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How do Non-profit Open data Intermediaries enhance Open data Usability? A Systematic Literature Review

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Non-profit organisations (NPOs) are one type of open data intermediaries connecting different actors in the open data ecosystem. They perform a number of activities, from requesting the government to open up the data to application development. Such activities can have an effect on open data usability barriers that other actors in the open data ecosystem encounter. The objective of this study is to systematically review the literature on the influence of NPOs' activities on the usability barriers for open data users in the open data ecosystem. The authors identified and analysed fourteen relevant papers. This study shows that NPOs conduct various activities that relate to different intermediary roles in the open data ecosystem, which in turn can affect certain usability barriers. Moreover, NPOs may perform different activities depending on the type of open data they work with. However, the connection between the activities and open data usability barriers for open data users cannot be clearly established from the selected articles, as most of them do not focus on establishing such a link. This review highlights a literature gap in relation to NPOs' activities and their effects on open data usability.

CCS CONCEPTS • General and reference~Document types~Surveys and overviews • Social and professional topics~Professional topics • Information systems~Data management systems~Information integration

Additional Keywords and Phrases: open data, intermediaries, non-profit organisations, usability

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1 INTRODUCTION

Open data intermediaries are actors in the open data ecosystem that connect other actors, open data producers and data consumers, to each other [1]. By doing so, they facilitate the (re-) use of open data. Intermediaries conduct specific activities

that can decrease the usability barriers through a number of activities [1]. One specific type of intermediaries concerns Non-Profit Organisations (NPOs), including non-governmental organisations and civil society organisations under its umbrella, which function to serve neglected populations, expand the freedom or empower people, engage in advocacy for social change, and to provide services to the public [2].

This study's objective is to systematically review the influence of the activities of non-profit open data intermediaries on the usability barriers for open data users in the open data ecosystem. The structure of the paper is as follows. First, we discuss our research approach in Section 2, followed by the review of the results in Section 3. Then, in Section 4, we discuss the findings and provide a conclusion, the limitations of this review, and future research directions.

2 RESEARCH APPROACH

We conducted a systematic literature review using the approach suggested by Xiao and Watson [3]. The research objective guided our search terms. We used intermediary-related keywords because an initial search using NPO-related search terms provided an insufficient number of articles in the same databases. The final query string was: (intermediary OR intermediaries OR infomediary OR infomediaries) AND ("open government data" OR "open data") AND (usability OR use OR usage).

Figure 1 depicts the papers' selection process. We collected 215 papers by searching three databases: Scopus, Web of Science, and GoogleScholar. Our search string is applied to the title, abstract, and keywords. Only the first 50 publications were collected from GoogleScholar, given considerations of time limits with over fourteen thousand results. We scanned the abstracts of the publications and discarded those not related to the intermediaries, leaving 49 papers to assess for eligibility. Further exclusion criteria concerned studies that did not contain an analysis of non-profit/non-governmental/civil society organisations, leaving thirteen eligible papers. A forward search using the Scopus database led to the inclusion of one paper, providing fourteen final papers. Of those, seven are journal papers, two are conference proceedings, three are book chapters, and two are project reports. The works were published between 2014 and 2020. The primary geographic areas of the papers' are Africa ($n = 4$) and Europe ($n = 3$). The main research disciplines of the research are Governance and Information Technology/Data.

Data extracted from each of the papers included NPOs' details such as their mission, initiative in focus (if applicable), and activities performed. Moreover, for each paper, the details about the research questions/objectives and methods were extracted. The data is shared through the 4TU Research Data portal and can be accessed via <https://doi.org/10.4121/20418768.v1>.

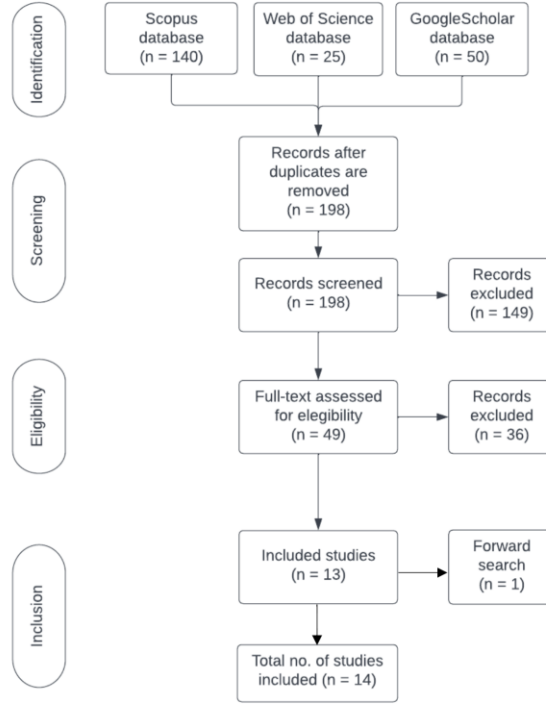


Figure 1: Paper selection process.

3 RESULTS

We carried out a qualitative directed content analysis to summarise the results of the reviewed papers. The full list of papers and complete table from this section are available via the 4TU Research Data portal.

Only two papers link usability barriers to NPOs' activities. The article by Gascó-Hernández et al. [4] identifies a lack of skills and knowledge as a usability barrier and focuses on training activities that NPO provides to the users. However, they have not found evidence of impact on the use of open data. Another paper by Mutuku and Mahihu [5] identifies usability barriers such as lack of awareness, low data quality, and low ease of use. The activity investigated is applications development, which has improved the usability of open data.

Other papers do not focus on the open data usability barriers but they describe activities performed by NPOs. Therefore, to analyse and link the activities to the usability barriers we use intermediary roles classification by Den Haan [1]. The seven roles identified are demander of data, producer, validator, developer, communicator, aggregator, and educator. Table 1 presents activities assumed for these roles, usability barriers they affect, and examples of NPOs' activities from the reviewed literature.

Table 1: Intermediary roles, their respective activities, and affected usability barriers.

Intermediary role	Proposed activities	Affected usability barriers	Examples of NPOs' activities
Demanders of data	Request for specific datasets to be released, or lobby for particular open data policies.	Lack of communication between data providers and users	Demanding data from the local government; pointing out the lack of data to the specific government agencies
Producer	Collect data in the field and merge it with existing datasets, in order to create new data.	Lack of reliability/quality; issues with linking/combining the data	Re-sharing data requested from the government; carrying out investigations to assess projects performances; scraping data
Validator	Validating data, checking its accuracy.	Lack of reliability/quality	Analysing and interpreting the data; cleaning data
Developer	Developing websites or applications.	Lack of availability/accessibility; issues with findability, usability, and linking/combining of the data	Producing tools and budget analysis; implementing platforms; building a data repository
Communicator	Present data in formats, contexts, and through channels fit with the skills and knowledge of end-users.	Issues with usability, understandability, and linking/combining of the data	Providing budget data in machine-readable and open formats for government offices; developing a toolkit to understand government policy; publishing reports; creating data visualisation tools; supporting communities' use of secondary data
Aggregator	Aggregating open data from multiple sources.	Issues with findability and linking/combining of the data	Consolidating and translating raw data into usable data; data aggregation or integration
Educator	Addressing the lack of knowledge and improving skills of the end-user of open data.	Issues with usability and understandability of the data	Providing training and workshops to the general public, private and public sector to raise their skill level and knowledge of open data

It also shows that all activities representing the roles of open data intermediaries are performed by NPOs, and can potentially affect certain usability barriers. The most performed activities are for the roles of Communicator ($n = 9$ papers), Developer ($n = 9$), followed by Educator ($n = 7$), Validator ($n = 6$), Aggregator ($n = 5$), Demander ($n = 3$), and Producer ($n = 3$).

4 CONCLUSION

Our literature review revealed that NPOs conduct various activities that can potentially decrease usability barriers. However, these activities and their link to the barriers were not the main focus of most selected literature. Therefore, the identified activities can only be considered illustrative, and their effects on the usability barriers are speculative.

The activities that NPOs perform in the selected articles also depend on the type of open data. For example, NPOs working with budget data do data visualisation, portal development for the users, budget analysis reports, and training [4, 6], whereas an NPO working with government contracting information produces reports, advocates for the data disclosure, and organises educational programmes [6]. Thus, to analyse a full range of NPOs' activities, different data types should be considered.

The scientific contribution of this study is to show a gap between the literature on the activities conducted by NPOs on one hand and open data usability on the other hand, and their relationship. The societal contribution of this research is as

follows. While policymakers expect NPOs to reduce the usability barriers for open data use [7], this research shows that it is not yet clear whether NPOs actually reduce usability barriers. The research limitation of this study is the choice to limit the number of papers identified from the GoogleScholar, which could have excluded a number of relevant publications from being identified. The suggestions for future research are: investigating the roles and activities of NPOs in different countries and for various types of open datasets, and looking into the effects of the NPOs' activities on open data usability barriers.

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