Challenges in End User Development for Services

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ABSTRACT
The Third International Workshop on end user development for services (EUD4Services) focuses on the challenges faced by researchers and practitioners in applying End User Development ideas and principles to the area of service-oriented software design and construction. The topic is a natural development following on from two previous workshops which charted the territory of existing tools and research systems, and created a community of researchers and practitioners working in the area. This year edition aims to define a shared research agenda which can direct future work acting as a catalyst of joint effort towards the establishment of EUD for services.

Categories and Subject Descriptors
D.2.6 [Software Engineering]: Programming environments--Interactive environments. D.3.2 [Information Storage and Retrieval]: On-line information services--Web-based services. H.5.3 [Group and Organization Interfaces]: Collaborative computing.

General Terms
Design, Experimentation, Human Factors, Management.

Keywords
Annotations, Component-based systems, End-user composition, End-user development, Meta-design, Service composition approaches, Service-oriented architectures, Web services.

1. INTRODUCTION
Service-oriented software promises to bring flexibility to organisational support, allowing applications to be constructed "on demand" thus keeping track with changing needs. Constructing such software has so far been the prerogative of software professionals, who are trained to manage the complexity of software technology. Attempts to open up this activity to non-programmers, such as "mashups" have been mostly driven by details of the underlying technology such as event propagation and data connections between services.

Researchers from the End User Development community [3] have created theoretical and practical results which can be useful for opening up service software construction to non-programmers. However, the uptake of EUD within the SOA paradigm is hampered by a set of emerging issues, including intrinsic difficulties stemming from the complexity of technology and distributed nature of computations [4].

The workshop aims to sketch a research agenda on the topic of EUD in service-based computing which can influence several streams of research in software engineering, human-computer interaction, and services computing. Our goal is to bring together researchers and practitioners who have faced the problem of making the SOA paradigm available to end-users, might have some ideas on how to facilitate it, and have experimented with these ideas. We expect to generate a debate on the potential of SOA for non-technical developers in both professional and personal lives, highlighting the major drivers and barriers to the establishment of the EUD paradigm for service design.

2. WORKSHOP PLAN
The workshop aims to explore the set of challenges arising when opening up service development to end users, and fuse the most pertinent ones with an analysis framework developed through the previous workshops to create a roadmap of this emerging area of research.

Following this aim, we will start with a keynote presentation by Professor Gerhard Fischer. A number of challenges will then be presented and discussed by their contributors. In the afternoon, we will introduce the EUD4Services analysis framework and will work together on validating the framework and on using it to create a roadmap of EUD4Services.

3. CHALLENGES
We are indebted to the following additional contributors1 to our review of challenges involved in applying EUD to the Services Sector:

- Antonio Piccinno, Università degli Studi di Bari
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- Carla Simone, Università degli Studi di Milano Bicocca
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- Fabio Paternò, CNR
- Federico Cabitza, Università degli Studi di Milano Bicocca
- Liliana Adissono, Università degli Studi di Torino
- Maria Francesca Costabile, Università degli Studi di Bari
- Maristella Matera, Politecnico di Milano
- Matteo Picozzi, Politecnico di Milano
- Paolo Bottino, Sapienza Università di Roma
- Stefano Valtolina, Università degli Studi di Milano

1 Names are listed in alphabetical order of first name.
3.1 Tools simplification
Contributors highlighted the complex nature of contemporary web services and the associated standards, stressing the negative effect this has on the usability of environments which aim to support the development of service-based applications. The connection between services was categorized as taking place at three levels: directly between service components in a style exemplified by BPEL, between service components and the overall application, and directly mediated by the user interface. The latter two were perceived to lend themselves better to EUD activities, yet appropriate user-centric design combined with semantic reasoning technologies can produce tools which can also support specifying service connections to the direct connection level.

In addition, our existing observations show these models are person-specific, since they are influenced by education, level of programming skills and work background. Therefore another challenge is to choose between finding a general representation suitable for all users, or the alternative of allowing the representations used by service development tools to be personalized for different users and different contexts.

3.2 Domain-specific tools
One approach to resolving the technical complexity is to create tools which “speak the language of the user” reflecting the terminology, concepts, and rules (the domain) the user is comfortable with [1]. The idea underlying this approach is to give up on generality to focus on the specific knowledge of the user, creating tools which are grounded on the tasks at hand.

The domain-specific approach requires an in depth analysis of the work practices in the specific domain to be supported. It relies on the user domain experience, which is used as main design metaphor to create artifacts operating upon familiar information, concepts and processes.

3.3 Personalisation
Personalizing the representation of services and their connections to the different users is believed to reduce the cognitive gap between the representation of the service application and the mental model an individual user has of that application. Creating mechanisms allowing such personalization was perceived by our contributors as one of the key challenges of the area, requiring advances on a number of issues:
(a) Tool architectures allowing radical personalization of interface elements;
(b) Automatic mechanisms for personalization;
(c) Creating a system of user profiles linked to best representations and level of functionality exposed.

3.4 Context-customisation
Similar issues also arise when customizing a service development tool to context – we need to devise a customizable structure of the tool, we need to design mechanisms allowing automatic customization, and we need to create a taxonomy of context attributes which influence the tool to a sufficient degree to warrant customization.

Another dimension of using context is to enable the service applications created by end users to adapt to context of deployment. For this we need to represent user-relevant context elements and the effect they have on the service application in a way comprehensible by our end users, and devise mechanisms for turning low-level context sensor events into meaningful high-level context information. This relates to the challenge of semantic tagging which also featured in the contributions to challenges submitted by our participants.

3.5 Semantics of Services
Another major challenge is related to service discovery. With the proliferation of available services, successful end user discovery and consumption requires the development of user-oriented notations for describing the service functionality, performance, reliability, costs and other attributes. The use of ontologies and semantics for service specification is a mature area of research which as of yet is not concerned with the specific requirements of users who do not come from technical background.

Another challenge included the use of semantics to facilitate service composition. Once the data consumed and produced by services is semantically tagged, we can use logic reasoning to semantically connect different services and automate the construction of different service application and activation of other systems. In such a system (e.g. [4]) an end user would be able to create service applications by just selecting from a shortlist of compatible services for the different tasks in the application, a shortlist which is automatically prepared by the system.

3.6 Collaboration and Support
It is accepted that the tools for end users developing service applications should support the social aspects of annotating, discovering and using services to compose them in working applications, then sharing this applications and the experience of creating them with the user community. The challenge is to design appropriate social mechanisms allowing social support and sharing of design artifacts, and to provide support for these within end user-oriented service development systems and approaches.

Another challenge would be to study users working together on annotating a service or creating a service application, and, accepting the role of semantic annotations of services and designs as a contextual and cultural mediator, to identify appropriate representations for a specific domain or a specific group of users.

4. ACKNOWLEDGMENTS
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5. REFERENCES