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Using Prediction Markets to Support IT Project Management

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ABSTRACT

Developing obtainable, clear and measurable work expectations early in the project planning process is an important part of successful project management. Converting these expectations into project milestones and communicating openly about progress toward them is critical to every project's success. Optimistic estimation biases of IT workers, poor estimating techniques and group politics can hamper communication and decrease the chances of success. A prediction market is a tool that might help project managers overcome these obstacles.

Prediction markets are online marketplaces that adapt many of the same structures found in stock markets to aggregate information about the probability of future events. These markets have produced reliable estimates in a variety of settings including within corporations. This presentation will describe the design, implementation and evaluation of a prediction market to support the communication needs of an IT project manager overseeing the implementation of a software system within a distributed team environment.

Keywords

Project Management, Knowledge Management, Team Learning, Prediction Markets

RESEARCH OBJECTIVES AND QUESTIONS

Developing accurate cost and duration estimates is a difficult task that continues to challenge project managers in a range of industries (Galway, 2007). Once these estimates have been incorporated into a project plan, often as milestones, maintaining open communication about progress toward these goals is essential to increasing the likelihood of project success (Hartman and Ashrafi, 2002). The standard methods for communicating progress in project settings are meetings, reports and deliverables. However, these methods are hampered by temporal and political factors that limit their effectiveness. For example, it is not often politically acceptable to express doubt about another team member's ability to complete a task on time, especially if that member believes the goal is attainable. A method for improving communication, such as a prediction market, about objectives important to the success of a project has the potential to improve the overall project success rates. The objectives of this study were to design, implement and evaluate the utility of using a prediction market to improve project communication.

THEORETICAL FOUNDATIONS OF THE STUDY

Project Communication

There is debate about the extent to which IT projects are failing (Glass, 2006) and what constitutes a successful or failed project (Baccarini, 1999; Chiocchio, 2004; Crawford, 2002). However, most agree that open and truthful communication is a key requirement for successful project management (Haywood, 1998). In addition, good communication can lead to improved project knowledge, which Kotnour (2000) found to be positively associated with project performance. Although IT project teams recognize the importance of communication, many communication problems are still reported (Hall, 2007). Developing new knowledge about tools for supporting project team communication will be of value to IT project management practitioners and researchers.

Prediction Markets

The hypothesis that markets could efficiently aggregate relevant private information was first articulated by Friedrich Hayek (1945). Wilson (1985) and Myerson (1981) built on Hayek's work to develop theories related to the optimal designs for market mechanisms, for which they won the 2007 Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel (i.e. Nobel Prize in Economics). Prediction markets are mechanisms that adapt many of the same structures found in stock markets to aggregate information about the probability of future events. The use of markets to predict future events has been studied under different names including prediction markets, information markets, event markets, and other names. These marketplaces have produced more reliable predictions than the Centers for Disease Control's statistical models for

predicting the occurrence and severity of flu outbreaks (Polgreen, 2006), the Associated Press' and Gallup's polls for predicting public office elections (Berg and Rietz, 2003), statistical models for predicting Hollywood box office receipts (Gruca et al., 2000) and other traditionally hard-to-predict events.

A prediction market allows participants to buy and sell shares in contracts that mature based on the outcome of future events. Much like a traditional futures market, the price for shares in various contracts is determined by the supply and demand for those shares. An individual accumulates points/money in these environments by buying shares in contracts tied to events that happen. Market prices often are interpreted as the group's consensus. For example, if the price of a stock that pays \$1 if Team A reaches its milestone on time is \$0.55, then it is said that the market consensus is that there is a 55% chance that Team A will reach its milestone on time. If Team A does not reach its milestone on time, each share converts to a value of 0 dollars/points. This is a simple example of a binary outcome prediction market that was pioneered by professors at the University of Iowa in the late 1980s.

The current belief is that prediction markets are accurate for at least four reasons (Polgreen, 2007). First, prediction markets aggregate information from all participants, each of whom has different information about the issue in question. Second, the market provides incentives to encourage knowledgeable participants to reveal information through their trades. Third, the market provides feedback to participants through market prices. Finally, all trades are anonymous. Thus, traders can signal information through the market that they might not want to announce publicly to their peers. Complete anonymity coupled with no rewards likely would result in significantly reduced participation. In this study, the anonymity dimension was balanced with a set of financial and reputation-based rewards tied to overall performance. Only a member's overall performance, not individual trades, were visible to the entire group.

Although empirical studies support the use of prediction markets in contexts where a large group of knowledgeable individuals are available, there has been no research examining the use of prediction markets within corporate environments to support the management of IT projects.

RESEARCH METHODOLOGY

This study adopted a design science research paradigm. Within this paradigm, the boundaries of human and organizational capabilities are extended through the designing, building, application and evaluation of IT artifacts to solve relevant problems (Hevner et al., 2004). The problem this study addressed was how to improve the success rate of IT projects. Improving communication about progress toward project goals is seen as a potentially fruitful approach to improving the success rates of IT projects. Table 1 provides a brief description of the activities this project undertook that map with Hevner et al.'s (2004) guidelines for conducting design science research.

Guideline	Project Activity
1. Design an Artifact	Designed a marketplace where information important to the project's success could be aggregated in a useful format.
2. Problem Relevance	Project success rates and project communication are widely recognized problems.
3. Design Evaluation	Evaluation included the performance of the innovation, usage data and end-user surveys.
4. Research Contributions	The research creates new knowledge about the design, implementation and evaluation of a new method for promoting project communication that practitioners and researchers can build upon.
5. Research Rigor	The research processes and tools were drawn from widely used behavioral research methods.
6. Design as a Search Process	Multiple contract variations were explored within the market.
7. Communication of Research	This presentation is just one of the planned communication methods we intend to employ to communicate the results of our work.

Table 1. Application of Design Science Research Guidelines

PROCESS

Axiom, a large multinational corporation, undertook a project to implement a new integrated software testing environment. The goal of the initial phase of this project was to transition 26 ongoing projects into the new testing environment. The

project manager established milestones for each of the 26 projects based on conversations with the individuals responsible for performing the work. A prediction market was created with contracts tied to each of the individual project milestones.

Trading was facilitated using prediction market software from Inkling Corporation (www.inklingmarkets.com). All participants (N=33) were part of the software testing business unit. They were provided one hour of training, given accounts with 5,000 Inkles (the system's internal currency) and invited to trade stocks based on their beliefs about the likelihood of projects reaching their milestones on time (e.g. Project XYZ will complete automated testing within the new system by 6/15). Milestone dates and level of integration expected varied for each project and were part of the contract description in the system. Team members worked from four locations and were provided with incentives for holding the most Inkles at the end of the project (half-day off of work for first place, company T-shirt for second place and a gift certificate to a local eatery for third place). The prediction market system was used actively for six weeks. After all trading was completed surveys were sent out and awards were distributed.

CURRENT STATUS OF THE PROJECT

All data have been collected and most of it has been analyzed. We are finishing the analysis and interpretation phase of the project.

DESCRIPTION OF WHAT AUTHORS PROPOSE TO PRESENT AT CONFERENCE

The authors plan to present the preliminary results of the study.

Notable Results

- Participation in the market was very high (87%) with the average trader making 23.28 trades over the six weeks that the market was open.
- The market correctly predicted twenty four of the twenty six project milestones (92%).
- The introduction of the prediction market led to a major project milestone being revised and clarified prior to the start of the project.
- A survey at the end of the project suggested that the software was easy to learn and promoted discussion within the group.
- The overall project experience was positive for the group and company management are exploring the potential use of prediction markets in other business units.
- The implementation of a prediction market in a setting where the individuals participating in the market have a great deal of control over the outcome of the contracts introduced concerns about insider trading.

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