

A Socio-Technical Approach towards Supporting Intra-Organizational Collaboration

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Abstract. Knowledge work in companies is increasingly carried out by teams of knowledge workers. They interact within and between teams with the common goal to acquire, apply, create and share knowledge. In this paper we propose a socio-technical model to support intra-organizational collaboration which specifically takes into account the social and collaborative nature of knowledge work. Our aim is to support in particular the efficiency of collaborative knowledge work processes through an automated recommendation of collaboration partners and collaboration media. We report on the theoretical as well as practical aspects of such a socio-technical model.

Keywords: collaboration, media selection, knowledge work, recommender system

1 Introduction

In times of information overload, acceleration of all life areas and world-wide globalization today's companies need highly qualified and motivated employees who are able to handle information efficiently and transfer them continuously into innovation. These knowledge workers are specialists. They have the relevant knowledge about facts, concepts, relations and methods of their working domain or discipline. With their ability to continuously acquire and apply theoretical as well as analytical knowledge, knowledge workers are the most valuable capital of innovation centered companies. In their self-conscious social role as specialists they are even willing to voluntarily share their knowledge out of moral obligation and community interest [1].

In parallel today's companies are looking for new strategies to gain access to and utilize highly qualified and motivated knowledge workers in order to increase the efficiency of knowledge work and to manage the continuously growing complexity of

information, processes and resources. Their major challenge is to turn this hidden capital of knowledge workers into innovation as efficiently as possible.

With this paper, we want to present a socio-technical approach for supporting knowledge workers as contributors to collaborative communities in work-integrated learning. This approach is being developed as part of the APOSDLE project¹.

2 Supporting Collaborative Communities

Collaborative communities are built up and growing through social interactions between knowledge workers with the common purpose to acquire, apply, create or share knowledge. These social interactions can be divided into interactions related to other knowledge workers and interactions related to knowledge, e.g. they *create, use, comment, rate, discuss, tag* knowledge or they *communicate, collaborate, rate, comment* or *tag* on each other. All interactions create new knowledge by externalization (tacit to explicit), internalization (explicit to tacit) and combination (explicit to explicit) of knowledge [2]. With our approach we want to increase the efficiency of knowledge creation in collaborative communities and support their social interactions. Thus we propose two ways of socio-technical support: *recommendation of collaboration partners* and *recommendation of adequate collaboration channels and tools*. Both ways are described in following sub sections.

2.1 Recommendation of Collaboration Partners

Before collaborations actually take place knowledge workers may ask themselves a question like “Who of my colleagues could help me with the work I’m currently doing?” To support knowledge workers in answering questions like this, recommendation of collaboration partners is the first step of our socio-technical support. In APOSDLE recommendations are based on the *work context learning model* [3]. The aim is to recommend for a knowledge worker (i.e. knowledge seeker) a set of knowledgeable persons (i.e. possible collaboration peers) adopting the expert role. To find them, APOSDLE maintains user profiles [4] based on a multi-layered overlay user model. From the user model perspective its structure shows similarities to the *ELM-ART* system described in [5]. APOSDLE’s recommender system can also be classified according to [6] as knowledge based recommendation system because it heavily depends on knowledge about the users modeled beforehand.

The *work layer* of the user model is the basis for calculating recommendations of collaboration partners. It describes all tasks and work processes a knowledge worker has done while using the APOSDLE system. The work layer of the user profile is continuously updated with usage data as the knowledge worker interacts with the system.

¹ The goal of APOSDLE (<http://www.aposdle.org>) is to enhance the productivity of knowledge workers by supporting informal learning activities in the context of knowledge workers’ everyday work processes and within their work environments

The recommender system uses a learning need analysis as described in [3] as the foundation to calculate a knowledge seeker's learning need as well as knowledgeable persons. All found persons are then ranked based on how often they have gained competencies covering the learning need. At the end of this process a ranked list of knowledgeable persons has been generated which then will be presented to the knowledge seeker.

2.2 Recommendation of Collaboration Media

In real-world - especially in computer-mediated - collaboration scenarios the selection of a collaboration tool² is mostly not reflected. Knowledge workers use the tool they like best or the tool everybody use or the tool provided by the organization or company. Very often the tool finally selected for computer-supported collaboration is not at all appropriate with regard to the task to be performed, the collaboration context and the collaboration partners. If we try to improve the performance of knowledge workers, we have to review this part of collaboration.

The research field of media selection provides a variety of different theories: *trait theories* (social presence theory [7], task-oriented media selection [8], media richness theory [9] and task closure theory [10]), *social interaction theories* (symbolic interactionist perspective [11], social influence model [12] and critical mass theory [13]), *experience-based media appropriateness* (technology acceptance model [14], channel expansion theory [15] and effects media appropriateness [16]) as well as *theories considering group dynamics* (media synchronicity theory [17]).

All these theories try to describe the user behavior regarding media selection. If we analyze the different media selection approaches considering experienced knowledge workers with individual preferences, we come to following key conclusions:

- Most approaches consider media selection from the perspective of a collaboration initiator only. The perspective of the cooperation partner is completely left out.
- Some approaches are focused on external conditions influencing media selection while personal conditions are left out (e.g. critical mass theory [11]).

Based on the critical observations [18][19] we design a media selection model that combines the strengths of different media selection theories like technology acceptance model, channel expansion theory, critical mass theory, social influence theory or social interaction perspective. Our *media selection model for intra-organizational collaboration* (see Fig. 1) provides an approach towards recommending and pre-selecting collaboration tools for a certain work or learning context. Therefore our model takes into account three elementary influence factors: knowledge seeker, knowledgeable person and collaborative community.

² We use the term *tool* when describing a software application that provides the functionality to interact via a certain *medium*. Medium refers here to a certain communication transfer channel which stores and delivers information or data between sender and receivers.

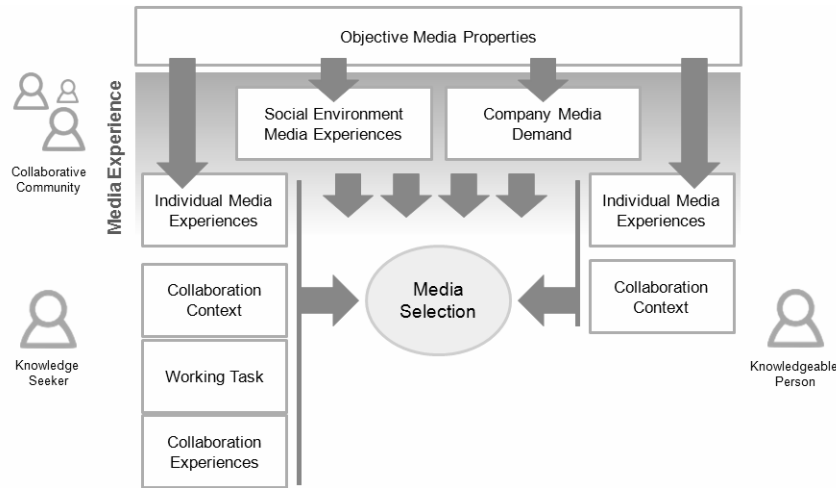


Fig. 1. Influence factors of media selection model for intra-organizational collaboration

On the knowledge seeker's side we differentiate the factors *working task* (complexity and information spreading), *collaboration context* (time pressure, time to answer and location) and *collaboration experiences* (personal perspective and experiences of the knowledge seeker from earlier collaborations with a knowledgeable person). The knowledgeable person also has an own *collaboration context*. In addition, both knowledge seeker and knowledgeable persons are influenced by their *individual media experience*. This factor reflects the personal experiences with collaboration media and tools of each collaboration partner. We also need to consider further environmental influences which affect media selection at both ends: *social environment media experiences* (media experiences of a team, department or other communities) and the *companies media demand* (media experiences of the company or organization). The *objective media properties* (richness, feedback time, synchronicity, re-use etc.) go only indirectly into the model. They influence the individual media experience.

Beside other factors our approach focuses in particular on the medium experiences and preferences of the individual and their social context – for example their collaborative community. Thus it requires in depth knowledge about these experiences and preferences to allow a technical meaningful implementation.

The media experience of knowledge workers can be derived from their collaboration history. But without having initial history information our approach would not be able to produce meaningful recommendations. Therefore we combined this method with a straightforward *collaboration profile based media recommendation* taking the *collaboration profiles* of knowledge seeker as well as knowledgeable persons into account.

With this combination of collaboration profile and experience based recommendation of collaboration media, we support the technical aspect of social

interactions within a collaborative community as well as increase the efficiency in working with knowledge.

3 Conclusions and Future Work

With this paper we proposed a socio-technical approach towards supporting collaborative communities of knowledge workers and motivating them to actively participate in organizational knowledge communities. We aim to support them technically through recommending adequate collaboration partners and recommending suitable collaboration media and tools. We described a media selection model that is based on media experiences and the knowledge workers context. An important feature of our model is that we not only considered the knowledge seeker but also the other collaboration partners (knowledgeable persons) and their social context. The model combines experience-based factors and objective media properties influenced factors. Another advantage of the proposed model is its robustness and the simplicity. Thus if one factor in the model is missing the algorithm still calculates meaningful values.

The next step towards a verification of our proposed model will be a larger evaluation within the APOSDLE context. This evaluation comprises a comparison of model less media selection with our proposed model. In parallel we will analyze reasonable indicators for the efficiency of knowledge work in collaborative communities.

For the recommendation system of APOSDLE we plan to extend and refine the user model by integrating knowledge indication events. This new type of events will be collected in the learning space of the 3spaces model.

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