Requirements Survey and Documentation of a Geo-information System Applied to Land Value Capture Policies

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Extended Abstract

In this paper we present an ongoing research that seeks to determine how the spatial characteristics of geo-information have to be considered, and included in a system requirements documentation.

In the last decades, researchers point out that the production and use of maps is no more an exclusive task of cartographers or geographic information experts (Green 1993, Brus et al. 2010, Brown et al. 2013). Due to technological advances in GIScience and Cartography, and the easiness in acquiring, disseminating, and using geographic information systems and geospatial data, users from different areas of expertise produce their own geo-information products. However, significant problems can be observed in these products, as a result of this geographic information spread: the lack of theoretical knowledge in Cartography results in cartographic products with communication problems (Green 1993), deficiencies in understanding the significance of data (and thus their analysis), lack of context for data use or data control (Brown *et al.*, 2013), to point out just a few.

One of many different areas that work with spatial information is municipal governments for the collection of taxes on land, such as the land value capture policies. Land valuation represents the increment of a land value

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due to public investment in infrastructure. When a land parcel benefit from certain service – like urban paving; constructions of public squares and parks; access to bus stops and terminals; sewer systems; water supply; among others – its value tend to increase. However, the parcel owner had no direct influence on this valuation. It's socially unfair for a private owner to benefit from a public investment that should improve the whole community. So, land valuation capture refers to the return to society of the amount of undue valuation. One way to capture the land valuation is through *betterment taxes*. Those taxes are applied over a valued land, so the amount can be reapplied to fund and enable new investments and to benefit the community. In order to be fair and efficient, the charging of those taxes should be based on spatial analysis. Those analyses must be accurate because the collection of taxes directly affects taxpayers and, therefore, the society. Consequently, the use of geographic information systems by municipality technicians must achieve this desired goal.

We propose a Requirements Engineering (RE) approach for the design of a geographical information system to the problem of land valuation capture. Through well-known techniques of Requirements Engineering (Kotonya & Sommerville 1998, Sluter *et al.* 2014, Sommerville & Sawyer 1997), we aim to collect and document (ISO, EC & IEEE 2011) the information from users of the system. The requirements engineering allows computational systems to be built according to the users' needs, by incorporating their needs in the early stages of the system construction, and referring to those needs during the entire construction process. However, despite being widely used in computational science, requirements engineering is poorly used in GIScience. There are few methodological or technical contributions of requirements engineering to geo-information system design in the scientific literature. Therefore, this research aims to determine how users' requirements may contribute to the design of geo-information systems for the land value capture policies.

The process of requirements engineering is here divided in four stages, in accordance with the literature, and adapted to the characteristics of the geo-information (Kotonya & Sommerville 1998, Sluter *et al.* 2014). In the first stage, that is requirements elicitation, information about the users will be gathered together with the use context of the system and its application domain. Following, the elicited information will be analyzed and negotiated with the system stakeholders. At this stage the goal is to eliminate or minimize ambiguities, conflicts and misinformation. From these results, the next stage will be the official documentation of requirements survey. The documentation standards **ISO, EC & IEEE 29148:2011 – Systems and Software Engineering – Life-cycle processes – Requirements Engineering** (ISO, IEC & IEEE 2011) will be used as foundation for the definition of a geo-information system documentation standard, taking into

account the geo-information particularities. We are trying to define how those particularities can modify the requirements specification and what could be changed or added in the final documentation for these characteristics to be considered.

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