherto unexplored (Yin, 2014). We characterize Kawal Pemilu as such a case because it represents a citizen-led engagement which is a relatively unexplored phenomenon. Furthermore, the case was previously inaccessible to the research community since citizens involved in the initiative were intentionally anonymized for safety reasons (Graft et al., 2016). Therefore, we chose a single case study design since it provides a powerful tool to gain a deep understanding of all components at a different level of analysis that shaped the OGD citizen engagement.

Figure 3 illustrates the single case study design with embedded units of analysis. The embedded units include the governmental organizations providing open election results data (i.e., the Election Commission), the infrastructures of open election results data, a group of citizens engaging with open election results data (i.e., Kawal Pemilu), the application developed and used by the Kawal Pemilu group for digitizing and monitoring election results, and members of society impacted by the election.

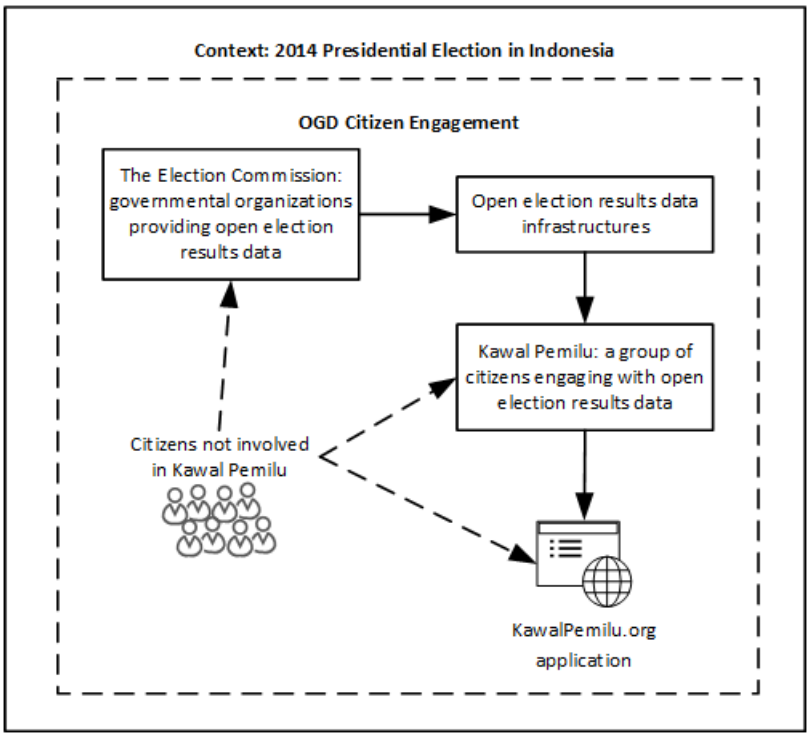

Figure 3. The context and the unit of analysis and its embedded units of analysis under study.

3.1. Case study information sources

A case study typically combines data collection methods such as document archives, interviews, and observations, and sometimes questionnaire data (Dubé and Paré, 2003). A combination of information sources strengthens the grounding of a theory-building and provides a synergistic view of evidence (Eisenhardt, 1989) which ultimately enhances the construct validity of the study (Yin, 2014). We collected various types of qualitative data from multiple sources of evidence (see Table 3):

- Open and semi-structured interviews. Interviews are the main information source in this case study. The first author conducted seventeen semi-structured interviews with fourteen respondents who were involved in the Kawal Pemilu initiative and three Election Commissioners from different administration levels (one province and two municipalities).
- Presidential election regulation documents including internal memos of the Election Commission. These documents provided information regarding the vote-counting or recapitulation processes and the enactment of election victors.
- News articles related to the 2014 presidential election and social media posts related to the election and Kawal Pemilu (e.g., Facebook posts, tweets, blog posts). These were sources for facts describing what happened in society during the course of election and opinions of various election stakeholders such as politicians and voters.
- Academic articles, essays and book chapters related to Kawal Pemilu.
- Kawal Pemilu's documentation included the initial public discussion of features of KawalPemilu.org and the official KawalPemilu.org design and architecture created by the founders. These documents offered comprehension of how the KawalPemilu.org application was designed, developed, and evaluated.
- Unobtrusive artifacts including the Election Commission's open data portal and web pages announcing the *real count* of the election, the KawalPemilu.org pages, and external web pages related to election results data. The artifacts provided facts about the characters and properties of datasets being released and used for monitoring election results.

Table 3. Overview of the information sources that were used in the case study.

Information sources	Number of information sources used
Open and semi-structured interviews	17
Presidential election regulation documents	7
News articles and social media posts	35
Academic publications	8
Kawal Pemilu documentations	2
Unobtrusive artifacts	31
Total	**100**

The first group of interviewees included volunteered citizens with different roles including the founder of the initiative, one developer, one digitizer coordinator, and eight digitizers. They were all highly educated having at least a bachelor's degree. Eleven of them were male (78.57%) and the rest are females (22.43%). Due to difficulty in finding respondents from the first group, a chain referral sampling technique or snowball sampling was used to locate other interviewee candidates. The snowball method is applicable when the focus of the study is concerned with a relatively private issue (Biernacki and Waldorf, 1981) such as our study since the identities of Kawal Pemilu volunteers were not revealed to the public for safety reasons (Graft et al., 2016). An initial list of respondent candidates was created and consisted of two volunteer coordinators of the Kawal Pemilu initiative. The list was expanded and ultimately twelve verified interviewees were added. After conducting fourteen interviews with the Kawal Pemilu volunteers, we decided to stop expanding the interviewee list because the data collected gradually provided similar information. The interviews were conducted from October 2017 until January 2018 through online voice calls and face-to-face meetings. On average, an interview session took an hour to complete. All interview sessions were recorded as agreed by the interviewees and transcribed literally.

A list of interview questions as part of the case protocol was developed and tested with five academic researchers working in open data dan information sharing fields. The questions were developed based on the conceptual model of conditions and factors of OGD citizen engagement introduced in Section 2, particularly concerning the individual level for the volunteers and organizational and societal levels for the officials. Questions for the volunteers were designed to deeply understand how they engaged with the initiative. Examples of the questions are concerned with what their roles were in the initiative, how their activities were carried out, what motivated them, and what challenges they faced during the engagement. While questions asked to the officials of the Election Committee were established to understand how they opened election data. For instance, what business processes were performed to release the election data, what challenges they encountered when publishing the election data and how they dealt with the challenges, and the future of open election data. A complete overview of the interview questions can be found in Appendix 2.

3.2. Data analysis

We recorded all the interviews as permitted by the interviewees and the recordings were transcribed non-verbatim. We offered the interviewees the possibility to check the transcripts, but no changes were made. All transcripts were then imported into the ATLAS.ti software. We also imported other sources of information described in Table 3 into ATLAS.ti, including the presidential election regulation, news articles, academic articles, essays, book chapters, and Kawal Pemilu's documentations. The software facilitates the development and identification of codes, visualization of codes and categories, and analysis of patterns (Friese, 2012).

Developing codes from the transcripts is the initial step in the multistage analysis of qualitative data (DeCuir-Gunby et al., 2011). Ryan and Bernard (2003) indicate that typically codes can be theory-driven where a priori codes are developed from existing theory or concepts or data-driven in which new codes emerge from the raw data. As previously mentioned, the purpose of using the case study is to explore whether the conditions and factors identified from the literature are applicable in a particular case of OGD citizen-led engagement and to identify those missing from the literature but emerge from the case. Therefore, we followed recommendations by DeCuir-Gunby et al. (2011) for developing both theory-driven and data-driven codes.

To develop theory-driven codes, firstly the first author created a codebook containing a list of codes and their meanings from the results of the literature review, as recommended by Saldaña (2013). Secondly, the author checked the existence of these codes against the texts from different sources of information including interview transcriptions. If a code exists, then its descriptions provided by interviewees or other sources of information were labeled. Finally, the codes were shared among two other authors and validated based on discussions. Code reviews and revisions and reliability evaluations were conducted in this final step.

The data-driven code development was started by splitting a meaningful group of sentences related to conditions and factors of OGD engagement of Kawal Pemilu from its founder transcriptions, as recommended by Saldaña (2013). The first author assigned potential themes to these subsamples of information. Then, the texts of other sources of information were evaluated to find similarities with the developed themes. Next, the first author created codes based on the emergent similar themes and tagged the texts with the codes. Finally, the codes were shared among three other open data researchers and the reliability was assessed. The codebook can be found here: [*link removed for blind peer review*].

4. Case study background

The Indonesian presidential elections are organized and managed by the Election Commission or Komisi Pemilihan Umum (KPU), at the national level, and its branches at provincial (KPU Provinsi or KPUP), municipal (KPU Kabupaten/Kota or KPUD), district (Panitia Pemilihan Kecamatan or PPK), village (Panitia Pemungutan Suara or PPS), and polling station level (Kelompok Penyelenggara Pemungutan Suara or KPPS) respectively (Komisi Pemilihan Umum, 2014b). Votes are manually cast and tallied by the KPPS members at polling stations in the C1 form. The tallies are then aggregated manually at higher administrative levels until reaching the national level from C1 to D1 (village), DA1 (district), DB1 (city/municipality), DC1 (province), and finally DD1 forms (national). Figure 4 illustrates the hierarchical processes of the presidential election tabulation.

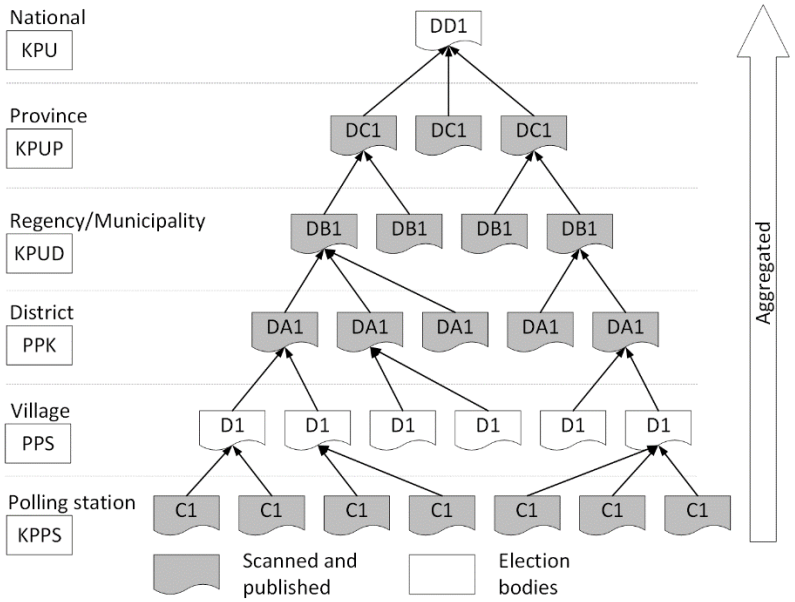

Figure 4. Levels of hierarchy in the vote-counting process adapted from Komisi Pemilihan Umum (2014b).

In its internal memo number 1395/KPU/VII/2014, KPU introduced new processes at the municipal and provincial levels (Komisi Pemilihan Umum, 2014a). KPU obliged KPUDs to scan the copy of C1 forms collected from polling stations as JPEG image files and upload the resulted files to the KPU website through an internal secured application. KPUDs and KPUPs were also required to create and upload Excel versions of the DA1, DB1, and DC1 forms. These files were then published on KPU's open data portal.

In the 2014 presidential election, only two pairs of the president and vice president candidates contested, Prabowo Subianto paired with Hatta Rajasa (hereafter "Prabowo") competed against Joko Widodo and Jusuf Kalla (henceforth "Jokowi"). Intense competitions, involving heightened debates that escalated into clashes between supporters of the two camps in social media platforms such as Facebook and Twitter, have caused fragmented social conversations (Lim, 2017). Ultimately, both Prabowo and Jokowi claimed victory over the election after the voting was closed, and these declarations were confusing to the public since the final announcement of the results would only be officially concluded two weeks afterward (Graft et al., 2016). The situation worsened due to quick count results, collected and published by survey organizations, which were inconclusive (Lim, 2014).

The above-mentioned problem and the released of election results data have led to the emergence of Kawal Pemilu among many other citizen-organized initiatives for digitizing presidential election results (Brajawidagda and Chatfield, 2014). Initially, Kawal Pemilu was founded by an Indonesian citizen living in Singapore and later technically developed by other four Indonesians living in different locations (i.e., California, Sidney, Netherlands, and Germany). Later on, the founder recruited 700 volunteers for crowdsourcing the verification and digitization of election results in C1 images. After receiving considerable media coverage, Kawal Pemilu became a prominent intermediary platform functioning as an electoral monitoring tool for society. Citizens were not only able to view the current outcomes of the counting, but also to scrutinize, flag, and report anomalous results displayed by C1 images. In the end, Kawal Pemilu results deviated only 0.01 percent from the KPU's final tabulation. Its prominence has led Kawal Pemilu to be featured as an example of a case study in international

practical reports from different fields such as election (ACE Electoral Knowledge Network, 2014) and open data impact (Young and Verhulst, 2016).

5. Case study analysis: conditions and factors influencing citizen-led engagement with Indonesia's presidential election data

In this section, we describe the conditions and factors that influence citizen-led engagement in our case study. We use the conceptual model that we developed in Section 2 as a framework to describe the findings.

5.1. Conditions and factors for citizen-led engagement with OGD at the societal level

Necessary conditions for the emergence of citizen-led engagement with OGD and its contributing factors at the societal level concern the opening of election data.

5.1.1. Necessary conditions

Our literature review showed that the existence of a legal and political framework is an important condition for citizen-led engagement with OGD. The case indeed confirmed this since the Election Commission's main motivation to open election results data was to comply with the Public Information Disclosure Act. The interviewed officials also claimed that the Commission publishes not only election-related data but also other data such as work and budget plans and procurement. Moreover, the 2014 presidential election regulations (Komisi Pemilihan Umum, 2014b), enacted by the Commission, mandated the facilitation of public access to the vote tallying processes at the polling stations. One commissioner commented:

> *"Especially if we talk about the data related to the election, indeed, if we talk about regulation, the KPU has regulated [...] in KPU regulations as a follow-up to the Public Information Disclosure Act ..."*

5.1.2. Contributing factors

Our literature review showed that a democratic culture is an important factor that can stimulate citizen-led engagement with OGD. The case confirmed this since citizens, civil society organizations, and political parties demanded the opening of election data to improve the transparency of the presidential election processes (Graft et al., 2016). The demands were very much inherited from the society's perceptions of the previous presidential elections which have been poorly managed by the Election Commission. In those elections, the voter's registration processes were chaotic and in some areas, the ballots were manipulated during the document transfer from polling stations to the higher administrative level (Mietzner, 2009). These demands manifested in the form of data and information requests addressed to the Election Commission. One commissioner said:

> *"Because there are also requests such as vote results per polling station [...]. Requests for the results of recapitulation at district A, B, C and others, like that. Also, sometimes [we have] requests from the [political] parties or from institutions such as survey institutions, NGOs, and so on. Well, when the KPU has opened the data [and] there is a request, please access [the data] that you need and just download it immediately"*

5.2. Conditions and factors for citizen-led engagement with OGD at the organizational level

At the organizational level, necessary conditions and contributing factors are related to the processes for managing the sustainability of election data publication.

5.2.1. Necessary conditions

The literature review showed that having sufficient organizational resources and feedback mechanisms in place are two important conditions for citizen-led engagement with OGD. This was confirmed in the case since one of the interviewed commissioners said that the Commission had prepared the worst situation that could impede the process of opening up election data such as electricity outage by hiring a power generator. He also added that the Commission had allocated budget resources for necessary elements needed for open election data provision including internet connectivity, computer software and applications, hardware (i.e., computers, scanners, servers), network infrastructure and additional personnel hired specifically for scanning, inputting and uploading data.

The case also confirmed that the availability of feedback mechanism between OGD providers and users is another condition necessary for the citizen-led engagement. Since the C1 forms were created manually at polling stations and later transported to the village's offices, they were prone to errors and manipulation. Brajawidagda and Chatfield (2014) identified 125 *anomalous* C1 forms on the Commission's open data portal which were reported by citizens on photography-based social media platforms located at https://c1yanganeh.tumblr.com. The Kawal Pemilu volunteers also found such forms and reported them to the Commission through a liaison. Interestingly, the Commission officially instructed KPUDs to monitor the platform and plan the corrective follow-up actions (Komisi Pemilihan Umum, 2014a). One commissioner confirmed this and described the corrective actions as follows.

> *"The correction mechanism was done, for example, by the head of the KPPS, [the committee at polling station level], in the recapitulation meeting at a district level. He or she read the C1 form in front of the witnesses, the oversight committee, and the PPK members. If there was a mistake, for example, a number writing error, it would be corrected immediately. The right numbers were written and signed by the meeting participants, while the errors were crossed out. After that, the corrected C1 form was scanned and uploaded and the previously uploaded form was overwritten."*

One Kawal Pemilu volunteer who was tasked to inspect anomalous C1 forms corroborated the follow-up mechanism by the Commission and viewed it as a significantly important condition for the engagement. The volunteer described her experience in reporting the errors as follows.

> *"So, I know very well that the KPU people who manage the server must have been overloaded. But, every time we send an email and send it once like twenty erroneous C1s, and they protested 'Ma'am, don't send us twenty problems please, at least five per batch, so we can check them easily.' They corrected the C1s as fast as they can. That's it. So even though they're busy and I don't know whether they're overwhelmed or not, but I was sure they're busy. Even at eleven o'clock at night or two o'clock in the morning, I send an e-mail to them, it was always be responded. Yes, the response was not immediate at that time, but definitely responded. Not being ignored."*

5.2.2. Contributing factors

Our literature review showed that institutional arrangements related to OGD provision encompassing organizational culture, process, and structure and technical aspects of OGD provision are two contributing factors that influence citizen-led engagement with OGD. The case corroborated this as the Commission institutionalized not only through formal regulations and internal memos but also through informal reminders distributed to KPUDs and KPUPs via a messaging application. For example, a message was circulated by the Commission to its branches for achieving "100% target uploaded in 2 x 24 hours".

The case also confirmed that technical aspects of open election data can stimulate or hinder the engagement. Election result datasets were provided through the Application Programming Interface (API) services in JavaScript Object Notation (JSON and Hypertext Markup Language (HTML) format. The use of API enabled Kawal Pemilu developers to build a dynamic yet lively application. The infrastructure orchestration of election data provision encompassing the hardware (e.g., computers, scanners, computer networks, web and file servers), software (e.g., application for scanning and uploading C1 form and for inputting the DA1, DB1, and DC1 forms), operators, internet connectivity, and electricity also plays role. The quantity and quality of the opened election data were heavily dependent on these infrastructures and failure occurs in one of these infrastructures might hamper the data publication process. For example, internet speed was mentioned as the major barrier for uploading the C1 forms. Other examples concern the maintenance of the KPU web portal when operators tried to upload C1 forms and insufficient internet bandwidth. Finally, the competency and capability of operators in KPUD and KPUP play an important role because the process of data publication extremely depends on their skills.

5.3. Conditions and factors for citizen-led engagement with OGD at the individual level

5.3.1. Necessary conditions

Our literature review showed that the ease of engaging with OGD (effort expectancy) and individual motivations to engage with OGD are important conditions for citizen-led OGD engagement. However, the perceived ease of engagement was not mentioned in our case since the primary issue encountered by volunteers who developed the Kawal Pemilu platform did not revolve around the efforts or skills needed to engage with OGD. Instead, the main challenge was related to the verification mechanism needed to ensure accurate submission of results, the incentive mechanism for volunteers who inputted in election results, and the availability of the Election Commission's open data portal. The condition related to the degree of ease in engaging with OGD was not mentioned either among volunteers who digitized the C1 forms.

The importance of individual motivations to engage with OGD was supported by the case. Most of the volunteers were intrinsically motivated to contribute to solving societal problems encountered in the presidential election. We found different problems which were concerned by the volunteers. Three volunteers wanted to offer evidence-based election results and reduce the polarization in society. One of them stated:

> *"With the results of Kawal Pemilu, there will be no more doubts in the society about the election results. So, people also have no pros and cons, because if there are pros and cons, it won't stable, riots can arise, and so on. So, for better social stability. It's my biggest motivation."*

The other two volunteers wanted to contribute to cleaner government and better governance, while another volunteer said that she wanted to make sure that the elected president was not a war criminal. Interestingly, we found that two volunteers who developed the Kawal Pemilu platform were motivated to mastering the intellectual and technical challenge in providing a sound solution to facilitate the citizen-sourcing of election results digitization.

We identified a *sense of urgency* as one of the important conditions for citizen-led engagement which was not found in the literature, yet emerged in the case. Only two pairs of candidates competed in the election, and as a result of this head-to-head competition, polarization between the two supporting camps occurred. Clashes between these supporters were visible not only on social media platforms (Lim, 2017) but also in real life as captured by journalists. For example, two pedicab drivers in Pamekasan of East Java fought each other due to different preferences over the candidacy (2014).

Another example concerns two groups of Balinese villagers who were about to fight using machetes as a result of differences in the preference of election candidates (2014). On a larger scale, the polarization potentially is a serious threat to society, especially when both camps announced their victors. The fear of possible eruption of social conflicts that could be triggered by potential hostility of the competition was mentioned by the founder of the Kawal Pemilu:

> *"My earliest move was to see the danger of this nation divided when I saw Prabowo declaring victory, and Jokowi also declared victory. Two of them declared victory even though the candidates were only two and the situation had been fierce for months, even more than a year. [...] And we all know that it's exactly the very half-neck-to-neck [...]. Our nation is divided into two. [...] It was very dangerous because it could lead to conflict, concerning horizontal conflict as well. Therefore, I try to find a solution, can we show who wins."*

5.3.2. Contributing factors

The literature review showed that the availability of appropriate resources, social influence, and perceived data quality can contribute to citizen-led engagement with OGD. While the case supported the availability of resources and influence from social relationships, the perceived data quality was unsupported. Resources needed for developing Kawal Pemilu platform and digitizing election results were affordable to volunteers and to some degree can be minimized. For example, four volunteers used their free time to develop the platform and spent only $55.83 for buying domain and hosting the websites. Other volunteers also digitized the C1 forms in their free time or sometimes developed the platform parallelly with doing their official works.

The influence of social relationships is a contributing factor in the case since nearly all volunteers were recruited by their 'close' social media friends, particularly by the founder of Kawal Pemilu. After setting up the core team consisting of four volunteers with a software development background, the founder recruited volunteers for digitizing election results using a secret Facebook group and adopting a Multi-Level Marketing (MLM) tactic. He targeted a thousand volunteers by enlisting ten trusted close friends and encouraging each of them to recruit another ten friends who were also asked to recruit ten friends (10 x 10 x 10). However, the recruitment was intentionally stopped when it reached 700 volunteers before the Kawal Pemilu's front-end site became very popular.

However, the perceived data quality as a contributing factor to citizen-led engagement with OGD was unsupported by the case. Instead, the discovery of erroneous data motivated volunteers to detect more data as such and be the first to share or post the data on social media platforms. One volunteer commented:

> *"If we found [an erroneous C1 form], we were just excited to look for other [C1] problems."*

Another volunteer stated:

> *"In fact, actually I was excited to find this case. We wanted to know exactly [and] captured these strange things [done by] a [corrupt] KPPS officer."*

Three factors, which were not identified in the literature review, emerged in the case as contributing factors to the OGD citizen-led engagement at the individual level, namely *competition*, *diverse skills* of volunteers, and *social media use*. Kawal Pemilu was among one of many citizen-led engagement initiatives competed in digitizing and displaying accurate results of the presidential election and initially lagged few days behind other initiatives. Although at first, Kawal Pemilu founder felt disappointed for being lagged behind, he tried to reveal the competitor's weakness in the validation process of the digitization results and designed a better solution for the process.

The variety of capabilities and skills possessed by volunteers was identified as one of the contributing factors to the citizen-led engagement with OGD. Among volunteers were programmers, web security specialists, data analysts, designers, social media specialists, journalists to public relations. The diversity helped create not only reliable and secure platforms but also social media communication of Kawal Pemilu for seeking public supports and reaching media coverage.

The intensive use of social media platforms was found to contribute to the citizen-led engagement with OGD. For example, Facebook was used for recruiting volunteers and managing the progress of digitization efforts, and Twitter for promoting the initiative, publishing the current election results from the digitization and increasing the public awareness. These platforms provide the environment needed for a citizen-led engagement, direct access to a swarm of citizens (Brajawidagda and Chatfield, 2014). The founder of Kawal Pemilu acknowledge the roles of social media as an enabler to his initiative:

> *"We created a Facebook page, published all [the results], a Twitter account. We have a team that focuses on managing social media [account]. So, in our social media [accounts], we are doing a lot of posts, mentioning various kinds of important figures and so on, so [people] starting to keep up, people know, people are starting to make them viral too. "*

5.4 Overview of case study findings

We examined the existence of the conditions and factors in the case at different levels and identified the emergent conditions and factors missing from the literature (see Table 4). Some conditions and factors identified in the literature review were supported by the case. They include the availability of a legal and political framework, democratic culture, sufficient budgetary resources for opening data, the availability of feedback mechanism, the institutional arrangements and technical aspects of open data, intrinsically motivated citizens, the availability of citizens' resources, and influence from social relationships. Some conditions and factors were found in the literature but unsupported in the case: citizens' perceived ease of engaging (effort expectancy) and data quality. Furthermore, some conditions and factors missing from the literature emerged in the case, including the sense of urgency, competition among initiatives, citizens' diverse skills, and the intensive use of social media.

Table 4. Identified conditions and factors for OGD engagement in the case of Kawal Pemilu.

LEVEL	CONDITIONS/ FACTORS	TYPE	FOUND IN THE LITERATURE	FOUND IN THE CASE
SOCIETAL	Conditions	Legal and political framework	Yes	Yes
	Factors	Democratic culture	Yes	Yes
ORGANIZATIONAL	Conditions	Resources	Yes	Yes
		Feedback mechanism	Yes	Yes
	Factors	Institutional	Yes	Yes
		Technical	Yes	Yes
INDIVIDUAL	Conditions	Effort expectancy	Yes	No
		Motivations	Yes	Yes
		Sense of urgency	No	Yes
	Factors	Resources	Yes	Yes
		Social influence	Yes	Yes
		Data quality	Yes	No
		Competition	No	Yes
		Diverse skill	No	Yes
		Social media use	No	Yes

Notes: Green cells indicate that the case confirms the literature; orange cells indicate that the case shows a certain factor was not found in the case; yellow cells indicate new factors.

6. Discussion

This study focuses on citizen-led engagement in which citizens fully independently organized themselves, with low or nonexistent involvement from the government, in using OGD to solve a societal problem. Our case shows highly initiatory citizens who innovate with the opened election data and provide a more effective and transparent service in tabulating the votes to society. Reflecting on the level of government involvement with the end-users of open data (Sieber and Johnson, 2015), this study represents the *government as a platform* model in which the government merely supplies data infrastructures to be used by citizens. Different modes of government involvement in open data provision and use and different initiatory levels of citizens towards open data use can explain different types of OGD citizen engagement (see Figure 5). A low level of government involvement which is responded with low or no initiative of data use by citizens will likely lead to no engagement. High involvement level of government which is responded with a low or nonexistent initiatory level of citizens is the main characteristic of *government-led engagement*. Open data hackathons and innovation contests are good examples of this engagement. In *co-produced engagement*, government and citizens collaborate as partners in the use of open data.

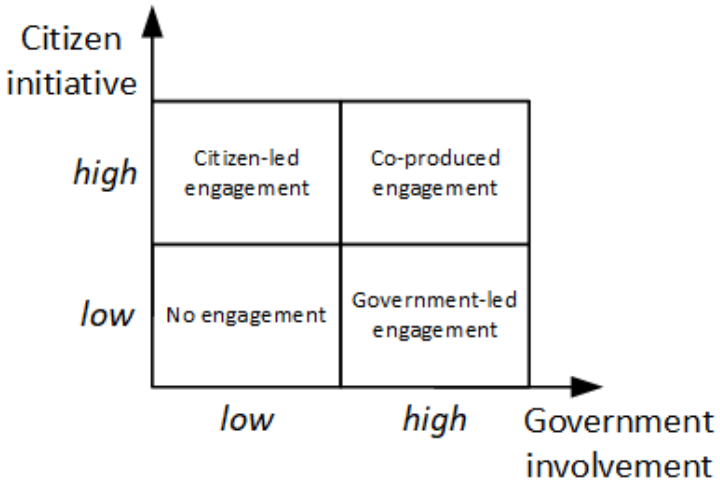

Figure 5. Four different types of engagement based on the level of government involvement in open data provision and use and the level of citizen initiatory response toward open data.

Our case shows that the emergence of citizen-led engagement with OGD requires the fulfillment of different conditions at societal, organizational, and individual level: legal and political conceptual models granting mandate to open government data, budgetary resources designated for the realization of OGD, interaction mechanism between OGD providers and users, intrinsically motivated OGD users, and users' sense of urgency towards societal problems. The sustainability and quality of this engagement are shaped by contributing factors found both in the literature and the results of the case. These conditions and factors may play a less important role in other types of citizen engagement. For example, in a government-led engagement such as a hackathon, participants tasked by their companies can be extrinsically motivated to perform their jobs and no sense of urgency involved in it. In co-produced engagement, interaction mechanism might not be a necessary condition as it is embedded in the active collaboration between government and citizens.

The biggest challenges in achieving the necessary conditions for the emergence of citizen-led engagement with OGD are creating intrinsically motivated OGD users and increasing the users' sense

of urgency towards societal problems. Our case involves societal issues which are revolving around government transparency problems and the fragility of social relationships. In the Western context, governments focus more on stakeholders from sectors that produce economic value from open data and overlook the transparency issues (Susha et al., 2015). The answers to the challenges might lie on the improvement of data literacy and education among citizens, for example by organizing events to promote the availability of open data such as hackathons and innovation contests. However, educating citizens through formal and informal open data training (Gascó-Hernández et al., 2018) is a long-term continuous effort. The training curriculum should combine the introduction of open data and the teaching of analytical skills to encourage the use of open data (Gascó-Hernández et al., 2018). Knowledge about the context (i.e., societal problems) and interactions with the government during the course can increase the training effectiveness. The success of open data training can be accelerated by implanting the training interventions in a specific context related to societal issues (e.g., combating corruption, disaster mitigation) while taking into account the unique characteristics, interests, and expectations of different types of users. Combined with collaboration between citizens and other stakeholders such as private sectors, open data training can advance the formulation of scenarios to solve societal problems as shown in the case of population decline in the Netherlands (Ruijer et al., 2017).

Having the presumption that all the required conditions are met will lead to, predictably, the question of whether citizen-led engagement with OGD automatically emerges. We suggest that governments should also take contributing factors into account, particularly at the societal and organizational levels. At the societal level, the magnitude of the demands of society for transparency will likely affect the extent of efforts taken to release government data and establish regulations related to organizational processes and structures of OGD provision. This requires the continuous cultivation of democratic culture in government processes by involving public participation in policymaking. At the organizational level, institutional arrangements related to organizational culture will likely affect the interactions between data providers and citizens. We urge governments to improve their official's mental attitude toward serving the society at large and responsiveness towards feedback from the public. Technical aspects of OGD provision affect the budgetary resources allocation of OGD implementation. Integrating open data publication process into existing or legacy systems and creating data interoperability across governmental units are costly and embedding them into government budgeting will require more effort. Therefore, we propose a prioritization of opening high-value datasets that are relevant and important to citizens. For example, government spending data will likely be highly valued by citizens living in developing countries suffering from low transparency.

At the individual level, beyond the open data training we suggested, political participation aspects of voluntarism in citizen-led engagement initiatives can be complementary to explain the volunteered acts. Empirical research and practitioners already suggested that engaging with OGD is a manifestation of a citizen's political and community interests toward solving societal problems (see Graft et al., 2016, Davies, 2010, Hutter et al., 2011). One of the political participation models which have the potential to predict independent citizen-led participation is Civic Voluntarism Model (CVM) (Verba et al., 1995). CVM, in line with our findings, predicts that citizens will participate in a political movement if they have the resources needed to participate (e.g., time, money, communication, and organizational skills), they are psychologically motivated to participate, and they are asked to do so (volunteer recruitment through social influence).

7. Conclusion

The objectives of this study are to investigate the necessary conditions for the emergence of citizen-led engagement with OGD and to identify which factors stimulate this type of engagement. Hence, the study provides insights into how citizen-led engagement with OGD emerges. We reviewed the open data literature particularly concerning conditions and factors of OGD citizen engagement and developed a conceptual model of conditions and factors at three different levels: societal, organizational, and individual. Then, we applied the conceptual model to a case study of the 2014 presidential election in Indonesia in which citizens developed and used a platform based on open election data to digitize and monitor election results.

From the literature we identified five conditions for the emergence of OGD citizen-led engagement: 1) the availability of a legal and political framework that grants mandate to open up government data, 2) sufficient budgetary resources allocated for OGD provision, 3) the availability of OGD feedback mechanisms, 4) citizens' perceived ease of engagement, and 5) motivated citizens. In the literature we found six factors contributing to OGD engagement: 1) democratic culture, 2) the availability of supporting institutional arrangements, 3) the technical factors of OGD provision, 4) the availability of citizens' resources, 5) the influence of social relationships, and 6) citizens' perceived data quality. Some of these conditions and factors were found to be less important in the studied case, namely citizens' perceived ease of engagement and citizens' perceived data quality. Moreover, we found several new conditions that were not mentioned in the studied literature, namely: 1) citizens' sense of urgency, 2) competition among citizen-led OGD engagement initiatives, 3) the diversity of citizens' skills and capabilities, and 4) the intensive use of social media. The difference between the conditions and factors that played an important role in our case and those derived from our literature review might be due to the type of OGD engagement that we studied, namely citizen-led engagement, without any government involvement.

The scientific contributions of this study are twofold. First, we developed a conceptual model of conditions and factors related to citizen-led engagement with OGD from the literature. This model can be used by other OGD researchers and can function to study citizen-led engagement in another context, such as cases in other countries. Our model can also be used to compare citizen-led engagement to other types of engagement (e.g., government-led engagement) and to better understand how these different types of engagement with OGD relate to each other. Second, we carried out an empirical case study of citizen-led engagement. Citizen-led engagement is rarely studied in the open data literature compared to other types of OGD engagement, such as government-led engagement and co-production engagement. Our study contributes to filling this knowledge gap.

The societal contributions of this study are as follows. From our case study, we derived insight into how citizen-led engagement emerges, more specifically under what conditions it emerges and which factors contribute to citizen-led engagement. OGD policymakers should prioritize and stimulate those conditions and factors that enhance OGD citizen engagement to create more value with OGD. Furthermore, they should be used in the development of government open data policies.

Conditions and factors comprising the proposed conceptual model may change over time and this may lead to the emergent needs for adjustment and refinement in other contexts. Our findings are based on a single case study from a particular country with interviews as the main source of information. Whether our findings also apply to other cases needs to be examined case-by-case. New avenues for future research in citizen engagement can emerge. We recommend further research to evaluate our proposed conceptual model of conditions and factors in government-led or co-production settings and compare the results with this study. Moreover, cross-country cases will be fruitful for generating

the findings and propositions that can contribute to the open data theories. Last but not least, investigating the relationship among conditions and factors and how they explain citizens' intentions to engage with open data using quantitative surveys will also be an interesting direction for future research.

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Appendix 1: Papers selected in our Systematic Literature Review

Source	Findings (Condition/Factor)	Methodology	Context
Selected from the search results			
Altayar (2018)	Citizens' expectations for transparency Government political reform, e.g., enactment of law and regulation Internal and external institutional pressure	Case study	Motivations to adopt OGD in Saudi Arabia
Purwanto et al. (2018a)	Intrinsic motivation, i.e., altruism or contributing to societal benefits Social influence, particularly from social media friends	Case study	Factors influencing OGD engagement in Indonesia
Máchová et al. (2018)	Integrated open data portal (i.e., regional, municipal, national) Providing advanced search, visualization and analytics features Promoting the availability and feedback on datasets Offering training, documentations and guidelines for users Continuous benchmarking of open data success	Document analysis	Usability evaluation of 5 OGD portals (Australia, Canada, India, UK, USA)
Sayogo and Yuli (2018)	Collaboration between government, academics, private entities and general public Willingness of government officials to accept criticism and suggestion Accommodating leaders Commitment of government agencies	Case study	Success factors of OGD at a local government in Indonesia
Svärd (2018)	Sufficient budgetary resources for municipality to release OGD	Case study	Implementation of OGD in two Swedish municipalities
(Weerakkody et al., 2017a)	Relative advantage of OGD Compatibility of OGD Observability of the output of OGD use	Survey	Predictors influencing the use OGD in the UK
Saxena and Janssen (2017)	Effort expectancy Social influence from family, peers, and supervisors Facilitating condition (e.g., internet access) Voluntariness of use	Survey	Factors influencing the acceptance and use of OGD in India

Source	Findings (Condition/Factor)	Methodology	Context
Wirtz et al. (2016)	Perceived risk-based attitude of public servants Perceived legal barriers Perceived hierarchical structuring of authorities Perceived bureaucratic decision-making culture Perceived organizational transparency.	Survey	Barriers opposing the introduction of OGD in Germany
Zuiderwijk et al. (2015)	Performance expectancy Effort expectancy Social influence Voluntariness of use	Survey	Predictors of acceptance and use of OGD technologies
Yang et al. (2015)	Legislation and policy (i.e., regulations and agencies' policies) Organizational cultures (e.g., conservative towards OGD) Involvement of leaderships and related authorities Perceived liabilities, benefits, losses and efforts External (e.g., media and the public) and internal (e.g., other agencies) pressures	Case study	Determinants of OGD in Taiwanese governmental agencies
Susha et al. (2015)	Interaction with OGD users Provision of support to OGD users Organizing OGD stakeholders around a certain societal issue	Case study	Challenges of OGD user engagement in governmental agencies in Swedia and the Netherlands
Parycek et al. (2014)	Clear definition of responsibilities Integration of OGD platform into existing systems Evaluation of OGD initiative very shortly after its inception	Case study	Success factors of OGD implementation in the City of Vienna
Conradie and Choenni (2014)	Fear of false conclusions from OGD Financial effects of OGD Opaque ownership and unknown data locations Priority of OGD	Case study	Barriers of OGD release in the City of Rotterdam
Neuroni et al. (2013)	Legal and political mandate Clear Executive commitment Technical security and standardization	Case study	Requirements of OGD from 18 Cantonal State Chancelleries of Switzerland

Source	Findings (Condition/Factor)	Methodology	Context
Kuk and Davies (2011)	Current personal situation and benefit Contribute to collaboration with others Provide alternative to government services Prospects of monetary reward Economic potential of OGD Showcasing abilities to prospective employers Contribute to public value	Case study	Hackers' reasons for engaging with OGD in the UK
Added from forward and backward search			
Hossain and Chan (2015)	Political leadership Institutional pressure Emergence of technologies in digital market Interoperability of datasets Organisational readiness Management commitment	Case study	Antecedents of adoption of OGD in 6 Australian governmental agencies
Yang and Wu (2016)	Facilitating conditions Organizational capability Perceived usefulness External influence Organizational culture Perceived risks	Survey	Determinants influencing government agencies' OGD in Taiwan
Barry and Bannister (2014)	Resource constraints Potential loss of revenue Uncertainty surrounding compliance with regulation	Case study	Barriers to OGD release in Ireland
Janssen et al. (2012)	Institutional barriers Legislation barriers Technical barriers Task complexity Use and participation barriers Poor information quality	Workshop	Barriers of OGD
Zuiderwijk et al. (2012)	Data availability impediments Insufficient metadata provision No interaction with OGD provider	Workshop	Impediments of OGD

Source	Findings (Condition/Factor)	Methodology	Context
Wirtz et al. (2018)	Ease of OGD use Usefulness of OGD Intrinsic motivation Internet competence	Survey	Determinants of citizens' intention to use OGD in Germany
Wirtz et al. (2017)	Ease of OGD use Usefulness of OGD Transparency, participation and collaboration expectancies	Survey	Determinants of OGD use by citizens in Germany
Weerakkody et al. (2017b)	Perceived OGD usefulness Perceived ease of using OGD Social influence	Survey	Factors affecting users' behavioural intentions towards OGD in the UK

Appendix 2: List of Interview Questions.

	Guiding Question	Role of Interviewee
1.	What is your opinion about open government data?	Volunteers and officials
2.	What are your hopes or wishes for the government regarding this open government data initiative?	Volunteers
3.	What do you think about citizen engagement in using open government data? What do you think should be done to encourage and increase citizen engagement in using open government data?	Volunteers
4.	In your opinion, what is Kawal Pemilu? What were the main objectives of Kawal Pemilu? Were these goals achieved?	Volunteers
5.	How did you involve in Kawal Pemilu? What were your roles in the initiative? How did you carry out your tasks in Kawal Pemilu? What motivate you to engage in the initiative?	Volunteers
6.	In your opinion, what societal problems would you perceive to solve by engaging with Kawal Pemilu? What were the benefits offered by Kawal Pemilu (to the government, the community, or other parties)?	Volunteers
7.	What major challenges did you encounter during your engagement with Kawal Pemilu? How did you deal with those challenges?	Volunteers
8.	To what extent did personal benefits influence your engagement in the Kawal Pemilu?	Volunteers
9.	To what extent did fun and enjoyment influence your engagement in the Kawal Pemilu?	Volunteers
10.	To what extent did your trust in the government (Indonesian Election Commission, particularly), trust in open election data, and trust in Kawal Pemilu's developers and volunteers influence your engagement in the Kawal Pemilu?	Volunteers
11.	Out of personal benefits, fun and enjoyment, and trust, which factor influences you most? Why? Out of personal benefits, fun and enjoyment, and trust, which factor influences you least? Why?	Volunteers
12.	To what extent did the believes or values of important others (e.g., family, friends, colleagues) influence your engagement in the Kawal Pemilu?	Volunteers
13.	To what extent did the believes or values of important others (e.g., neighbours, communities, society) influence your engagement in the Kawal Pemilu?	Volunteers
14.	To what extent did creating benefits for society influence your engagement in the Kawal Pemilu?	Volunteers
15.	Out of the believes of close social relationship, those of broad one, and societal benefits, which factor influences you most? Why? Out of the believes of close social relationship, those of broader one, and societal benefits, which factor influences you least? Why?	Volunteers
16.	To what extent did the accuracy of the open election data and its metadata influence your engagement in the Kawal Pemilu?	Volunteers
17.	To what extent did the format of the open election data and its metadata influence your engagement in the Kawal Pemilu?	Volunteers
18.	To what extent did the currency of the open election data and its metadata influence your engagement in the Kawal Pemilu?	Volunteers
19.	To what extent did the understandability of the open election data and its metadata influence your engagement in the Kawal Pemilu?	Volunteers

	Guiding Question	Role of Interviewee
20.	To what extent did the interoperability of the open election data and its metadata influence your engagement in the Kawal Pemilu?	Volunteers
21.	Out of the data accuracy, format, currency, understandability, and interoperability, which factor influences you most? Why? Out of the data accuracy, format, currency, understandability, and interoperability, which factor influences you least? Why?	Volunteers
22.	To what extent did the reliability of the open election data services and support influence your engagement in the Kawal Pemilu?	Volunteers
23.	To what extent did the assurance of the open election data services and support influence your engagement in the Kawal Pemilu?	Volunteers
24.	To what extent did the responsiveness of the open election data services and support influence your engagement in the Kawal Pemilu	Volunteers
25.	Out of the service reliability, assurance, and responsiveness, which factor influences you most? Why? Out of the service reliability, assurance, and responsiveness, which factor influences you least? Why?	Volunteers
26.	What were the most important factors that influenced your engagement in the Kawal Pemilu?	Volunteers
27.	In your opinion, to what extent is opening the election data benefiting the government, especially, your institution? To what extent does the opening of the election data benefit society members (for example, the community, political actors, academics, journalists)?	Officials
28.	To what extent is Open Government Data implemented by your institution? Could you tell me about business processes performed by your institution especially related to opening data for election tabulation?	Officials
29.	What major challenges did you encounter when performing the election data publication? How did you deal with those challenges?	Officials
30.	What do you think about citizen engagement in using Open Government Data? What do you think should be done to encourage and increase citizen engagement in using Open Government Data? What do you think makes people want to use Open Government Data?	Officials
31.	What do you think of initiatives carried out by citizens to use open election data such as Kawal Pemilu? In your opinion, to what extent did Kawal Pemilu benefit your institution? What are your projections about open election data in the future?	Officials