

Scientific report

Purpose of the visit. The 15 days long visit of Alexander V. Lotov, Professor of Lomonosov Moscow State University, to University Rey Juan Carlos (Spain) was related to the research in the framework of the ESF project “Toward Electronic Democracy (TED)”. The research is devoted to application of the methods for informing the lay stakeholders on the tradeoffs between multiple decision criteria through Internet in participative decision making as participative municipal budget planning. In particular, it was planned to use the Web decision support methods and software tools developed in Russia in the research related to supporting of participative decision making at the municipal level, which is carried out by the University Rey Juan Carlos in the framework of the TED project.

Description of the work carried out during the visit. During the visit, the research was aimed at the development of the methods for integrating the visualization-based methods, which inform the lay stakeholders on the topics related to municipal budget planning and support them in expressing their individual preferences through Internet, with the methods aimed at constructing a group decision in a fair transparent way. Informing and supporting the lay stakeholders implies informing and supporting of non-mathematicians. Thus, developing of simple and user-friendly, yet rigorous, group decision support methods is needed. During the visit, intensive research was carried out aimed at the development of such methods. The main ideas developed in the framework of the research were formulated in the form of a paper that will be submitted to one of the international journals. Prof. A. Lotov gave a seminar talk “Methods for Pareto Frontier Visualization and their Application in Decision and Negotiation Support Systems” and a lecture “Application of Pareto frontier Visualization in Decision Support Systems” devoted to the visualization-based approach to multicriteria decision making developed in Russia.

Description of the main results obtained during the visit. As the result of the research, a new approach to the developing of participative decision support tools was proposed. Shortly speaking, it applies interactive Pareto frontier visualization combined with expressing of preferences in the form of goals, which are then used in goal-based arbitration procedures for the design of the group decision. Thus, the aim of the study was to develop such a procedure in web that can transform stakeholder's preferences into the group decision in a fair transparent way. The procedure must be

simple enough to be used in the case of lay stakeholders. To satisfy the simplicity requirement, the preference information must be obtained from the stakeholders in a way that could be easily understood and applied by them. On the other hand, such information must be sufficient to be used in rigorous arbitration schemes.

In the procedure developed in the framework of the research, the preference information is restricted to the goals that are specified by the stakeholders. The single-shot goal identification turned out to be the simplest form of expressing the preferences, which is convenient for the decision makers. Thanks to their simplicity, the goal methods have found a broad real-life application. However, the goal method has a disadvantage – if the feasibility information is unknown, the goal may be too ambiguous or too pessimistic. In the case of experts, this problem may be not too important since experts understand the feasibility frontiers and can locate the goals consciously. However, the lay stakeholders usually do not possess such information. In this case, using their goals as the preference information is impossible. To solve the problem, the stakeholders are informed on the Pareto frontier provided in a graphic form in the framework of the proposed approach. This information must help them to understand the feasibility frontiers and apply the goal methods consciously. In the case of more, than two criteria, visualization of the Pareto frontier can be carried out by the Interactive Decision Maps (IDM) technique. Identification of the preferred feasible goal supported by the Pareto frontier visualization is known as the Feasible Goals Method (FGM). Combination of the FGM with the IDM software results in a simple graphic tool for Web decision support that informs the users on the Pareto frontier in multicriteria decision problems and provides a framework for goal identification. In the framework of the developed approach, the FGM/IDM technique is used for supporting the stakeholders in the process of identifying the feasible goals. Since the stakeholders are supported by visualizing the Pareto frontier, they can identify the feasible goals consciously. Thus, the goals can be considered as the maxima of their value functions over the Pareto frontier. This interpretation of the goals selected by the stakeholders can be used for constructing the group decision rule. Several possible goal-based arbitration procedures were considered and their properties were discussed. In particular, the arbitration method developed at the University Rey Juan Carlos was adapted to the preference information expressed in the form of feasible goals.

This concept will be implemented on Internet in the client-server environment. The initial preparation of the decision information will be carried out at the server. Then, stakeholders will receive (via Internet) the prepared information and the Java applet that supports independent exploration of the Pareto frontier. Finally, with the help of the applet, they will have to specify the feasible goals, which will be used in arbitration procedures applied at the server.

Future collaboration with the host institution. Future collaboration includes implementation of the Web tools, which were developed in Russia, in the research carried out in the University Rey Juan Carlos in the framework of TED project. One of the research topics will be related to experimental application of the procedure developed during the visit. Experimental application of the procedure in the University Rey Juan Carlos and in Lomonosov Moscow State University is planned. Moreover, it is supposed that the concepts developed during the visit will be applied in the participative budget planning procedures developed by the University Rey Juan Carlos for the government of Madrid. It is planned that Prof. A.Lotov will take part in this activity.

Projected publications/articles resulting or to result from the grant. As one of the results of the visit, the paper was prepared entitled “Framework for participative group decision support over the web based on Pareto frontier visualization, goal identification and arbitration”. Along with Alexander Lotov, the paper is co-authored by David Rios Insua, Professor and Vice-Rector of the University Rey Juan Carlos, and Roman Efremov, who is working at the University Rey Juan Carlos on leave from the Computing Center of Russian Academy of Sciences supported by a young post-doctoral foreign researchers grant of the Spanish Ministry of Education and Science and the TED program. The paper describes the concept of integrating the Web-based Pareto frontier visualization methods with the methods aimed at constructing a group decision in a fair transparent way. Possible applications related to participative budget planning are discussed.