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Future themes in the operational environment of the Finnish cadastral system

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ABSTRACT

The cadastral systems used in each country and region have developed through the centuries to their current form. We cannot assume that the current situation will remain the same from this point to the future. There are signs in recent studies and development projects throughout the world that those cadastral systems which are traditionally seen as well-functioning also need to be renewed as society changes at a rapid pace.

This study is set up to analyze the future needs of a cadastral system and registers related to it in Finland. The objective of the study is to reveal future themes affecting the operational environment of the cadastral system by using research methods provided by futurology. The method used in this study is called environmental scanning and it consists of three phases: collecting events, recognizing phenomena and combining the phenomena as themes.

The study analyses 352 literature sources and reveals 14 different future themes in the operational environment of the cadastral system, which are economic pressure, demographic changes, development of technology, transparent society, safety, environmental values, globalization, digitalization, know-how, quality, political change, soft values, public-private partnership and crowd sourcing. The future themes, their possible relations between each other and their significance for the cadastral system are analyzed by using the concepts of megatrends, trends, wild cards, driving forces and weak signals and reflecting the results to research made in the field of land management internationally.

The results can be used when renewing a cadastral system, in order to consider possible future themes that may affect the system. Detecting and recognizing the future themes provides an opportunity to react and change the course of action in order to adapt to the future. The results are not only usable in the Finnish context, but can also be applied in other countries' development of their cadastre and as part of environmental scanning.

1. Introduction

Finland uses the German cadastral system for registering and maintaining property rights. The cadastral system has developed through centuries to its current form (see e.g. Niukkanen, 2014). There are signs in recent studies and development projects throughout the world that those cadastral systems which are traditionally seen as well-functioning also need to be renewed as society changes at a rapid pace (Bennett et al., 2011; Grant et al., 2014; Hirst, 2014; ICSM, 2014; LINZ, 2013).

The renewal process of a cadastre is not quick—a cadastre is a basic register of a society and needs to be revised with care. What are the needs of a future cadastre? In what kind of society will we live and what kind of framework does society set for the cadastre? These are questions that are not easy to answer. In this article, we try to set the basis for this kind of discussion by detecting the forces of change in the operational field of the cadastre.

There are tools to predict the future by observing the present and the past. The object of this article is to detect possible future themes that will have an impact on the operational environment of the cadastre. The themes are detected with the help of environmental scanning, a method from futurology. This article introduces the

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themes at a general level and discusses their significance in terms of the cadastre. By identifying the possible themes for the future, the actor(s) may change their own actions based on possible effects of the drivers (Naisbitt, 1984).

In the process of detecting possible future themes, the study analyses different megatrends, trends, wild cards, driving forces and weak signals of the cadastral system in Finland and registers related to it. The article will also contribute to the traditional methodology used in cadastral studies by introducing methods from futurology. To reach the research objective, the operational environment of the cadastre itself needs to be defined. So, the first research question is formulated as follows:

1 How is the operational environment of the Finnish cadastral system defined? (Q1)

The answer to the first research question (Q1) is formulated with the help of literature research. After defining the operational environment of the cadastral system, it is possible to focus the actual research on the object of this study. The object is the cadastral system, not the society as a whole. So, the second research question is formulated as follows:

2 What are the future themes of the operational environment of the Finnish cadastral system? (Q2)

The second research question (Q2) is answered by using environmental scanning as the method. The use of the method is explained more thoroughly in Section 2. The primary goal for the scanning is to detect future themes in the operational environment of the cadastre and analyze the themes by using the concepts of megatrends, trends, wild cards, driving forces and weak signals and reflecting the results to research made in the field of land management internationally.

This article is constructed as follows: the first section has given the reader an introduction to the objective of the study and its background and significance. The second section will introduce the methodology used in this study. The third section focuses on defining the operational environment of the cadastre. Finally, the fourth and the fifth sections present the results of this study and provide conclusions and discussion.

2. Methodology and material

2.1. Study design

Environmental scanning is a method used in futurology to recognize the changing forces, or drivers of change, in the operational environment chosen (see e.g. Gordon and Glenn, 2009). The operational environment is the socio-cultural, political, ecological and economic environment in which the chosen object operates. These four parts include the frames set by different resources (infrastructure, money), the actors acting in the environment (citizens, administration, companies) and their interactions. (Rubin, 2002).

The phenomena to be observed in environmental scanning are different megatrends, trends, wild cards, driving forces and weak signals. Toivonen (2011) and Toivonen and Viitanen (2015) recognized nine different categories of the forces of change: globalization, action optimization, differentiation, technology as an enabler, urbanization, aging population, environmental pressure, safety and search for meaning.

There are several ways to approach environmental scanning and they are related to the purpose of use of the scanning. The scanning may be conducted in a way that is undirected or conditional, passive, active or directed, informal or formal. (See Aguilar, 1967; Renfro and Morrison, 1983; Spies, 1991). The decision has to be done with the purpose of the scanning in mind. Overall, the purpose of scanning is to understand the context and the environment that the object is operating in. With the help of this understanding, the aim is to be able to adapt to future changes and create a better operating environment for the future, as well as to provide information for the decision-making process (Spies, 1991).

The concept of *megatrend* may vary from country to country (see Toivonen, 2011). In this study, *megatrend* is used to describe a widely recognizable phenomenon that has a realized development history and most likely will continue to develop in the future, such as globalization (Mannermaa, 2004). The difference between a megatrend and a trend is the significance of its effect. A *trend* in this study is a phenomenon which has less effect on everyday life than a megatrend, but still describes some overall development. It is widely recognized as a characteristic of a society, but most likely will not have a major effect in the future and may be a part of a megatrend (Kamppinen et al., 2002; Rubin, 2004). A *wild card* is a factor which creates uncertainty. Its likelihood for realization is small, but at the same time, if realized, the effects may be significant. Some examples of wild cards are terrorist attacks, an asteroid hitting the Earth or a change in the Gulf Stream (Petersen, 1999; Rubin, 2004). *Driving forces* are phenomena which steer public sentiment and decision-making in the society, in a certain organization, or among certain people. They might not be continual phenomena, but relate to the attitudes and the current thinking of people, and are regarded as truisms. A driving force could be, for example, “the world needs constant economic growth” (Rubin, 2004). *Weak signals* in this study are considered phenomena which give an early hint of some future event that has not been realized yet. They cannot be clearly recognized from the past and their realization is very uncertain. But if realized, they might become trends or megatrends (Hiltunen, 2010; Mannermaa 2004; Rubin, 2004).

2.2. Data sources

There are different options for conducting environmental scanning and the choice of the scanning method depends on the purpose of the scanning. This study aims to detect themes that may influence the future cadastral system and therefore the choice to conduct the search as directed scanning was made. We can say that the environmental scanning has a specific object, which is the cadastral system, and the goal is to find new information. Choo (2001) describes this kind of scanning as “formal search”, “directed scanning” or “searching”, depending on the terminology used. This approach to environmental scanning provides analyzable data, and the goal of the scanning is to find new information, which might even produce surprising results.

The information sources were selected to present the operational environment of the Finnish cadastre. In addition to this, a few other information sources were used to add the point of view of cadastre as part of the society. The selection of the data sources was made by the authors especially from the cadastral point of view and it is possible that if the sources were different, the results from the scanning might be different as well. The importance of the selection is discussed in Section 5. The literature sources include the leading magazine for land surveying (*Maankäyttö* http://www.maankaytto.fi/) and its articles from January 2012 until June 2015 were searched. In addition to this, literature sources included the blog and news webpage of the National Land Survey of Finland (http://www.maanmittauslaitos.fi/) from January 2014 until June 2015. A few other sources were also used: the personal blog of Zack Kanter (http://zackkanter.com/) and the leading Finnish newspaper *Helsingin Sanomat* (http://www.hs.fi/) for the summer of 2015. The data sources were magazine operating in the cadastral field, newspaper, lectures, blogs and websites, and also previous research

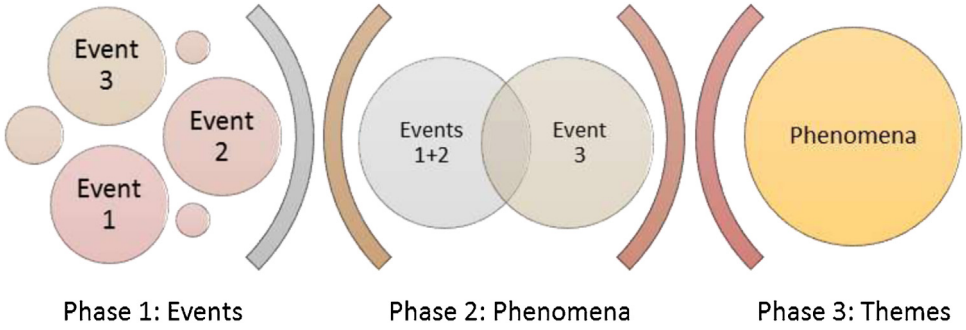

Fig. 1. Schematic of the data collection and analysis.

(Toivonen and Viitanen, 2015). The scanning was conducted during June to August 2015 and included data sources from a period of two years.

The data collection consisted of three phases (see Fig. 1). The first phase was to collect single events from the chosen sources and record them. After collection, the events are analyzed by identifying different phenomena (Phase 2) that are created by one or more events collected in Phase 1. The third phase of the study included recognizing the future themes behind the phenomena detected in Phase 2. Some of the phenomena might belong to more than one future theme, and some future themes may affect more than one phenomenon.

In the context of this study, events represent single happenings which come up in the data collection phase. For example, an event can be one piece of news, a topic in the news or a phrase in the environmental scanning material. As the events are discovered, they are recorded in the data. The events create the basic material for analysis, and phenomena and themes are derived from the recorded events. Since the events are pieces of news, similar events might occur. Similar events (for example Event 1 and Event 2 in Fig. 1) can be combined to create a combined event. After analyzing and possibly combining the events, they are recorded as phenomena. A phenomenon in this study describes a recognizable happening which does not have limitations regarding its breadth or distribution. The phenomena detected are then analyzed once again, with a focus on "what lies beneath". The third phase of the analysis concentrates on finding broader themes that create the base for the phenomena detected. The difference between phenomena and themes in this study is that the themes describe a wider scale and the current views which affect the other, more visible phenomena in the operational environment of the cadastral system.

After collecting the data, the future themes and phenomena found in Phase 3 are analyzed by searching for different megatrends, trends, wild cards, driving forces and weak signals. The analysis is discussed in Section 4. Fig. 2 represents the hierarchy behind one future theme.

The number of events recorded in this environmental scanning process was 352. Each event was recorded as an observation, and the data source was also recorded. Based on the observations, we found 54 different phenomena. The third phase of the environmental scanning process was to identify future themes behind the phenomena. There were 14 themes that were identified, and a theme could be behind more than one phenomenon.

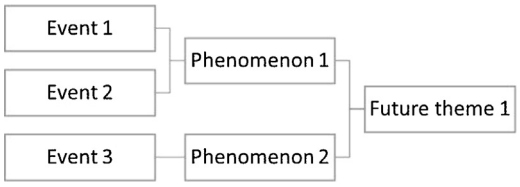

Fig. 2. The future themes are formed based on the hierarchy model above. Events (in this model event 1 and event 2) can be seen as events of phenomenon 1. Event 3 can be seen as an event of phenomenon 2. Phenomena 1 and 2 can be seen as phenomena of the future theme 1.

3. Operational environment of the Finnish cadastral system

A cadastral system describes the current property division in an area. The cadastral system normally includes the cadastre, cadastral map, land register and also cadastral surveying (Williamson et al., 2010). The registers and maps include information about land-related rights and information about real properties. According to Henssen (1995) and FIG (1995), a cadastre is a systematic, public and up-to-date register which contains information about real properties and cadastral units corresponding to them in a certain area. The land and water areas are identified and their dimension and location are defined. We can say that information in the cadastre answers the questions: where and how much? The land register is a register of land related rights, such as ownership rights. The information in the land register answers the questions: who and how?

The objective of this study is to discover future themes for the operational environment of the cadastral system. To achieve this objective, the operational environment of the cadastral system shall first be defined. The definition of the operational environment of the cadastral system is of major importance and the four dimensions of the operational environment (see Rubin, 2002) need to be clarified in the framework of the cadastral system. The four dimensions are socio-cultural, political, ecological and economic environments creating the environment the object is operating in (see Fig. 3).

The National Land Survey of Finland (NLS) is the major authority responsible for maintaining the cadastral system in Finland. The socio-cultural environment of the cadastral system, especially of the legal surveys, has changed towards a customer-oriented approach (see e.g. Kotilainen, 2013, 2014). In addition to this, studies around the world show that citizens are becoming more connected with cadastral data since the smartphone revolution and other smart devices utilizing spatial data in everyday life (see e.g. Steudler, 2015).

In Finland, the land information system, including the cadastre, cadastral map and land register, along with the population information system, community information system, and building information system, are seen as base registers of society (see Niukkanen, 2014). The main characteristics for the base registers are coverage and reliability. Coverage means that the registers include register units and their official identification numbers, and reliability that the maintenance of the registers is the authorities' responsibility. Since the cadastre and land register are maintained by the NLS, which is a governmental body under the Ministry of

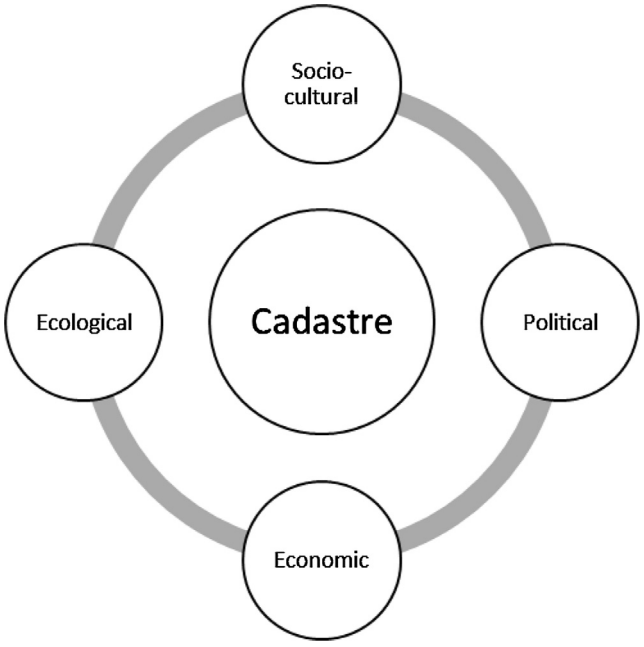

Fig. 3. The operational environment of the cadastre. The outer circle and its four dimensions of operations (socio-cultural, political, economic, and ecological) create the stage for the functions of the cadastre.

Forestry and Agriculture, the political environment includes legal changes and changes in society.

The cadastre should not only include private interests related to land, but also public rights, restrictions and responsibilities (Kaufmann, 2014; Paasch, 2012). These different public regulations include also regulations concerning the environment and natural resources. There is, no doubt, a need and use for the public regulations which are included in the cadastre, as well as for those regulations which, for whatever reason, are not included in the registers. These regulations and needs create the ecological environment of the cadastre.

The financial crisis hit Europe and Finland in 2009 and has had an effect on the NLS and cadastral activities as well. The rationalization of functions has also been a major concern at the NLS. At the same time, citizens have used less frequently the services provided by the NLS. Since the NLS is financed by the state, the economic environment of the cadastral system is closely related to the economic environment of the society. On the other hand, the land creates 17% of the national value of Finland (Peltola, 2010). Taking this into consideration, since the cadastre covers all of the land in Finland, the economic environment of the cadastral system includes the land and values related to it.

4. Results

This study revealed 14 different future themes in the field of the Finnish cadastral system and registers related to it. The themes are economic pressure, demographic changes, development of technology, transparent society, safety, environmental values, globalization, digitalization, know-how, quality, political change, soft values, public-private partnership and crowd sourcing. In this section, these future themes are analyzed in terms of their assessed impact, based on the environmental scanning process, to the cadastral system and its related registers in Finland. The different future themes and the phenomena that represent a certain theme are presented in Table 1.

Economic pressure is seen in almost every phenomenon in the operational environment of the Finnish cadastral system. It affects phenomena such as the rationalization of actions, building electronic services, and changing land markets. At the same time, it is a driver for the authorities' reliability and a transparent society. *Demographic change* can be seen in phenomena like an ageing population and urbanization. *Development of technology* is obvious and it has an effect on several phenomena in the cadastral environment. For example, accurate information, different innovations, and the total change of lifestyle towards virtual environments are phenomena caused by the development of technology. *Transparency of society* can be seen in the cadastral field as a demand for open communications between authorities and citizens. *Digitalization* is a theme that is recognized widely and also in the Finnish government's platform (GP, 2015). It can be a driver behind several phenomena, e.g. development of electronic services, integration of different registers, the use of smart devices, and the growing and changing utilization of spatial data. The *integration of registers* and growing use of smart devices create a need for information security. *Safety* is a theme that includes these questions but also relates to the reliability of authorities, the handling of disasters and instability of society. *Environmental values* have an effect on phenomena like energy production, education and economy. *Globalization* can be seen in the operational environment of the cadastre in many ways, e.g. demand for interoperability between national information systems, ethicality, and open data. Phenomena like the need for education and life-long learning and the rationalization of actions, as well as change of modus operandi of different organizations are related to the theme of *know-how*. As digitalization demands the integration of registers, the significance of *quality* grows. *Quality* affects also customer satisfaction, interoperability of registers and reliability of authorities. *Political changes* can be observed in many ways in the operational environment of the cadastre, e.g. changes in legislation, importance of environmental values, and economy. *Soft values* play a role in phenomena like ethicality, customer-oriented approach, and mental and physical well-being, for both employees and citizens. *Economic pressure* creates a need for *change of modus operandi* and arises as a question of the *privatization of services*, at least some of them as *public-private partnerships*. *Crowd sourcing* is a theme which has arisen from the development of technology and use of smart devices.

As we recognize the future themes and learn to name phenomena belonging to a certain theme, we can try to be prepared for the changes in the operational environment of the cadastral system. In the right column can be seen certain phenomena and it can be then observed in the left column, to which future theme(s) a certain phenomenon belongs to. Knowing this, it is possible to recognize different connections between phenomena and future themes which leads to increased ability to design registers for the future needs. For example, if we see around us smart devices and customer-oriented approach to design functions, we can say that they are a part of a larger future theme, *crowd sourcing*. On the other hand, having requirements for reliability of register and authorities and interoperability between different registers indicates that there is a future theme related to the *quality*.

Each future theme has an effect on the operational environment of the cadastral system and its related registers. Some themes may be partly overlapping and thus the phenomena caused by the themes may be similar (for example, economic pressure and public-private partnership are both themes towards rationalization of modus operandi). Fig. 4 shows relationships between the future themes and phenomena identified in the environmental scanning and how one theme may be connected to other themes and phenomena and vice versa. As Fig. 4 presents, the relationships are very complex and interconnected with each other which makes the whole field of the future trends confusing.

The future themes (turquoise boxes in Fig. 4) in the operational environment of the Finnish cadastral system, the connections

Table 1
Phenomena and future themes in the operational environment of the Finnish cadastral system.

Future themes	Phenomena
1 Economic pressure	Rationalization of actions, electronic services, development of technology, life-long learning, interoperability of information systems, transparent society, reliable authorities, environmental values, globalization, sustainable development, privatization, structural change of farms, legislation, development of society, change of modus operandi, change of land markets, innovations, productivity, orderliness
2 Demographic changes	Ageing population, economy, urbanization, soft values
3 Development of technology	Accurate information, economy, life-long learning, rationalization of actions, interoperability of information systems, innovations, change of lifestyle, modelling, change of modus operandi, open data, 3D cadastre, development of services, globalization, virtual environments
4 Transparent society	Open society, transparent society, economy
5 Digitalization	Electronic services, rationalization of actions, integration of registers, interoperability of information systems, open data, transparent society, mobility, quality of public services, innovations, development of services, utilization of spatial data, 3D cadastre, development of technology, smart devices, virtual environments
6 Safety	Information security, reliability of authorities, disasters, development of technology, globalization, instability of society, war
7 Environmental values	Economy, development of technology, globalization, education, development of services, energy production
8 Globalization	Interoperability of information systems, environmental values, economy, inequality, know-how, open data, innovations, development of technology, sustainable development, ethicality, safety, war
9 Know-how	Education, life-long learning, rationalization of actions, know-how, change of modus operandi
10 Quality	Reliability of registers, up-to-date registers, reliability of authorities, customer satisfaction, rationalization of actions, interoperability of information systems, digitalization, transparent society, customer-oriented approach, accurate information, development of technology, economy, functionality of information systems
11 Political change	Legislation, politics, transparent society, environmental values, economy, open data, interoperability of information systems
12 Soft values	Ethicality, demographic change, transparent society, life-long learning, electronic services, customer satisfaction, innovations, change of modus operandi, customer-oriented approach, mental and physical well-being
13 Public-private partnership	Privatization of public services
14 Crowd sourcing	Transparent society, customer-oriented approach, development of technology, smart devices

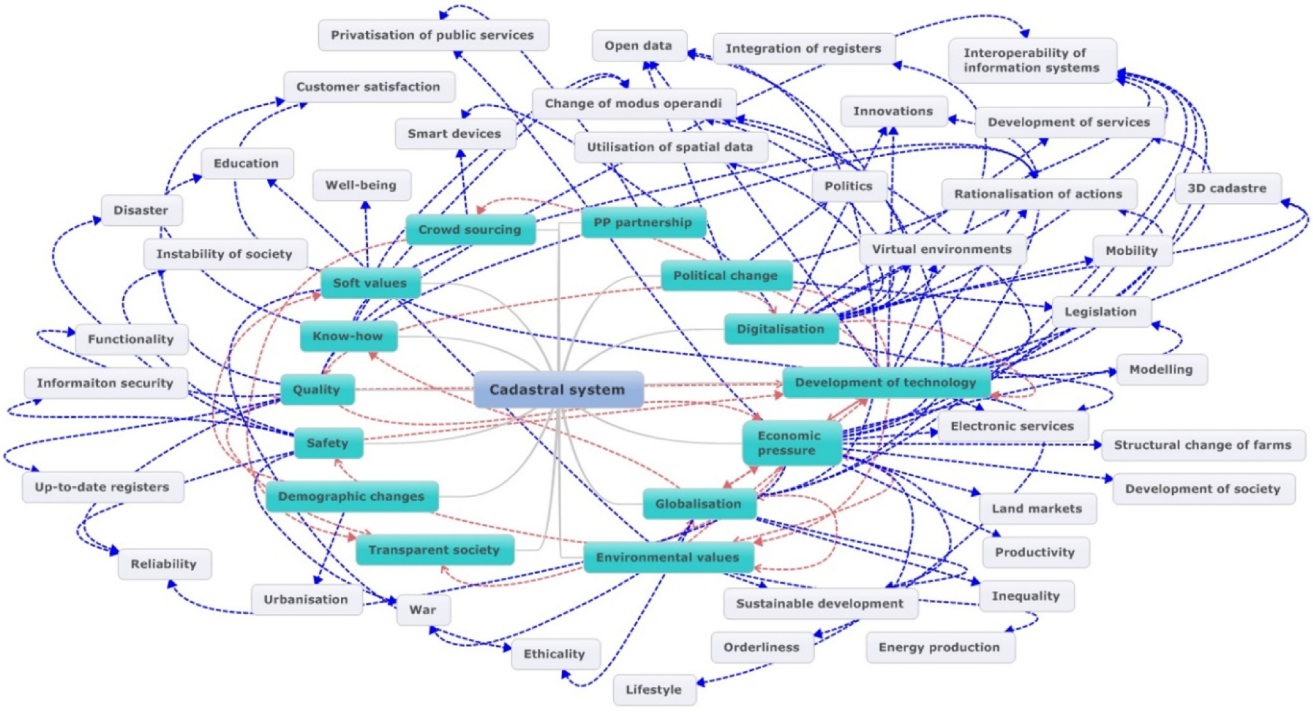

Fig. 4. The complexity of future themes and phenomena occurring in the operational environment of the Finnish cadastral system.

between the themes (red arrows), the phenomena (white boxes) and the connections between themes and phenomena (blue arrows) are presented in Fig. 4. The map of future themes, phenomena and their connections is very complex and multiple themes may be behind one phenomenon. Also, one theme is usually behind more than one phenomenon. When renewing a cadastral system, this complexity should be kept in mind. It shows that, depending on which future theme we are focusing on, our actions might affect more than one issue at a time.

For example, the interoperability of information systems is a phenomenon which has slightly different shades of meaning, depending on the theme behind it. If globalisation is the theme, interoperability is connected to the standardisation of information systems and closely linked to the land administration domain model and its research (see Paulsson and Paasch, 2015). If the theme behind the interoperability is economic pressure, the efficiency of registers is the key element (Cordero Ferrera et al., 2011).

The content of a cadastral system has been expanded through the years, presently being not only the record of land-related data, but also in support of sustainable development (Williamson et al., 2010). This means that other types of information also needs to be recorded—not only information about parcel sizes and ownership rights, but also, e.g., information about public rights and restrictions (see Paasch, 2012).

The purpose of environmental scanning is to identify trends, mega trends, drivers etc. The results of this study show that there are many factors driving change in the operational environment of the Finnish cadastral system. Some of the drivers of change identified in this study can be found in other studies of futurology as well. How important each driver is seen to be depends on the scope and the context of the study (Toivonen and Viitanen, 2015). For example, digitalization can be seen in the Finnish context as a megatrend since it is a major theme in the Finnish government strategy (GP, 2015).

The themes may also have a different meaning depending on the context they are analyzed in. Safety in the Finnish context is mostly connected to information security, but also to the possibility of war (or even cyber war and terrorism). In countries where there are more hazardous natural forces, the security might also mean preparing for earthquakes or tsunamis (see e.g. Iizuka et al., 2015).

5. Discussion and conclusions

Some of the future themes found in this study are more or less truisms. Some phenomena in the society have been seen for decades, such as globalization, whereas some of them have only become more powerful during recent years. An example of this is the financial crisis, which seems to affect strongly the environment of the cadastral system. Or, for example, climate change has added the question of environmental values to the discussion (see e.g. Dwyer, 2011).

The purpose of environmental scanning is to detect megatrends, trends, wild cards, driving forces and weak signals. Based on the results of this study, it can be stated that in the operational environment of the Finnish cadastre, megatrends, such as globalization or development of technology, can be clearly recognized. In our opinion, environmental values are a megatrend affecting the entire world. Digitalization may still be "just" a trend, but the growing need and use of digital information will push it to become a megatrend. The beginnings of this can be seen in the ISO 19152 Land Administration Domain Model and the reasons behind its development (see van Oosterom and Lemmen, 2015).

In Finland, the legal cadastral surveys are always made by authorities. Economic pressure as a megatrend has forced the authorities to take a closer look at reducing their costs. Would it be more efficient to privatize the tasks? On the other hand, a theme behind this thinking is that we should do something to reduce costs (of course, in a governmental organization this is a matter of government funding, so at the same time, it turns out to be a political issue).

Behind the results, it can be seen that there are certain drivers of change affecting the operational environment of the cadastral system. One driver is that there is a cadastre at all. We assume that the need for a cadastre will remain in the future. But what if we will be living in a totally virtual environment in 50 or 100 years and the need for a cadastre as it is now is no longer there? Virtual lifestyle can be said to be already a trend, but when looked at from the cadastre's point of view, could also be seen as a weak signal. Is it something that surveyors should consider more closely? Lemmen et al. (2016) ask if it would be possible to use bitcoins for land transactions. This kind of development would also allow land administration to be governed by a community, not authority. Also, crowd sourcing as a tool for updating and maintaining the cadastre is, in our opinion, a weak signal to which should be paid attention when designing future cadastral system and registers related to it.

The wild cards' likelihood to realize is small, but at the same time, if realized, the effects may be significant. As stated before, digitalization and web-based cadastres is something that we have been working towards for a long time in the field of land management. But what happens if there is a total global blackout of all the digital information networks for several years? It is unlikely to happen, but if it does, it would have major effects on the cadastre as well. Would we then need to take a step back towards a paper and pencil cadastre?

There is no reference data to evaluate the results in terms of other similar studies, since the authors have not identified other studies combining environmental scanning with cadastral studies. However, the method of environmental scanning seems to answer quite well to the needs of the object of this study. A widely-recognized disadvantage of the chosen method is that it is quite time-consuming and laborious (see e.g. Toivonen and Viitanen, 2016, 2015). Criticism regarding the found themes and their analysis is also reasonable, because how do we know that the found themes and the conclusions made based on the analysis are the right ones? It is possible that if data sources were different, the results from the scanning would be different as well (see e.g. Toivonen and Viitanen, 2015). This is a hinder of the chosen method because it relies a lot to the selection of sources. On the other hand, this also enables the method to be used for specific purposes. When inspecting the results it is important to notice the importance of information sources. Are the "right" future themes found and do they represent the studied subject?

There are various ongoing projects regarding the future cadastre. Steudler (2015) shows that, in the future, challenges concerning the cadastre lie in issues like open access, open data and crowd sourcing, leading to questions like information security. At the same time, Land Information New Zealand has published a strategy for the future cadastre which emphasizes the accuracy of data recorded in the cadastre (LINZ, 2013). The future challenges found by Steudler (2015) are similar to the results of this study and indicate that environmental scanning is suitable for detecting the future needs of a cadastral system and registers related to it.

The results show interesting themes for the future, of which some are even inconsistent between each other. For example, crowd sourcing is a future theme and at the same time, quality is another theme. If updating the cadastral data in the registers would be done by utilizing crowd sourcing, how can the quality and accuracy of the data be verified and who is responsible for that? The future also seems to bring demand for more transparent society of which the reliability of authorities is an example. At the same time, it seems that the public-private partnership and privatization of actions are rising theme and phenomenon for the future of the operational environment of the Finnish cadastre and in our opinion, these two might also be contradictory. The next step will be to recognize, based on the results of this study, what effects the future themes might have to the cadastre and cadastral system.

For the development of the Finnish cadastre, this study gives tools to understand the megatrends, trends, driving forces, wild cards and weak signals which shape the future of the society and the cadastral system. The results of this study can be used in other

countries as well, bearing in mind that this environmental scanning was done in the operational environment of the Finnish cadastral system. The 14 future themes found in this study may be used as a part of environmental scanning in another country.

This study used environmental scanning as a tool to detect the future themes of the operational environment of the Finnish cadastre. The 14 found themes were economic pressure, demographic changes, development of technology, transparent society, safety, environmental values, globalization, digitalization, know-how, quality, political change, soft values, public-private partnership and crowd sourcing. After detecting the themes, they were analyzed by using the concepts of megatrends, trends, wild cards, driving forces and weak signals and reflecting the results to research made in the field of land management internationally.

The results of this study should not be treated as fact, but rather as an overview of Finnish society in its current situation. Some of the driving forces, however, may occur in other countries as well. Since the environmental scanning has been done in this study as directed scanning (see Spies, 1991), the results reflect the operational environment of the studied object. For future research, the results of this study creates a good basis for evaluating what kind of effects these future themes might have to the Finnish cadastral system.

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