

Crowd Sourcing for Land Administration: Perceptions within Netherlands Kadaster

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Key words: VGI; crowd sourcing; land administration; cadastre

SUMMARY

Crowd sourced or volunteered geographic information (VGI) is spatial information that is generated and donated by citizens, usually using spatially enabled mobile devices. The data is harvested by online services (e.g. OpenStreetMap.org) and is used to produce alternative geographic datasets. The disruptive paradigm shift is potentially the biggest since the advent of digital computing. In the realm of land administration, it is forcing traditional cadastral mapping and land registration agencies to rethink why and how they operate. International bodies including FIG and RICS have recognized the issue. At the 24th FIG Congress in Sydney 2010, Robin McLaren declared mobile phone technology would radically change the nature and governance of societies. At the 2011 FIG Working Week in Marrakech, Peter Laarakker and Walter De Vries introduced the concept of 'OpenCadastre.org'. The 2011 FIG Commission 7 Annual Meeting included a full day seminar on Cadastre 2.0. It dealt specifically with the issue of crowd-sourced data in land administration. Meanwhile, in late 2011, RICS released 'Crowd Sourcing for Land Administration'. How these statements and ideas are being dealt with 'on the ground' within land administration organizations is less clear. This paper aims to provide some clarity. It presents the results of a study in progress aimed at assessing the perceptions of VGI within land administration organizations. The Q-methodology was applied using participants from different parts of Dutch Kadaster, The Netherlands. The results reveal a range of perceptions of VGI across a modern land administration organization. These understandings are potentially beneficial for VGI-related strategic decision-making and change management within all land administration organizations.

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1. INTRODUCTION

The opportunity for utilizing crowdsourcing in land administration is increasingly being examined. In this paper the term is considered synonymous with the concept of Volunteered Geographic Information (VGI). Crowdsourcing can be understood as the process of collecting and aggregating data from ordinary individuals, usually by means of web enabled mobile devices. It is an extension of participatory approaches to geographic information systems, where people use web technology to map their immediate environment. The concept significantly modifies how geospatial datasets can be populated (Devillers et al., 2002). In the context of land administration, this could mean using crowd sourced data in the processes of land adjudication, surveying, demarcation, and recording: tasks that are usually encumbered by regulation and often the exclusive realm of government or agents of the state (Laarakker and de Vries, 2011).

An increasing number of publications are dealing with the general drivers, nature, and application of crowd sourced spatial information (Goodchild, 2007a; Goodchild, 2007b). These explore how people used wikimapia and openstreetmap, and when VGI can play a crucial role or not (Goodchild, 2008; Goodchild, 2009a; Goodchild, 2009b; Goodchild and Glennon, 2010). In the study area of land administration, preliminary analyses are presented in (McLaren, 2010), (Uitermark et al., 2010), (McLaren, 2011), (Laarakker and de Vries, 2011), and the collection of works from international symposium on Cadastre 2.0 (FIG, 2011). However, to date limited empirical work has been undertaken in this domain: there remain many unanswered questions regarding the accuracy, authority, assuredness, availability, and ambiguity of crowd sourced data. Meanwhile, the potential for crowdsourcing to provide a low cost and high-speed solution in areas where cadastral coverage is lacking is eagerly anticipated. As such, it is unclear whether crowd sourced land information is an opportunity or threat to good land administration.

This paper aims to provide some clarity with respect to these issues. Specifically, an understanding of current perceptions of crowd sourcing within land administration organizations is sought. These understandings can be used to guide the implementation of changes to land administration organizational strategies and operations- as potentially brought about by crowd sourcing. The research methodology is first outlined: the Q methodology underpins the study. Results are then summarized. The paper concludes with a number of early key findings and articulation of future implications for strategy and operations in land administration organizations.

2. METHOD

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In order to compile the views of land administration staff members with respect to crowd sourcing, an appropriate research methodology was required. The overarching conceptual research design is provided in Figure 1: the underlying subject areas of crowd sourcing, land administration, and views of professionals are linked together by undertaking an initial literature review followed by analysis of views through Q-methodology- explained shortly hereafter. The union of all three subject areas is considered to be this work's contribution to knowledge. The Q-sorts- an important component of Q-methodology- were executed with employees of Netherlands Kadaster.

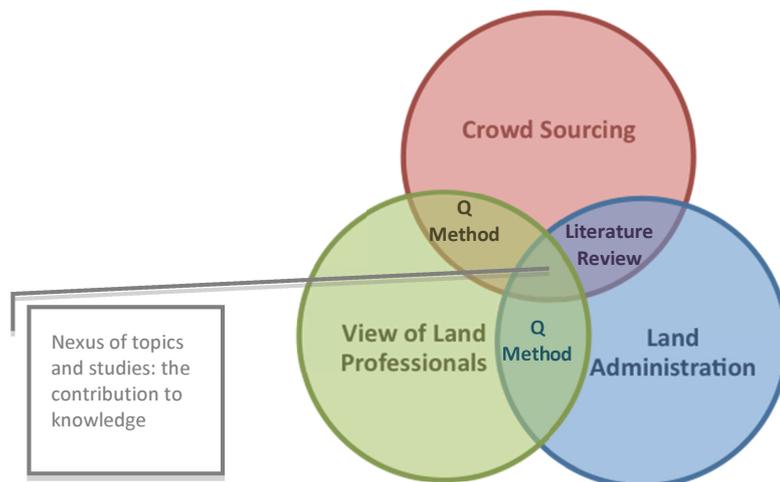


Figure 1. Research design

2.1 Q-methodology

Q methodology is a comprehensive set of steps to investigate clusters of subjective beliefs among individuals. (Brown, 1993) explains some of the ground rules of Q-methodology, and how it can be used to elicit participant's views about a topic. (Webler et al., 2009) and (Neff, 2011) apply the rules to execute a study on competing and overlapping views in environmental management. (Steelman and Maguire, 1999) describe how the Q-methodology can (1) identify important internal and external constituencies; (2) define participant viewpoints and perceptions; (3) provide sharper insight into participant preferred management directions; (4) identify criteria that are important to participants, (5) explicitly outline areas of consensus and conflict; and (6) develop a common view toward the policy. The methodology encompasses a broader philosophy of how subjectivity can best be studied. The Q-methodology relies on Q statements and Q sorts of Q participants (also referred to as P sample).

2.2 Q-statements

Q-methodology builds on a set of Q-statements. These are statements representing the entire range of views on a particular topic. The Q methodology has two ways of deriving the Q statements: through the collection of quotes from scientific and/or grey literature from the topic of interest; or, through a comprehensive literature study (Neff, 2011). In this study we collected a set of statements from literature. The Q-statements of this study are provided in

the results section.

2.3 Q-participants

The next stage of Q-methodology involves the selection of the Q-participants. We used the rules of thumb from (Webler et al., 2009) on the selection process, and on the minimum number of such participants. We choose to select four types of employees of the Netherlands Kadaster Staff from different departments of cadastre offices Zwolle (5 participants) and Apeldoorn (11 participants) were selected to participate in the interview. The number of participants (16) was therefore above the minimum requirements of ten (10). These participants came from within four (4) divisions in the organizations. Each section/department provided one or two participants to participate in the interview. The selection was based on the potential acquaintance with crowdsourced data. This resulted in 5 categories: 1) those likely to know about crowdsourcing and have a view about how it fits the organization, such as managers from mapping department (at least 2 participants); 2) IT people from mapping department likely to know about crowdsourcing, but maybe do not have a view about how it fits in the organization (at least 2 participants); 3) operational staff from mapping department likely not to know about crowdsourcing, but have a strategic view about the organization (at least 2 participants); 4) Strategic managers from the cadastral part of the organization likely not to know about crowdsourcing, and likely not to have a strategic view about the organization (at least 2 - one from Apeldoorn; 1 from Zwolle); and 5) operational staff from the cadastral part of the organization (at least 2).

2.4 Q-sorting/ranking

The next stage was executing the Q-sorts with the participants. A sort is the result of a participant placing the statements written in separate print cards in rank order of “most agree” to “most disagree” (beginning with -3 and end with +3 with 0 as midpoint). The number allowed in each category is as follows: 2, 3, 5, 7, 5, 3, and 2 (sum is 27) (Figure 2 and 3). All responses, which are negative, are on the disapproval of the statement at hand. The responses, which are positive, indicate favour on the statement. Zero indicates a neutral or indifferent opinion about the statement. Each participant took approximately 25 minutes to complete the Q-sorting. During the sorting exercise we interviewed each participant.



Figure 2. Example Q-sort

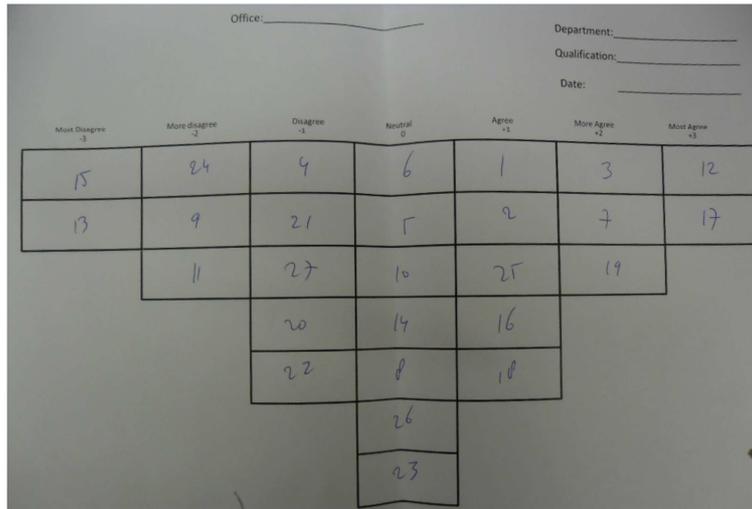


Figure 3. Recording the Q-sort

2.5 Q analysis

Upon completion of the Q sorts, analysis took place using *PQ method software*, a statistical package tailored to the requirements of Q Methodology. This software clusters Q sorts based on factor analysis. The factor analysis generates the combination of statements that explain the majority of the variation in responses.

3. RESULTS

This paper focuses on a selection of the findings. First we explain which factors were dominant, and then we provide a summary of which belief system each of these dominant factors represent.

3.1 Q-sorts and Factor Rankings

Table 1 provides the 4 most dominant factors in relation to the Q statements. The columns 1 to 4 are the 4 factors. The values ranging from -3 to +3 represent the degree to which each factor agrees with each statement (-3 representing completely disagree; +3 representing completely agree). For example, the first extracted factor (marked '1') has statement 2 registered as -2 (i.e. more disagree), while the second extracted factor (marked '2') has statement 2 registered as -3 (strongly disagree), etc. Although more than 4 facts could be generated from the Q analysis the 4 factors represent a significant portion of the variation in results.

Table 1. Q-sort statements and their factor rankings

| No | Statements | Factor ranking | | | |
|----|---|----------------|----|----|----|
| | | 1 | 2 | 3 | 4 |
| 1 | the market should be used to determine the utility of VGI | 0 | 0 | -1 | 0 |
| 2 | laws should enable free access to all data | -2 | -3 | -1 | 1 |
| 3 | free access to technology will create more valuable information | 1 | 1 | 0 | -2 |

| | | | | | |
|----|--|----|----|----|----|
| 4 | control and regulations relies on a regulatory system of licenses maintained by the government | -1 | 0 | -2 | 0 |
| 5 | all prices for information products should be negotiable | -2 | -2 | -2 | 2 |
| 6 | technology can develop right if the government has strong role in setting the rules and standards for technology | 0 | 0 | 1 | 0 |
| 7 | there must be a freedom of access to laws as a tool to achieve the main goal of information freedom | 2 | 0 | 0 | 0 |
| 8 | the amount of rules on information production should be as minimal as possible | 1 | 3 | -3 | -1 |
| 9 | free access to technology will create more sophisticated technology | 3 | 2 | 0 | -3 |
| 10 | governance and development rely on laws and long-term policy plans | 1 | -3 | 2 | -1 |
| 11 | technology which most organizations adopt is the best | -2 | -1 | -3 | 0 |
| 12 | technology and its development should be open to all citizen | 3 | 1 | 0 | 1 |
| 13 | economic value of information products depends on a system of government guarantees | 0 | 1 | 2 | -1 |
| 14 | open source technology is a way to implement the freedom of access laws | 0 | -1 | -1 | -2 |
| 15 | all legal data sharing restrictions should be deleted | -3 | -2 | -2 | 3 |
| 16 | government should have control on prices of cadastral information through a pricing scheme | -1 | -1 | 0 | 0 |
| 17 | freedom of information is the highest goal and people can be self-organizing | 0 | -1 | 3 | -3 |
| 18 | market of willing buyer willing seller determines which technology has the highest value | -1 | 0 | 0 | -2 |
| 19 | laws can guide and steer the technological development | 0 | 1 | 1 | -1 |
| 20 | all agencies should adhere to open source standards | -1 | 0 | -1 | 1 |
| 21 | there should be no restrictions on technological development | 2 | -1 | -1 | 2 |
| 22 | free supply and demand create the market for information | 1 | 2 | 1 | -1 |
| 23 | all information should be for free | -3 | -2 | 3 | 3 |
| 24 | strong government and enforcement of rules are crucial for development | -1 | 3 | 2 | 2 |
| 25 | the use of standards is a good way to steer development | 1 | 1 | 1 | 1 |
| 26 | the role of private sector is to advance the technology | 0 | 2 | 0 | 0 |
| 27 | government should pay a key role in regulating prices and price setting | 1 | 0 | 1 | 1 |

The 4 factors can be categorized into four belief systems. Each of these belief systems are discussed in the subsequent section. Interviews of participants who loaded highly on a factor were revisited to help assign meaning to the factor analysis results.

3.2 Belief cluster of market orientation and unbridled technology development

This belief cluster embraces most of the participants. The core values include an unbridled trust in the good of technology (statement #9, +3) and on the positive effect of technological development for citizens (statement #12, +3). It differs from any other belief system in the view that access to information requires freedom of information (statement #7,+2). At the

same time, information should not necessarily be for free to all citizen (statement #23, -3). It should be regulated but not restricted (statement #15, -3). During interviews the high loading participants in this factor argued that it is good to have laws which allow flow of information. They also argued that for citizens to get access to technology, open source is of importance. One of the advisors from the strategic and policy division) indicated that, *“Information is produced with cost which someone has to pay for and that not all information should be provided for free”*. Another strategic advisor reiterated that, *“Though more information is currently provided for free, there are still some information that cannot be accessed for free”*. Self-regulation, openness and freedom are key values, but information should have a reasonable market price. There is a large opportunity for citizens in this belief cluster. They all agree that it is not good for the Kadaster organisation if all information is provided for free, but argue at the same time that all types of new technology could enter the Kadaster organization.

3.3 Belief cluster of government control and regulated technology development

The actors representing this factor emphasize a strong role for the government in any technological development (statement #24, +3), yet as little regulation as possible for internal operations (statement #8, +3). Free access should not be allowed (statement #2, -3) and enforcement of government rules is crucial now (statement #10, -3). The government should therefore enforce rules to achieve control over information dissemination, and control private sector development. One of the high loaders in this belief cluster stated that *“government is important driver to support private sector for innovation of technology, it is important to have government rules and legislations at hand to make possible for the innovations, the few rules that are set by the government can help promote technological development”*. He further said *“though the private sector has a role to make advancement in technology, the public should help in the innovation of technology”*. Thus participants believe in central regulation, control where possible and prudence with new technology. There is a central role for government in this belief cluster.

3.4 Belief cluster of citizens orientation, self-organization and bottom-up development

For the third belief clusters self-organization (statement #17, +3), freedom (statement #23,+3) and contextual technology development (statement #11,-3) are the core values. Any type of rule for information is counterproductive. This belief cluster values the use of crowdsourced (free) data even though there may be hesitation to incorporate these in cadastral systems data (statement #8, -3). While the view supports the use of technology, the high loaders in this belief cluster emphasize that the government does not always use or adopt the best technology: *“the technology that government adopt might be the cheapest and after some time it is no longer suitable for use and needs to be changed”*. A central tenet is that information provided by the government should be provided for free to the citizens to use. Citizens are capable of using the right information at the right time for their own development.

3.5 Belief system of free market with regulated society

The forth belief cluster is a mix of all the previous ones. While free information (=at no cost) is a core value (statement #23, +3), the participants of this belief cluster also fear that free access (=without any restrictions) has a potential negative impact for society (statement #9, -3). As the results to statement # (+2) are contradicting this, the high loaders in this cluster

may not have been consistent in their views. This belief system combines some economic and technological views in a seemingly contradicting way. This factor is negative on open source technology as a way to implement freedom of access laws, but at the same time, also supports freedom of information as the highest goal for people to govern themselves. The high loaders of this clusters stated during interviews that people can be self-organised if they have the right information, and they can do things better: *“it is not clever to have free access to technology, it is naive to do so; it is not clever to let everything be open,”* The group also believe that is not good to set prices, the market should set prices for products. The views support the idea that for some essential information, the government should set prices for them to be accessible to all citizens.

3.6 Differences amongst staff members

When linking the high loaders of each belief clusters to the position of the staff members within the Kadaster there are some patterns.

The relative high score on technocratic views of the cadastral officers indicate that they support technological development without government interference. In particular, the strategic and policy staff belonged to the first, market oriented, belief cluster.

The general operational staff members were key high loaders in the second, government control, belief cluster. These staff members strongly valued government rules, regulations and control of all land information activities. These are people who are likely not to know about crowd sourcing and how it fits the organization. Their fear is that, an uncontrolled market of information will lead to public organizations (such as Kadaster) to lose their business.

The staff from management of the mapping and IT division (people likely to know crowdsourcing but may not know how it fits the organization) had strong preference for the self-organizing belief clusters. They are of the view that the quality of crowdsourced data cannot be assured and that should be used for social networks. This means spatial information should be provided by the government for free to support citizens who seek land information. Though they believe in free flow of information by government (as IT managers, information flow might have been important endeavours in their professions and might have informed their decisions), they indicate that the government should be flexible in adopting new technologies as a way to achieve the goal of providing free spatial data.

Finally, the mixed belief cluster was mostly embraced by the operational staff members of the mapping division.

The heterogeneity of views of staff members within a single organization is likely to influence strategic choices when adopting or not adopting crowdsourced information. Even with a stronger influence of strategic staff members, it is possible that discretionary decisions of staff members with alternative views will slightly change the actual direction of technology adoption. This study has highlighted in which direction such possible discretionary decisions may be taken.

4. CONCLUSION

The study aimed at exploring the views that Netherlands Kadaster staff members hold about crowdsourcing, whether the perceived views were influenced by their cadastral profession background or experience, and to assess how these views could potentially influence future organizational strategies of these cadastre offices. Data was collected from sixteen staff members from two offices of the Netherlands Kadaster. Their views could be summarized by four distinctly different belief systems. Although the market-oriented view of the Kadaster staff members is most dominant, the differences in views cannot be underestimated when adopting or not adopting crowdsourced oriented policies. A possible reason that could explain the differing viewpoints about crowdsourced land information might be the professional background of the respective staff members. The fact that such differences exist suggests important challenges exist for cadastral practitioners and policy makers responsible for cadastre activities in the Netherlands and other similar contexts.

Thus, although the findings can only be judged in the context of the case studied, it can be applied in many other parts because many concepts addressed in the case were not unique. Knowing the views of the Netherlands cadastre officials, it now becomes important to know whether the citizens are also ready to volunteer geographic data to their land organisation as they do to the social networks (Parker et al., 2010). The analysis showed different schools of thought regarding government involvement with crowdsourcing activities. Some believe that active involvement of government and enforcement of rules are crucial for development of cadastral activities and advocate that government needs to intervene to protect the society by deciding what is right for the society. Others caution that too much interference by the government on crowdsourcing activities could hinder creativity and innovations of technology that will result in retarding development. It is therefore important that organisational strategies address how to deal with the flexibility of the changing technology.

This study supported the contention that crowdsourcing is viewed as a threat by public cadastral organizations. It is therefore paramount that cadastral organizations place the crowdsourcing concept in the overarching set of future goals of their organisations. The practitioners have to understand the motivation behind crowdsourcing and set their goals accordingly. Furthermore, since the views of cadastral officials differ with professional experiences, it is quite relevant to rely on a systematic and comprehensive method of identifying and classifying views when implementing new strategies in the organisation such as integrating crowdsourced land information with cadastre data: to know which professionals within the organisation will support and those likely not to support and hinder the implementation thereof. A comparative study can be carried out to study how useful crowdsourcing can be in support land information systems of the developing countries, where generally there is lack of land information systems or the systems are not well functioning.

REFERENCES

- Brown S.R. (1993) A primer on Q Methodology. *Operant subjectivity* 6:91-138.
Devillers R., Gervais M., Bédard Y., Jeansoulin R. (2002) Spatial Data Quality: From Metadata to Quality Indicators and Contextual End-User Manual. , Paper presented at

- the OEEPE/ISPRS Joint Workshop on Spatial Data Quality Management, 21-22 March 2002, Istanbul.
- Goodchild M.F. (2007a) Citizens as voluntary sensors: spatial data infrastructure in the world of Web 2.0. *International journal of spatial data infrastructures research* 2:24-32.
- Goodchild M.F. (2007b) Citizens as sensors: the world of volunteered geography. *GeoJournal* 69:211-221.
- Goodchild M.F. (2008) Commentary: whither VGI? *GeoJournal* 72:239-244. DOI: 10.1007/s10708-008-9190-4.
- Goodchild M.F. (2009a) Neogeography and the nature of geographic expertise. *Journal of location based services* 3:82-96.
- Goodchild M.F. (2009b) Virtual geographic environments as collective constructions, in: H. LIN and M. BATTY (Eds.), *Virtual Geographic Environments*, Beijing, pp. 15-24.
- Goodchild M.F., Glennon J.A. (2010) Crowdsourcing geographic information for disaster response: a research frontier. *International Journal of Digital Earth*:11.
- Laarakker P., de Vries W.T. (2011) www.Opencadastre.org - Exploring Potential Avenues and Concerns, FIG Working week. Bridging the gap between cultures, Marrakech, Morocco. pp. 16.
- McLaren R. (2010) Can the Innovative Use of Mobile Phones Support More Effective Land Administration Services?, FIG Congress 2010. Facing the Challenges – Building the Capacity, Sydney, Australia, 11-16 April 2010.
- McLaren R. (2011) Crowdsourcing support of land administration. A new, collaborative partnership between citizens and land professionals.
- Neff M.W. (2011) What research should be done and why? Four competing visions among ecologists. *Frontiers in Ecology and the Environment* 9:462-469. DOI: 10.1890/100035.
- Parker C.J., May A., Mitchell V. (2010) An exploration of Volunteered Geographic Information stakeholders, GISRUK, University College London
- Steelman T.A., Maguire L.A. (1999) Understanding participant perspectives: Q-methodology in national forest management. *Journal of policy analysis and management* 18:361-388.
- Uitermark H.T., van Oosterom P.J.M., Zevenbergen J.A., Lemmen C.H.J. (2010) From LADM - STDM to a spatially enabled society : a vision for 2025 + powerpoint. In: *Proceedings of the world bank annual bank conference on land policy and administration*, 26-27 April 2010, Washington D.C., USA. 13 p.
- Webler T., Danielson S., Tuler S. (2009) Using Q method to reveal social perspectives in environmental research Greenfield MA: Social and Environmental Research Institute.

BIOGRAPHICAL NOTES

Eliaisa Keenja has more than 10 years experience as an Estate Officer at the National Housing Corporation of Tanzania. Between 2010 and 2012 she completed a MSc in Geo-information Science and Earth Observation (Land Administration) with the ITC Faculty at the Univeristy of Twente. She is also trained in land economy, property management, and valuation.

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Peter Laarakker is a strategic advisor in land administration and spatial data infrastructures for the Board of Netherlands Kadaster. He is also an advisor at the Royal Netherlands Academy of Arts and Sciences in the Geodetic Commission. Previously he has undertaken consulting work with the Kosovo Cadastre Agency, GDLA Vietnam, and Chang'an University in China. His education includes qualifications from University of Groningen, Erasmus University of Rotterdam, and Delft University of Technology

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