HOW DO CITIZENS BENEFIT FROM A SMART CITY?

A CASE STUDY OF JAKARTA, INDONESIA

RESEARCH PAPER

WORLD WIDE WEB FOUNDATION

CiPG Innovation Policy Governance

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[2] *Open Data Lab Jakarta, World Wide Web Foundation*

1. Introduction

1.1 BACKGROUND

The usefulness of information and communications technology (ICT) in creating new channels for public participation and more open government is widely acknowledged (Bertot, et al 2010; Ionescu, 2013). In the developing world, ICT has been a key factor in bringing about positive change across various sectors within the state and society. In Indonesia, ICT has played a big role in facilitating communication between the government and its citizens to enhance public service delivery (PSD). In particular, ICT has been key to the implementation of the government's open data initiative over the last three years.

In 2011, Indonesia was one of the pioneering countries to join the Open Government Partnership. Immediately thereafter, Indonesia launched Open Government Indonesia (OGI) with the aim of introducing open government reforms into Indonesian bureaucracy, including a strong commitment towards open data. Despite being at an early stage, the implementation of OGI shows promising signs of progress, with three action plans enacted in the last four years.

In the Southeast Asia region, Indonesia could be considered a frontrunner in implementing open data at the national as well as sub-national levels. In some cases, the open data initiative's progress at the sub-national level has surpassed national progress. Jakarta, for example, became the first city to have its own gubernatorial legislation on data management. The city administration and agencies are required to make its data open to the public, driving the development of open data activities in the city.

This research focuses on Jakarta as its case study because it has the most integrated PSD information system in Indonesia and has been actively involved in a number of open data projects. Jakarta is also one of the first cities to have its own dedicated reporting applications. Under the leadership of Governor Basuki Tjahaja Purnama (Ahok), Jakarta has promoted and implemented open government initiatives since 2012. This was marked with a series of events such as Hackathon Jakarta[1] and the initiation of the Jakarta Smart City programme in 2014.

The Jakarta Smart City programme provides information on traffic conditions, PSD updates and flood reports, and is expected to promote deeper citizen engagement and to create more effective public services that use information technology.

Most data in this programme is citizen-generated, with citizens using their mobile phones to access applications that aggregate, analyse and feed data back to the government or to other stakeholders. In Jakarta, internet penetration is approximately 56% (APJII and P.UI 2015), and mobile-phone ownership is estimated at over 97% (BPS 2015), suggesting that internet infrastructure is not a significant barrier to running programs like this successfully.

1.2 METHODOLOGY

In this case study, we wanted to find out how the existing Smart City initiatives within or outside of the Smart City programme have benefitted citizens. Specifically we wanted to understand how Smart City applications targeted intended (internal and external) users, how these users were engaged, and how they benefitted from these applications. We also wanted to know who was not using these applications, and why.

The primary method used was a survey of 400 respondents, the responses of which were later confirmed or enriched in focus group discussions (FGDs). The research used a stratified sampling method, dividing the overall population into sub-groups, then creating a composite sample by drawing sub-samples from each of these sub-groups. This sampling method is used because stratification provides a more refined representation of preselected sub-groups. In this research, the population was stratified according to Internet penetration, since the applications rely on Internet access and infrastructure. The samples from sub-groups were gathered using two methods: online and offline surveys. Mirroring the 56% Internet penetration in Jakarta (APJII and P.UI 2015), the proportion of responses collected from online and offline surveys was set at 50:50.

The sub-samples were gathered through convenience sampling – respondents were selected based on their

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1 Hackathon Jakarta (popularly known as #HackJak) was Indonesia's first open data challenge, and produced around 53 mobile apps to solve common urban challenges, primarily addressing budget management and public transportation.

availability, which means that they are individuals who were the most willing and able to participate in the study. In the offline survey, questionnaires were distributed in public places, such as city parks, universities, city tour buses, and bus and train stations. These locations were chosen to represent the diversity of respondents' backgrounds, reflecting that of the general population. The online survey was distributed through social media (Twitter, Facebook, websites, blogs), as well as through the Center for Innovation Policy and Governance (CIPG) partners. The surveys were conducted from 16 November 2015 to 11 December 2015, covering both users of the applications (n=139) and non-users (n=261).

To gain a deeper insight from user and non-user respondents, CIPG held two confirmatory FGDs. This method is particularly useful for exploring people's knowledge and experiences and was used to examine not only what people think, but also how they think and why they think that way.

Since the FGDs were confirmatory, participants were chosen from existing survey respondents and were further screened based on the validity of their answers. CIPG contacted the respondents by text message and email, and follow-up communication was conducted by text message and phone call. In the email, the organisers attached the research terms of reference and allowed seven to ten days for respondents to confirm their attendance. Only a total of six respondents attended the scheduled FGDs, despite a large number having been invited. This admittedly, is a low sample, but nevertheless provided the qualitative data to support the survey results.

The results of the surveys were quantitatively analysed and the FGD results were textually examined to reveal themes and patterns. The results of the analysis are presented in this paper. The first part of this paper provides the background and methodology while the second part presents a brief overview of the applications analysed in this study. The third part discusses the results of the survey, and the final section offers a few concluding remarks on what can be learned from this case study.

2. A Brief Background of Jakarta Smart City Applications

This research examines the business process of the Jakarta Smart City programme and three applications connected with it: Qlue, Waze, and Peta Jakarta. These applications provide a communication channel between the government and its citizens and have – it has been argued – successfully increased public participation, contributing to improved governance. The factors contributing to the success of these channels are: (i) the use of an open source platform; (ii) the harnessing of existing channels (e.g. using Twitter in the case of Peta Jakarta); and (iii) the involvement of the government and its agencies. Each of the three applications is described briefly below.

Qlue, Waze and Peta Jakarta are integrated with the Jakarta Smart City business process, and supply data to the Jakarta Smart City platform. As indicated earlier, public service applications have emerged rapidly, both at national and sub-national levels, since the open government initiative was launched nationally in 2011.

The timeline below illustrates the different public service applications that were introduced after Indonesia launched the open government initiative. The first integrated public service monitoring application was LAPOR!, initiated by the president's office for development, monitoring and oversight (locally referred to as 'UKP4'). This application aimed to provide a national platform to convey citizens' complaints to the government.

The creation of LAPOR! triggered the development of other public reporting mechanisms in Indonesia. In 2014, Peta Jakarta started mapping floods in Jakarta using the social media network Twitter, which led to a cooperation between Peta Jakarta and the Jakarta Disaster Management Agency ('BPDB'). At the end of 2014, Governor Basuki Tjahaja Purnama launched the Jakarta Smart City programme as an integrated information platform; and in 2015, Qlue was appointed by the city government as its official partner to handle citizens' reports through the Smart City platform.

2.1. LAPOR! AND ROP

LAPOR! was launched in 2011 to handle requests, reports and complaints at the national level. LAPOR! is currently managed by the Executive Office of the President together with the Ministry for Bureaucracy Reform and is connected to 87 ministries, departments and agencies (MDAs), five sub-national governments and 44 state-owned enterprises.

Daerah Khusus Ibukota (DKI) Jakarta was one of the first sub-national governments to connect to LAPOR! Previously, Jakarta had *Respon Opini Publik* (ROP) or the Public Opinion Response as their main public reporting tool, and LAPOR! is connected to that platform. This means that every report on DKI Jakarta that comes to LAPOR! is channelled directly to ROP. Technically, one dedicated city administrator handles all reports coming from LAPOR!.

ROP is the official public reporting channel and is owned by the city administration of Jakarta. The channel gathers citizens' reports through Hotline 164, the city administration's official call centre and social media account (for emails, text messages, Twitter and Facebook). ROP also collects reports from LAPOR!. Despite the variety of channels available, statistics from the ROP website show that most reports come from the city's official Twitter account, with 7946 reports up to March 2016, while the call centre received 16 reports and only one report came from LAPOR![2]

2.2. QLUE AND CROP

Qlue is an application that connects Jakarta residents with their neighbourhoods and city officials, letting them report information about their surroundings, thus using citizen participation to address problems in the city.

Developed by Terralogiq – an official Google Partner Corporation in Indonesia – Qlue launched in December 2014. It has a sister application called CROP (*Cepat Respon Opini Publik*), which officials use to respond to reports from Qlue. The two applications directly connect citizens and officials, enabling officials to provide services and address complaints. Qlue intends to expand its partnership to other cities.

Besides running the application, Terralogiq provides technical training on CROP to a range of users, from city administration officials down to users at the sub-district level. CROP is available on both handheld and desktop platforms, making it easier for sub-district heads to track citizens' complaints.

Qlue crowdsources data and delivers real-time reports

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2   See http://prov.jakarta.go.id/opinipublik/statistik [accessed 1 March 2016]

directly to officials in every jurisdiction. With social networking features, citizens are able to follow text and picture feeds posted by fellow users about what goes on in their surroundings. In mid-2015, Qlue launched the private company report feature – where citizens could file reports on private companies such as restaurants, banks, shopping malls – as an expansion of their service.

2.3. WAZE

Waze is an application that provides mapping services to enable its users to share real-time traffic and road information. It was originally designed to create a free digital map of Israel, where it is based. The cooperation between the Jakarta Smart City programme and Waze started as a partnership between the Jakarta government and a Google partner in Indonesia (Google now owns Waze).

Traffic information provided by Waze mainly circulates among citizens and so direct interaction between citizens and the government is not necessary. Citizens report traffic and road conditions to other 'Wazers' (Waze users). In return, they get an aggregated map with traffic information they can use as needed. Waze also provides real-time routes 'Wazers' can choose when they travel from one point to another.

Waze shares its data with the Jakarta Smart City programme as part of its Google enterprise data package. Data generated through Waze, like traffic congestion, is shared to the Jakarta transportation agency for immediate action and as an input to future planning. The city government also shares project information data on roads and other related transport projects that can affect citizens.

2.4. PETA JAKARTA

Peta Jakarta is a project that allows citizens in Jakarta to contribute to a publicly accessible map of flooding in Jakarta through Twitter. The data collected via Twitter is linked to the Jakarta Smart City platform and can be accessed through the Jakarta Smart City portal. Peta Jakarta, officially launched in 2014, is a unique collaboration between a university (SMART Infrastructure Facility, University of Wollongong), Twitter and a government disaster management agency that uses data to provide real-time responses to natural disasters[3].

The data collected from Peta Jakarta is used by the Jakarta city government for more effective management of floods. In 2016, Peta Jakarta also benefitted from the additional data supply from Qlue and pasangmata.detik.com – a citizen-generated information hub that enables citizens to report notable events, including floods.

The motivation behind Peta Jakarta is to use existing platforms (in this case, Twitter) to collect information on flood conditions. Twitter is a useful platform as it has a very large user base in Jakarta. During monsoon season, citizens actively share information on flood conditions through Twitter. Peta Jakarta collects these tweets and uses #banjir and #petajkt to map flood locations in real-time.

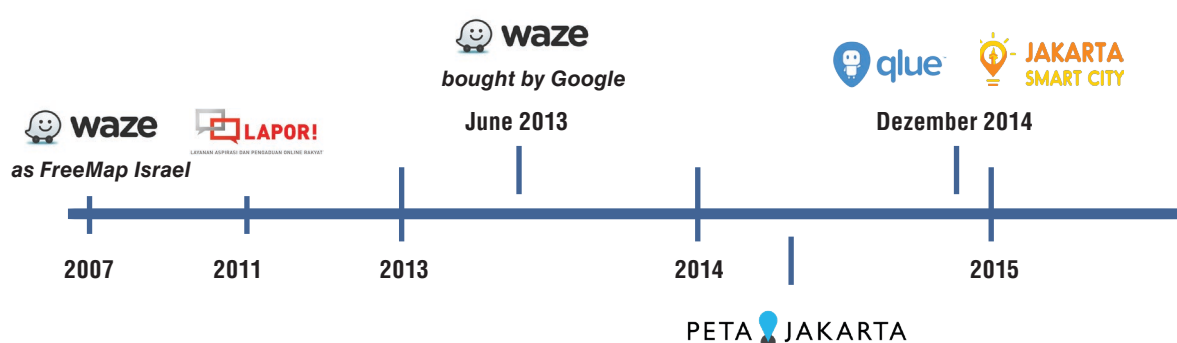3   See ttps://www.petajakarta.org/banjir/en/ [accessed 1 March 2016]

Figure 1: Application development timeline

3. How are citizens engaging with data through Smart City applications?

3.1. CAPACITY TO ENGAGE: USERS AND NON-USERS ACTIVITIES

Based on the survey results, all surveyed users of the Jakarta Smart City applications have smartphones and Internet access, and all use smartphones as the main channel to access the Internet, with laptops as the second most used channel. Most non-users also have smartphones (99%) and Internet access (96%). Like users, most non-users use smartphones to access the Internet. The prevalence of smartphone usage to access the Internet is consistent with the APJII and PUSKAKOM UI (P.UI) finding regarding Indonesian Internet-user profiles. The survey found that Jakarta has the highest Internet penetration in Indonesia, with 5.6 million people (56% of the population) having access, with smartphones as the most-used device to access the Internet (APJII and P.UI 2015).

Two important points need to be mentioned here. First, it is possible that the high usage of smartphones – giving individuals easy, low-cost Internet access – causes high Internet penetration. Second, the high mobility of users and non-users could justify the prevalent use of mobile phones to access the Internet. It is clear that most users and non-users have the infrastructure required to use the applications mentioned above.

The survey results show that almost all surveyed users of the Jakarta Smart City applications also use social media, with the messaging application Line as the most used (91%). The majority of surveyed non-users also use social media, with Facebook being the most popular platform (82%). From the percentage difference in social media usage, we gathered that users are more active in various social media compared to surveyed non-users (see Figure 2). This means that surveyed users are more likely to have more than one social media account at any one time. Consequently, even though the usage of cellular phones for social media is similar between users (95%) and non-users (90%), many users have multiple accounts in different social media. This increases the likelihood of users getting more information than non-users.

Considering the media habits of surveyed users and non-users above, it is evident that even though they have equal access to infrastructure, their habits in engaging with media are different, resulting in different levels of exposure to information. This may be one of the reasons why surveyed non-users have not used the applications studied in this report.

3.2. KNOWLEDGE AND USAGE OF JAKARTA SMART CITY AND ITS APPLICATIONS

The majority of surveyed users and non-users of the three applications reported that they were not aware of the Jakarta Smart City programme. However, the percentage of non-users who were not aware is much higher than the percentage of users who were. Based on these findings, it is likely that those surveyed who were users of other public reporting applications or channels were more likely
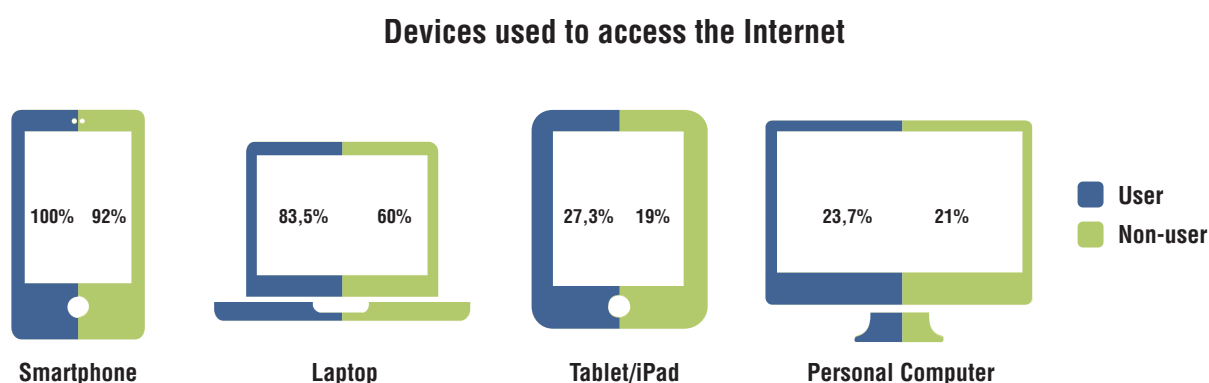
Devices used to access the Internet

	User	Non-user
Smartphone	100%	92%
Laptop	83,5%	60%
Tablet/iPad	27,3%	19%
Personal Computer	23,7%	21%

Figure 2: Similarities in used Internet device of user and non-user (multiple answers possible)

to become aware of the Jakarta Smart City platform and its applications.

Of the three applications connected with the Jakarta Smart City programme, the most popular application is Waze, with traffic congestion being the most reported and searched-for issue (see Figure 3).

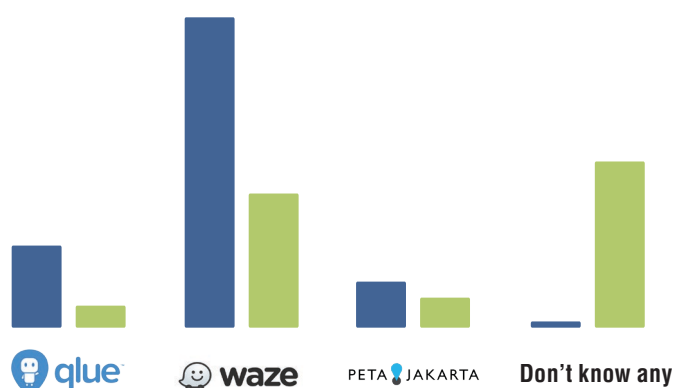**Do you know any of these applications?**

Figure 3. Knowledge regarding applications of Jakarta Smart City (multiple answers possible)

Waze was noted as being more relevant to respondents needs as it provides traffic information. The popularity of Waze is apparent not only among surveyed users but also non-users who emphasised the relevance of Waze to their daily problems, with traffic jams being their principal concern (see Figure 4). This is largely because people commute every day in Jakarta for work or other activities, and traffic congestion is a daily reality that non-users have to face. As it is relevant to their daily experience, it becomes their top concern.

Surveyed users have similar concerns to non-users, with traffic congestion the most reported issue. The consistency between users' and non-users' major concerns is a result of these being the problems generally experienced by the citizens of Jakarta.

The lack of infrastructure is perceived as the main barrier stopping those surveyed from learning about, and using the application. However, we found that the real problem is poor communication between the city government, citizens and the application developers, rather than infrastructure. This is suggested by our finding that surveyed non-users don not actually encounter problems with infrastructure, but that a number of surveyed individuals are not aware of the existence of the Jakarta Smart City platform or the three applications connected

with it. This lack of awareness may be caused by the lack of information exposure previously outlined. Poor communication not only leads to a lack of awareness, but also affects perceptions of integrity. We found some respondents are aware of the applications but still not using them. They are sceptical about their reports actually being used by government to drive change.

3.3. CITIZENS' USE OF AND BENEFITS FROM SMART CITY INITIATIVES

There are three major factors that surveyed users have identified as influential in their use of the applications; (i) ease of use; (ii) relevance to their interest; and (iii) ability to search for information. These factors correlate closely to one's personal motivation. For example, a surveyed user shared how her dislike of police conduct has led her to report the street locations of police through Waze to inform other users with the same concern. A large proportion of users emphasise searching for information as their motivation for using the applications. However, more surveyed users search for information in the applications than use them to report issues.

There were two constraints that prevented the surveyed non-users from using the applications. The first is lack of information about the applications and how they benefit citizens. Those surveyed seemed to need evidence that this initiative works and improves people's daily lives. The second constraint has to do with concerns about privacy. Surveyed non-users were not actually aware of how their data would be treated by either the application developers or the government.

But for those who have used the applications, they reported several benefits:

• They mediate the interaction between citizens and government (largely Qlue). Findings showed that respondents are generally hesitant to interact with the government, and these applications give them a way to voice their concerns without having to directly interact with government officials, something they have found frustrating in the past. These applications have lowered the barrier to filing complaints. Reports are cascaded to the relevant work units and then communicated down to the neighbourhood unit level through Qlue. This mechanism enables complaints and problems to be addressed and for the process to be monitored by the complainant. With their privacy guaranteed, respondents feel safer when they report their concerns.

- They help foster citizens' participation and sense of belonging by crowd sourcing information (Qlue, Waze, Peta Jakarta). Survey respondents are able to share and receive information relevant to their concerns. Through easily accessible channels, they were also able to convey their concerns, complaints and suggestions to the government with ease. With both Qlue and Peta Jakarta, respondents felt part of the government, helping to solve problems by reporting them proactively. In the case of Waze, users feel part of a larger community, helping each other navigate through a common predicament – traffic.

- They help citizens assert their rights (largely Qlue). Survey respondents become aware of their right to have decent public facilities. The initiatives and applications enable users to assert their rights and to demand improvement in public facilities.

- They enable citizens to improve current conditions. Generally, people use applications to make their lives better, be it navigating a traffic-congested city or ensuring that a street light is fixed. Waze is seen by users as very helpful in navigating Jakarta's traffic, while some of those who have complained using CROP were able to see their problems resolved by responsible government agencies.
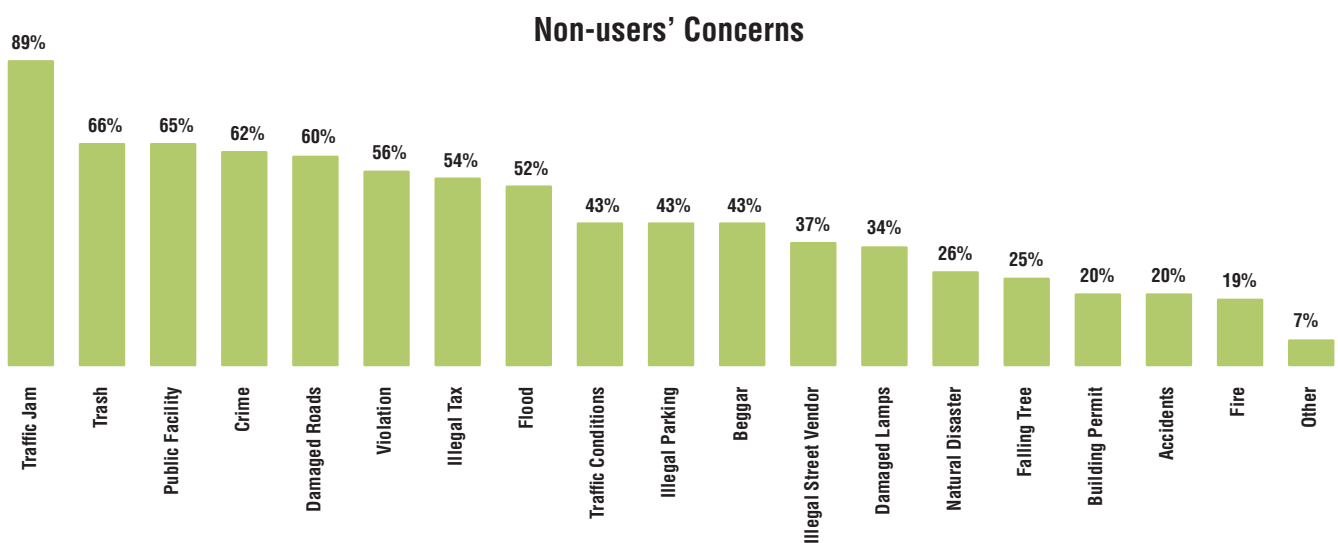
Non-users' Concerns

Figure 4. Non-user's concerns (multiple answers possible). Source: Authors.
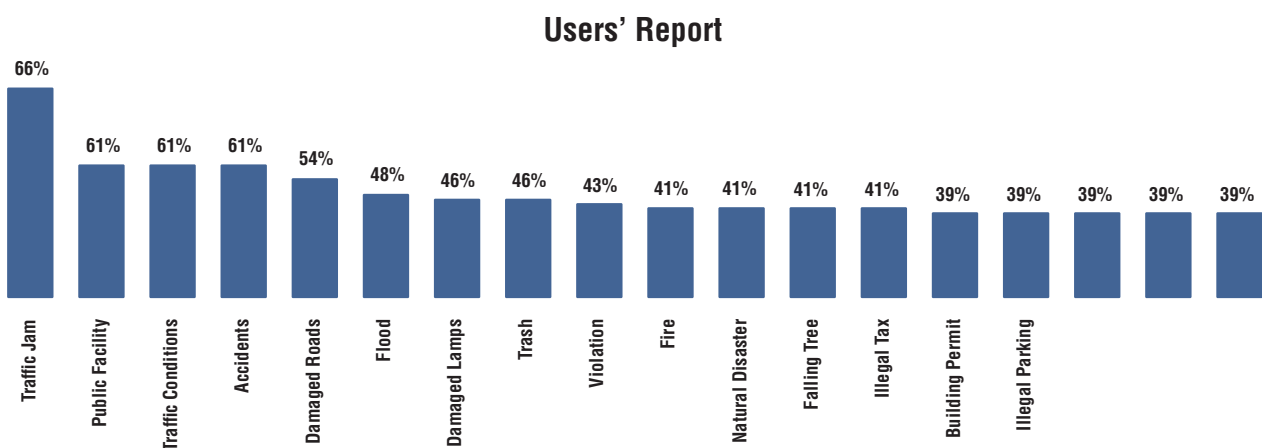
Users' Report

Figure 5. User's report topic (multiple answers possible). Source: Authors.

4. What are the implications of this case study?

It is evident that the Jakarta Smart City initiative has been able to bring citizens closer to the government. Through the applications connected with the initiative, the programme has provided various channels for citizen reports, gathering significant amounts of citizen-generated data. Best and Krueger (2005) suggest that political participation is influenced by the resources enabling citizens to participate, and that technology has been key in enabling citizens to communicate with the government and partake in development. Through the Jakarta Smart City initiative, technology has helped bridge relationships between citizens and the government.

However, there are issues about inclusiveness as these applications depend on access to smartphone technology. There are also concerns that the government has not been 'marketing' the Jakarta Smart City initiative sufficiently to attract widespread adoption.

The case study highlights the following ways citizens behave in smart city programmes, with particular reference to applications that were developed within the context of making cities smart and more habitable.

First, citizens use applications that are relevant to their needs. As the survey findings suggest, applications that solve problems faced by citizens are the most used. This confirms the finding of earlier studies that providing better services to citizens (Garcia & Pardo 2005) or helping citizens respond to or navigate around specific problems (Lee at al. 2014) are necessary preconditions for successful e-government applications. This is why some authors argue that the use of technology has to result in concrete economic and social value (Cranefield at al. 2014).

Second, citizens' trust in government is important for the use or continued use of smart city applications. Many surveyed non-users of the applications remain resistant to using them because of their lack of trust in government to use the data appropriately and respond to their concerns. In one study, it was argued that trust in government's use of e-government applications is not only about whether government is able to deliver on its promises, but also about whether government has the necessary organisational and technical capacity to respond to citizens in a useful way (Colesca 2009). This seems to mirror the case of those surveyed in Jakarta – although some users did not seem to care whether government

is responsive and being able to report was sufficient. Building trust in government itself, much more than in its applications, is critical for the adoption of government-related applications (Abu-Shanab 2014).

Third, sustainability in the use of the Jakarta Smart City applications is dependent on citizens' perceptions of the benefits. The Jakarta case study suggests that the usefulness of applications is the primary consideration for those surveyed who were using them, and why surveyed non-users might consider using them too. In this case, several authors have argued that application development should be citizen-centred to make it successful, with expectations and opinions of various stakeholders taken into account (Axellson et al. 2013). As such, government should get to know what citizens want and need, commit to satisfy these, and acknowledge that these will change with time (Bertot et al. 2008).

Fourth, transparency and openness in the use of citizen-generated data is important. For surveyed non-users, the transparency and openness in how their data is used is important, emphasising the importance of trust. For surveyed users, their engagement with government through these channels is enhanced by being able to report anonymously, without fear of repercussions following negative reporting. However, both users and non-users in the survey do not really understand how their data is used and whether or not this process can cause them harm. Transparency, in this case, is important. In the area of citizen science, while citizens should be in the front-seat in a process of co-creation, there should also be transparency as to why the data are collected and how they will be used. This requires a social contract between stakeholders that will make the rights and responsibilities clear to all parties (Fradera et al. 2015).

Finally, privacy is an emerging concern for users and even non-users of smart city applications. For both surveyed users and non-users, privacy has become an emerging issue associated with the Jakarta Smart City applications. They were aware that they were sharing their online footprint and exposing their user credentials with app developers and government. While some studies report that concerns about privacy negatively affect the use of e-government applications (Colesca 2009), this does not seem to be the case with the surveyed users, but it does seem to apply to the non-users. Privacy concerns are likely to increase as the Jakarta Smart City programme

continues to build applications and use data generated from them. Consequently, it is important to think about ways to define and protect citizen privacy. Martinez-Balleste et al. (2014) argue that in the context of smart cities, protection of data privacy should include essential aspects such as identify, query, location, footprint and owner privacy. It would be interesting to look at how this will operate in the Jakarta Smart City programme, especially as most of the applications are dependent on user location (to track floods, make complaints, or monitor traffic) and some require an online identity (Peta Jakarta). Future research is necessary to understand whether privacy concerns will undermine the success of smart city applications.

For more information on this project, visit our website at labs.webfoundation.org or get in touch with us directly at **contact@webfoundation.org**. Other related media are also available in the resources section of our website.

↘ If you want to learn more about the project, email us at **contact@webfoundation.org**

↘ If you want to look at other open data projects, see **www.webfoundation.org**

↘ If you want to give it a try and implement the approach – with or without us – let's talk!

REFERENCES

Abu-Shanab E (2014) Antecedents of trust in e-government services: An empirical test in Jordan. Transforming Government, People, Process and Policy 8(4): 480–499

Axelsson K, Melin U & Lindgren I (2013) Public e-services for agency efficiency and citizen benefit: Findings from a stakeholder centered analysis. Government Information Quarterly (30): 10–22

APJII and P. UI (2015) ProfilPengguna Internet Indonesia 2014. Jakarta: APJII

Best SJ & Krueger BS (2005) Analyzing the representativeness of internet political participation. Political Behaviour 27 (2): 183–216

Bertot JC, Jaeger PT & McClure CR (2008) Citizen-centered e-government services: Benefits, costs, and research needs. The Proceedings of the 9th Annual International Digital Government Research Conference. pp. 137–142

Bertot JC, Kaeger PT & Grimes JM (2010) Using ICTs to creata a culture of transparency: E-government and social media as openness and anti-corruption tools for societies. Government Information Quarterly (27): 264-271

BPS (2015) Statistik Indonesia 2015. Jakara: Badan Pusat Statistik

Colesca SE (2009) Understanding trust in e-government. Economics of Engineering Decisions 3. Available athttp://158.129.0.15/index.php/EE/article/viewFile/11637/6319 [accessed 1 August 2016]

Cranefield J, Roberston O & Oliver G (2014) Value in the mash: Exploring the benefits, barriers, and enablers of open data apps. Paper presented at the 22nd European Conference on Information Systems. Available athttps://pdfs.semanticscholar.org/558e/488fea46d6dace20c6e434a3f0dcc16b5f55.pdf [accessed 12 July 2016]

Fradera R, Slawsdon D, Gosling L, Fraser P, Makuch K, Makuch Z, Madani K, Martin K, Slade R, Geohegan H, Moffat A &Haklay M (2015). Exploring the nexus through citizen science. Nexus Network Thinkpiece Series. Available athttp://www.thenexusnetwork.org/wp-content/uploads/2016/01/Fradera_final22Jan2016.pdf [accessed 2 July 2016]

Gil-Garcia R & Pardo T (2005) E-government success factors: Mapping practical tools to theoretical foundations. Government Information Quarterly (22): 187–216

Ionescu L (2014) The positive effect of ICT infrastructure in reducing corruption and increasing transparency. Economics, Management and Financial Markets 8(2): 167-172

Lee M, Almerall E & Wareham J (2014) Open data and civic apps: First generation failures, second generation improvements. ESADE Working Paper No. 256. Barcelona: ESADE. Available athttp://observgo.uquebec.ca/observgo/fichiers/25713_gri1.pdf [accessed on 18 June 2016]

Martinez-Balleste A, Perez-Martinez P &Solanas A (2013) The pursuit of citizens' privacy: A privacy-aware smart city is possible. IIEE Communications Magazine. June 2013. pp. 136–141.Available athttp://crises2-deim.urv.cat/docs/publications/journals/794.pdf [accessed on 13 August 2016

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