Case-based Workflow Modeling in Support of Automation the Teachers' Personal and Social Behavior

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Abstract

One part of teachers is very active participant in virtual social space forming Personal Learning Networks (PLNs) with the aim to receive and share knowledge, taking the role of a tutor or a learner. Their time and effort could be optimized if they utilize some functions for automation of important and often repeated activities. The paper explores several possibilities for performance support of teachers when they use their PLNs. The workflow technology of business informatics is applied to model activity structures that could be recommended for following by teachers. This could shorten the distance among learning, effectiveness and time.

Introduction

Nowadays, teachers receive a wide range of knowledge using social networking sites, looking for suitable contacts and appropriate content. They spend less or much time in the networked world performing different activities to search, interact, share, like/dislike, group, etc. Their time and effort can be optimized if they utilize some functions for automation like: group people, group messages, prioritize activities, or if they use tools for searching on a given criterion, filtering, recommending, etc. On the other side, the previous research shows that Personal Learning Network (PLN) has potential to facilitate the development of given personal and professional skills and abilities. PLN can be used for learning through active participation or through observation of others' activities. The teachers' behavior during the PLN utilization can also be optimized through different techniques for automation to shorten the distance among learning, effectiveness and time.

For the purposes of this exploration we use the gathered data from the previous study [Iva 12] and several scientific reports, e.g. Twitter in EFL education [Mor 09], Graasp for collaborative learning [Li 12], social media for engineering communication [Meh 10]. Current research papers are related to the typical activities performed by teachers and learners when they use social networking sites. These activities are not structured in any criterion. One interesting example for activities grouping in time (weekly) is presented in [Wan 12]. The authors perform an exploratory study about the Facebook utilization as a learning management system to facilitate teaching and learning in two elective courses (formal education). For this purpose a special Facebook

group is created. The activities from the teacher side include: information announcement with integrated hyperlinks, pictures and videos; course recourses sharing in format of text, PowerPoint and PDF. The event function is used to organize course content in weeks; two type of discussions are managed: through received feedback after the event announcement and through usage of default discussion function; link to an external survey is created; journaling and monitoring of the students' activities is done. Learners reflect on a topic and share opinion and resources, receive feedback from other participants, and manage contacts. The findings point that learners like Facebook wall used as a notice board and as a journal of activities and content, structuring the activities in weeks, possibilities for communication and interactions. They see the potential of Facebook as a tool for learning management in spite of the existing constrains and limitations. In this example the tutor goes further and groups learning activities in time (weekly) and students appreciate that.

The identified teachers' activities in social networking sites are following: share, communicate, collaborate, comment, give opinion, announce event, announce results, moderate discussion, search, add contacts, upload files, read. We are going further not only to select the activities, but also to ascertain the logically arranged sequences of activities. Modeling of workflows is performed from two perspectives for automation: (1) functional – using the main functions of social media to support teachers (e.g. add comment, add people, upload file, like), (2) operational – considering the personal preferred operations in the process of automation.

The methodology of case-based adaptable workflows is applied to structure the activities of teachers in social networks and to adapt to their personal needs. Case-based reasoning [Aam 94] is related to a collection of cases that record performed activities. These gathered cases could be used to: (1) recommend the most suitable case to support teacher's behavior or (2) to form a new case based on the existing cases and emerging new situation [Min 14].

The aim of the paper is to explore the possibilities for automation of several regularly repeated activities of teachers when they use their Personal Learning Networks and to develop structured case-based workflows. This will be a base and first step for software development. In this work several workflows are created, describing some typical activities for teachers.

Related work

When we refer to the effectiveness of teachers' activities, we take into consideration previous research related to people and content searching, filtering and recommending. In this section several examples showing facilitation of social networks' users through available automated functions are explored. These examples are used for better understanding user needs and existing technical solutions.

Automation techniques

- A method for *selection of social media content* (Twitter) is proposed in [DeC 11]. The selection criteria are based on the different weights for a wide variety of content attributes. The content diversity is quantified then through applying the information theoretic measure entropy. The result set includes minimum distortion on a given topic.
- A system that *tracks conversations* on social platforms (Facebook and Twitter) is developed to identify and *prioritize posts and messages* that are related to a given topic (enterprises). An agent is created with functions facilitating the processes of monitoring, tracking and responding to customers [Ajm 13]. Different messages are connected to different weights to be prioritized. For example, messages with complaints have high priority and stimulate discussion and active participation.
- The problem about *influential users and passive users* on Twitter is treated in [Rom 11]. The authors present an algorithm that identifies who is an active participant and influences others and who is a passive user (does not read messages or ignores them, follows many people, re-tweets rarely). User activity related to posts forwarding is tracked and is a base for algorithm calculation. The algorithm can filter content that is most rated and liked.
- Personalized item recommendation widget is presented in [Guy 10]. Recommendations are done after *collecting the relationships among people, tags and items*. The recommender system is evaluated and the results point that a hybrid people-tag-based recommender has several advantages than recommendations based on people work.
- Another recommender system based on *user-model* is developed in [Set 08]. The software learns user's preferences about the received knowledge, predicts the usefulness of given messages for him and recommends suitable ones. The proposed solution is evaluated using social networking website Orkut and results are promising according to the authors.
- A framework with a possibility to *summarize Twitter stream messages*, retirement of messages and their reconstruction around a given topic is presented in [Yan 12]. An algorithm detects evolutionary events between two different intervals of time. The authors wish to understand how user interests change and evaluate and how topics are trending.

Types of Users in Social Networks

The types of Social Networking Sites (SNS) users according to their performed activities and level of participation are examined in [Bra 11]. The authors divide users in five groups: sporadic, lurkers, socialisers, debaters and actives. The data are gathered after a survey and users' typology is verified after quantitative and qualitative analysis.

An empirical study and analysis about the activities and contributions of users in online social networks are analyzed in [Guo 09]. The findings point that user behavior

is related to daily and weekly contributions through posting, but their participation time cannot be described with exponential distributions. The authors propose models describing how users create links and how their networks progress in time.

The factors that are important for lifetime forming in online social networks are researched in [Lan 11]. They divide lifetime to active and passive according to users' activities and behavior. The prerequisites for passive lifetime are two: received activity and undirected activity among friends of a user. Authors have five recommendations contributing to stimulation of active behavior: encouragement for friendships, making friendships not only with popular users in the network, encouragement for communication, friendly attitude to new users, and encouragement for frequent posting.

For the purposes of our research we divide users of social networking sites to passive and active in their time of usage. They can be characterized by different level of activeness in different time of their learning sessions according to their learning priorities and goals. The users learn by observation or through participation and possess favorite activities. The learning of these users could be optimized if recommendations with structured activities are supposed. Figure 1 presents a model showing the criterion and procedure for structured workflows generation. The software gathers data and understands the favorite activities of a SNS user; creates a user model with preferences; classifies this user in the category of passive or active for the current learning session; generates workflow with structured activities to satisfy or motivate for participation the passive user and to satisfy the active one.

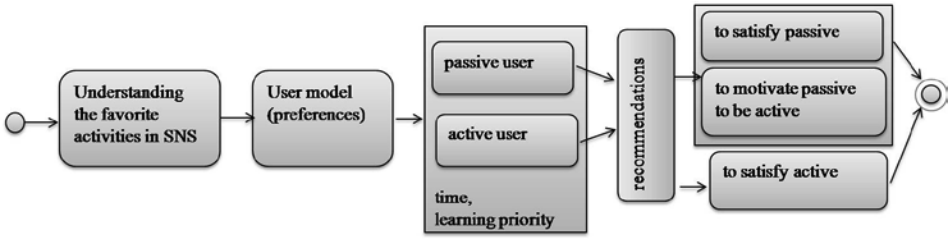

Figure 1: Criterion and procedure for generation of structured workflows

We created two different sets with activities typical for passive and active users. Under passive user we understand a person who prefers to learn alone without getting advantages of participation and communication. Passive users learn through observation: read the shared knowledge, accept or not friendships, follow people, monitor activities, track activity stream, use applications with special purposes, search. The activity set of active users consists of activities that contribute to enrichment of the network knowledge: add comments, publish content/opinion, share link/file, like/dislike, join/create groups, use chat, communicate via direct messaging or other applications, extend contacts, make friendships.

Serendipity, Accidental and Intentional Learning

Usually, learning in social networks occurs accidentally and in a serendipitous way and it depends on the specificity of created Personal Learning Network. Every individual teacher sees different messages and unique information stream. This fact has an impact on learning curiosity and changing learning needs. [Kop 12] argues that emerging applications such as recommenders, RSS aggregators and microblog platforms are effective because they can facilitate serendipitous learning on open online networks. Teachers have control on their PLNs organization, but also they are in touch with unexpected information sources. At this moment serendipity is not automated, just serendipitous content and contacts could be recommended.

On the other hand, PLNs are created intentionally according to the teachers' interests and future plans. This suggests that they strive to be connected to people who are sources of topic related content. In spite of the intentional disposition of PLNs, we find many serendipitous events and processes. In this aspect our supposition in the paper is that teachers respond to serendipitous events in intentionally topic-driven PLNs (Figure 2).

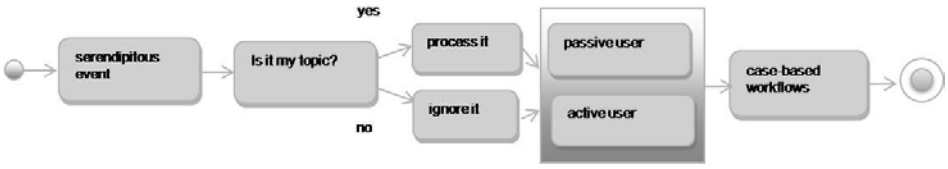

Figure 2: Serendipitous events in intentionally topic-driven PLNs

Research methods

The research design of this paper follows the design-oriented paradigm of business informatics [Hev 04]. It aims at conducting a feasibility study on whether workflow technology is applicable in order to partly automate the work of teachers in PLNs and to increase the reusability of this work. Following a build-and-evaluate cycle as proposed in [Hev 04], a workflow model for learning procedures within PLNs is created (during the build phase) and its technical feasibility is tested by deriving a couple of workflow instances from the activities observed in recent PLNs (during the evaluate phase). The results of this technical feasibility study are a prerequisite for our future work. The two main research questions are: *Q1 Representation:* How can activities of teachers in social networks be represented and structured in a workflow model? *Q2 Applicability:* Can the workflow model be populated by cases (workflow instances) for different learning scenarios and user types?

The representation is developed by creating a workflow model following recent technical standards for workflow design, and the applicability is tested by modeling a set of diverse workflow samples.

Modelling workflows

Traditionally, workflows are "the automation of a business process, in whole or part, during which documents, information or tasks are passed from one participant to another for action, according to a set of procedural rules" [WFM 99]. Recently, a broader notion is emerging, where a workflow describes any flow of activities. This notion includes the activities of a learner during the use of a PLN for a particular learning task. For instance, a learner might prepare a course on a novel topic and use the PLN for identifying the most important issues and for collecting teaching and examination material.

A workflow consists of a control flow and a data flow. A set of activities combined with control-flow-structures like sequences, parallel or alternative branches, and loops forms the control flow. In addition, activities consume resources and create certain products, which both can be physical matter (such as paper books) or information. The data flow describes the interaction of activities with resources and products.

Workflows can be executed automatically by a Workflow Management System (WfMS). The WfMS enacts the workflow and controls its execution. There are two types of activities: manual activities and automated activities [Wes 12]. Manual activities are performed by human beings who might use software systems during execution or who might perform the activity without any software, for instance, by reading a book. Automated activities do not involve a human user; they are executed by a software service, for instance, by a Twitter analysis tool. The WfMS triggers the activities in the order that is specified by the control flow. In case of an automated activity, it calls according to the software service. In case of a manual activity, it informs the user via a work list (a kind of interactive to-do-list) what is to do, which tools and data are available, and whether there is a deadline until when the activity has to be finished. When an activity has finished execution, the WfMS receives the results of the activity via the return values from a service or by a click on the completed button of a work list. Then, the WfMS triggers the next activity or activities.

In this work, several workflows are created, describing some activity structures for teachers in their active timeline and passive timeline. Here are shown the workflows in Business Process Modeling Notation (BPMN) [Wes 12] related to: the process of getting to know a new item from the topic, getting feedback for slides and how to discover an expert for a topic.

Workflow 1: Getting to know a new subtopic from the topic

Workflow 1 for a passive user

W1 describes the process of getting to know a new subtopic from the topic (Figure 3). The first step in the workflow is to receive a serendipitous message. If this message contains intriguing information in the area of the teacher' interests, then the user can go further clicking on the link. Then the software could suggest this teacher to subscribe to the information source (if a RSS feet exists) or/and to follow the person who share this information. Also, the software could recommend a search to be performed for finding the similar information sources or resources. The received knowledge should be summarized in different forms (note taking, passing quiz, game playing, etc.).

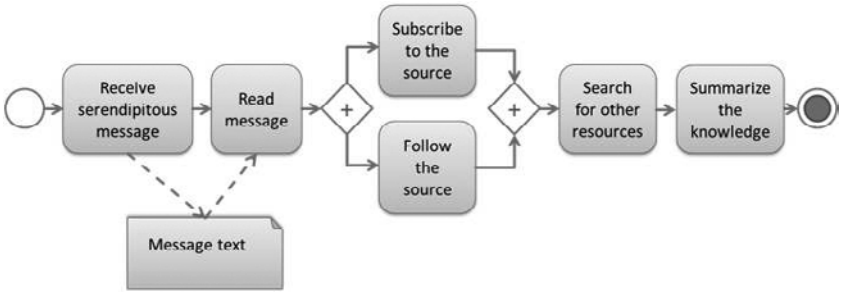

Figure 3: Workflow 1 for a passive user

Workflow 1 for a passive user with an intention to be activated

The aim of this workflow is not only to suppose future activities, but also to stimulate participation of a passive user (Figure 4). After receiving a message and reading its content, at the beginning the person acts as a passive user subscribing to the source or/and following the person who shares this information. Then, the software recommends to post opinion or/and communicate with the human information source. At the final step, the knowledge has to be summarized using different methods.

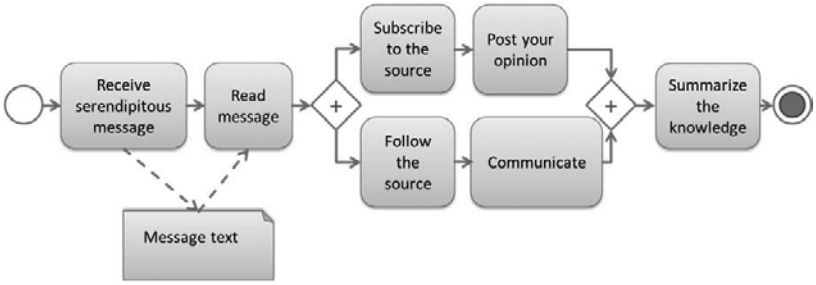

Figure 4: Workflow 1 for a passive user who could be activated

Workflow 1 for an active user

The suitable activities for an active user after reading the content of a message could be to comment/like/share content, search for other resources that could again be commented/liked/shared, etc (Figure 5). The last step is related to drawing of conclusion about the reached knowledge.

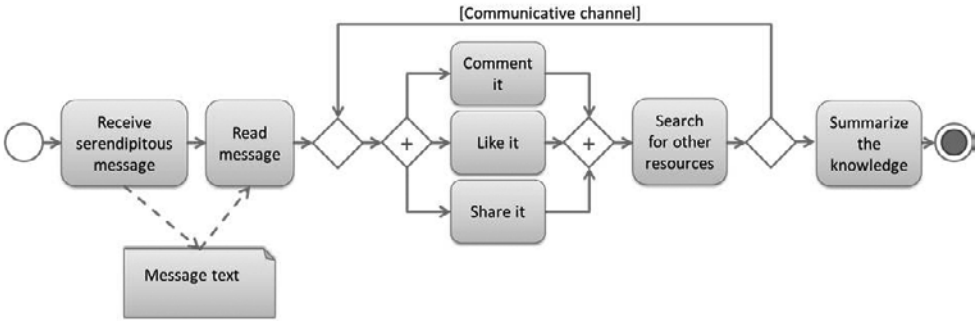

Figure 5: Workflow 1 for an active user

Workflow 2: Getting feedback for slides

Workflow 2 for an active user

W2 describes how to get feedback for slides (Figure 6). W2 is suitable for an active user who is sociable and should publish the content. In the first step the slides should be put on SlideShare. Then the slides could be announced in the social networks and the link could be shared. The user goes further with performing activities such as: to describe the presentation or a separate slide, to ask questions related to the presented topic and to organize a discussion through replaying the received answers. At the end the feedback is collected and summarized.

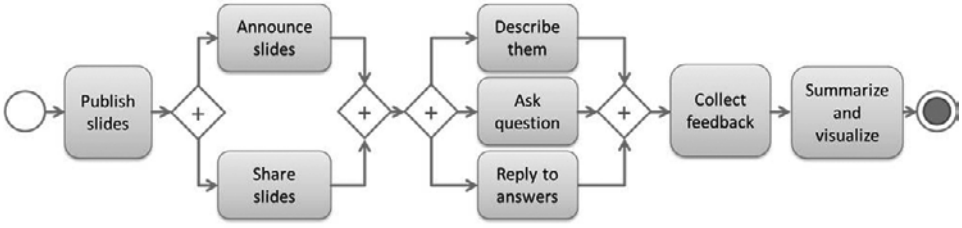

Figure 6: Workflow 2 for an active user

Workflow 3: Discover an expert for a topic

Workflow 3 for a passive user

W3 shows how to discover an expert for a topic (Figure 7). First, the user should be interested in the content of a message and should read it. Then the user could perform content/people search through the Twitter/Facebook stream. The received results should be selected that should lead to the finding of a person with an advanced knowledge about the given topic. In the subsequent step the user could subscribe to the information source or follow the found expert.

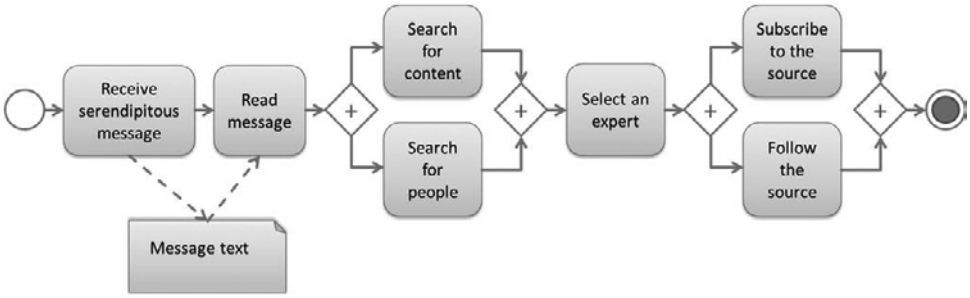

Figure 7: Workflow 3 for a passive user

Workflow 3 for a passive user with an intention to be activated

This workflow is modeled for a passive user who can be activated (Figure 8). In this case as a subsequent step is suggested an active action like communication with the found expert.

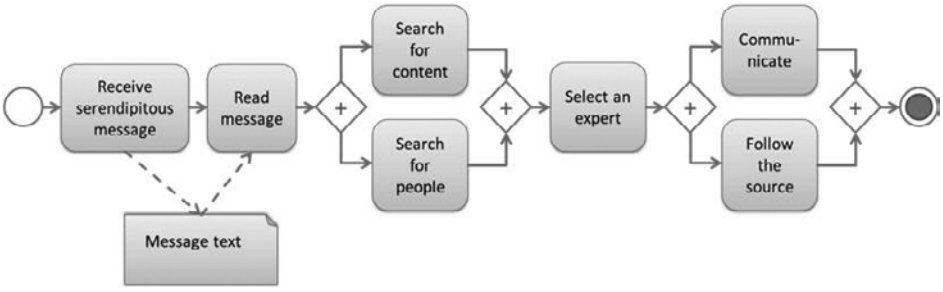

Figure 8: Workflow 3 for a passive user who could be activated

Workflow 3 for an active user

When a user is active and he is looking for an expert, then he could perform several activities: to join a specific group, to connect and communicate with people, to follow them and their messages (Figure 9). Then the user could select the best person fitting his interests.

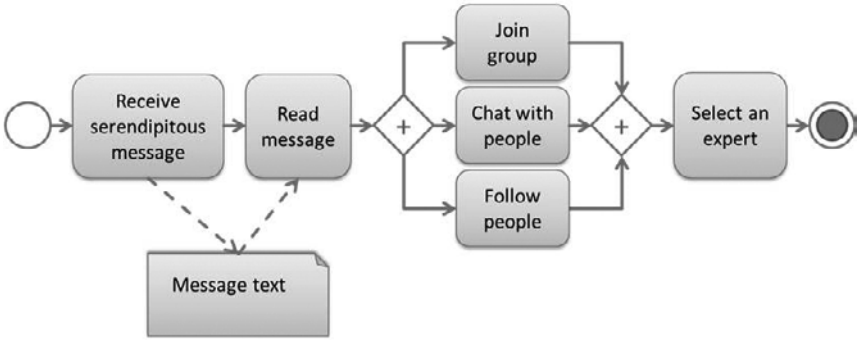

Figure 9: Workflow 3 for an active user

Conclusions

The paper presents models of structured activities in time and according to the learning priority and learning needs utilizing case-based workflow technology. The workflows originate from serendipitous events and they are categorized according to the user type. These workflows describe important cases of activities performed during the PLNs organization and utilization. They will support teachers through recommendations and guidance giving, making their learning more effective. The created workflows are the first step in the process of software development. They figure the main functions for activities' automation and semi-automation facilitating the teachers' personal and social behavior. We think that the automation of typical activities is a crucial prerequisite leading to the achievement of improved learning quality.

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FIGURES

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