Attention-Aware Collaboration Modeling

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Abstract. Recently, a great variety of web-based collaboration support technologies (CSTs) have become available for people to collaborate for various purposes. On the other hand, CSTs are leading to more attention stress — more and more people are becoming overwhelmed by many simultaneous projects and the associated tasks. However, little research has been done on how to design collaboration management mechanisms that can help managers control collaboration activities for better collective efficiency. We lay the foundation of research in this regard by developing a model of team collaboration while emphasizing the attention aspects of collaboration, which we refer to as Attention-Aware Collaboration Modeling (AACM). In this paper, we present core concepts and basic principles of attention-aware collaboration management based on Attention Economy Theory.

Keywords: Attention-aware, Collaboration modeling, Attention stress.

1 Introduction

Collaboration management has been proposed to enhance collaboration efficiency (Schuster et al, 2000). However, most existing collaboration management and support mechanisms are based on workflow and groupware systems. Collaboration activities, which are ad hoc and dynamic in nature, cannot be managed very well in such systems. Further, advanced collaboration support technologies have opened a vast set of opportunities for people to collaborate with each other.

Meanwhile, advanced collaboration support technologies such as online meeting systems also created more attention stress: people are being overwhelmed by many tasks and human attention is the scarcest resource. Unfortunately, attention management has not been emphasized in commercial collaborative support systems, rendering them ineffective in helping managers control collaborative attention. We believe that research is needed in this direction. In this paper, we develop an AACM approach for attention management.

The contributions of this paper are threefold: First, we indentify the problem of attention-aware collaboration management and specify requirements for attention-aware modeling. Second, we propose an attention-aware modeling approach to support collaboration management. Third, principles of efficient attention-aware
collaboration management are investigated. To the best of our knowledge, this is the first practical endeavor to embed attention-aware management as a key component in collaboration management.

2 Research Background

Traditional workflow management mechanisms and groupware are widely used by collaborative teams for collaboration support. Each of these mechanisms focuses on various aspects of collaboration and different types of collaboration models are embedded in these systems. For example, Collaboration Management Model (Schuster et al., 2000) draws existing primitives from workflow and groupware models and introduces new primitives for previously unsupported collaboration process requirements. However, to support effective collaboration management, a model of collaboration needs to be defined at a level of granularity, which covers all the major components and mechanisms of team collaboration.

As information in working place has grown increasingly abundant and immediately available, attention becomes the limiting factor in the consumption of information. Based on research in cognitive science and psychology, Attention Economics Theory (Davenport, 2001) defines attention as “focused mental engagement on a particular object of interest”. The key argument for attention economy theory is that attention is a limited resource and attention management has a direct impact of company revenue. Further, human attention, as an important resource in organizations, can be scheduled, shifted and protected. Attention models have also been studied in IS research (Horvitz et al., 2003), where attention was described by Bayesian models and take as inputs sensors that provide streams of evidence about attention and provide a means for computing probability distributions over a user’s attention and intentions.

Similar to other collaboration management approaches, the model proposed in this paper also focuses on collaboration activity and process management. The unique feature of our approach is that human attention is used as a key factor to schedule, monitor and improve collaboration.

3 Problem Specification and Requirement Analysis

In this section, we use collaborative software design as an example to illustrate the problems of collaboration management under attention stress. Consider that a group of seven people from a software company are assigned to the task of designing an intelligent campus system. Out of the ten people, one person is designated as the project manager. The rest six people are divided into three teams (with 1, 2, 3 participants respectively) and each team has a team leader. The process of software design has four main steps, i.e. requirement analysis, architecture design, individual module design, and budgeting. These main tasks can be further divided into more detailed sub-tasks. For example, the design of each module (e.g. financial system, student management, and so on) can be a sub task of the individual module design task. Figure 1 describes the collaborative software design case.