

# Understanding Decision-Making Needs of Open Government Data Users

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## Abstract

Open Government Data (OGD) promotes transparency, innovation, and value creation that makes information gathered by the government about the city and community open to all. The City of Cincinnati Open Government Data Portal allows citizens to access local data as part of a local OGD initiative. Although these datasets are available and are used by a broad audience, little is known about how users engage with this data and the general usability of the platforms. To learn more about this audience, this study is conducted in two steps 1)- a think-aloud activity and 2)- an online survey. Through these activities, we aim to gather information about how the users are interacting with the available data and for what purpose are they interacting with different sections of the portal. After gathering relevant data from the think-aloud activity, we aim to generate a questionnaire by analyzing all the information collected in the previous event at a larger scale. Using a web-based survey shared with individuals via Qualtrics, we will explore the use of the portal to gain more insight and knowledge on user requirements and their suggestions. The endpoint of this study is to develop insights that will help us understand user expectations and how changes could benefit the portal.

CCS Concepts: •**Information systems** → **Data Analytics**.

Additional Key Words and Phrases: Human Computer Interaction, Open Government Data Portals, Open Data Usage, Value Creation

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## 1. Introduction

Open Government Data is a technology platform that allows citizens, organizations, and even governments to participate in new ways to ensure government accountability [1]. OGD is often presented in an online portal, and in-system activity data can give some insights into the citizens successfully utilizing government data [1]. OGD has taken the initiative to release a massive amount of government data sets to the citizens to create new application opportunities but also to impress new burdens inherent to large-scale distributed data integration, collaborative data manipulation, and transparent data consumption [8]. The City of Cincinnati Open Government Data Portal [5] is an interactive website where citizens, industries, and agencies have access to raw data about their local area. The City of Cincinnati Office of Performance & Data Analytics gathers a considerable amount of data about the City. It updates the information on City's Open Government Data Portal and CincyInsights. CincyInsights is a companion tool to the data portal that was designed to visually enable citizens to know more about what is happening in their city and neighborhood using Tableau tools.

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These include links to datasets about permits and licenses, market analysis, education/research needs, viewing public safety, and public health, to name a few. Sharing this kind of data is intended to ensure transparency, innovation, and to improve service delivery to the citizens. We are trying to understand the community perceptions regarding values such as usability, innovation, and know all the valuable aspects of the website. The contribution of this study is to learn more about the ways that individuals use OGD for decision-making and create design insights that can increase data accessibility and encourage the development of creative tools to engage, serve, and improve Cincinnati neighborhoods and residents' quality of life. To investigate these topics, the study includes a think-aloud activity to help in gaining information that we may be able to find a way to improve government accessibility, increase opportunities for local innovation, and create a social impact. In the think-aloud activity, participants are asked to use the system while continuously thinking out loud- that is, merely verbalizing their thoughts as they move through the user interface. The feedback gathered will help to understand if the following aspects of the portal- typical uses, typical use patterns, if it allows users to navigate easily and find information quickly, if it is informative for decision-making needs, and if the overall layout is engaging.

The study will take an exploratory and grounded approach to answer the following research questions:

- How and for what purposes do users typically engage with the available data from the City of Cincinnati Open Government Data Portal?
- How do individuals feel about the usability of the visualization and navigation tools that are being used?
- What features and datasets best support the common uses of Cincinnati Open Data?

## **2. Background**

In 2009, the White House issued an Open Government Directive requiring federal agencies to take immediate actions towards transparency, participation, and collaboration [4]. Following suit, governments around the world have released datasets they have been collecting over time using information technology and systems as part of their operations. These datasets are known as Open Government Data. These are datasets they have been collecting over time using information technology and systems as part of their operations. The purpose of releasing OGD is to bring more business opportunities and benefits to society. According to previous literature, OGD has four value-generating mechanisms related to its application and utilization, including transparency, participation, efficiency, and innovation [2]. It is also studied concerning four types of social benefits: enthusiasm for technology, the pursuit of novelty, rejection of authority, and community involvement [3]. The benefits also range from transparency to public service improvement, citizen engagement to the creation of social and economic value. We operationalize transparency here as the act of making this information available, however, as is the case in open governments that make records transparent, there is no guarantee that available information will meet users' information needs or be used in decision-making. This study will investigate this type of transparency to learn more about how it contributes to open data users' local decision-making.

## **3. Cincinnati Open Government Data Portal and CincyInsights**

The Open Government Data provides us the City's raw data sets in various fields such as economy, traffic reports, crime, and business. It provides real-time information about various projects happening in the City. CincyInsights is a dashboard that has all these that are accessible to citizens 24/7. Users can easily interact and analyze the mapped data. Five major strategic priorities of both the websites

are Safer Streets, Growing Economy, Thriving and Healthy Neighborhoods, Innovation Government, and Fiscal Sustainability.

INSTANCEDID	INCIDENT_NO	DATE_RE	DATE_FR	DATE_TO	CLSD	UCR	DST	BEAT	OFFENSE	LOCATION
FBCE481-0E16-4254-88E7-61FA6...	149019911	2014 Aug 12 ...	2014 Aug 10 ...	2014 Aug 10 ...	J-CLOSED	201	CENTRAL BUSINESS	1	RAPE	06-TRANSIT FACILITY
74DC4E70-9B8C-4072-9C32-744FD...	189021897	2016 Aug 26 ...	2016 Aug 26 ...	2016 Aug 26 ...	J-CLOSED	201	5	3	RAPE	02-MULTI FAMILY APARTMENT
33B8704F-706F-457F-8531-4F342...	21103676	2011 Aug 23 ...	2011 Aug 23 ...	2011 Aug 23 ...	J-CLOSED	600	2	2	THEFT	33-DRUGSTORE
80027D1F-3F03-4429-8530-00005...	149019532	2012 Dec 01 ...	2009 Nov 13 ...	2012 Jun 01 ...	D-VICTIM REFUSED T...	201	3	1	RAPE	02-MULTI FAMILY
9EE3F254-4217-435A-8583-75F04...	189022696	2019 Aug 18 ...	2015 Jan 01 ...	2017 Dec 31 ...	J-CLOSED	201	4	4	RAPE	01-SINGLE FAMILY HOME
30987A8F-2946-4039-8391-54E2C...	189029647	2015 Oct 30 ...	2015 Oct 29 ...	2015 Oct 29 ...	K-UNFOUNDED	201	2	1	RAPE	08-SCHOOL
CC578885-846E-4C12-85EE-1046A...	139031452	2013 Nov 18 ...	2013 Nov 17 ...	2013 Nov 17 ...	J-CLOSED	201	5	3	RAPE	48-PARKING LOT
92A296A8-D187-40CC-8096-209CF...	199003291	2019 Feb 16 ...	2019 Feb 16 ...	2019 Feb 16 ...	J-CLOSED	201	4	5	RAPE	02-MULTI FAMILY
9CC5136-59F5-405A-9F01-44D127...	189026088	2018 Sep 26 ...	2018 May 01 ...	2018 Jul 27 ...	J-CLOSED	201	4	5	RAPE	01-SINGLE FAMILY HOME
79A8A733-7911-4288-9A16-2197D...	169031880	2016 Dec 05 ...	2016 Dec 05 ...	2016 Dec 05 ...	J-CLOSED	201	3	4	RAPE	02-MULTI FAMILY
19E7B718-8A9D-43FE-8589-BF5D0...	41101908	2011 Apr 02 ...	2011 Apr 01 ...	2011 Apr 01 ...	D-VICTIM REFUSED T...	201	4	2	RAPE	02-MULTI FAMILY
90D09407-8008-48CC-42C1-7738...	189026667	2016 Aug 13 ...	2016 Aug 13 ...	2016 Aug 13 ...	J-CLOSED	201	4	4	RAPE	47-STREET
2C3D48B0-3A87-48DF-88D9-3531...	199002974	2019 Feb 12 ...	2019 Feb 05 ...	2019 Feb 07 ...	D-VICTIM REFUSED T...	201	4	4	RAPE	02-MULTI FAMILY APARTMENT
0E2A208A-C861-4483-9261-01EAC...	139012688	2017 Apr 12 ...	2017 Apr 11 ...	2017 Apr 12 ...	J-CLOSED	201	1	3	RAPE	52-OTHER OUTSIDE LOCATION
043624FE-30A0-494E-800D-C19E8...	139033480	2013 Dec 13 ...	2013 Dec 12 ...	2013 Dec 13 ...	D-VICTIM REFUSED T...	201	3	4	RAPE	47-STREET

Figure 1: Screenshot of crime data on the Cincinnati Open Government Data Portal.

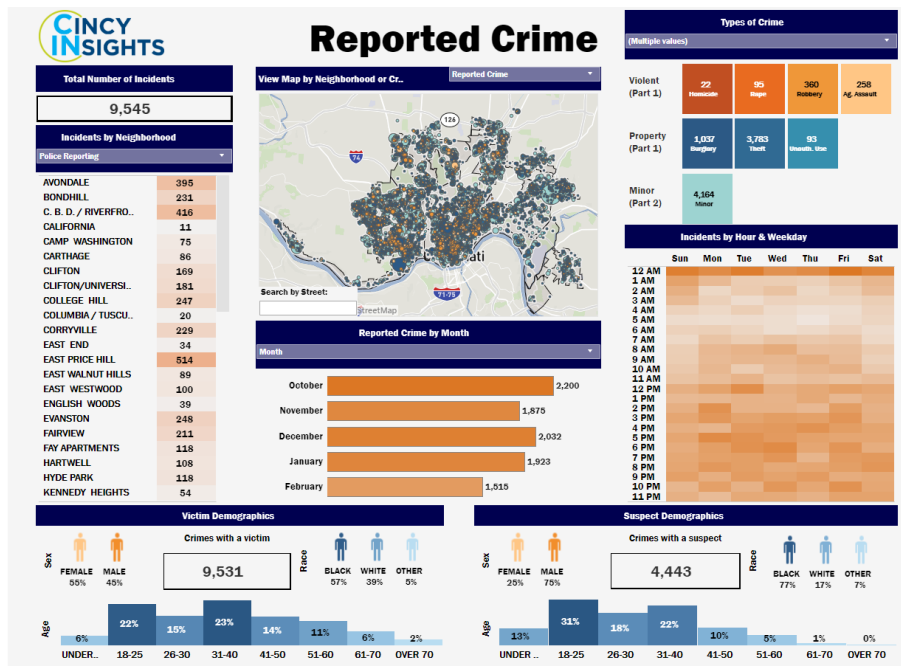


Figure 2: Screenshot of crime data displayed on CincyInsights

4. Methods

A study will be conducted to focus on the unknown aspects of the portal, along with how it would improve the overall usability of the system. Individuals are recruited from local community groups and registered users of the Cincinnati Open Data Portal. The target population will be citizens aged

above 18 years living in Cincinnati. Two types of users will be recruited – superusers, or (citizens who actively use Open Government Data) and non-superusers, those citizens who are unaware of the website. The study will be carried out by performing a think-aloud activity – an activity considered to be the most valuable usability method, according to the Nielsen Norman Group[6] to gather information on the portal. If it allows users to navigate easily and find information quickly, to find the site informative for decision-making needs, and if the overall layout is engaging. Although testing five users each from the superusers and non-superusers group for this type of study is ideal, we aim to perform the study until the saturation of results. We will be starting to reach out to the non-superusers from the University of Cincinnati – Faculty members and students who are using the City of Cincinnati Open Government Data portal for the first time. This activity will take place for about an hour and will be conducted in university labs after giving detailed instructions and getting signed consent forms from the user. Later this semester, we will be reaching out to the City of Cincinnati to help us recruit superusers of the system. This study will be conducted in two concatenated stages:

The first stage will be a think-aloud activity (will be held on 20 participants until saturation of results) where individual participants will be asked to use the system while thinking aloud. This method is considered to be a robust and secure method that gives the research team a direct exposure to how users think. Qualitative Thematic analysis will be performed to examine relationships between participants' community perceptions regarding values such as transparency, usability, and innovation. The participants for the research are observed while they use the website and will be asked to explain what they are doing during the process. The participants are given detailed instructions before the activity begins. They will also need to sign a consent form that states that they are 18 years and above and are willing to participate in the study. They will be asked to think out loud as much as possible: to say what they're looking at, what they're trying to do, and what they're thinking while using the portal. This study is performed to assess the quality of the website and to determine how usable it is. This session will be around 1 hour, and a detailed report is generated at the end of each user performing each task. Questions will be asked while the participants use the City of Cincinnati portal to test the usability of the website and if it provides an experience that covers 5 E's of usability as defined by Whitney Quesenberry [7] – effective, engaging, ease of use and error-tolerant.

Superusers, or citizens who actively use Cincinnati Open Data, will be asked to work with the portal in a way that they usually engage with it - preferably one or two tasks that they typically perform and provide immediate feedback on the usability of the website. This stage will help us analyze the drawbacks and improvement areas of the portal. Non-superusers will also participate in a second group that may be given a task or two since they do not typically use this tool. These users will provide insightful information from a different user perspective as they are inexperienced with the open data portal.

Based on the information gathered in stage one, an online questionnaire via Qualtrics ([www.Qualtrics.com](http://www.Qualtrics.com)) that may contain Likert scales and multiple-choice questions (MCQs), open-ended, and closed-ended questions will be created. This questionnaire will be sent out by the City of Cincinnati to registered users of the portal as a survey and may be posted on their website. The survey will be conducted on 500 participants (will be distributed to a large group of registered users; much fewer are anticipated to complete the study based on prior work). The action takes a ground approach to answer questions like "Who are the primary users of the City of Cincinnati Portal, and how do they typically engage with the available data? ", "Can non-superusers tell what is happening in their neighborhood from the information on the portal? " and "How do individuals feel about the usability of the visualization and navigation tools that are being used?"- It will take about 15 minutes to

complete the survey. Information gathered from this survey will allow us to observe whether the patterns observed in the Think Aloud are generalizable to the larger population of users and will contain a variety of perspectives along with it being rich in data since the survey is conducted on a large scale.

#### **4.1 Data Analysis Plan**

Data will be collected, imported, and linked for analysis. Data will be reviewed manually to ensure that the number of in-person meetings does not result in more than that number of responses. Additionally, a manual review will be completed to ensure that data is valid. Qualitative coding of themes will be used to evaluate these think-aloud activities. Preliminary data will be assigned to the data to describe the content. Patterns will be searched in these codes after saturation. A detailed report will be produced after naming and defining these themes. Through values such as transparency, innovation, and usability, we may be able to find a way to improve government accessibility, increase opportunities for local innovation, and create social impact.

#### **5. Early Results**

Pilot studies were conducted on two participants - non-super user and superuser. Here, the superuser and the non-superusers were made to think aloud as they perform various tasks designed, keeping in mind the endpoints of this study. While the participants performed these tasks, our research team observed and noted down every action and word said by the participants. This helped us gain information with regards to what the users felt while performing the tasks as well as the strong and weak points of the portal itself. Individual implied informed consent was gathered from these individuals before they proceeded to complete the activity.

From the first think-aloud activity (conducted on a non-superuser), we learned that the user had a problem with navigation as he preferred a fixed ribbon at the top of the webpage, preferred using the a-z search bar and preferred having related/useful links below every section. The user also mentioned that while choosing which neighborhood was safe to move in, the user used the crime report to make this decision. The map that showed the crime rates differed in its interface when the time frame was changed six months to four years. The user also found that the webpage had an overwhelming amount of information, and some pages indicated that it was still under construction.

From the second study (conducted on a superuser), we analyzed that the user had difficulty in shifting from the Open Government Data portal to CincyInsights while comparing the local city address data. The user also felt that the screen size was not adaptable and usable - maps could not be viewed clearly. On the positive aspects of the website, the user mentioned that he liked the big buttons and found the interface easy to navigate. He also said that he found the information accurate and up to date. Once the Think-aloud event was completed, the participants were thanked for their cooperation. Participants were also made aware that they are welcome to contact members of our research team to view aggregate reports of findings when the study is completed. More think-aloud activities will be performed similarly until saturation. Participants will be made aware that they are welcome to contact members of our research team to view aggregate reports of findings when the study is completed.

#### **6. Future Work**

Based on these pivot studies, since the sample space is just two people, the next steps would be to perform more think-aloud activities to find the root problems faced by the citizens while using the portal and to analyze the results in-depth to assist in reporting and recommending to the city and other stakeholders. More insights about the culture of the open data portal, data visualization tools, and

community problems faced by the citizens will be analyzed. This will not only help us to analyze the key improvement areas in the City of Cincinnati portal but also all the other Open Government Data portals as well. Inspecting this will help us gain new perspectives about the usability of OGD portals and understand if it meets the overall user's information needs.

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