'LEAN' PUBLIC PARTICIPATION GIS: TOWARDS A SUSTAINABLE TOOL FOR PARTICIPATORY URBAN PLANNING

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Abstract

The paper presents softGIS service, which is a currently developed, free and open source online Public Participation GIS (PPGIS) service, allowing for the collection of local knowledge from urban dwellers, and supporting participatory urban planning. The paper discusses recent enhancement of the service with functions facilitating multi-way communication between the actors involved in planning processes with the focus on the software development methods. Most of the PPGIS efforts to date have been rarely implemented in real decision-making situations and suffered from the low level of system sustainability. In an effort to overcome this, we propose a lean PPGIS approach, which aims at better supporting user and customer needs, improved cost efficiency, and easier adoption, leading to the increased sustainability.

Keywords: softGIS, urban planning, web-services, PPGIS, geoinformatics, lean software development

INTRODUCTION

In 2007 urban population exceeded the half of the total human population (UNFPA, 2007). Even though the most of the recent urbanization trend falls on the developing world, the share of urban population in western countries is even higher and exceeds 72% in Europe (UN DESA, 2009a). Cities have therefore become the primary living environment for humans. For this reason alone, providing a good quality of life for urban dwellers is essential. What is more, sustainable urban development is an important component of global sustainability (Alberti 1996, Haughton and Hunter 2003). As the spatial organization of cities has an impact on the fulfillment of the above goals, urban planning has become an important tool for ensuring their realization. There is a growing need for tools and methods that would support planning with better knowledge of the internal functioning of cities, the factors affecting the urban quality of life, as well as social, environmental, and economic outcomes and conditions of planning decisions.

Sustainable development is based on three interdependent components: social development, economic development, and environmental protection (UN, 2005). The social component is referred to by some sources as social acceptability. Decisions that are beneficial for the economy and for the environment will not be sustainable if they are not accepted by the public. Social development provided by the decisions is also a value on its own, and should lead to a more democratic and inclusive societies. Public participation in decision-making might therefore be one of the ways to provide more socially acceptable solutions. If sustainable urban development is the goal, there is a need for public participation in urban planning that shapes the spatial organization of cities. Such a need has been enshrined in numerous international documents, such as the Leipzig Charter or Agenda 21 (UN DESA, 2009b).

In addition to addressing a general goal of urban sustainability, public participation in planning may serve specific goals and purposes. Innes and Booher (2005, modified) list the rationales for public participation from the perspective of decision-makers:

- to know and take account of the preferences of the public in decision making,
- to improve decisions by incorporating local knowledge into existing knowledge base,

- to advance fairness and justice by recognizing the needs and preferences of the groups that would be otherwise not recognized,
- to get legitimacy for decisions,
- to meet legal requirements.

Drawing on the theory of communicative planning and the reflections on the planning practice in the United States, Innes and Booher (2005) argue that the first four rationales are seldom met in real decision-making situations. Among other factors, they attribute this to the inadequacy of currently used methods, such as public meetings, and review surveys. It is not surprising then, that there have been numerous attempts to support public participation in planning with new techniques, adopting different paradigms and traditions. One such paradigm has called for the use of geospatial technologies in a way that supports public involvement in planning. Such efforts fall under the domain of Public Participation GIS (PPGIS), and their application domain is not limited to urban planning, but embraces such disciplines as environmental management, transportation planning and natural resource mapping.

PUBLIC PARTICIPATION GIS

The interest in PPGIS research and development comes from different sources. The groups traditionally interested in PPGIS have been the universities and non-governmental and grassroots organizations. In the academia, the interest initially stemmed from the criticism of GIS as a technology representing the knowledge of experts and institutions, not equally representing different groups of the society (Harris and Weiner, 1998). PPGIS has thus become an important part of a broader area of research called GIS and Society and has penetrated critical GIS agendas, in which the relationships between society and geospatial technologies are investigated (O'Sullivan, 2006; Elwood, Schuurman and Wilson, 2011). For NGOs and grassroots organizations, the practical reason for adopting and using PPGIS has been to become a partner for decision-makers, and to empower marginalized groups with access to data and information (Sieber, 2006). Such motivations have been therefore driven by social and political context in which they developed, with the empowerment and social change as desirable outcomes. In this perspective, the decision-makers are often seen as adversaries that represent the privileged groups, and PPGIS serves as a tool to create a counter-power for the existing structures.

In an overlapping yet different perspective, PPGIS aims at incorporating the local knowledge of residents into the existing knowledge base for planning. Local knowledge is a personal and subjective knowledge that has a spatial component and comes from the everyday experiences and interactions between people and the environment (Rantanen and Kahila, 2009). Talen (2000) proposed a bottom-up GIS as a platform for synthesizing the knowledge of experts with the local knowledge of participants. In bottom-up GIS, resident perceptions and preferences are stored directly in a desktop GIS database, with the help of the facilitator. A vision to incorporate local knowledge into existing data sets was also behind the softGIS methodology, envisioned as a bridge builder between residents and planners (Kahila and Kyttä, 2010). In softGIS, however, local knowledge is collected through map-based online questionnaires. SoftGIS methodology is described in detail further in the article. What is important to note here is that in both bottom-up GIS and softGIS approaches, local knowledge is incorporated into existing data sets to help guide planners and decision-makers in arriving at more efficacious solutions. Thus planners and decision makers become the main recipients of the data and, by extension, beneficiaries of the PPGIS effort.

In the tradition of communicative planning, planning processes are understood as a process of constant interactions between the variety of involved actors (Innes, 1998). With the advances in information and communication technologies (ICTs), the observation that the communication patterns in modern societies differ from those in planning processes has become increasingly obvious. In this perspective, the motivation for PPGIS comes from the inadequacy of the currently used participation methods with an increased availability of the enabling technologies (Kingston, 2011). Online PPGIS have become feasible with the raise of the mapping websites that opened the technology for the broader public (e.g. MapQuest, Google Maps) and the programming frameworks and APIs that allowed for easier software development (e.g. Google Maps

API, MapServer, OpenLayers). The variety of enabling technologies have opened up the potential for a synergistic convergence of GIS and ICTs in a form of map-based online discussions (Rinner, 2001), Web 2.0 features and social media integration (Rinner, Keßler and Andrulis, 2008; Sani and Rinner, 2011), and the content contribution mechanisms, such as volunteered geographic information (VGI) (Goodchild, 2007; Tulloch, 2008). From this perspective, PPGIS serves as a communication platform enabled by the new technologies, with the multiple practical purposes, such as sharing the ideas, consensus building or argumentation, as well as with various possible social outcomes.

In fact, it is difficult to discern between different motivations, and in most cases, there are many motivations behind each project. What is evident, however, is that most of PPGIS efforts have been initiated in academia, and have been driven by research goals, rather than by problems, which they aimed to solve. In the result, most of the PPGIS projects ended up one-off efforts supported by research grants and discontinued after the grant completion. PPGIS literature is replete with experimental or prototype applications that have never been implemented in a real decision-making situation, as there was no one to maintain the system or simply because the system was not intended for the real-life operation. A growing part of the literature focuses on the conditions and barriers for the adoption of the participatory tools in planning (Slotterback, 2011; Johnson and Sieber, 2011). Little is known, however, about the influence PPGIS would have on real participatory processes in planning or on the quality of decisions made with the use of the technology. There have been repeated calls for the evaluation of PPGIS efforts, but these efforts have been rare and far between.

PPGIS EVALUATION AND SUSTAINABILITY

Due to the diversity of approaches and contexts, the evaluation of PPGIS is a challenging task (Jankowski and Nyerges, 2003). Another factor hindering the possibility to measure PPGIS effectiveness is the difficulty to establish a causal relationship between technology and the outcomes of its use (Sieber, 2006). Nevertheless, there have been efforts to provide general frameworks for PPGIS evaluation.

Jankowski and Nyerges (2003) propose social outcomes and task outcomes as the main aspects of PPGIS evaluation. Instead of looking for “making better decisions”, they look for “better decision-making” as a task outcome, in which the use of technology leads to the effective participation and sustainability of its outcomes. Social outcomes include such aspects as learning, and changes in the social and institutional structures. Their framework provides an insightful perspective on PPGIS project as a dynamic process, but is mainly intended to structure PPGIS design, rather than to serve as an evaluation grid for existing PPGIS applications. In an earlier effort at formulating evaluation framework for PPGIS, Barndt (1998) proposed the three main criteria: (1) the value of the results for decision-making, (2) the quality of process management, and (3) the support for the community development goals. From the perspective of process management, he highlights *sustainability*, defined as the ability of the system to support itself and to operate over a long term. The first and the third aspect of Barndt’s framework might be considered *task* and *social* dimensions, respectively. Consequently, the three dimensions of an evaluation framework that we propose here, and which draw on the two above frameworks, are:

- task outcomes,
- social outcomes,
- sustainability.

We consider sustainability as the core criterion to evaluate PPGIS software and its development process. If the goal of PPGIS efforts is to continuously improve the decision-making, as well as to provide a long lasting social value, system sustainability is crucial. The issue of sustainability is essential also from the perspective on urban planning as a continuous process which never ends (Horelli and Wallin, 2010).

The implementation, maintenance, and the use of the system requires the adopting organization to come up with resources. System sustainability might be thus achieved only when it provides valuable outcomes and serves the goals of the adopting organization. An organization is then considered a customer of the service and a party that is responsible for the system maintenance. With information and computation technologies becoming increasingly powerful and easy to use, the barriers to the adoption become less technological, and

more organizational and institutional. In order to implement and maintain the participatory technology, the institution has to see the value of public participation in decision-making, and to set aside financial, technical and personnel resources (Ganapati, 2010).

In most countries, urban planning is a duty of public administration. Municipalities and their planning agencies prepare planning documents and convene the participation process. They seem thus to be the primary customers of PPGIS services. However, geospatial technologies have been seldom implemented by the public administration to support citizen participation in decision-making (Ganapati, 2010). Public administration should be therefore seen as a customer of PPGIS. For a customer to pay for a product, the product has to provide value. The value does not have to be monetary, but must be important enough to convince the customer to spend resources. The reason for a potential failure of real-life PPGIS implementation might be therefore that the systems failed to provide enough value for the customers. In the remainder of the article we propose a *lean* approach to PPGIS software development, which aims at better supporting the needs of customers. Lean methods are expected to lead to the easier adoption of software, improved cost efficiency of the development process, and to the increased system sustainability. We also review the ongoing development cases as examples of lean approach and discuss challenges for the adoption of lean methods.

LEAN SOFTWARE DEVELOPMENT

The lean software development methods derive from various sources, including lean manufacturing and agile software development (Poppendieck and Cusumano, 2012). The agile software development is an iterative process that solves the problems of inflexibility of a waterfall process model (Highsmith, 2000). The agile development follows short iterations over the elicitation of the requirements, software design, planning, implementation and testing, with the aim of fast delivery and flexibility to the changing requirements. The agile methods reduce the risk of huge investments on the features that have not been tested in practice and have not been proven to be necessary (Agile Manifesto, 2001). The agile methods bring flexibility and quality to the software itself, but they do not guarantee or take into consideration the economic perspectives of a long running project.

The lean method differs from the agile in that it focuses on overall economic sustainability of the product under development. It aims at producing understandable prototypes of services, testing them, and selling them to customers and users. The lean software development combines the agile methods with the lean manufacturing principles (Poppendieck and Poppendieck, 2003). The term ‘lean’ was introduced as an improvement in manufacturing processes and refers to not spending a single resource on a product, before it has been sold or otherwise proven to be valuable for the user. In this way, the process can be seen as focused on creating the value for the user, eliminating waste, optimizing value streams, empowering people, and continuously improving (Fig. 1) (Womack, Jones and Roos, 1991; Ebert, Abrahamsson and Oza, 2012).

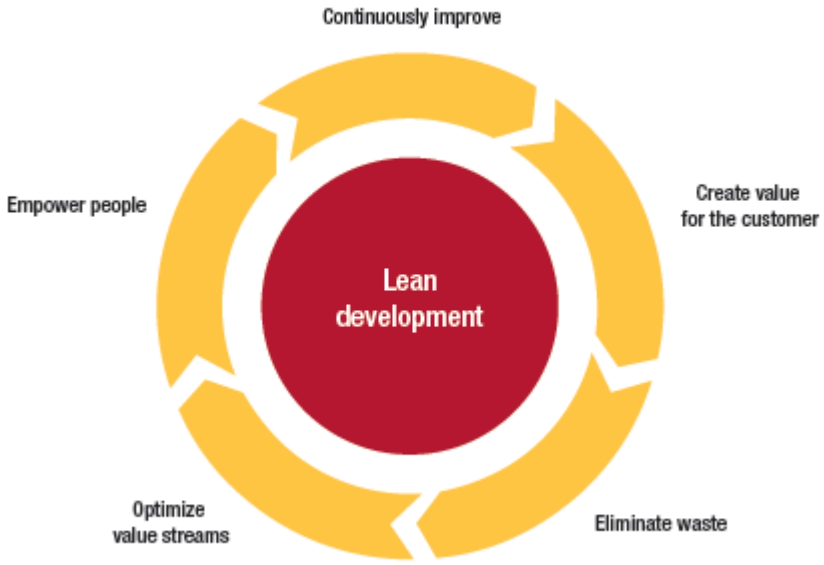

Fig. 1. Lean product development cycle (Ebert, Abrahamsson and Oza, 2012).

The product and the concept can be sold before they have actually been developed. If selling the concept does not work, the product should never be developed. On the other hand, if the concept finds a lot of interested users and customers that are able to pay for the service, the product should be developed. Lean processes also emphasize a continuous learning process, in which the developers learn about their users and customers, through the attempts to solve their problems. Close collaboration of both users and customers makes the developers aware of the most critical issues regarding the success of the service under the development.

LEAN PPGIS FOR URBAN PLANNING

The technologies, that support the development of most PPGIS services, such as Google Maps API, OpenLayers or MapServer, are inexpensive or free of charge, and have become commodities. In a commodity market, it does not make sense to put efforts on technological development. The effort should be rather put on the design issues related to bringing value for the users. The resources should be spent on concept testing, user experience development and customer creation. Investing and focusing on the right development issues is expected to make the developed PPGIS services more sustainable. Funding long-term projects is in this way a fundamental issue, which also underlies technological changes requiring upgrades and maintenance of the service.

In the following paragraphs we evaluate from softGIS perspective the users and the current applications developed. The rate at which the current features support participative urban planning processes requires more research and a new set of metrics. But nevertheless the softGIS services are used in production and do fulfill a certain need for the current case studies.

Users and customers

The distinction between the users and the customers is crucial in the process software service design due to differing requirements and a different way of evaluating the quality of the service. In the urban planning context, we consider the customer as the person or organization making the decision to implement PPGIS and participatory processes. Without the initial decision to use PPGIS methods in a municipality, one cannot infer that PPGIS is what the municipality wants or needs. The concept of the service to be developed has to be presented in an understandable way that highlights the main benefits for the customer and the users. Presenting the service either leads to a decision of implementing the service or to modifying the concept to fit

the specific requirements of the target customer. Only after a positive decision to buy or to use software that the concept presents, the development together with the users begins.

PPGIS users in urban planning

The proper definition of different user groups and the level of their skills allows to focus the design decisions on the right issues. The main user groups in PPGIS for urban planning can be considered to be:

- urban planners,
- citizens.

In the urban planning context the general skills of an urban planner who focuses on land use planning can be very different from other urban planners who, for example, focus on transportation planning. Urban planners may also differ in terms of general computer skills. In softGIS we have identified the main tasks that need to be done for creating a PPGIS service and using it in the urban planning context.

The identified high level tasks include:

- creating content for a PPGIS service,
- marketing the PPGIS service,
- analyzing the outcomes of the PPGIS service,
- presenting and/or using the outcomes for urban planning purposes.

Depending on how each municipality has organized their urban planning and what skills the individuals involved have, these tasks might be performed by different user groups.

PPGIS customers in urban planning

Identifying who is the person involved in making decisions of using PPGIS is important as this person or persons might be considered the customers of the service that provide the much needed funding. For participatory applications it would be controversial to consider the citizen to be the customer. Although as taxpayer to the government, municipalities and agencies, citizens support indirectly PPGIS services and the government is a purveyor of this support. The ethics behind this is to develop PPGIS services that produce customer value. The situation of PPGIS can also be considered as a two-sided market where government agencies provide the required monetary support by buying the PPGIS product and citizens are the ones who should gain the value. Producing value for only one side does not produce the same amount of value as providing products that both sides can use and value. In two sided markets only one side pays, and as clarified above in the urban planning case the funding would come from the government side.

SOFTGIS

SoftGIS is the term used for both the methodology and the software originally intended to collect the residents' perceptions of their living environment and to combine them with physical geographical information and other geospatial data layers. Based on the principles of the environmental psychology and participatory GIS, softGIS methodology allows for the micro-scales and individualized research on the spatial aspects of relationships between human and physical environments. Even though the methodology was first used in a place-based research, it has been intended from the beginning as a tool supporting public participation in urban planning (Kahila and Kyttä, 2009).

To this date, softGIS data has been collected using web-based questionnaires allowing for the collection of both place-based and non-place-based information from respondents. Place-based questions allowed respondents to draw points, lines and polygons on map, which are then stored in a geospatial database. Other questions are facilitated by multiple-choice and radio buttons, slide-bars, open-ended questions, etc., which allow to collect non-locational information, such as socio-demographic background or the user feedback on the questionnaire. To this date, numerous research projects have been realized using the

softGIS methods, including such diverse domains as the relationships between the urban density and the perceived environmental quality (Kyttä, Kahila and Broberg, 2011), child-friendly environments (Kyttä, Broberg and Kahila, 2012) or urban mobility patterns, which is an ongoing project.

In recent years, there has been a development effort to support decision making by integrating softGIS data into the urban planning process. The requirements for sustainability of the service have been raised, and. the deployment of participatory web services and their continuation from one project to the other was the main requirement. Below we provide the examples of the services that have been developed along with the considerations over the problems encountered and the software development methods used.

SoftGIS questionnaires

SoftGIS questionnaires has been developed for many municipalities and cities in Finland including Helsinki and Espoo - the two biggest cities in Finland. These questionnaires were developed to provide flexibility in adding new features and contents with as good as possible usability. Usability, data reliability, and different requirements for the data collection and research using the data were the main priorities for developing these questionnaires. As a result, we implemented a platform where questionnaires were defined with writing JSON and new features could be easily added with the help of Javascript and html. The ease of use was aimed at software developers with a knowledge of javascript, html and JSON formats. The questionnaire has been successfully been deployed in a number of cases since the first version was used, including, besides Finland, also Japan and Australia. Although the questionnaires did fulfill their purpose and they are still used there is a constant problem of the cost of setting up a new instance of the questionnaire. Developing and deploying such a questionnaire does require a developer with the right skills. These developers are usually hard to find and expensive. Moreover, combining softGIS with urban planning practices in the form of web questionnaires only provides a low level of participation. To be able to support both higher and lower levels of participation other types of services needed to be implemented.

SoftGIS urban planning service

The softGIS services developed to support urban planning in different stages are a combination of different prototypes. These prototypes has been developed and experimented with in different urban planning cases in Vaasa and Järvenpää. Some of the prototypes are clearly valuable and their maintenance and further development is ongoing. The prototypes developed until today under the softGIS methodology include:

- *geoforms service enabling the creation and deployment of softGIS questionnaires,*
- *dashboard* allowing citizens to view urban planning projects on a map,
- *planning proposal* services, which aims at presenting a draft urban plan and enabling a map-based discussions over the proposal,
- *idea competition* services aiming at allowing citizens to evaluate multiple planning and development ideas,
- *analysis application* which allows for the visualization of questionnaire answers.

The development of the first three services (dashboard, geoforms and planning proposal) has been following the lean development practices, which enabled the efficient usage of scarce resources. Concept problems and failures have been recognized early in the development process, which has saved a lot of development time. The two latter services (idea competition and analysis application) have been following different approaches.

At the moment, the most popular service that has been implemented is the geoforms questionnaire service. The other services are under development or suffer from various problems. Some of the problems that have been considered require changes in the existing urban planning practices and thus cannot be resolved solely by further software development investments. All of the services are still at an initial stage of the development process, therefore it is not easy to attribute their success or failure solely to the software development method. Below we present the services supporting public participation in urban planning

developed as part of the family of the softGIS services. In each case we provide the information on the software development method and reflect on the sustainability of a feature.

Geoforms

Geoforms is a service that enables the urban planner or the researcher to create questionnaires, publish them, and download the collected data to their own computers. The software has been used in the cities of Vaasa, Järvenpää and Lisbon (Fig. 2). Some of the main problems encountered during the meetings and interviews with urban planners, has been their lack of time to learn to use a new software. What is more, smaller municipalities do not have enough urban planning cases suitable for usage of the geoforms service. The time that urban planners are able to devote to learning a new software is scarce. Using a questionnaire in an urban planning project has to be done with care and in the right time frame during the process. This filters down the number of projects that are suitable for using the questionnaires to only a fraction of all the ongoing projects in a municipality. The use of the service by each urban planner does not happen often enough to master the user interface. This situation either requires the municipality to assign a person to create questionnaires and handle the participatory service for all planning projects, or calls for a simplification of the questionnaire creation and analysis of the data. Another way to support users and providers of the service is to form user communities and developer communities that would share information about the proper use the geoforms and the best practices. To be able to create such communities the usage of the software should grow to reach a point where such communities would be self sustaining.

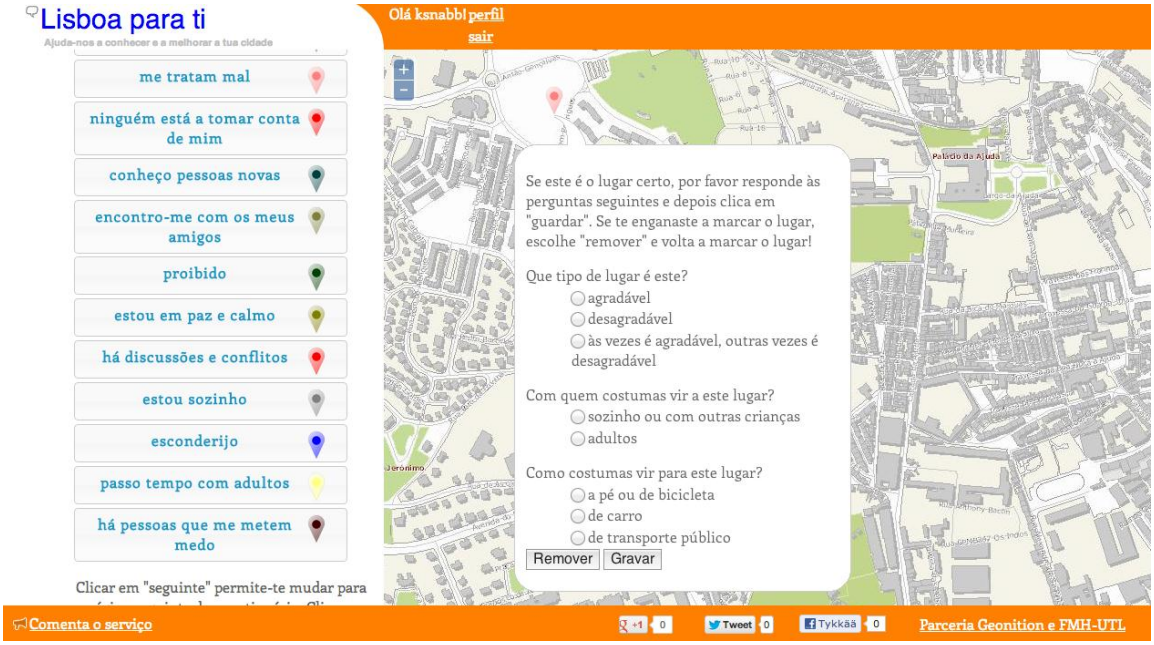

Fig 2. the geoforms application used for place-based research in Lisbon, Portugal

Dashboard

The dashboard is the simplest service in the softGIS family of services. It enables the citizens to browse ongoing planning projects and to navigate to the participatory service that is currently in use for a particular project (Fig. 3). The dashboard solves the problem for the citizen of finding out which projects in a municipality invite the participation and provides easy navigation to the service. This enables the service to support multiple simultaneous projects. The requirement for the dashboard did not come from the customer, but from the development team. The solution has been positively received by the customer. The dashboard has become the main part of the softGIS service and serves as the entrance page for the citizens involved in participatory planning..

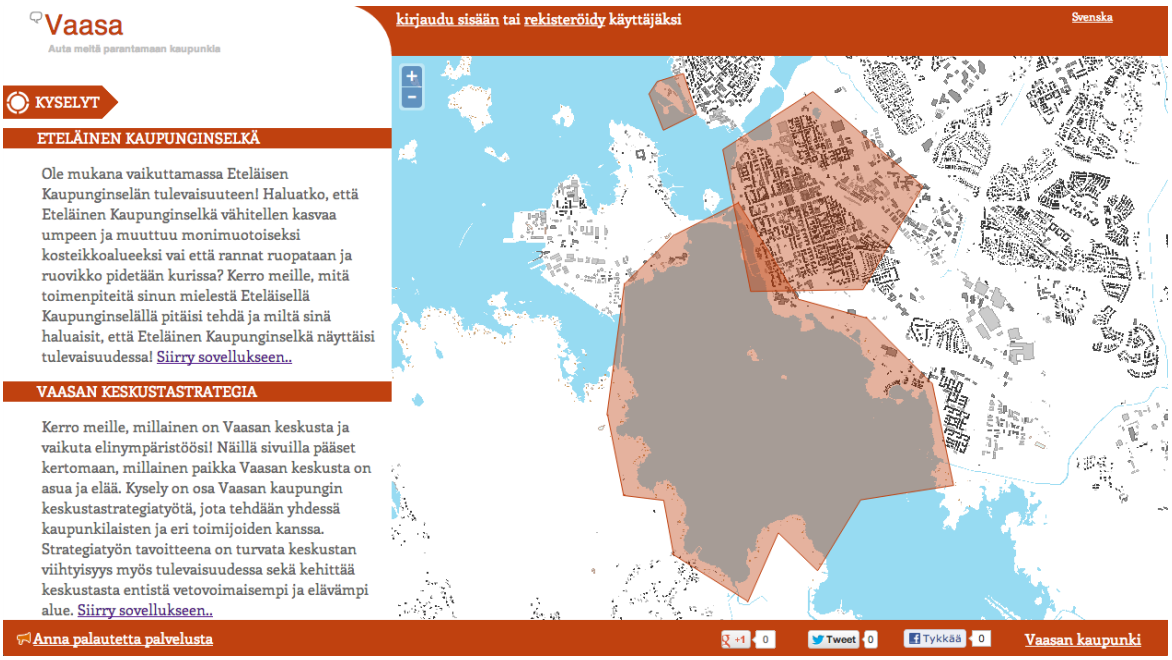

Fig 3. the dashboard application, currently used in the city of Vaasa, Finland.

Planning proposals

The service has been developed to present the plan proposals on a map and to enable map-based discussions (Fig. 4). The discussion takes a form of an argumentation map (Rinner, 2001) albeit with a minimal set of features. The service has been used in the city of Järvenpää for two of the projects: *Lepola III* and *Perhelän kortteli*. The former did not seem to draw the interest of the citizens, and received only a few comments. The latter drew more interest and with a small marketing collected about sixty comments from the users.

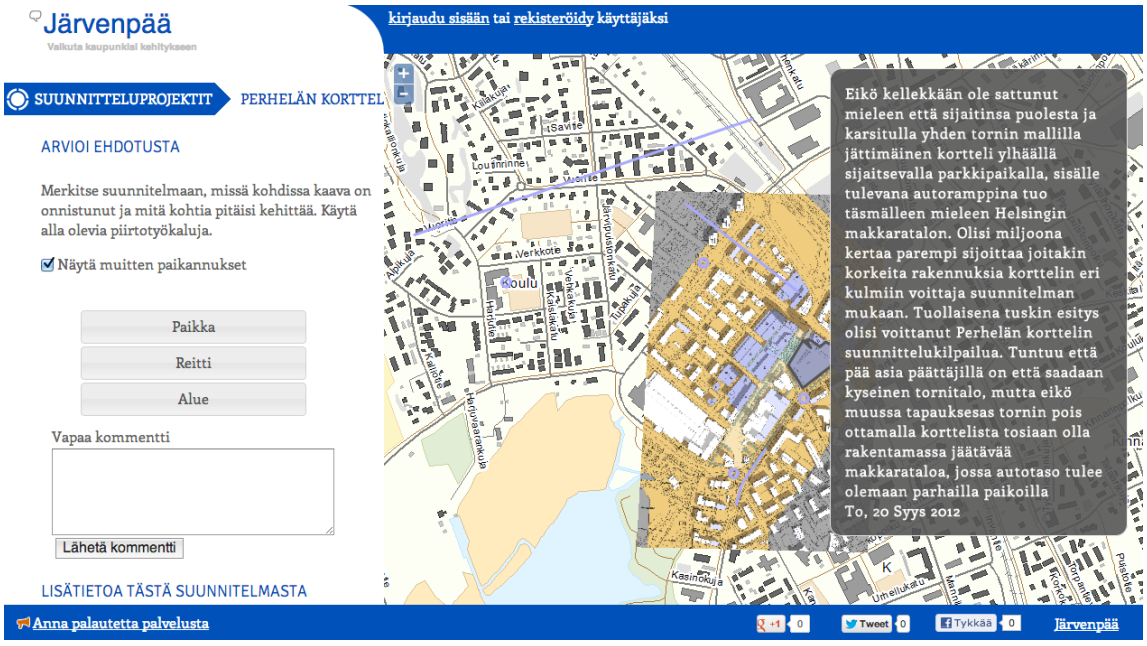

Fig 4. The planning proposal application with a user comment; the application is currently used in the city of Järvenpää, Finland

The planning proposal application is still under development and requires further testing with the end users. Until now, a few problems related to the service have emerged. Most of them have been related to presenting the draft plan in a manner understandable for the citizens. The problem also includes the data

format of the plans which is not open or otherwise compatible with web mapping. Nevertheless, the municipalities have shown an interest in further development of the service and the development is ongoing.

Idea competitions

Idea competition is a way to present urban planning ideas to the public for evaluation. In the city of Vaasa an idea competition was organized with the help of an internet evaluation application. Citizens were allowed to view graphic representations of the ideas, read the explanations, and then evaluate the proposals according to several factors, such as: activities, atmosphere, social, aesthetic, and overall. Citizens were also allowed to submit free comments. In the Vaasa case there were four ideas that had been developed to facilitate the evaluation work for the citizens. Thirty six evaluations form the users were collected during the idea competition phase. Fifty percent of the evaluations were directed towards one of the ideas and the rest of the ideas got an equal amount of four evaluations each. This indicates a usability problem in the software as the idea that was listed the first on the list received the half of all contributions.

Further development concerning the idea competitions has not been made due to lack of resources. The idea competitions did not have a clear business model and thus the costs of maintenance and further development could not be covered. In this case, we can say that we did not successfully follow lean methods, which led to the service that did not suit the customer needs, and was not able to guarantee the economic sustainability.

Analysis application

To inform the decision making process, the local knowledge collected through the questionnaires has to be presented in a comprehensible manner to urban planners, according to their informational needs, role in the process, and the level of knowledge and skills. To this date, *softGIS* data exploring applications have been developed separately for specific questionnaires with specific data sets. The analysis has been done for each questionnaire in desktop GIS, and did not automatically support different questionnaires with different semantic combinations of the data. The biggest obstacle to develop a generic visual-analytical application has been the lack of the well defined ontology for collected data. At this stage, the analysis application development is resource-expensive and is not an ongoing effort. Whether such a service is necessary depends largely on the level of skills of the users. If the level of skills of the data recipients allows them for the manual data operation in desktop GIS environment, the service will not be implemented. In this case, following lean thinking prevented spending resources on an unnecessary and overly expensive feature.

TOWARDS LEAN METHODS

The implementation of lean methods in software development is challenging. It might take years of work and require a change in the organizational culture to support the lean thinking. It is typical for project customers to have numerous, overly specific, and even conflicting requirements. In case of the urban planning, some of the requirements might not support the initial idea of public participation in urban planning, nor solve the existing problems faced by the citizens, the planner, or the municipality in general. Evaluating which requirements are actually valid and necessary is a demanding task as such, and being able to explain why something has not been implemented or will not be implemented might be even more challenging. The lean processes are to a large extent about people and their beliefs in how things work and should work. Changing organizational cultures and being able to implement lean software development requires effective communication between the project stakeholders, customers, users and developers of the service to form a common ground.

In the long run, the governments and the municipalities are expected to be the main customers of PPGIS services. For such actors, the contracts with software developers or service providers have to be specific. This is a fundamental problem that hinders implementation of lean software development methods for government projects. Lean software development methods are about not making large designs upfront before testing some basic features in practice. This requires a different kind of model to fund and develop the

software to be used by government agencies. Nevertheless, we see the potential in lean methods especially in the context of online PPGIS, which is still an uncertain area for software developers and their customers.

When the agile development movement started, it took years before the benefits and results were found. The benefits of lean development seems to follow the same route. There is a clear hype cycle of lean methods as there is increasing amount of successful books and online materials covering it. However, there is still no clear evidence of the benefits of lean development methods, only a clear incentive towards lean practices. The metrics for lean development in the context of PPGIS still have to be developed and followed. Some of the metrics might be the resources used for the software development, the number of user per service, cases supported by the service and so forth. As we stated earlier we consider the sustainability of the software functions and the whole family of services as the core evaluation criteria.

Sustainability, however, cannot be the sole criterion, especially in such a socially and politically vulnerable and value-laden domain as urban planning. For instance, the goals of the adopting organization might be contrary to that of disadvantaged groups, and there is always a need for the sensitive evaluation of the broader societal influences of the participatory technologies. Nevertheless, if the goal of PPGIS efforts is to continuously improve the decision-making and to provide a long lasting social value, system sustainability remains essential. We might say that the sustainability is the core criterion for the evaluation of the software and its development process, while task and social outcomes should serve as the criteria for the evaluation of the whole PPGIS endeavour.

CONCLUSIONS

In the paper we articulated the need for improved sustainability of the Public Participation GIS services for urban planning, as well as the basic evaluative criteria for the PPGIS efforts. As an effort to overcome the low rates of the real-life adoption of participatory technology, we proposed the use of the lean software development methods for PPGIS software. To exemplify the software development methods in use, we presented several ongoing development projects within the softGIS service family, along with the examples of practical implementations in urban planning cases in Finland. The future work will focus on the evaluative criteria for the software development processes, the sustainability of the services, as well as the task and social outcomes of PPGIS projects. The knowledge base will be broadened by expanding the customer base for the software including the municipalities and planning agencies in Finland and in other countries, such as Poland and Portugal, as well as among different customer and user groups. The long term goal of current softGIS efforts is to develop a set of sustainable and flexible tools for public participation in urban planning that are able to operate in various cultural, institutional and organizational settings, thus contributing to sustainable urban development globally.

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