Information Scent and Open Government Data (OGD) engagement: Research agenda

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ABSTRACT

Vis-a-vis the digital innovation, i.e. Open Government Data (OGD), in the annals of public administration, the impetus upon user engagement holds eminence given the possibilities unleashed via value derivation. However, user engagement depends to a large extent to which OGD platforms deliver in terms of information expectations of the user. In this vein, the significance of "information scent", i.e. the propensity of a user to dig deeper into a web portal based on the quality aligned with the intrinsic goal of the user, assumes importance for facilitating optimum user engagement with the OGD portal. Drawing inferences from the experts' opinion, this study seeks to present possible research themes around this edifice. Given that OGD-research has underscored the need for website maintenance in terms of provisioning quality OGD and conducive portal features for furthering user engagement, the significance of information scent via OGD portals for consistent user engagement merits consideration for furthering the contours of OGD literature.

CCS CONCEPTS

• **Computing in government**; • **Open Government Data**; • **Computing in other domains**;

KEYWORDS

Information Scent, Open Government Data, OGD, User engagement

ACM Reference Format:
Stuti Saxena, Guillherme Costa Wiedenhoft, Edimara Mezzomo Luciano, Charalampos Alexopoulos, Nina Rizun, Euripides Loukis, and Ricardo Matheus. 2023. Information Scent and Open Government Data (OGD) engagement: Research agenda. In *16th International Conference on Theory and Practice of Electronic Governance (ICEGOV 2023), September 26–29, 2023, Belo Horizonte, Brazil.* ACM, New York, NY, USA, 7 pages. https://doi.org/10.1145/3614321.3614345

ICEGOV 2023, September 26–29, 2023, Belo Horizonte, Brazil

ACM ISBN 979-8-4007-0742-1/23/09…$15.00
https://doi.org/10.1145/3614321.3614345

1 INTRODUCTION

Open Government Data (OGD) initiatives are the prominent e-government innovations which entail the provision of structural and functional datasets pertaining to the government via dedicated web portals [1]. OGD initiatives are spearheaded by the governments with the anticipation that there shall result increased transparency of its operations and functioning, further citizen participation in governance, bolster citizen trust in the government and further public accountability [2][3]. The success of the OGD initiatives is premised on the fact that it shall be re-used by the users hailing from diverse backgrounds (citizens, professionals, journalists, non-profit sector, entrepreneurs, and the like) for value derivation and innovation [4][5][6][7][8]. Given the heterogeneous OGD ranging across divers domains like energy, education, climate, transport, economy and the like, the entire user engagement process entails consistent and continuous interface of the users with the machine-readable datasets accessible via the OGD portals-case in point being the data interoperability, data linkage or data visualization [9][10][11][12][13][14][15]. The intricacies involved in the process of user engagement with data is complex and requires decision-making on every turn whether it relates to the cognition involved in assessing the data attributes, the information processing entailed or the possible biases that get entangled in decision-making via data analysis and interpretation [16]. Matching the information scent theory to that of the OGD management by the user, it may be inferred that the search for the appropriate OGD vis-a-vis the overarching objective may lead her to look for the "prey" in the form of the desired OGD and the sequel of further OGD search happens to pass on account of the clicking of the related web links as per the information requirement. Information scent has been conceptualized in the information foraging theory [17] wherein it relates "to determine where someone will go when searching for information related to their goal" [18: 1323]. Thus, depending

Table 1: Studies pertaining to the relevance of information scent vis-a-vis e-government portals

Author /s	Context	Main findings
[27]	Information retrieval via Italian versus UK government websites	Information is cataloged across one channel for availing public services in the Italian case whereas there are multiple associative paths to avail public service in the UK case which adversely and positively user-friendliness of the web portal respectively in Italian and UK cases
[28]	User-friendliness of Dutch municipal websites	Websites' design should be refurbished across context, content and UI
[29]	Web 2.0 e-government websites	User help and navigation facilitation features should be provided
[30]	Government website in Miami (US)	Users' failure to find the desired information and lack of customized information delivery pose challenges in portal usability
[31]	e-Government metadata standards in Italy modeled on UK lines for an Italian municipality website	Taxonomical and tagging tools should be designed to suit the user needs
[32]	E-government websites of UK	Usability may be enhanced by improvising design features
[33]	User-friendliness of municipal e-government websites in The Netherlands	Specific and detailed links alongside descriptors should be provided for furthering congenial user experience
[34]	Citizens' collaborative stance in emergency management	Information scent lends credibility to the information provisioned via the government portal
[35]	User-friendliness of the municipal websites of The Netherlands	Link labels ought to be contextually valid to increase information scent

upon the Search Engine Result Page (SERP) which displays the information pertaining to the dataset, users are tempted to use it or discard it as per the relevance of the information retrieved.

Contextualizing information scent theory to the OGD field, it is clear that unless the users perceive the efficacy of the information scent provided by the OGD portal, the user interest would not get positively affected. Therefore, conceding that as far as OGD web portal analysis is concerned, hitherto the focus has remained limited towards assessment of its quality and features but the critical role of information scent-so critical for mainstream web portals' analyses-remains to be included in the repertoire of OGD researchers. The present study seeks to present a research agenda for assessing the role of information scent for facilitating user engagement via the OGD web portals. The remainder of this paper is structured as follows: following a brief on the literature on information scent and OGD with specific focus on user engagement, the research methodology based on expert opinion is summarized followed by an overview of the research pointers research pointers relevant for OGD across the frame of information scent and the concluding remarks are provided towards the close of the paper alongside the implications for practitioners and policy-makers.

2 RELATED RESEARCH

2.1 Information Scent and User engagement

Information scent furthers user navigation apart from the website evaluation and navigation tools' engagement [18]. Furthermore, information scent pattern is reflective of the extent to which a technology is efficacious from the perspective of the user-case in point being the desktop or the mobile device [19]. Information scent is being conceived as a strong determinant of website usage and usability [20]. Information needs are matched with user actions in terms of how the user is led deep into a web link [21] such that "Link text that is highly related to the information goal is said to have a high information scent" [22: 8]. Besides, the visual representations in the form of previews, representative images, summary images, etc. provisioned via the search engine result pages also serve as information scents for furthering information search and harnessing behaviors [23].

In terms of User Interface (UI), the user adapts her cognitive faculties for exploring as per goals, sensemaking via semantic knowledge, serial evaluation and visual search [24]. For that matter, the hyperlinks available via the web portal tend to be manipulated by the information scents to determine the users' behavior thereby impacting the extent to which s/he is attentive and focused, confident, efficient and able to handle the UI interface management effectively [25]. For instance, in the case of an e-commerce application-i.e. internet shopping, it was deduced that the UI in terms of system usability was determined by the "perceived" information scent [26].

2.2 OGD portals and User engagement

As such, there are limited e-government focused studies deliberating specifically upon information scent with even ancillary reference being made to it here and there (Table 1).

Studies focusing on OGD web portals and user engagement are primarily based on the need for furthering user engagement via the portals for value derivation (Table 2). The main emphasis is upon portals' evaluation across benchmarks in terms of the OGD quality provisioned by them.

2.3 Summing up

From the aforesaid, it is clear that whilst the significance of information scent is attested in terms of influencing UI efficacy, its relevance has not been documented in the OGD research till now. Thus, OGD-focused literature is concentrated on portal usability and evaluation vis-a-vis the OGD quality, per se. Whilst scant attention is paid to its importance even across the e-government

Table 2: Studies pertaining to the OGD portals' evaluation

Author/s	Context	Main findings
[36]	OGD portals are assessed against the 8 principles stipulated by the Open Data Working Group	OGD portals need to meet the demand-supply equilibrium in addition to real-time publishing
[37]	US OGD portals are assessed for their quality	Structural-functional impediments linked with OGD portals bars user engagement
[38]	International OGD websites assessed against content, semantics and functionality	OGD quality is a factor of internet access and country's economic standing
[39]	13 Brazilian OGD portals are analyzed	Prominently, OGD is diverse in terms of quantity and content; CSV formats are available and OGD portals run on CKAN platform
[40]	260 OGD portals are assessed for their metadata quality	Metadata availability, retrievability and quality are critical areas worth improvisation
[41]	Quality assessment of Italian OGD portals	OGD quality is low and benchmarking framework is needed
[42]	Assessing Brazilian municipal websites	Data openness principles are not being adhered to as per the law
[43]	US OGD portals are evaluated	Apart from being at a nascent stage, analytics and visualization features need improvisation
[44]	OGD portals of the Gulf Cooperation Council (GCC) countries are assessed	OGD quality is different across the six countries and there is need for complete, updated and machine-processable OGD
[45]	Analysis of OGD portals' usability	OGD portals' capacities' building should be done to further user behaviors related to searching, interacting and analyzing OGD
[46]	OGD portals are assessed in terms of their usability	Benchmarking criteria are provided against OGD accessibility, discoverability and re-use
[47]	Assessment of 60 Greek OGD portals in terms of content, functionality and technology	OGD portals are not well-developed in terms of semantic, technological, functional and thematic aspects
[48]	OGD portals are evaluated against quality standards	Outdated and incomplete OGD pose challenges for user engagement with OGD portals
[49]	Assessing the standard vocabulary use in the South Korean OGD portal	Apart from lack of data which is of poor quality, there is no systematic standard vocabulary or legal norms to facilitate OGD re-use
[50]	EU OGD portals are assessed (2015-17)	Homogenization is lacking and economic development and OGD progression move at tandem
[51]	US OGD portals are assessed in terms of accessibility and user engagement	Accessibility levels are high but the OGD provision needs to match the user demands
[52]	Heuristic evaluation of Chinese OGD portals in terms of their functionalities	Help functions and domain-specific OGD portals need to be improvised
[53]	OGD portals' usability is assessed against specification, feedback and requests	Accessibility, discoverability and interoperability of OGD should be enhanced
[54]	Usability analysis of 41 OGD portals	Some OGD portals are facilitate whilst others are challenging for user engagement
[55]	Quality of Latvian OGD portal is assessed	Relatively less OGD is published and there is low OGD quality
[56]	OGD portals of Croatia are assessed	Information and system quality of OGD portals isn't robust to facilitate user engagement
[57]	Analysis of OGD portals' quality across the 6 countries in Western Balkans	OGD portals' quality is inadequate given the inconsistent formats and incoherent analytical tools
[58]	Metadata quality of GCC OGD portals is assessed	Qatar's metadata quality is better than the others and there are marked quality inconsistencies across the metadata
[59]	Nigerian OGD portals are studied	Apart from being incomplete and outdated, OGD quality is low

research, it is merited to look into the possible research avenues vis-a-vis OGD.

3 RESEARCH APPROACH

The study is based on expert insights. Expert opinion research methodology is useful for eliciting perspectives from the seasoned domain experts in their field such that the experts serve as "intellectual bins" [60] for filtering their perspectives. These experts help in brainstorming and deliberating upon a new-fangled or exploratory idea or research theme where a kind of scenario-building or forecasting and prediction is required. The experts hailed from heterogenous backgrounds and were approached with a systematized set of questions (Appendix 1) in line with research protocols

Table 3: Background of the experts approached for the study

Expert's academic background	Expert's country of professional affiliation	Expert's research interests
Political Science and Public Administration	Portugal	e-Participation, ICT (Information and Communication Technology) for development, Social media
Public Administration and Policy	Turkey	Government reform, policy analysis, digital government
Information and Systems Engineering	Pakistan	Open Data, Legal informatics
Information and Systems Engineering	Greece	OGD, Legal informatics
Applied Informatics	Greece	Emerging technologies (Chatbots and Knowledge Graphs) for eGovernment
Technology, Policy and Management	The Netherlands	ICT (Information and Communication Technology)-architecture, stakeholder engagement, solutions
Computer Science	Tanzania	Blockchain, Artificial Intelligence
Computer Science	Norway	Strategic use of information systems and IT-business value in turbulent environments
Information Systems Engineering	Belgium	Digital transformation, Smart cities, User participation, Open Data
Business-Society Management	The Netherlands	Policy and governance, Planning and decision-making in China, Transport infrastructures, Sustainable urban development
Informatics in Management	Poland	Digital government, Legal and managerial aspects of digital government, Sustainable development
Public Administration and Policy and Information Science	Mexico	Information management and policy, Simulation science

[61] [62] during the month of February, 2023 (Table 3). In line with the perspectives of the experts, the research pointers were determined in line with the overarching objectives of the study.

4 FURTHER RESEARCH POINTERS

It may be mentioned at the outset that across each of the research pointers provided in this Section, information scents' impact on the OGD usage behavior may be ascertained via different research methodologies like cross-sectional and longitudinal studies apart from the triangulation studies backed by the mixed research methodologies.

The first set of research themes pertains to the improvisation of the OGD portals in line with the information needs of the users. Thus, apart from the three research streams, viz., personalization of web environments, designing website in a better way, web links' positioning and identifying the components of websites that aren't serving the information needs of the users [63] [64] [65], OGD portals may likewise be refurbished aesthetically and structurally-functionally with less complicated features to ascertain that the overarching goals of the user for OGD engagement are met. Furthermore, since the interoperability and data linkage features are also tapped by the stakeholders, the same is liable to be influenced by information scents.

Second, from the side of the OGD publishers, the e-service quality may be improvised keeping track of the visitors' automated usability of the OGD portals. It is clear from the web pages' statistics as to their background location as well as their duration of engagement and how efficacious has been the user engagement in terms of the downloads, visualization and analytical tools accessed and the specific selection of the variables for the same. These are potential areas of research across different contexts apart from the varying influence of the information scents in terms of gender, personality, motivation levels, contexts, professional background, academic qualifications, income levels, economic background of the country, social influence, nature and scope of tasks entailed while interacting with OGD portals, internet efficacy, mood, behavioral and psychological factors, perceptions related with the quality of OGD and the sources, conducive conditions, perception of transparency and openness in governmental functioning, perceived insecurity and risks, individual-level, group-level and community-level engagement. For instance, the competitive or cooperative engagement [66] with OGD portal may be a viable research objective to understand how the user engagement is furthered or dampened in the case of hackathons or co-creation activities, for instance.

Third, expanding the user base is important for the optimum re-use of OGD thereby furthering value derivation and innovation. Making OGD portals more inclusive for differently-abled users or the lesser privileged ones on account of the digital divide or economic backwardness in line with the need for providing more enriched web information scents is another potent research stream [67]. Furthering user engagement is also determined by the level of awareness that they have regarding the potential of OGD and this is a potent area of further research vis-a-vis information scent as to how the latter is a determinant of the former, i.e., higher the level of awareness, more/less is the information scent contingent upon the confidence levels, ease of use and relevance of OGD that the users are engaging with.

Fourth, "information scent provides the heuristic" for the user [17: 11] to engage with the OGD portal and the hyperlink's information scent has a potential impact on the user behavior [25]: thus,

OGD adoption, usage and usage continuance studies may be further investigated among the existing users and potential ones. Precise OGD location in line with the search string output as also the supplemental images provided via the OGD portal are instrumental in determining the behavioral propensity towards OGD adoption and usage. Likewise, the differentials across the nature, scope and other structural-functional-temporal-spatial determinants of OGD impact the extent of OGD linkage and interoperability among the users.

Information acquisition via web portals is done in a sequential and planned or serendipitous manner [68] and in the context of user engagement with OGD, both the modes are liable to be determined by personal as well as contextual factors. Information needs are also different among the OGD users depending upon the broader purposes of the usage applications. Likewise, aspects such as individual creativity, web perceptions via involvement, enjoyment, playfulness, delight, flow, occupational stress, behavioral anxiety, internet addiction, security concerns, social relations' management, OGD salience for work performance and the like are the potent influencing factors vis-a-vis information acquisition and information needs [69] [70] [71] [72].

Finally, taking into account the aforementioned strands, the evaluation assessment and benchmarking models may be developed as per the specific case contexts-case in point being the different OGD portals across vertical and horizontal administrative levels or the different sector-specific OGD portals.

5 CONCLUSIONS

With the background that information foraging theory is useful for web design and assessment [73] [74], this study was based on the possible influence of information scent on OGD engagement vis-a-vis the diverse users. Thus, perspectives were drawn from experts hailing from different academic backgrounds and a synthesized gist was presented in the form of research pointers for understanding the role of information scent vis-a-vis OGD engagement. Broadly, the research strands were developed alongside the spectrum of OGD publishers and OGD users. The research contours indicated in the study showed the significance of meeting the information-seeking propensities of the different stakeholders by providing them customized user-friendly OGD portals to further their engagement with the OGD portals. It is anticipated that this cognitive angle to the literature hinged on OGD engagement shall lend to novel insights thereby resulting in a win-win situation for the publishers as well as the users. Apart from contributing to the OGD literature in general, the study provides a grounding for further research using the lens of information scent to derive inferences regarding the OGD portals' structural and functional dimensions.

The study has implications for the practitioners as well. For one, the public managers, technical experts, software developers and others concerned directly or indirectly with the OGD initiatives must ensure that the aesthetics and designing of OGD portals should be user-friendly apart from being efficacious in terms of its functionalities and serviceability. This mandates the institutionalization of a robust ICT infrastructure which supports the state-of-the-art OGD portals. Ipso facto, apart from allocating budgetary corpus for the sustainable ICT infrastructures, the necessary resources may be required to equip the manpower with training and professional needs to understand and operationalize the OGD initiatives. Furthermore, furthering promotional and awareness campaigns apart from providing the users with adequate training to facilitate their use and adoption of OGD would merit sustained political and administrative will and support across the horizontal and vertical administrative tiers. Finally, for ensuring the sustainability of the OGD initiatives, the vision of the government needs to be spelt out clearly for appreciating the immense potential of OGD initiatives not only for the users via their ingenuous efforts but also for the government via their co-creation, collaborative and accountability focus.

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APPENDIX A: QUESTIONS POSED FOR THE EXPERTS

- What are your perspectives regarding the user-friendliness of OGD portals as per your academic pursuits so far?
- What are the drivers and barriers towards information-seeking behaviors of the OGD users?
- How can the integration of Information Scent framework be used for further OGD research?
- What are the implications of aesthetics and design of OGD portals for furthering OGD engagement of the users?
- What are the lessons for the practitioners and policy-makers of appreciating the significance of Information Scent for understanding the information-seeking and user engagement propensities in the context of OGD initiatives?