Multi-Dimensional Land Management Systems: a Delphi Study of the Expert Community

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SUMMARY

With the population rapid grow, land resources are becoming scarcer and valuable, requiring complex and dense urban planning, which coerce the overlapping and integration of structure arrangements in space. This, in turn, enforce an efficient usage of the built environment, meaning that perspectives for utilizing vertical land resources, among others, need to be made. Multi-dimensional Land Management Systems (MLMS) are developed for achieving, handling and analyzing the restrictions, responsibilities and rights (RRR) of land properties in space, time and different levels of detail. Accordingly, advanced multi-purpose sustainable MLMS are crucial to significantly contribute to current space and time built environment demands, as well as serve various end-users, to allow diverse and rich services.

Current research on MLMS mostly put emphasize on technical aspects, e.g., database and visualization. Mapping the functionalities and fundamentals of MLMS is hardly addressed, where the clear purpose and design of these systems, in terms of services they should provide to the various end-users, are still required. Critical questions and change of ideas that will serve as working grounds are still not fully formalized in defining the perceptions of the involved parties - the expert community, where various system definitions should be carefully illustrated.

It is vital to understand the experts perspective regarding the systems fundamentals, and to qualitatively asses their needs and expectations from a functional MLMS. It is also important to realize and model emerging and influential technological trends in land management that directly affect land resources. For this purpose, we designed a Delphi study, that is an iterative questionnaire addressed to the experts community, for investigating and understating their requirements and expectations from MLMS. The experts that participated in this study include real estate, urban planning, transportation, cadaster and geodesy. The study's questions are written in a manner that

does not guide the participants to a specific answer, but rather in a way that enables inferring as much information as possible. The questions are categorized under two groups: 1) semantic, theoretical and mathematical definitions focusing on the contributions, importance, and practicalities of MLMS (for example: "How many dimensions are needed for describing temporal changes?" to understand whether time should not be handled as a single dimension, since it may represent several change types, e.g., geometrical, topological and thematic); 2) questions related to data management, e.g., data structure and data model, functionalities and processes, data collection, accuracy, and visualization.

This paper will present the outcome of this Delphi study, and the general guidelines that should be considered for incorporation when formalizing MLMS and its various applications. Results will show that integrating temporal and scale aspects in MLMS need to be analysed and well formalized beforehand. Our Delphi study firstly specifies the disciplines that use MLMSs, and their methods they will use them. According to these, our paper will outline the recommendations for formalization long-term aspects required in an applicative MLMS, which will serve various experts and users from various fields having different needs. These will include, among others, data structure, processes and functionalities that are related to all dimensions.