Designing Access Control of a Spatial Decision Support System for Collaborative Maritime Spatial Planning

Mikko Rönneberg*, Søren Qvist Eliasen**, Pyry Kettunen*, Christian Koski*, Juha Oksanen*

* Finnish Geospatial Research Institute FGI, firstname.lastname@nls.fi
** Nordregio, firstname.lastname@nordregio.org

Abstract. Successful maritime spatial planning processes require stakeholder engagement and participation, thus requiring tools that support collaboration. Communication-driven spatial decision support systems are designed to facilitate decision making processes of complex spatial problems and are therefore suited for this task, but there are unresolved questions about user access control for these systems. In this study, user access control was designed for a spatial decisions support system for collaborative maritime spatial planning based on observation of two user tests. It was found that there were three distinct groups of users with special access needs to collaborative functionality. The level of access to functionality was organised into three groups: passive *participants*, actively contributing *collaborators* and managing *moderators*.

Keywords. Spatial Decision Support System, Maritime Spatial Planning, User Access Control

1. Introduction

Maritime Spatial Planning (MSP) is a public process of analysing and allocating human activities in marine areas to achieve objectives specified usually by political processes (Pınarbaşı et al. 2017). The MSP processes and dialogue are generally organised and lead by public planners. Stakeholder don't participate in all phases of the MSP processes, but when they do, their roles are clearly defined (Collie et al. 2013). However, the competencies and knowledge of the stakeholders often differ (Morf et al. 2019, Luyet et al. 2012). Successful MSP processes require stakeholder engagement and participation (Pınarbaşı et al. 2017) and thus require tools that support collab-

Published in "Adjunct Proceedings of the 15th International Conference on Location Based Services (LBS 2019)", edited by Georg Gartner and Haosheng Huang, LBS 2019, 11–13 November 2019, Vienna, Austria.

This contribution underwent double-blind peer review based on the paper. https://doi.org/10.34726/lbs2019.28

oration (Rassweiler et al. 2014; Pert et al. 2013; Center for Ocean Solutions, 2011).

Spatial Decision Support Systems (SDSS) are designed to facilitate decision making processes of complex spatial problems and are therefore suited for the task of MSP. SDSSs provide a framework that integrates database management, geospatial analysis, visualisation, and expert knowledge of decision makers. (Densham, 1991) SDSS can be categorised based on their focus area, such as, data, models, knowledge and communication. Communication-driven SDSS facilitate the communication between different stakeholders to generate some form of results. (Stelzenmüller et al. 2013) To determine how this collaboration works, for example in a SDSS, it is important to know what functionality users have access to in the system. This is determined by the concept of access control or control of user access. In role-based access control (RBAC) permissions assigned to user roles are defined beforehand and users are then assigned to roles based on their responsibilities. The main benefit of RBAC is the low administrative overhead of assigning users permissions, but it also has shortcomings, such as, lack of flexibility and fine-grained control. (Tolone et al. 2005)

This study focuses on designing role-based access control in a communication-driven SDSS for collaborative MSP called Baltic Explorer. The key questions regarding the RBAC are: what user roles are required and what functionality do the user roles have access to? To identify the user roles and their functionality requirements the use of Baltic Explorer was observed in two distinct user tests.

2. Methods

Baltic Explorer is a communication-driven SDSS for collaborative MSP being developed in BONUS BASMATI - Baltic Sea Maritime Spatial Planning for Sustainable Ecosystem Services project. As a web map application, Baltic Explorer is suited for all devices with modern browser support. The user interface is designed for both small and large touchscreens but also for PCs with traditional input devices. In Baltic Explorer users collaborate on a shared workspace where they can share and also edit shared features. Users can also select data to overlay in the shared workspace for other users to see. This collaborative functionality of sharing, editing and overlaying causes many access control challenges, as users of communication-driven SDSS in a collaborative MSP usually have different responsibilities. To gain insight into how groups collaborate using such SDSS for collaborative MSP, Baltic Explorer was used in two distinct user tests. During the tests all participants had access to most of the functionality of Baltic Explorer.

In the first "Workshop test", Baltic Explorer was tested with users in the Pan Baltic Scope cross-border meeting: "Better maritime planning – towards a shared future, together" organised by FIAXSE in Umea, Sweden. The participators were mainly MSP planners and stakeholders. The test focused on examining which functionality of a collaborative SDSS helps in common MSP tasks. Baltic Explorer was used to support the task. Both groups had two facilitators, one (a planner) acting as the meeting chair and the other managed a shared view of Baltic Explorer on a large screen. The rest of the participators' utilised personal devices to use Baltic Explorer. In the second "Game test", Baltic Explorer was tested twice with each three group types: MSP students, GIS experts and non-experts. The test focused on examining how well each device configuration (personal, shared or both devices) supported common MSP tasks. All groups of three were assigned the same task of playing an MSP game. The goal of the game was to collaborate in preparing a plan that takes into account the interests of each participator and the overall interests of the group. The groups used Baltic Explorer either on personal, shared or both devices. For this study, the main research method in both tests was observation of the roles participants took while using Baltic Explorer.

3. Results

During the tests the participators were observed to identify distinct roles. In the "Workshop test" the participators were observed to pay close attention to the shared display managed by a facilitator. The facilitator was observed to be a distinct role as they control the shared display. Some participators also often interacted via the shared display. Participator were observed to physically move to the shared display to contribute into the discussion, even though they had a personal display to work with. This occurred when their personal view of the workspace was in a different state than the shared view, for example, a participator might have been editing a feature not yet ready to be shared on the workspace and wanted to join the conversation. Thus, active participators were observed to be a distinct role. During the "Game test", in the groups with personal displays and a shared display, one or more participator were observed to performed the same tasks as the "Workshop test" facilitator. They kept the shared display synchronised for the group to have an updated view of the workspace. The shared display was also used to edit features.

Access control for Baltic Explorer, including user roles and access to functionality, has been designed based on the observations from the tests while taking into account the context of MSP and SDSSs. Role-based access control was chosen over only a user-based access for Baltic Explorer since only a few user groups with special access to collaborative functionality were identified. Thus, Baltic Explorer has three user roles: *participant*, *contributor* and *moderator, Figure 1*. Each user can use their own device to access the workspace and manage their personal view. Users can also use their personal device to present their personal view as the shared view visible for all.

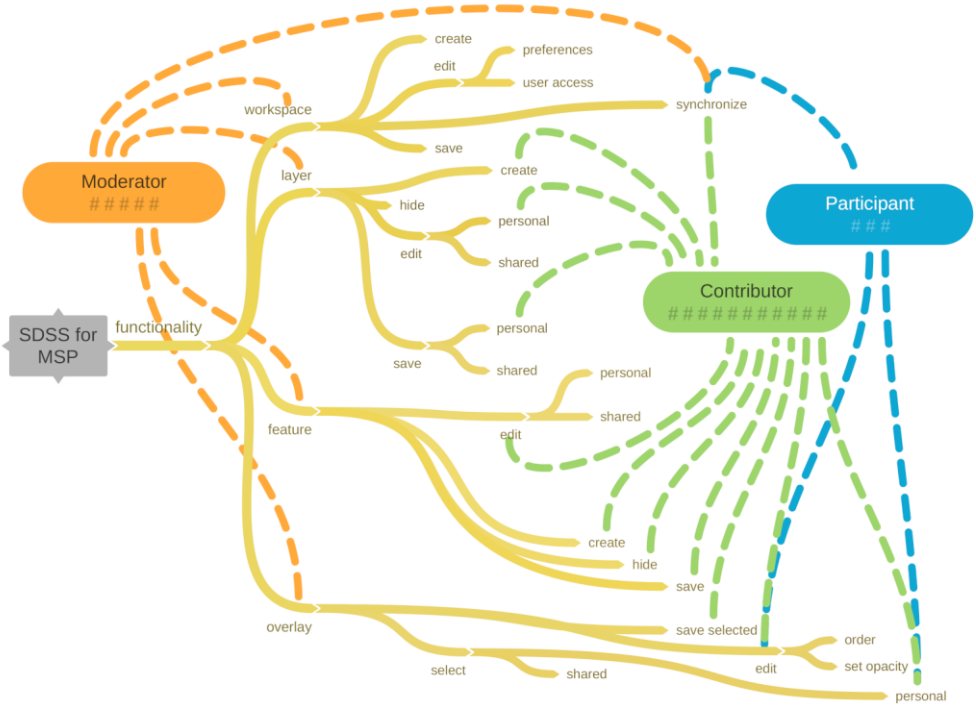

Figure 1. The functionality user roles have access to in a Baltic Explorer workspace.

The *participant* group only has access to basic functionality, such as, viewing features and overlaying data, *Figure 1*. They can select the overlaid data of their personal view, but when they synchronise the overlaid data of the shared view is updated in their view. In an MSP setting, persons who don't actively want to contribute to the task but instead are interested in the process phases and the results of the task, can be assigned as *participants*. The *contributors* group has access to sharing functionality, such as, adding features to the workspace for all to see, *Figure 1*. *Contributors* can select and save the overlaid data of their personal view, share and edit features on the workspace and synchronise the workspace using their personal view. *Contributors* can be, for example, planners or stakeholders who actively want to contribute to the tasks and take part in the decision making. The *moderator* group has access to all functionality regarding the workspace, *Figure 1*. The *moderator* controls the workspace, keeps the shared view synchronised for all viewers and selects the overlaid data visible to the synchronised personal views of *participants*. All layers and features created by the *contributors* can be edited by the *moderator*. It is intended that a *moderator*, who has access to all the workspace functionality, should be the one controlling the shared view. The *moderator* can, for example, be one of the meeting organisers in an MSP setting.

4. Conclusion

In this study, control of user access was designed for a SDSS for MSP based on observing user tests. It was found that there were three distinct groups with special needs of access to collaborative functionality. The level of access to functionality was organised into three groups: passive *participants*, *actively contributing collaborators* and managing *moderators*. The designed access control should be further evaluated in other phases of MSP to further refine the functionality each user group has access rights to. Development of Baltic Explorer will continue based on these findings.

References

Center for Ocean Solutions (2011). Decision Guide: Selecting Decision Support Tools for Marine Spatial Planning. The Woods Institute for the Environment, Stanford University, California. Available at: http://pacmara.org/wp-content/uploads/2013/03/cos_pacmara_msp_guide.pdf [Accessed 10 JUL 2019]

Collie J. S, Beck M. W, Craig B, Essington T. E, Fluharty D, Rice J, Sanchirico J. N. (2013). Marine spatial planning in practice. Estuarine, Coastal and Shelf Science, 117, 1–11.

Densham, P. J. (1991). Spatial decision support systems. Geographical information systems: Principles and applications, 1, 403–412.

Luyet, V., Schlaepfer, R., Parlange, M. B., & Buttler, A. (2012). A Framework to Implement Stakeholder Participation in Environmental Projects. Journal of Environmental Management, 111, 213–219. http://dx.doi.org/10.1016/j.jenvman.2012.06.026

Morf A., Kull M., Piwowarczyk J., Gee K. (2019) Towards a Ladder of Marine/Maritime Spatial Planning Participation. In: Zaucha J., Gee K. (eds) Maritime Spatial Planning. Palgrave Macmillan, Cham, https://doi.org/10.1007/978-3-319-98696-8_10

Pert P. L, Lieske S. N, Hill R. (2013). Participatory development of a new interactive tool for capturing social and ecological dynamism in conservation prioritization. Landscape and Urban Planning, 114, 80–91.

Pınarbaşı K, Galparsoro I, Borja Á, Stelzenmüller V, Ehler C. N, Gimpel A. (2017). Decision support tools in marine spatial planning: present applications, gaps and future perspectives. Marine Policy, 83, 83-91.

Rassweiler A, Costello C, Hilborn R, Siegel D. A. (2014). Integrating scientific guidance into marine spatial planning. Proceedings of the Royal Society of London B: Biological Sciences, 281(1781), 20132252.

Stelzenmüller V, Lee J, South A, Foden J, Rogers S (2013). Practical tools to support marine spatial planning: A review and some prototype tools. Marine Policy. 38. 214–227. 10.1016/j.marpol.2012.05.038.

Tolone W, Ahn G, Pai T, Hong S. 2005. Access control in collaborative systems. ACM Comput. Surv. 37, 1 (March 2005), 29-41. DOI=http://dx.doi.org/10.1145/1057977.1057979