Databases and information systems are crucial for a large variety of today’s networked applications. Together with Web technology they form the major tools to manage the information flood on the Internet and provide pervasive information access anytime anywhere. However, deficiencies in interoperability and the lack of standardized semantic descriptions of different information sources still hamper the synergetic use of multiple systems across the Web. The emerging techniques of web services address some of these problems by trying to standardize semantic descriptions, addressing security issues and fostering interoperability and seamless service integration. However, these problems cannot be solved by information technology alone. Modeling semantics for intended goals relies on human cognition and cultural notions that will need strong interdisciplinary research. Similarly, standardization efforts will only succeed if they find broad acceptance by industry partners.

Issues in Personalization

Networked services accessible from a variety of client devices offering access to up-to-date information are a desirable goal, however, at present their usability for the individual user remains doubtful. Given the increasing variety of services individual users will hardly be able to choose adequate services to satisfy their goals unless effective personalization techniques for can be provided. This is because when interacting with different services users are rather more interested in accomplishing some high level goals, than in the technical details of each specific service. A detailed use case scenario for the desirable capabilities of web services and a discussion of present standards is given in [6].

Effective personalization has to assist the user in:
- Collecting and managing their individual profile information, preferences and dislikes
- Suggesting possible collaborations among services with respect to the user’s goal
- Selecting adequate services for subsequent execution

Generally speaking, a user’s notion of adequate services will strongly depend on several characteristics. The most important aspect will be the explicitly stated query terms or semantic descriptions of the service’s desired capabilities. However also implicit knowledge like a user’s history of interaction (often referred to as the long-term profile), the current intention, a user’s situation (e.g. location, emotions, etc.), a user’s personal background and general assumptions that can be applied on behalf of the domain.

Many research efforts in the area of the Semantic Web involve the gradual transformation of concepts from Knowledge Management and Artificial Intelligence to the Web. However, considering the efforts of traditional expert systems and their subsequent problems, we cannot address these problems using mere deductive, rule-based approaches. Since even with the help of cognitive and social sciences, psychology or analytical philosophy, explicit expert knowledge will be hard and often even impossible to supply [3]. And what is more, the reasoning involved has been proven to contain non-monotonic parts in assessing utilities and the subsequent decision making leading to complex, often even NP-hard logics. But, though the general problem will perhaps never be solved, relying on a restricted set of goals, utilities and profile information can be expected to help in specialized domains.

Personalization Techniques

Anticipated service profiles or usage patterns can help to allow for user-centered service behavior offering support at different stages of the expected interaction process. Incorporating knowledge from cognitive sciences can make the assigning of users to certain patterns even more reliable. Recent research on the nature of commonly used preferences and their integration into databases and information systems has gained broad attention. In particularly, providing an intuitive semantics has been characterized as one of the key issues [4]. User preferences thus have to comprise the notion of relevance and specific users’ expectations in an easy to apprehend manner. In today’s systems, however, personalization capabilities are mostly restricted to the mere declaration of keywords, subscribing to different channels or customizing features like the layout or presentation of information.

But dealing with personalization of information services needs even more than the intuitive collec-
A basic idea is to expand all queries within user interaction with a carefully selected set of implicit information before posing it to the various services. Expansion of queries with synonyms of search terms or thesauri has already proven to be an effective technique in information retrieval applications. Blending user provided explicit requirements with implicit knowledge from long-term profiles, intentions, situations or the domain thus seems a promising technique for service personalization. However, by adding too many query terms a search might easily become too specific and return empty results. Thus for the personalized selection of services based on input parameters we need a cooperative answering behavior that can also handle soft constraints and relaxes query terms in a user-defined way until suitable services can be recommended.

Another research issue deals with the automatic adaptation of content that has to be delivered to the various client devices. Since web services propose a good paradigm for mobile usage, both the posing of queries and the subsequent delivery of content has to be adapted to the user’s client device. Also in this task personalization plays an important role. A probable loss of information on restricted devices has to be set against improvements in presentation quality. Techniques like progressive delivery, automatic stylesheet transformations or summarization have to be incorporated. A study for the case of mobile client devices including personalization and cooperative behavior is given in [5].

**Aims of the APIS Project**

Focusing on all these techniques for personalization and interoperability the APIS project tries to achieve the vision of providing advanced personalization techniques for information services. The benefits of personalized web-based information services are pervasive information access and the usability for wide-spread applications beyond business-to-business interactions and e-commerce. Services for information filtering of news channels, collaboration and information sharing or Internet search engines and portal technology are already beginning to support the information needs and flexibility that are inherent in today’s way of life. Together with innovative wireless technologies and powerful client devices these services can help to pave the way towards unrestricted mobility.

The APIS project is dedicated to bring together researchers from different disciplines to improve the personalization capabilities in today’s information services. APIS would like to invite researchers interested in cooperation on advanced personalization techniques from disciplines like social sciences, psychology or philosophy and especially industrial partners to join. Current participants are (in alphabetical order):

- Wolf-Tilo Balke, Computer Science, UC Berkeley
- Hubert Dreyfus, Analytical Philosophy, UC Berkeley
- Michael Franklin, Computer Science, UC Berkeley
- Ulrich Güntzer, Computer Science, Universität Tübingen
- Werner Kießling, Computer Science, Universität Augsburg
- Klaus Mainzer, Analytical Philosophy, Universität Augsburg
- Matthias Wagner, Future Networking Labs, NTT DoCoMo
- Lotfi Zadeh, Computer Science, UC Berkeley

**Literature**


