

Cultural Differences in Temporal Perceptions in Global Teams and the Design of an Aware Calendar to Circumvent these Differences

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Our research team is studying the impact of cultural differences on global software engineering teams. The ultimate goal of these studies is to recommend collaborative technologies that will better support development teams. However, we are not at this goal at this point in time but collecting data about the impacts cultural differences might have. We are currently running a study on two Fortune 500 companies that combines semi-structured interviews, ethnographic studies and survey research to attempt to understand two culturally-based research issues. The first of these issues is “what type of temporal perception differences exist between different cultures that comprise the software development teams and what impacts do these differences have on communication and coordination between the cultures?” The second of these issues is “how do cultural differences impact trust between team members and how does this impact affect team member motivation and satisfaction?” The rest of this abstract will discuss the first issue in more detail.

We have run a pilot study on student software teams in order to test out our methods. This study has been conducted over the last year. The study was run at a university known for its diverse student body and also for its online programs in which students - work in virtual teams. An online survey was distributed to teams and follow-up interviews were conducted with a subset of the teams studied. Cultures were identified by the Globe Study [House et al., 2004]. The study found the following temporal perception differences between cultures:

- *Temporal Rigidity* – a measure of how flexible one is to schedule changes
- *Temporal Urgency* – a measure of how concerned one is about the passage of time and the need to accomplish something
- *Lateness Behavior* - a measure of behavior with regard to schedules
- *Lateness Attitude* – a measure of the acceptability of adhering to schedules
- *Future Orientation* – a measure of how much one plans for the future

Interviews with team members found that these temporal differences did impact team member satisfaction, team communication and coordination. The differences did not necessarily affect team performance but made the work of the team leaders much more difficult. Those teams with good leaders who did a good job of managing these differences still succeeded. This management was easier when the teams were less virtual. For example, one team had difficulty with what *deadline* meant for code module delivery by team members. The culture of one team member assumed a finished code module delivered on the day the team set the deadline. The culture of the other team members assumed a finished code module delivered before the deadline so that testing and integration could be accomplished by the deadline. These differences in interpretation of the deadline came from cultural differences associated with authority and control in the two different cultures. The authoritarian culture led to less Future Orientation and thus, no planning for code integration. It was assumed that the leader set a deadline that would allow for time to do the code integration. The more controlling

culture also led to a sense of less Temporal Urgency (no need to be worried about time since I cannot do anything about it) and thus, less of a concern for getting work done at an earlier time because of possible problems that might arise. The team leader managed around this problem by assigning a second person to build the same code module but not without significant team member dissatisfaction.

This work ties in with other work going on at one of the universities of the authors, that is, a study of the problems individuals have with negotiating temporal structures and mapping their ambiguous structures on to electronic calendars [Wu et al, 2005]. New types of calendar features have been proposed that are more ambiguous in their nature, that is, approximate time usages can be scheduled as can relationships between time usage and event capture that impacts other time schedules. For example, one proposed feature is a calendar posting of best times to do activity A (e.g., going to the gym) based on searching other calendar entries.

Although the research team is currently building research models to demonstrate how the temporal perception differences impact team communication and coordination, we are investigating the development of a calendar awareness tool which will help to set schedules and to surmount some of the cultural differences associated with keeping schedules. For example, software teams keep databases of software bugs and software versions. When these are updated, the update events would be appropriate to send to interested individuals' aware calendars. These calendars would understand relationships between the event and other temporal structures in the electronic calendars, e.g., scheduled time on related work. The calendars might propose adjustments to existing schedules or create additional schedules based on the event. Aware calendars would also know about other temporal structures that constrain the lives of their owners. These structures could have cultural rules associated with them, e.g., how flexible the structures are, and how much they impact future structures, e.g., if a scheduled activity is not attended today, must it be attended this week?

The first Fortune 500 company has been interviewed and global team members are now filling out a survey measuring their temporal perception differences. The teams are in China, the U.S., Ireland and India. The surveys are translated to native languages where appropriate. The cultural differences are being measured by a technique called he gap analysis which asks respondents what they feel about a time issue and also what they think distant teams in another country might feel about a time issue. It is the gaps in these perceptions which will be related to coordination and communication effectiveness measures also captured with the survey. Those temporal perception differences that have the largest negative impact will be targeted for design support in the aware calendar.

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Wu, D., Tremaine, M. M. and Hiltz, S. R. (2005) Time Experience within an Organization: How do Individuals Manage Temporal Demands and What Technology Can We Build to Support Them? *In Proc. 11th America's Conference on Information Systems (AMCIS)*, Omaha, Nebraska.