Collecting, Reusing and Executing Private Workflows on Social Network Platforms

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ABSTRACT
We propose a personal workflow management service as part of a social network that enables private users to construct personal workflows according to their specific needs and to keep track of the workflow execution. Unlike traditional workflows, such personal workflows aim at supporting processes that contain personal tasks and data. Our proposal includes a process-oriented case-based reasoning approach to support private users to obtain an appropriate personal workflow through sharing and reuse of respective experience.

Categories and Subject Descriptors
H.3.4 [**Web 2.0**]: World Wide Web (WWW) – *experience Web, experience reuse*; H.4 [**Information Systems Applications**]: *Workflow management*; H3.3 **[Information Systems]** *Information Storage and Retrieval*

General Terms
Design, Human Factors

Keywords
Personal Workflows, Social Networks, Experience Reuse

1. INTRODUCTION
During the past years, social networks have been the subject of increasing interest and have demonstrated significant benefits for their users. They allow users to make new friends and to stay in contact with old ones, but also to make connections with people with similar interests and goals. Today, social networks provide and integrate an increasing number of general communication and collaboration services as well as specific apps. For example, the social network Facebook enables to form groups for sharing information about specific topics, it includes mailing and chat services for communication, instruments to enact polls, and apps such as doodle for event scheduling.

While existing services support the execution of particular activities, they still cannot be integrated to form a more complex flow of activities. However, quite often private users have goals that are much more complex to reach and require a more detailed planning of several tasks to be done, involving different people such as friends or professionals. Examples include moving to a different city, changing jobs, changing cars, planning group vacations, etc. These more complex goals require planning and executing a workflow. Unlike traditional workflows, which are typically understood as a means for automating business processes, these workflows are of personal nature. Such personal workflows [1] aim at supporting processes that contain personal tasks and data.

To our knowledge, there is no support at all for constructing and executing personal workflows, although there are many useful services available in social networks or in a cloud. This support gap could be bridged by a *personal workflow management service* that provides the glue among these services by supporting users to construct personal workflows according to their specific needs and to keep track of the workflow execution. However, textual descriptions of personal workflows are already discussed in various specific forums and are an important body of the existing experiential content on the Web. This is a clear indication of private users' need and willingness for exchanging experiences on personal workflows.

As part of the WEDA[1] project, we develop and investigate a new approach for a personal workflow management service being integrated into the social network Facebook. The personal workflow management service will benefit from the social network by

- using the network of people with similar interest (such as a Facebook group) to describe and share experience on personal workflows,
- exploiting existing services for task enactment in a personal workflow during its execution by a workflow engine,
- using the network of people (and possibly professionals) as workflow participants during task enactment.

Figure 1 shows a very simple example of a private workflow for organizing the joint watching of a soccer match with some friends. A personal workflow management service would support the execution of this workflow issuing respective Facebook services. For the first task, it would create a poll on Facebook involving selected friends and collect the answers to determine who wants to join. To obtain the projector, a group mail could be sent to those who confirmed their participation, asking who could bring a

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projector. The "Buy snacks & beer" task could be supported by posting a request on the wall, asking who will bring what, hence everybody sees what item is missing. Once this workflow (including the linking to the Facebook tasks) is available, the user only has to assign the initial people to invite. The remaining collaboration is controlled by the service. Further, this workflow could be shared among a community, such that others could organize their joint watching of a sports event in a similar fashion.

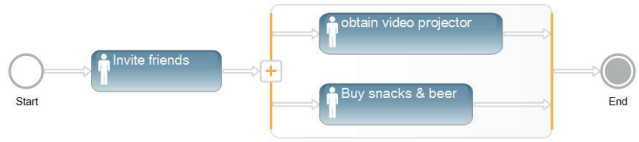

Figure 1 - A Sample Private Workflow

2. THE WEDA APPROACH AND GOALS

To support workflow execution, an executable specification of the personal workflow is needed. Workflow extraction from textual workflow descriptions in forums is one promising approach for this purpose, which we are investigating in a different project [2, 3]. However, in WEDA we follow a different approach. The idea is to let private users model their experience directly in the structured form of a workflow instead of using arbitrary free text. This requires, however, an easy-to-use workflow modeling language and respective editor that is appropriate for private users with little or no technical background. Such a workflow editor should guarantee workflow correctness by construction [4] and thereby ensure that the workflow can be enacted automatically. Furthermore, we aim at supporting private users during workflow modeling by enabling them to share their workflows and to reuse workflows from others. For this purpose, we propose to use a *process-oriented case-based reasoning* approach [5] that enables workflow retrieval and adaptation.

This approach, of course, relies on the willingness of users to collaboratively create repositories of personal workflows, which continuously evolve and expand to new areas. However, similar ideas have already proven successful for scientific workflows (cf. myExperiment [6], Wings [7]), i.e. addressing a community of professional researchers. Addressing private users, however, involves considering sociological issues such as the motivational factors for private users. In contrast to business workflows a personal workflow is assumable only created if its automated execution significantly simplifies the life of the users in the coordination of a complex, collaborative activity.

In summary, we identify the following research goals to be pursued in WEDA:

- To develop a personal workflow management service with the ability to enact and adapt workflows.
- To develop a workflow modeling language and graphical editor that is intuitive to use for private users.
- To investigate how to encourage private users to model their personal workflows using the developed approach.
- To research methods that foster the sharing of personal workflows as resources in a social network. This raises questions about the willingness of people to share resources but also involves technical aspects.

These goals come along with the following hypotheses, which will be investigated in future work:

- Workflow execution support for private workflows within a social network provides significant benefits to users without imposing to much additional burden.
- Social networks can foster personal workflow modeling by providing reusable experience.

3. PROPOSED SOLUTIONS

We now briefly sketch the personal workflow management service that we are currently developing to proof our concepts and hypotheses. Section 3.1 describes the system architecture and the model for access control of shared workflows in a social network. Section 3.2 presents the workflow modeling language and shortly discusses our plans for the integration in Facebook. Section 3.3 describes general scenarios on how we could assist a private user on workflow modeling and adaptation.

3.1 System architecture

The system architecture is illustrated in Fig. 2. The lower part of this figure shows the adaptive workflow management system CAKE [8], which includes a process-oriented case-based reasoning engine [9]. It supports similarity-based retrieval of workflows based on semantic descriptions [10] as well as the automatic adaptation of workflows [11]. The adaptive workflow management system is used for the enactment of workflows.

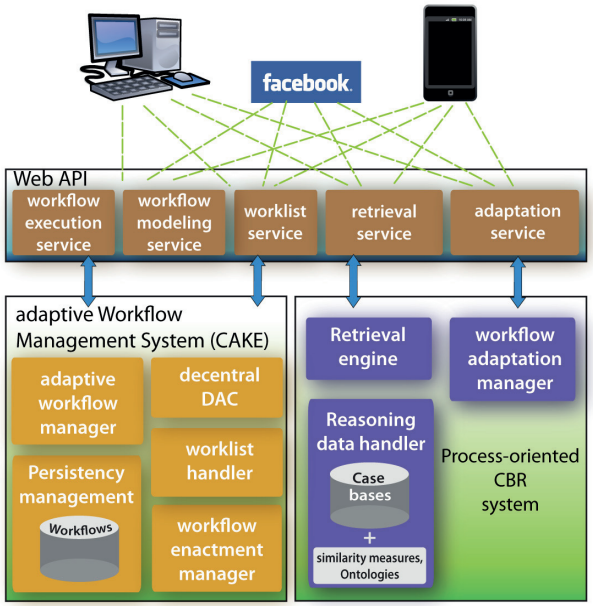

Figure 2- System Architecture

During workflow enactment, tasks have to be executed by services (e.g. a Facebook poll) or certain activities may require human workflow participants (e.g. friends in the social network). The responsibility for this delegation is taken by the worklist handler. Above the just described core system, a Web API layer supports its integration into the social network. Integrating new resources, such as workflows into a social network requires a dedicated model of access control for workflows. This is particularly important because workflow sharing requires that users are enabled to actively control the access rights of *their* personal workflows. In our personal workflow management service, access rights are handled by a decentralized Discretionary Access Control (DAC) [12]. Setting the access rights on a file for a certain user or group is a well-known example of a normal DAC.

By decentralized we mean that a user can transfer access rights to another subject. In doing so, a user can transfer the ownership of a resource or parts of it, e.g. allowing read access. The integration of apps in Facebook is an example of a decentralized DAC, because the user has to agree that the app accesses some of his/her personal information. The basic idea is that every resource in the system (a workflow, a task, and any further resources) has an owner who is allowed to manage the access rights for the resource. A central issue of this access control – also discussed in public – is that after passing the ownership to another subject it is not possible to trace how the shared resources will be used. For this purpose we will additionally integrate feedback mechanisms [13]. This mechanisms leverage the access control model to a more transparent model in which a private user not only knows to whom resources are passed, but also how they are used. Due to this transparency, misuse of the system could also be prohibited.

3.2 New workflow modeling language

The application of web technologies enables us to pursue the development of modern user interfaces independent of the system platform. It allows the development of adaptive user interfaces following L. Sullivan's "form ever follows function" what could be interpreted in context of UI-development as "form follows data" or "form follows user needs". Here, we propose a workflow modeling language (Fig.1 demonstrated already an example) which is derived from UML activity diagrams.

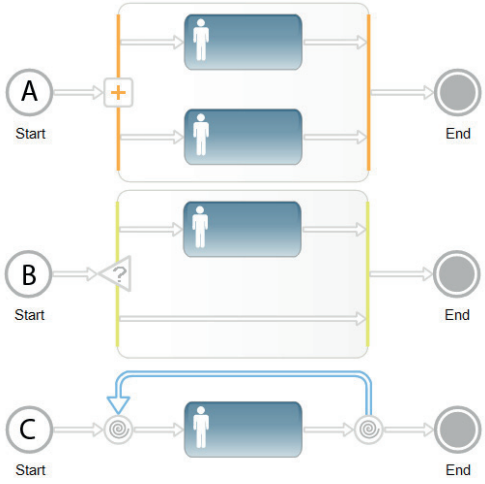

Figure 3 - control flow elements

Figure 3 shows a sketch of the three control-flow structures (parallel execution, conditional execution, loops) we support. Although we only replaced the original UML symbols, we think it will receive more acceptance by business and private users. This assumption is based on current HCI research where "enchantment" is an important aspect and beauty is part of enchantment in using UIs [14]. Furthermore many HCI researchers state that the visual appeal influences factors as (perceived) reliability, usability, information quality, trustworthiness and usefulness [15]. As part of our research, we will investigate what workflow control structures are really necessary for private users and how the control flow of tasks could be visualized even better. In the end we could also imagine a modeling language which does not look like a graph but rather like a game for task delegation.

3.3 Process-oriented case-based reasoning

Workflow modeling usually requires significant skills and experience in the respective domain (e.g. which steps are important when moving to a new city) and in modeling principles in general. Additionally, when performed using some modeling environment, skills in using this environment and knowledge about the available services that can be integrated into a workflow is important. As far as the quality is concerned, a well-designed workflow is hard to produce by a person with no or little experience in workflow modeling. Hence, workflow modeling from scratch is tedious and will probably not be accepted by private users who usually do not benefit from a significant number of repetitive executions of one and the same workflow. To address this problem, we propose a process-oriented case-based reasoning approach sketched below.

To relieve users from the burden to develop workflows from scratch, we aim at supporting a community of users with a similar mindset in collecting their workflows in a repository. This repository is the collective experience in private workflows of this user community and is only maintained by our system. The content of this repository is shared by private users and the access is controlled by the decentralized DAC. Further, every resource (particularly every workflow and every task) controlled by the decentralized DAC can be tagged with annotations, which leads to an enrichment with semantic descriptions. By this social tagging, a private workflow folksonomy [16] for this community will be created. Once the bootstrapping of such a workflow repository (e.g. through content provided by very committed key users; see also section 4) succeeds, less experienced users may obtain their own personal workflows by selecting an appropriate workflow from the repository and modifying it if necessary. For navigating in the workflow repository, we envision two options:

- The users may search for an appropriate workflow by using the tags from the folksonomy. The retrieval engine then proposes workflows with similar tags from the repository for reuse.
- Alternatively, users may start describing their problem by creating a brief sketch of the workflow (e.g. a sequence of 2 or 3 tasks) they are interested in, thereby specifying already some structure of the intended solution. The retrieval component will then propose workflows that contain a sub-workflow similar to what the user has specified. This method is similar to the retrieval via workflow execution traces [17] but our retrieval methods focus on the workflow structure.

If the user is satisfied with the found workflow, s/he can transfer it to the adaptive workflow management system and prepare it for execution. However, if necessary, the user can also manually adapt the current workflow by editing it via the workflow editor. As a step ahead of this manual adaptation, we also envision an automatic adaptation of workflows supported by workflow adaptation cases [11]. Such cases consist of the experience of former adaptations performed by users.

Once the user has transferred a suitable workflow to the adaptive workflow management system, s/he can assign friends or other volunteers for task execution and start the workflow. The workflow management system triggers the task execution in the specified order and monitors their execution status. When it should become necessary in the course of workflow execution, the user can even modify an already running workflow. The agile

CAKE workflow engine therefore provides a breakpoint mechanism [11]. It allows suspending certain areas of a workflow from execution to enable their modification without loss of consistency.

4. GROWING A COMMUNITY

Whether the integration in Facebook will be successful and provide benefits for private users depends on whether a critical mass of users [18] can be attracted. Hence, a core question is how people could be motivated to behave altruistically and share their knowledge in form of workflows. Today, there is no generally accepted solution to this problem, but we think that it is important to gather a couple of active key users to seed the community. Within the WEDA project, we will try find such key users from the students of our lectures on process-oriented information systems. Therefore, exercises in using the personal workflow management service will be included in the lectures. With the community obtained thereby, we also intend to validate the hypotheses we sketched at the end of section 2. For this purpose we will log and evaluate the usage pattern of the platform and conduct surveys via questionnaires.

For the future, an open API for the integration of additional services shall be provided. Thereby developers can create new service tasks and provide them to the community as a shared resource. We assume that the possibility to share every resource (a workflow, a task, and any further resources) and to trace its usage via our decentralized DAC could contribute to the reputation of the person who shared it. In a virtual community it is meaningful to the people to see that their shared resources are useful for others [19]. With a feedback mechanism a user could perceive how her/his workflow model propagates through the network and how it is adapted by others.

The use of a personal workflow management system would not only allow fostering the collaboration between social network friends but also within a broader community. We envision, for example, a "game" for task delegation. A private user could start a public workflow in which some tasks shall be accomplished by volunteers or professional service providers. This is well known as "Humans as a Service" in Cloud-computing [20]. They could be searched by an annotated skill profile or by GPS coordinates if a geographically closeness is important for a task.

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