

CTMR Research Update

Center for Technology Management Research Grants

The Stevens Alliance for Technology Management (SATM) has played an important role in stimulating and supporting research in the Howe School. Several years ago, the Howe School Center for Technology Management Research (CTMR) began awarding small grants to faculty with help from SATM. Since then, a number of important research projects have received startup funds from this grant program.

During the Spring Semester of 2002, CTMR released a call for proposals to Howe School faculty. The main purpose of the CTMR grants is to help faculty fund their initial research efforts so that they can pursue larger grants from other funding agencies. The SATM not only provided most of the funding for the current grants, but members of SATM sponsor organizations also volunteered their time to help review and evaluate the proposals.

We received five proposals on various topics relevant to the management of technology. Each proposal was evaluated based on three criteria: (1) the theoretical background and quality of the proposal, (2) the relevance to Alliance members and potential impact of results for Alliance members and (3) the probability of the proposed research attracting external funding. The evaluation panel included five SATM members: Ned Jarmas, Bob Kostelak, Roy Nicolosi, Mike D'Amico and Don Gulliksen. Three Howe School Faculty members also reviewed the proposals: Aaron Shenhar, Ted Stohr and Dick Reilly. The proposals were ranked based on the average evaluations across all categories and the top three proposals were designated for funding. The funded proposals included a diverse set of research topics.

Pat Holahan and Ann Mooney received a grant of \$20,000 for their proposal on *"The role of conflict in project teams: An exploration of its determinants and consequences"*. They focus on the degree and type of conflict that occurs during decision making. *Cognitive conflict* is functional because it is task-oriented and focused on

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judgmental differences regarding decisions concerning task execution, goals, strategy, and appropriate choices of action. *Affective conflict*, on the other hand, is dysfunctional. Affective conflict is more emotionally oriented and focuses on disagreements separate from the task at hand, like power struggles and personal incompatibilities. When affective conflict is high the team atmosphere is usually described as hostile, cynical, and annoying. Cognitive conflict has been found to positively impact decision quality and originality, as well as the team's understanding of and commitment to decisions. Affective conflict, on the other hand, has been found to be negatively related to decision outcomes such as decision quality, originality, commitment, and understanding.

Holahan and Mooney's research will expand on the literature on conflict in project teams by investigating the effect of several task characteristics (task uncertainty, task interdependence, goal clarity), a team composition characteristic (functional heterogeneity), and two communication characteristics (contentious and collaborative communication) on affective and cognitive conflict. Each of these variables is believed to have an appreciable effect on the amount and type of conflict project teams experience. The research will also investigate the effects of conflict on project outcomes such as constraint adherence (e.g. schedule and budget) and innovativeness. This research will be conducted using survey research methods with a sample of 60 project teams. These project teams will be drawn from several high tech companies including Lucent Technologies, AT&T, Mitre, Dialogic and others. This research began during the Summer of 2002 and will be completed by the summer of 2003.

Zvi Aronson, Pete Dominick and Thomas Lechler were awarded a grant of \$30,000 for their research on "*Situational project leadership: Balancing transactional with transformational approaches*". This research recognizes that effective project leaders must be able to formulate and communicate a strategic vision. This same attribute is characteristic of transformational leaders who are able, through their vision and inspiration, to broaden and elevate followers' goals, providing them with confidence to go beyond minimally acceptable expectations. The excitement and enthusiasm potentially generated by transforma-

tional leadership is analogous to the concept of project team spirit which Shenhar (1998) hypothesized would be an important determinant of successful project outcomes. Ongoing research currently being conducted by Aronson, Lechler, Reilly and Shenhar (2002) operationalizes project spirit as a multi-faceted variable derived from project culture, and team members attitudes and behaviors (e.g. commitment, satisfaction and pro-social/citizenship behaviors). Their empirical investigations have found these factors to be strong predictors of project success.

The specific research objectives of this project include:

- Determining whether or not there is a relationship between project manager leadership style (transactional versus transformational), project team spirit and successful project outcomes. Aronson et al's (2002) earlier analysis suggests that the emotional state of a project team (project team spirit) is important for project success. The question remains open, theoretically and empirically, as to how the project leader could influence project team spirit.
- Identifying how contextual factors (e.g. types of project teams, nature of tasks, cost parameters, scheduling parameters and performance parameters) moderate relationships between project spirit and leadership behaviors, and the impact of both of these variables on successful project outcomes. For instance, it is conceivable that for relatively routine kinds of projects transformational leadership behaviors will be less critical. In contrast, for projects with greater technological complexity and/or risks, transformational leadership behaviors should significantly augment transactional behaviors and impact project success.
- Exploring the impact of time on the relationships between model variables. In their recent article regarding time and its influence on causal relationships, Mitchell & James (2001) argue that in a time sequence, dependent variables could actually become the explaining variables for independent measures. For instance, in our model, over time, a positive relationship between perceived project success and project spirit could be hypothesized.

Jeff Nickerson was awarded a grant of \$19,756 for research on *Web Interfaces to Sensor/Actuator Networks*. Although the web was originally a mechanism for sharing documents, it is now being used for commercial transactions. Recently, educational institutions have begun to use the web to control sensor and actuator networks. Stevens has one of the more advanced examples of this, the web-based laboratory. Interfacing with a network of remote sensors and actuators is difficult. Feedback is usually non-existent. And

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usually the devices are shared, creating resource contention queues. While the Internet and other IP-based networks can provide ubiquitous connectivity, these networks often manifest performance lags, increasing the interface challenges. There are a few central research questions which the large proposals will seek to explore:

- Asynchronous and Synchronous modes of control: When are asynchronous versus synchronous interfaces appropriate? Are there just these two modes of interaction, or is there a continuum depending on the types of actuators and the amount of resource contention?*
- Feedback: What feedback mechanisms are appropriate and effective over the internet? Is visual feedback sufficient, or is tactile feedback essential? Are alternate channels for feedback necessary beyond that provided by the internet?*
- Visualization: In circumstances where multiple devices are being controlled, what forms of visualization are appropriate? Is creating the sense of peripheral vision important? Should visualization be guided by simple heuristics, so that decision making data is reduced, or is more information better?*
- Error handling: As mechanical devices are prone to failure, and the internet provides no state information, can reliable modes of control be put in place?*
- Interface Architecture: How should an interface work – is the interface something downloaded onto a client machine – or does it sit near the device, with the user interface essentially a remote window onto the device? How can multiple participants view and share control of a set of devices? How is control passed to another remote user? Is integration with other collaboration technologies necessary?*

Answering these questions will demand a combination of skills in engineering, computer science, and information systems. The goal of this research is to further refine the above set of questions, and lay the groundwork for a large, multi-disciplinary project to be proposed to both the NSF and DARPA.

All grant recipients are required to prepare a report summarizing their results in the form of a Working Paper. Past working papers can be reviewed on the CTMR website: <http://attila.stevens-tech.edu/~ctmr/>.

Management of Technologies Symposium Series 2002

Guarding Your Business: Enterprise Architectures for Security

October 22-24, 2002

Never has the need for security been so great. Never has it been so hard for management to understand the requirements and allocate the necessary resources to safeguard the organization. This symposium aims to bring technology experts and managers together to mutually explore the issues and best approaches to protect the information and physical assets of the organization.

The symposium examines the threats and risks faced by organizations in the post September 11 era. It also provides an overview of the latest security technologies, and presents an information security vision that shows how corporate assets can be protected by using a combination of technical and organizational approaches to security management

Keynote Speakers

Sallie McDonald is Assistant Commissioner for the Office of Information Assurance and Critical Infrastructure Protection in the Federal Technology Service in The General Services Administration (GSA).

Yalkin Demirkaya has fifteen years of law enforcement experience as a detective as well as a detective squad commander. He is the founder and currently the Commanding Officer of the Computer Crimes Investigation Unit of one of the largest law enforcement organizations in the world.

The fee for this timely event is \$700. Alliance Sponsor organizations are entitled to send two people without charge. The fee for additional Sponsor employees beyond two is \$500 each.

Register online:

[Http://attila.stevens-tech.edu/motsymposium](http://attila.stevens-tech.edu/motsymposium)

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Upcoming Events

The next Roundtable Meeting, on the topic of Idea and Knowledge Creation will take place October 7, 2002.

For further information on these and other Alliance activities, contact Dr. Larry Gastwirt: lgastwirt@aol.com