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WEAK SIGNALS IN SCENARIO BUILDING FOR FUTURE CADASTRAL SYSTEMS

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INTRODUCTION

Cadastral systems have described the relationship between man and land from their evolvement. As the relationship changes, so have changed the needs that this relationship sets for cadastral systems and their functions. Previously, the importance of megatrends, global drivers and trends in the context of cadastral systems have been studied and recognized (figure 1). To prepare for future, information on these issues before they become megatrends is of utmost importance. This article aims at recognizing the most important weak signals for cadastral domain and separating them from trends and megatrends by using computational text analysis. As a result, this article presents the weak signals which might grow in the future to be trends and megatrends affecting the future cadastral systems.

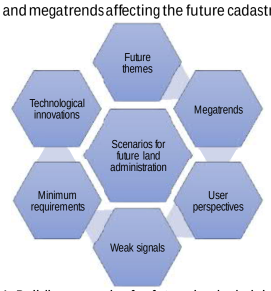

Figure 1. Building scenarios for future land administration requires detecting global themes, megatrends, user perspectives, weak signals, minimum requirements and technological innovations.

MATERIALS | METHODS

Data collection summarized:

Source: Scientific article database (Scopus)

Selected keywords: Land administration OR Land administration system OR Cadastre OR Cadastral system

Publication years: 2008-2019

Final data set: 1535 articles including publication date, authors, journal, abstract, keywords etc.

In this study, we use computational text analysis to detect future signals for cadastral domain. Yoon (2012) and later Lee and Park (2018) have outlined a framework that incorporates text mining for assessing the strength of future signals. This framework builds on the three-dimensional future signal space presented by Hiltunen (2008), and provides a good starting point for our case study as well. As text mining approaches usually, the framework starts from text collection. Here we use both scientific articles and news articles related to cadastral systems as data sources. Next step is to define keywords that cover all wanted dimensions. Third step is to construct keyword portfolio maps based on occurrence and frequency information of the keywords. Finally, we identify weak signal topics by statistical analysis and news search (Figure 2).

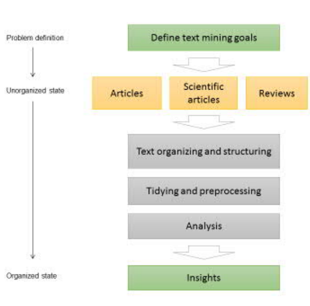

Figure 2. The methodological approach.

RESULTS

We have collected signals in three categories, based on their frequency and change in frequency. The categories are known signals, strong signals and weak signals. Known signals appear minimum 150 times and the frequency is stable during 2015-2018. Strong signal appears minimum 35 times and the frequency grows during 2015-2018. Weak signal appears minimum 5 but maximum 15 times and the frequency grows rapidly during 2015-2019. Table 1 presents examples of these signals categorized according to PESTE model.

Table 1. Examples on known, strong and weak signals categorized according to PESTE (political, economic, social, technological and environmental) model.

	Known signals	Strong signals	Weak signals
Political	National Change Future Control	Municipality Interoperability Transparency	Bureaucracy Enterprises Imperial Centralized Merger
Economic	Production Process	Tax Land Information System (LIS) Capital	Water user association Digital cadastral map (DCM) Smallholder
Social	Urban Rural Ownership	Customary Poor	License Trial Reservoir Equality
Technological	3D Land administration domain model	Unmanned Aereal Vehicle (UAV) Volunteered geographic information (VGI)	Fingerprinting Litecoin
Environmental	Resources Forest Water	Erosion Degragation	Afforestation High nature value land (HNVL) Drought

The results show a variety of signals in different categories. Political weak signals may show the tendency towards examining the organization of land administration, where centralized or decentralized registration and the authoritative role is examined. A similar interpretation can be done when examining the economic signals. Smallholders and other local actors, such as local water associations, may be in the center of land administration in the future. From social point of view, where known signals refer to examine rural and urban areas in land administration, lately pro poor land administration and customary land tenure have grown to be strong signals. Weak social signals, however, refer to licensing, conflict management and rights of indigenous people.

Technology, 3-dimensional space is more or less the status quo of land administration. Lately, volunteered geographical data and use of unmanned aerial vehicles have gained interest among scientists. Our study shows that in the future, different ways of creating trust in registers (fingerprinting, decentralized registers such as blockchain), may have a bigger role. Environmental issues are well covered in the land administration literature and we can notice that known and strong signals address roughly the larger scale topics as water and forest, and weak signals focus on environmental issues in a more detailed level.

CONCLUSIONS

The results can be utilized in a process of building scenarios for the future in any organization developing land administration and cadastral system (see Figure 3, the dimensions of future signs). It is important to notice that while megatrends as urbanization or prevailing issues as 3, 4 or 5 dimensional space are studied in the literature, new issues as fingerprinting are emerging. This study also shows that there might be more weight put into the new actors of land administration and we can argue that decentralization will bring more local players to the land administration field.

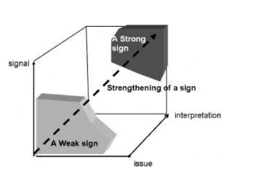

Figure 3. The three dimensions of future signs in 3-dimensional space (Hiltunen 2008).

When taken into global context, the importance and impacts of the weak signals should be taken into consideration in a national or regional context, depending of the cadastral system. As Hiltunen (2010) puts it, the interpretation includes always institutional aspects as cultural assumptions, but moreover, we can say that they actually include the aspects of three institutional pillars (Scott 2001): regulative, normative and cultural-cognitive. Although these elements can be found in all the institutional structures, their content varies from institutions.

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LITERATURE CITED

Ansoff, H.I.: Managing strategic surprise by response to weak signals. Calif. Manag. Rev. 18(2), 21–33 (1975).
Enemark, S. 2006. The land management paradigm for sustainable development. In Sustainability and Land Administration Systems. Williamson, I., Enemark, S., Wallace, J. (Eds). Department of Geomatics, University of Melbourne, Australia.
Enemark, S., Williamson, I., Wallace, J. 2005. Building Modern Land Administration Systems in Developed Economies. Spatial Science Vol. 50, No 2, December 2005. Pp. 51-68.
FIG (1995) The FIG Statement on the Cadastre, FIG Policy Statement, The International Federation of Surveyors (FIG), FIG PUBLICATION No 11, 1995.
Hiltunen, E. 2010. Weak Signals in Organizational Futures Learning. Doctoral dissertation A-365. Aalto University School of Economics. 118 p.
Hiltunen, E. 2008. The future sign and its three dimensions. Futures Vol 40 Issue 3. Pp. 247-260.
Hiltunen, E. 2006. Was It a Wild Card or Just Our Blindness to Gradual Change? Journal of Future Studies, November, Vol 11:2, pp. 67-74.
Krigsholm, P., Riekkinen, K., Ståhle, P. 2019 – forthcoming.
Krigsholm, P., Riekkinen, K., Ståhle, P. 2018. The changing uses of cadastral information: a user-driven case study. Land, Vol 7 Iss 3, 2018. 14 p.
Krigsholm, P., Zavialova, S., Riekkinen, K., Ståhle, P., Viitanen, K. 2017. Understanding the future of the Finnish cadastral system – a Delphi study. Land Use Policy 68(2017) 133-140.
Kuusi, O., Hiltunen, E., Linturi, H. Heikot tulevaisuussignaalit – Delfoi tutkimus. Futura 2 (2000) 78-92.
Lee, Y-L., Park, J-Y. 2018. Identification of future signal based on the quantitative and qualitative text mining: a case study on ethical issues in artificial intelligence. Qual Quant (2018) 52: 653. https://doi.org/10.1007/s11135-017-0582-8.
Mannermaa, M. 1999. Tulevaisuuden hallinta – skenaariot strategiatyöskentelyssä. Porvoo. WSOY. 227 p.
Moijanen, M. 2003. Heikot signaalit tulevaisuuden tutkimuksessa. Futura, 4 (2003), pp. 38-60.
Niukkanen, K. 2014. On the property rights in Finland – the point of view of Legal Cadastral Domain Model. Aalto University publication series DOCTORAL DISSERTATIONS 163/2014.
Petersen, J. L., Steinmüller, K. H., Adeyema, H. (2009) Wild Cards. In: Glenn, J. C. and Gordon, T. J. Futures Research Methodology. Version 3.0. With support from the Rockefeller Foundation. Millennium Project. CD-ROM. S. i-63. 1300 p.
Riekkinen, K., Toivonen, S., Krigsholm, P., Hiironen, J., Kolis, K. 2016. Future themes in the operational environment of the Finnish cadastral system. Land Use Policy 57, 702-708.
Riekkinen, K., Krigsholm, P. 2018. Megatrends shaping the future cadastral systems. The Annual World Bank Conference on Land and Poverty, Washingon, DC, USA, March 19-23 2018.
Scott, W.R. 2001. Institutions and organizations. SAGE Publications. 255 p.
Ting, L., Williamson, I. 1999. Cadastral trends: A synthesis. Australian Surveyor. Vol 44(1). Pp. 46-54.
Williamson, I., Enemark, S. Wallace, J., Rajabifard, A. 2009. Land Administration for Sustainable Development, Esri Press.
Williamson, I., Enemark, S. Wallace, J., Rajabifard, A. 2008. Understanding Land Administration Systems. Position paper. International Seminar on Land Administration Trends and Issues in Asia and The Pacific Region 19-20 August 2008, Kuala Lumpur, Malaysia.
Yoon, J. 2012. Detecting Weak Signals for long-term business opportunities using text mining on Web news. Expert Systems with Applications 39 (2012) 12543–12550.
Zevenbergen, J., de Vries, W.T., Bennett, R. 2018. Dynamics in responsible land administration; change at five levels. FIG Congress 2018, Istanbul, Turkey, May 6-11 2018.
Zevenbergen, J. 2004. A Systems Approach to Land Registration and Cadastre. Nordic Journal of Surveying and Real Estate Research, Vol 1(2004).