Chapter 8
Information Visualization and Policy Modeling

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ABSTRACT

Policy design requires the investigation of various data in several design steps for making the right decisions, validating, or monitoring the political environment. The increasing amount of data is challenging for the stakeholders in this domain. One promising way to access the "big data" is by abstracted visual patterns and pictures, as proposed by information visualization. This chapter introduces the main idea of information visualization in policy modeling. First abstracted steps of policy design are introduced that enable the identification of information visualization in the entire policy life-cycle. Thereafter, the foundations of information visualization are introduced based on an established reference model. The authors aim to amplify the incorporation of information visualization in the entire policy design process. Therefore, the aspects of data and human interaction are introduced, too. The foundation leads to description of a conceptual design for social data visualization, and the aspect of semantics plays an important role.

INTRODUCTION

The policy modeling process and lifecycle respectively is characterized by making decisions. The decision making process involves various stakeholders, that may have diverse roles in the policy making process. The heterogeneity of the stakeholders and their "way of work" is a main challenge for providing technologies for supporting the decision making as well as technologies to involve various stakeholder in the process. Stakeholders in this context may be citizens too, whereas often the term "eParticipation" is used in this context. Information visualization techniques provide helpful instruments for the various

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stages of decision making. To elaborate the different stages of policy making and the role of visualization in each stage, we have developed three-stepped design process for the roles of visualizations in the policy modeling lifecycle (Kohlhammer et al. 2012). The model propagates the steps of information foraging, policy design and impact analysis, where various visualization techniques can be applied to. These steps are investigated in particular for the FUPOL project, where the information foraging stage covers the visual representation of various data and data formats to get a comprehensible and understandable view on the given masses of information without losing the context and targeted task. The impact analysis step will use and cover both, the outcomes of the simulation activities of FUPOL. The outcomes of the statistical data mining methods will be covered to support both, the active and passive involvement of the citizens and to provide a kind of "public mood" about a certain topic.

For decision making in the policy life cycle, Data, information, and knowledge are crucial and important resources. Beside storing, managing and retrieving data, one important factor is the access to the increasing amount of data. A promising discipline facing the information-access challenge by investigating the areas of human perception, human-computer interaction, data-mining, computer vision, etc. is information visualization. One main goal of information visualization is the transformation of data to visual representations that provides insights (Keim et al. 2010) to users and enable the acquisition of knowledge. The access to data is provided by interactive "pictures" of knowledge domains and enables solving various knowledge and information related policy tasks. These "pictures" are generated through transformation and mapping of data (Card et al. 1999) to visual variables (Bertin 1983) that are perceived by human to solve tasks (Shneiderman 1996). Different approaches on creating this "picture" of data provide various ways of perceiving visual representation of data and interacting with them. The most popular way is to get first an overview of the entire domain knowledge in an abstracted way, followed by zooming and getting more detailed information about the knowledge-of-interest (Shneiderman 1996). This top-down approach (*Information Seeking Mantra*), proposed by Shneiderman (Shneiderman 1996) makes use of our natural interaction with real world. Getting into a new situation forces us to build association of known or similar situations and create an overview of the context. Further interactions in this situation are more goal-directed and detailed. The complementary bottom-up approach, premises that we are able to verbalize a problem or direction. The visual representation is then generated by the results of a search query. Based on the amount and complexity of the results various visualizations may provide abstracted views or detailed visual knowledge representations.

The process of information search can be further optimized by the technologies and methods of formalized semantics and ontologies, in particular in context of the Semantic Web.

Semantic Web targets on a machine-readable annotation of data to provide a "meaning" by defined and formalized relationships between resources on web. (Kohlhammer 2005) While Semantic We focuses on the machine-readability, Information visualization focuses on the maximization of our perceptual and cognitive abilities (Chen 2004).

In context of Information Visualization the aspects of data, user and tasks are of great importance. For designing Information Visualization tools the question: which data to what kind of users and for solving which tasks may provide an adequate design process. In this context the recent research investigates in particular the feedback loop to the data in Visual Analytics, the model-based visual knowledge representation in Semantics Visualization and the cognitive-complexity reduction of users in Adaptive Information Visualizations (AIV).