

# ICT-based Toolbox in OCOPOMO Project and Potential Methods for Integration

Peter Butka<sup>1</sup>, Marián Mach<sup>1</sup>, Tomáš Sabol<sup>1</sup>, Karol Furdik<sup>2</sup>

<sup>1</sup> Technical University of Košice, Letná 9, 040 01 Košice, Slovakia  
{peter.butka, marian.mach, tomas.sabol}@tuke.sk

<sup>2</sup> Intersoft, a.s., Floriánska 19, 040 01 Košice, Slovakia  
karol.furdik@intersoft.sk

**Abstract.** This paper describes solutions for integration of a SW platform in the OCOPOMO project, where ICT is used for the support of policy modelling by a combination of narrative scenarios, agent-based modelling, and e-Participation tools (all integrated via an e-Governance platform). The policy model for a given domain is created iteratively using cooperation of several stakeholder groups (decision makers, analysts, representatives of companies, civic society organisations, etc.). The paper provides basic information about the project, high-level design of the SW platform architecture, overview of integration technologies and a short discussion of their possible use.

## 1 Introduction

Current trends in e-Governance aim extend the paradigm of service provision towards a participation of relevant stakeholders and the public in a collaborative policy creation, while targeting challenges like efficient ICT support in foresights, managing complexity in policy making within complex socio-economic environments, developing appropriate policy models and IT solutions to support them. The design of a software platform and methodology providing an environment for modelling policies in a collaborative manner is in the focus of the EU FP7 R&D project OCOPOMO. One of the main problems in the development of the software platform is integration of particular components. This paper describes work in progress, information regarding this issue – state-of-the-art analysis of integration methods and discussion about their usage for the OCOPOMO platform. Next section provides overall description of the project with general architecture of the software. Then, current integration methods and technologies are presented as well as short discussion of their reuse in OCOPOMO case.

## 2 OCOPOMO Project and General Architecture of ICT Toolbox

The approach of the OCOPOMO project (Open Collaboration for Policy MOdelling, <http://www.ocopomo.eu>, see also [2]) focuses on long-term planning for governmental policy operators and decision makers. The project goal is to provide

and implement ICT-based support for integration of scenario generation, formal policy modelling and simulation experiments within one collaborative environment. The consortium of the 3-year project, which started in January 2010, consists of 10 partners from 5 European countries (Germany, Italy, Poland, Slovakia, UK) is coordinated by the University of Koblenz-Landau. The project results will be tested on two pilot applications - in Italy and Slovakia.

The policy modelling approach adopted in OCOPOMO is a combination of agent-based bottom-up and econometric top-down approaches. At the beginning of the iterative process involved stakeholders and analysts collaborate in the process of scenario development. The generated narrative scenarios are then used as a basis for two types of policy models, where experts produce a common macroeconomic agent-based simulation model. The designed policy models are then visualised and simulated. Validation and evaluation will produce revisions (alternative scenarios or changed individual models) serving as input for the next iteration.

One of the innovations of the project is in enabling stakeholders' collaboration using an ICT toolbox for communication, seamless information exchange, storing, searching and manipulation with the digital content. A high-level architecture of inner components and interfaces of the proposed ICT toolbox is presented in Fig.1.

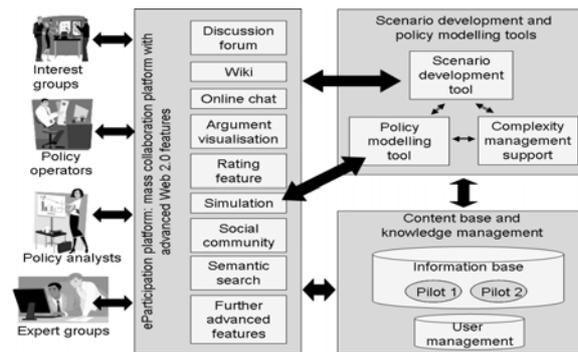


Fig. 1. ICT toolbox supporting open collaboration in OCOPOMO.

The open collaboration in narrative scenario development is supported by an e-Participation platform that encapsulates e-participation and collaboration features. Included tools provide place for scenario development supported by discussions, assessment and rating features of the policy description. The module of participation platform comprises of a collaborative space of the shareholders' community (content management, personalised data, annotation and enhanced search, customised scenarios, etc.). Tools for the policy modelling, visualisation and simulation will be integrated and functionally interconnected with the scenario development.

### 3 Integration Methods and its usage for OCOPOMO

One of the most important tasks for development of the OCOPOMO platform is to find an efficient and well functioning solution for integration of all the components.

Integration is a difficult task in process of system development. In general, the integration project should answer three basic issues [3]: 1) definition of integration architecture; 2) selection of integration infrastructure and technologies; 3) development and maintenance of integration documentation.

Two basic approaches to integration of several components are available - bottom-up and top-down. In the first case communication of components is processed directly between them and problems are fulfilled where necessary from the scratch, in second case there is high-level integration architecture. The most important types of integration are [3]: 1) data-level integration (moving data between applications); 2) application integration (sharing functionality or logic achieved through the use of application programming interfaces - APIs); 3) business process integration (existing solutions are take part in distinctive steps with business methods combined using business process modelling); 4) presentation integration (unified view of the information system in one presentation layer hiding background applications).

The basic infrastructure layer is the communication layer, which provides abstraction for communication details and transparency for accessing different remote systems and unifies the view on them. Technologies used for integration are often called middleware, a short overview of technologies can include:

- Database access technologies - simplest way for data-level integration, important for accessing and unifying of database connections, technologies are basically of two types - function-oriented and object-oriented access.
- Message-oriented middleware (MOM) - client/server infrastructure that enables and increases interoperability, flexibility, and portability of applications. It enables asynchronous communication between applications over distributed and heterogeneous platforms, with APIs for functionality access.
- Remote procedure calls (RPC) - similar to MOM, but with synchronous communication. Main idea is related to Distributed Computing Environment (DCE). Implementations of RPC protocols come from ONC/RPC specification, analogical systems are based on Java RMI, .NET Remoting, or XML-RPC.
- Object request brokers (ORB) - provide transparency on location, programming language, protocol and operating system. Interfaces are used for communication between objects, where communication is synchronous (usually) or asynchronous, and based on the location services within network.
- Web services - provide technological foundation for achieving interoperability between architecture elements based on the SOA, where basic aspects are XML messaging system, self-description of services and discoverability.
- Application servers (APS) - software platforms able to handle most of the interactions between clients and server tiers, provide a collection of already mentioned middleware services for deploying of business logic components.
- Enterprise service buses (ESB) - software infrastructure which acts as a mediator connecting services implemented in different technologies. ESB products are designed using JBI (open-source: Open ESB, Apache ServiceMix, etc.).
- BPM and workflows - business process can be modelled as a workflow, modelling can be done on different levels of details. Most successful standards are now BPMN for visual modelling and BPEL for execution.
- Content and presentation integration – portals and content repositories. There are several portal solution based on the specification of JSR168/268 or WSRP, like

Apache Pluto, GateIn, Liferay etc. Content Management Interoperability Services (CMIS) is a specification for improving interoperability, where Alfresco is probably the best solution.

In the OCOPOMO project we need to integrate different applications - toolbox for e-participation, simulation tool, policy modelling tool, etc. The main questions regarding the integration issues are: what approach will be used and which technologies will be implemented. Both approaches (top-down and bottom-up) are suitable for OCOPOMO, so it should be decided according to the technologies, which are reusable for particular components within platform and its possibilities for integration. Currently, we have several CMS-based systems with collaboration features (like Alfresco, Drupal, Joomla, etc.), simulation tool Repast or Mason, rule engine called DRAMS (developed within the OCOPOMO project). Scenario generation tools will be implemented based on the e-participation features. Since modelling and simulation tools will be integrated using standard API with basic data integration and a later expansion of the software is not expected, bottom-up approach for integration seems to be suitable solution. It means simple API/Data integration (wrappers, XML-based data exchange) of portal-based CMS/collaborative tools (Alfresco, best with CMIS-based API), Repast/Mason and DRAMS, and scenario generation tools implemented within selected portal solution (Alfresco Share or some other portal solution in Glassfish APS or JBOSS). The second option (if more flexibility will be needed in the future) is to design a top-down architecture of integration based on the web services combined individually for portal or through ESB solution. More details about this work-in-progress paper and its possible solutions will be discussed within the presentation at the workshop, where already new information will be available.

## 4 Conclusions

In this paper we have presented collaborative policy modelling as applied in the FP7 ICT OCOPOMO project and short discussion related to integration of particular simulation, modelling and e-participation tools in OCOPOMO software platform, which will be designed and implemented within the project.

**Acknowledgments.** The OCOPOMO project is co-funded by the European Commission within the 7th Framework Programme, contract No. 248128. The authors would also like to acknowledge the contributions of and express their gratitude to all the OCOPOMO project partners.

## References

1. Nowak, A., Szamrej, J., Latane, B.: From private attitude to public opinion: A dynamic theory of social impact. *Psychological Review*, Vol. 97, 362-376 (1990)
2. Furdik, K., Sabol, T., Dulinová, V.: Policy Modelling Supported by e-Participation ICT Tools. In: Proc. of METTEG 2010 conference, Olten, Switzerland (2010)
3. Juric, M., Loganathan, R., Sarang, P., Jennings, F.: SOA Approach to Integration. Packt Publishing, Birmingham, UK (2007)