# Continuously Improving Innovation Management through Enterprise Social Media

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## ABSTRACT

*This multi-year case study describes how our organization employed enterprise social media technology to change how we elicit, manage, and evaluate the large number of proposals submitted to our in-house research and development program and how we have continued to adopt and modify a single innovation management platform to address the strategic business needs of the corporation. We redesigned the proposal competition process using a commercially available innovation management platform as a mechanism to encourage posting research ideas, commenting on them, and finding researchers with similar or complementary ideas. As measured by a survey administered in two successive years, once when we were using older technology and again after the enterprise innovation management platform was introduced, participants' satisfaction level increased significantly under the new process. This article also provides and discusses participation data over a three-year period. With an increasing business need to reach out to broader audiences beyond the researcher participants, we added a precursor event to proposal solicitation and selection that enables consumers of the research to help shape the research program strategy and outcomes. This extension to the process using prediction markets garnered an encouraging level of participation in its first deployment. Besides describing the steps we took to adapt the technology and design and evaluate the new process, this paper offers observations for other organizations considering using enterprise innovation management software to continuously improve their ideation processes and broaden engagement across the organization.*

## INTRODUCTION AND RELATED WORK

Social media use is being rapidly adopted by business enterprises (Wang, 2011). While a lot has been spent on enterprise social media use for marketing and customer support, organizations are also using social media internally for efforts such as brainstorming, knowledge management, and strengthening social ties (Muller et al., 2012). The Chess Group's (2011) survey of business use of social media tools found that in 30% of organizations, at least half of employees are actively engaged with enterprise social media technologies.

This rapid uptake of enterprise social media tools has clearly provided opportunities for improving life at work (Holtzblatt et al., 2012). Increasingly, organizations have been exploring the use of social media to involve employees broadly in large-scale brainstorming events that go beyond surfacing and discussing ideas, to include refining and evaluating them, as well (Westerski et al., 2013). The socially-enabled platforms designed to help organizations achieve these goals are variously called large-scale deliberation systems, idea management systems, or innovation management systems; we will use the latter term for these platforms.

Studies of the use of innovation management systems have started to appear in the literature. For example, Westerski et al (2013) proposed a taxonomy for classifying and comparing these systems. Bailey and Horvitz (2010) described the use of an innovation management platform within Microsoft. Bjelland and Wood (2008) analyzed the processes used during an Innovation Jam, a "massively parallel conference" (Bjelland and Wood, 2008, p. 32) held online by IBM to propose, refine, and evaluate ideas for potential new products. Jouret (2009) described how Cisco's I-Prize competition was conducted to engage the organization and the public to help generate and choose an idea for a new product. What we have not seen, however, are longitudinal case studies or analyses of the effect of social media on the process of managing ideas within an organization, in large part due to the fact that enterprise social media has become ubiquitous only in the last few years.

Specifically, we were interested in knowing: can social media help to gradually yet positively change processes for encouraging, sharing, collaborating on, and funding innovation ideas within the enterprise? Richardson (2011) states that social media can be used to empower business stakeholders during process development and execution.

If so, how can we evaluate whether the new ideation processes represent an improvement? We had strong motivation for finding the answers to these questions because our corporation wished to change the process for how we collaborate upon and evaluate research proposals during the annual in-house research program (RP) competition.

This paper describes how we used enterprise social media over a five-year period for innovation management, to change how we elicit, manage, and evaluate the large number of proposals submitted to our research program. We started with 17 in-depth interviews to elicit requirements, then performed a survey of commercial vendors to see which idea management systems could potentially satisfy the most requirements out-of-the-box. We chose two products, performed a brief pilot evaluation and then selected one of them to begin implementation. We tailored the chosen product via cognitive walkthrough and participatory design sessions before deployment. Once in use, we analyzed data gathered during yearly surveys. Finally, we introduced an extension to the idea solicitation process within the last year to better address strategic business needs, which requests contributions from the consumers of the research and takes place prior to the yearly research idea solicitation campaign. This article describes the steps we took to adapt the technology and evaluate the new processes that the technology supported; and offers observations for other organizations considering using enterprise social media software to continuously improve their innovation management processes.

## BACKGROUND

Our company, The MITRE Corporation, is a not-for-profit organization chartered to work in the public interest. As a national resource, we apply our expertise in systems engineering, information technology, operational concepts, and enterprise modernization to address our sponsors' critical needs. To maintain our ability to offer state-of-the-art solutions to our customers, we draw upon an internal research program.

Each year, 600 – 900 initial research ideas are suggested for consideration over a five-month period from among our approximately 7,000 staff members located in two main campuses and 60 smaller sites in the US and around the world. Roughly ten percent of new ideas submitted each year are awarded funding. The research proposal process is demanding and highly competitive and attracts many of our best thinkers across the organization. Being awarded research funding is considered a significant professional achievement.

Managing a research program of this size is challenging. MITRE had a technology solution for supporting its research proposal process that worked efficiently for many years but it was written in custom code that was being phased out by the information technology (IT) group. At approximately the same time a transition to a new Chief Technology Officer (CTO) was taking place. The opportunity to update technology to support his vision for the proposal competition was a timely coincidence. The new CTO requested that technology be updated to enable nascent research ideas to be considered more broadly by the community.

The CTO's request for broad engagement had several facets. First, he wished to have technology support to provide relevant, competition-related information to people in many roles, including proposers, RP leaders, and consumers of the research (who could be our own staff members or customers external to the corporation). The technology should support these people in learning about research ideas and/or collaborating with each other, regardless of role and business unit membership. Further, he emphasized the need for a more transparent process that could adapt to changing organizational needs. By "transparent," the CTO meant that all participants in the research competition process should have easy access to key information such as the process schedule and stages, the expectations of people in different roles at the various process stages, the ideas being proposed, and the rationale for funding decisions. Because the research competition process could evolve over time, the technology supporting that process needs to be sufficiently flexible to be adapted quickly to the necessary changes. The CTO also wished to capture the degree to which all the stakeholders participated in the process. These requests are reflected in the following five goals:

1. Improve the ability of MITRE staff to learn about and collaborate on research ideas – across roles, proposals, innovation areas, business units, locations and time zones.
2. Gather research ideas, feedback, and research competition process information in a centralized location to better manage research knowledge.
3. Improve and support stakeholder decision-making.

4. Provide metrics and analytics of research ideas and participation.
5. Be able to quickly adapt to provide new or revised mechanisms for broader engagement with our own staff or external customers.

To meet these goals, we saw an opportunity to harness the high level of interest in the research program by employing a form of collective intelligence (e.g., see Malone, 2006 and DiMaio, 2008): "the dynamic aggregation of cognitive, reasoning, and knowledge resources of humans supported by intelligent and networked information systems" (DiMaio, 2008, p. 3). Collective intelligence is a broad concept that includes the ideas behind crowdsourcing (Howe, 2006). von Hippel contends that widely distributed groups of innovators can benefit from mechanisms that allow them to combine their efforts (von Hippel, 2006). Others also recognize the value of "bottom-up and need-driven innovation infrastructures and strategies" (Cobbenhagen, 2000, p. 28). Obtaining the CTO's support for this type of approach was an important step: systems dynamics literature supports the contention that achieving new goals is more likely when they are championed by someone in a position of top leadership (Meadows, 1999).

Once new processes are put into place, ensuring their adoption becomes the next challenge. Lewin (1948) advocates the "Action Research" approach, in which a change agent helps to establish standards via an "intervention method," which is a means of facilitating change. Once deployed, the effectiveness of the intervention is evaluated, and desired conditions are "refrozen" so people don't slip back into past patterns. In our case, the CTO is the change agent, the intervention method is the technology used to manage the proposal submission and competition process, and the evaluations described by this article measured the effectiveness of the intervention.

## REQUIREMENTS

Work began in 2008 on gathering the information needed for the revised proposal process and the technology to support it. Three user-experience specialists conducted 17 hour-long contextual interviews (Holtzblatt and Jones, 1993) with research program participants, decision-makers, and project leaders who use RP products with our customers. Contextual interviews occur in users' workplaces and probe how they work.

A notable finding of the contextual interviews was that staff considered the proposal competition a "mystery": locating information about competition processes had become difficult. If and when staff did locate the competition information, they perceived the process to be opaque and complex, with a work flow that had become fragmented. Similarly, the efficiency and effectiveness of the decision-making process was compromised due to the fact that multiple submission templates were used and a central repository for all proposals was only created when final selections were being made. A more coherent process was needed, and the technology used to support it needed to make the process easily understandable. This requirement aligned with the CTO's request that the process be made more transparent and support better knowledge management (goals 1 and 2).

Another requirement stemmed from goal 1 (enable ideas to be considered broadly by the community): the redesigned process and technology should allow for proposals to be viewed and commented on by anyone in the company. The comments were seen as a means to inform the proposers and factor into leaders' funding decisions (goal 3). To encourage hundreds or even thousands of people to spend at least a little time on the site each year, it needed to be navigable with no training. Further, comments could not be anonymous. In addition to being a method of self-policing against poor behavior, the desire for researchers and interested staff to make connections and learn about collaboration possibilities requires attribution.

To quantify participation, the technology needed to provide metrics of numbers of ideas and comments, and page view counts for each idea (goal 4). Further, the system should provide analytical information on the demographics of participants such as job level and location.

A further requirement was that the platform needed to be flexible enough to support shifts in business priorities without entailing a significant effort to revise or re-tailor the platform (goal 5). Since using social media is a disruptive technology (Santos, 2011), and one that could have unanticipated uses, we expected that the use cases could change quickly as our needs evolve. Thus, the platform needed to allow for customization and be scalable to other uses beyond those immediately planned for by the research program.

This combination of requirements led us to look for commercially-available innovation management platforms that could help drive a clear and inclusive process. Considered to be a subset of enterprise social media systems, innovation management systems allow for organizations to post, comment, and vote on ideas. Acquiring a commercial product eliminated the need to develop and maintain costly custom software and allowed us to deploy the initial capability in an operational site in four months.

Beyond the requirements already discussed, business needs dictated a price point of $150K or less in licensing fees per year and support from a trustworthy vendor. Fortunately, there were many vendors to investigate: at the time of our initial decision, a number of idea management platforms existed, such as the following. Qmarkets (innovation.qmarkets.net) software was developed to help companies complete a four-stage innovation process. Jive Ideation (www.JiveSoftware.com) was designed to enable crowdsourcing of ideas. Accept Ideas (www.acceptsoftware.com) facilitates capturing new ideas, validating existing ones, and pinpointing trends. Brainbank (www.brainbankinc.com) allows for organizations to track ideas from conception to implementation. The BrightIdea Platform (www.brightidea.com) supports collecting, ranking, and executing ideas. Spigit (www.spigit.com) aims to help organizations identify and implement new products and systems and improve process efficiencies.

We compared our requirements to the capabilities of these commercial idea management platforms. We also consulted information from industry analyses, emerging technology user group activities, and key conferences. As a result, we chose two candidate platforms, BrightIdea and Spigit, for further investigation. We piloted the BrightIdea platform but this effort did not yield promising results, so we undertook a rigorous evaluation of Spigit. Internally we rebranded the platform "Idea Market," and refer to it as such for the remainder of this article.

## PROCESS REDESIGN

We employed an iterative design-test-refine development cycle to determine the necessary platform customizations as well as to introduce process improvements. Importantly, we wished to use technology to enhance a people-driven process, not to 'replace' people with functionality in a 'tool.' Consequently, users in key roles worked alongside the implementation team throughout development.

After obtaining an evaluation license for Spigit (which we now call Idea Market), the implementers' first goal was to understand if and how the architecture and feature set of the platform supported the requirements. Staff members with different roles and viewpoints—those who submit research proposals ("idea generators"), leaders who choose proposals to be funded ("decision makers") and other stakeholders—were asked to be co-developers of the platform. This method is called participatory design (Schuler and Namioka, 1993): involving end users in the design process to the maximum extent practicable so that their needs can be well represented and they become invested in the system being developed. These participatory design sessions became the implementers' opportunity to surface what was not yet known about the competition process from previous years as little had ever been explicitly documented.

We determined that Idea Market's fundamental framework of categories, role-based permissions and single template provided the necessary scaffolding upon which to structure the new process. Right "out of the box," the technology enabled a process improvement: having a single, easily findable template eliminated the problem of staff trying to locate different, difficult-to-find templates for different technology innovation areas or business units.

The initial platform configuration provided a default page structure that was readily modified through a Site Administrator Dashboard (front-end) or by the vendor (back-end). All testing and design iterations were done on this site, which ultimately became the live site. We evaluated each page's content and purpose based on whether individual features complicated or simplified the overall competition process. Features that were judged to be too difficult to explain or too out-of-character for the research program or the corporate culture were easily hidden or removed through front-end or back-end means.

Following this initial streamlining of the feature set that could be achieved through front or back end modifications, the implementers performed a cognitive walkthrough (Lewis et al., 1990) to understand which features would require customization of the code. When using the cognitive walkthrough usability method, team members perform typical tasks in a step-by-step fashion to determine whether users would be likely to take the correct actions at each point. In our case, the implementers, along with members of the RP leadership team and idea generators, walked

through the proposal competition process while determining whether features should be used as is, customized, or deactivated. The criteria for making these decisions were:

1.  The impact to the decision-making workflow as evaluated by a RP leadership team member.

2.  The ability to improve collective intelligence and collaboration on an idea submission as evaluated by RP leadership team members and idea generators.

Twenty-five stakeholders with various roles then took part in six participatory design sessions. Participants freely discussed specific needs and concerns with moving to a more open innovation environment. Information from these sessions was used to refine the customization statement of work for the vendor. Customizations consisted of three main types:

*   to hide features that were unnecessary or overly complicated

*   to improve the ability to locate ideas and search within the database of ideas; for example, to find ideas by business unit, sub-unit, or geographical location of idea generator

*   to streamline the work flow of the decision-making process; e.g., customizing permissions for idea reviews and designing a site report to help decision-making and feedback tasks performed by the leadership team

Discussions with leadership team members during participatory design sessions illuminated the extent to which we also needed to address change management challenges. Leadership members stated that moving to an open, online environment, in which idea submission and commenting on ideas by anyone in the corporation was possible, could represent a significant cultural hurdle because it would be so much more transparent compared to how the competition had been handled in the past. Additionally, leadership team members were concerned that the shift to an online environment would compromise the face-to-face interaction that had worked for them in the past. To that end, the implementers highlighted the importance that the new online community be communicated as an *additional* vehicle for connecting and collaborating with staff across the corporation, not a replacement for face-to-face or verbal interaction.

An example of the resulting Idea Market home page can be seen in Figure 1. In accordance with goals 1 and 2, the home page provides a way for users to search across the database of ideas, which centrally locates all of the research ideas submitted by anyone in the company. Another goal (goal 4, regarding metrics and analytics) is satisfied because this web-based platform keeps track of page views, numbers of comments/discussion threads, number of votes, demographic information on the idea submitters, and other data items pertinent to collaboration and interaction transactions.

## EVALUATION METHODOLOGY

A separate, independent group from another business unit was assigned to evaluate the re-design efforts. This evaluation team designed a survey to capture the experiences of staff members who proposed research projects. The 2008 and 2009 surveys had approximately 80 multiple-choice questions (the exact number varies based on the responses to some of the questions) and five open-ended questions. It had 47 questions in 2010 and 40 questions in 2011. The evaluation team administered the survey in 2008, prior to using Idea Market, and again in 2009 - 2011.

The survey questions elicited demographic information, whether the proposers had previously participated in the research program, their understanding of the proposal process, their satisfaction level with their participation in the proposal process, and the perceived utility of feedback on their proposals. In 2009, proposers were also asked questions specifically about Idea Market. By comparing the responses to the 2008 and 2009 questionnaires, in particular, we can compare the observations and satisfaction levels of participants both before and after the implementation of Idea Market.

By moving to an online environment for proposal submission, commenting and tracking, it became possible to capture data on the extent to which the platform is used, which we term *participation metrics*. These metrics enabled us to baseline research program participation for the first time. The participation metrics include the numbers of ideas submitted, page views, comments made, and votes cast. Further, the metrics include the

geographic location of participants, the participants' role (such as idea submitter, commenter, customer-facing staff member, or research program leader), participants' level in the corporate hierarchy, and participants' business unit. We gathered participation metrics for the 2009, 2010, and 2011 competitions. By comparing the participation metrics for these three years, we can gain an understanding of the level of acceptance of Idea Market over time.
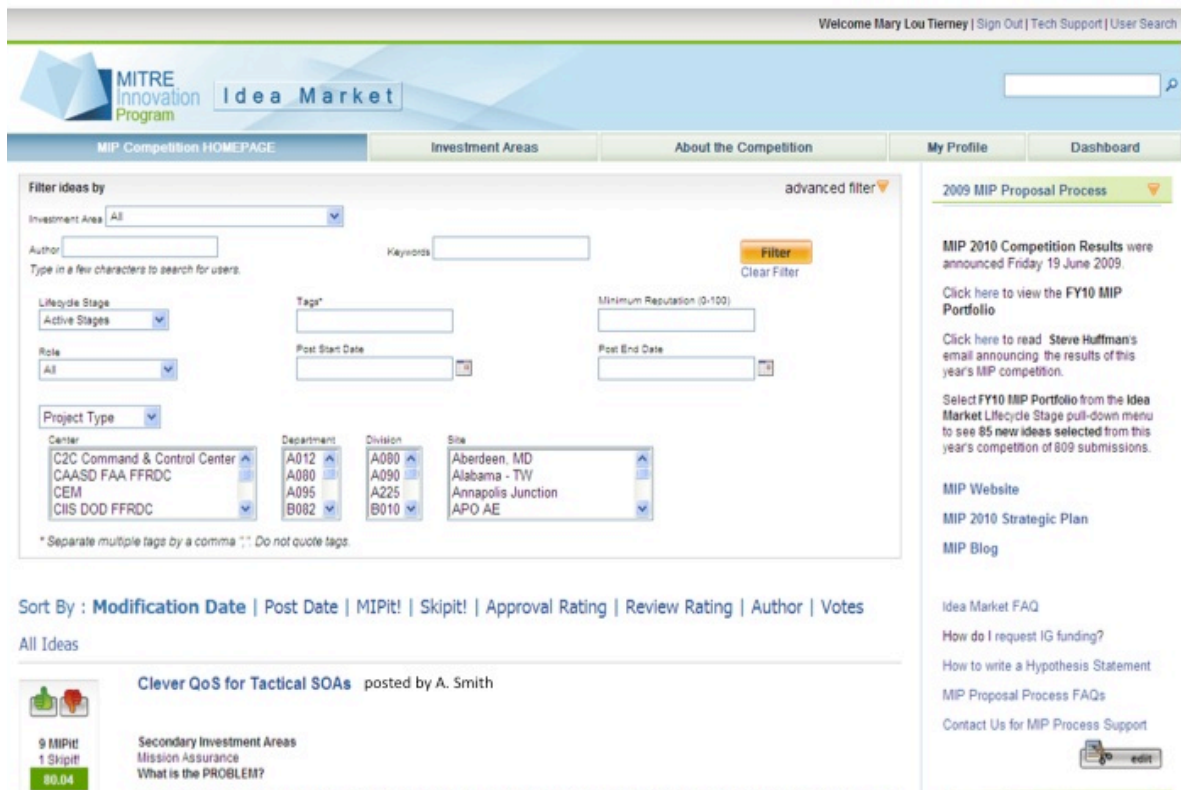


**Figure 1. Idea Market homepage in 2009**

## EVALUATION RESULTS

The questionnaire had a good response rate in all four years, ranging from 28% - 34% of those surveyed, depending on the year. In all four years the respondents had similar demographics: they were highly educated, long term (e.g., 53% - 54% had been at the company for 6 years or more), and were mid- to senior-level employees (see Table 1). The most interesting comparison is between the 2008 and 2009 results, because they yield insights into the progress made towards the objective of process improvement before and after the transition to Idea Market.

The respondents in 2009 – 2011 had at least some experience with Idea Market. Nearly all respondents (97%, 94%, and 94% in 2009 – 2011, respectively) of the surveys read at least one proposal in Idea Market. A majority (64% in 2009) voted on at least one proposal (participants could vote on whether they thought a proposal should be funded or not). A smaller majority (54% in 2009) commented on at least one proposal, while a sizable minority (38%, 29% and 35% in 2009 - 2011) made contact with a potential collaborator.

**Table 1. Numbers and characteristics of respondents to surveys**

| Characteristic | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|
| Number of respondents | 126 | 252 | 341 | 400 |
| Percentage of respondents with Master's degree or above | 80% | 85% | 82% | 81% |
| Percentage of respondents with doctorate degree | 45% | 36% | 36% | 34% |
| Percentage with six or more years of MITRE experience | 54% | 53% | 53% | 53% |

## *Closed-ended questions*

The questions soliciting information about proposers' understanding of the competition showed a dramatic difference between 2008 and 2009, as can be seen in Table 2. Competitors in 2009 found the process more understandable and predictable than those who participated in 2008. The difference in responses between the two years is statistically significant ($p<0.002$; all p-values reported here result from t-tests). Responses in 2010 and 2011 largely mirror the 2009 statistics, with some of the questions not being asked in 2010 and 2011 (and so were annotated in the tables with "NA" for "not asked").

Relative to 2008, 2009 survey respondents were somewhat more likely to perceive the proposal process as fair and consistent (see Table 3). The change between the two years is weakly significant ($p=0.083$). Note that several of the questions in this category were dropped in 2010 and 2011.

In contrast, proposers' experience with receiving feedback did not vary greatly over the four-year period (as shown in Table 4). The percentage of respondents agreeing or strongly agreeing with statements such as "feedback was useful" did not differ significantly between the 2008 and 2009 years ($p= 0.76$), although more than twice as many agreed that the feedback provided a clear rationale for funding decisions in 2011 as in 2008.

Few participants (14%) in 2009 felt that the online proposal process altered their chances for their proposal to be funded. More participants (41%) in 2009 agreed that the process improved their competition experience than disagreed (27%). 30% of respondents found Idea Market valuable; 37% did not, and 32% neither agreed nor disagreed.

**Table 2. Percentage of Respondents Agreeing or Strongly Agreeing with Each Statement Regarding Understanding and Predictability**

| Statement | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|
| Overall I had a good understanding of the research goals and objectives of the program | 32% | 61% | 66% | 60% |
| Process and procedures were easy to understand | 12% | 58% | NA | NA |
| Process and procedures were well explained | 14% | 54% | 72% | 60% |
| I understood research goals/objectives of the area associated with my proposal | 48% | 66% | 66% | 65% |
| I knew what to expect next | 6% | 43% | NA | NA |
| I had realistic expectations of what will happen | 39% | 58% | 59% | 58% |

**Table 3. Percentage of Respondents Agreeing or Strongly Agreeing with Each Statement Regarding Fairness and Consistency**

| Statement | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|
| Uniform evaluation metrics were applied to all proposals | 11% | 18% | NA | NA |
| There were similar opportunities for success | 20% | 38% | 33% | 36% |
| The same quality standards were applied to all proposals | 20% | 36% | NA | NA |
| The proposals were assessed fairly | 28% | 45% | NA | NA |

**NA = not asked**

**Table 4. Percentage of Respondents Agreeing or Strongly Agreeing with Each Statement Regarding Feedback**

| Statement | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|
| I received feedback | 70% | 78% | 83% | 81% |
| The feedback was useful | 59% | 61% | 58% | 67% |
| I understood the feedback | 74% | 77% | NA | NA |
| The feedback…clearly outlined the rationale for funding decision | 19% | 32% | 36% | 48% |
| I understood the rationale for the funding decision | 42% | 29% | NA | NA |

**NA = not asked**

### *Free-text comments*

In 2008 89 of the respondents provided 265 comments (where each comment is defined as a distinct cohesive thought). The content of the 2008 comments were analyzed using the SPSS Text Analysis for Surveys tool. This tool uses natural language processing algorithms to analyze open-ended response text as a set of phrases and sentences whose grammatical structure provides context for the meaning of a response. After analyzing this text, the key concepts and word patterns are extracted and classified into categories (IBM, 2011). The top ten categories are listed in the first column of Table 5.

The tenor of the comments was that of confusion about, and lack of understanding of, a complex process. Drilling down into the category of "the competition process in general," survey respondents reported breakdowns in the process that had previously been well supported prior to 2008. In their 2008 comments, staff specifically requested:

1. A more transparent process
2. A pre-published schedule located in places that people can easily find on the corporate intranet
3. A reduced number of submission templates
4. More complete, documented and timely feedback

Example comments are illuminating:

"The process was not as transparent as it could have been. Not having participated previously, I was often unsure of the next steps I should take and of the actions being taken by others."

"It would be helpful to get more immediate feedback."

"I think having an integrated tracking system that showed all RP submissions, their status, their categories, and all related multimedia (podcasts, videos of briefings, feedback, comments/critiques, etc.) would be invaluable"

In 2009, 138 respondents provided 237 comments. Once again SPSS Text Analysis was used to analyze free-text comments. The comment categories are listed in the second column of Table 5.

**Table 5. Free-text comment comparison**

| 2008 | 2009 |
|---|---|
| 1. Communicating the research program's goals and objectives | 1. The competition process in general and its complex and time-consuming nature in particular |
| 2. The competition process in general | 2. The funding process, especially regarding which funding source the competitors should be targeting |
| 3. Proposals and ideas | 3. The nature of the innovation areas (different domains or technical areas) |
| 4. Understanding the grand challenges and their role in the competition process | 4. Feedback and review criteria for submitted proposals (especially inconsistency of feedback) |
| 5. The decision-making process | 5. The decision-making and selection process |
| 6. The funding process, including the partitioning of funds among different domain areas and the amounts of funding available | 6. The relationship between the research topics and the customers that may benefit from the research |
| 7. Feedback and reviews of submitted proposals | 7. Building support for and briefing proposals |
| 8. The nature of research that is being sought by the competition | 8. The role of reviewers |
| 9. The research program in general | 9. The nature of the sessions during which proposals were reviewed |
| 10. The role of researchers' division leadership in the competition process | 10. The role of RP leaders and other decision-makers |

Some of the comment categories remained the same from 2008 to 2009: feedback and the processes for the competition, decision-making, and funding. We are interpreting the absence in 2009 of the 2008 categories that specifically pertain to the research program and the types of research ideas being solicited as an indication that the program leadership had communicated information about the program more successfully in 2009.

Some 2009 respondents noted that several of the operational, process-related issues highlighted in the 2008 survey were much improved. The presence of a reliable schedule, increased process transparency and a single submission template were appreciated by staff, as can be seen in the quotes below.

"Excellent process to solicit participation and innovative ideas."

"I liked the fact that there was a clearly articulated RP schedule set out well in advance, and that the process proceeded according to schedule."

"I think the process improved remarkably from last year. The #1 improvement: there was only 1 template (in Idea Market) that needed to be populated with the idea, instead of many, constantly changing templates that were different enough from one another as to require thought when copy/pasting. Overall, the 2009 competition was a vast improvement over that of 2008. Idea Market and its openness was refreshing."

The SPSS Text Analysis tool found 98 instances of the 12 most frequently used negative terms in 2008 and 67 instances of the top 12 negative terms in 2009. In 2009, eight of the top twelve words were, in fact, positive. Although the number of comments was approximately the same from the two years (265 versus 237), the decrease in the number of instances of the top 12 negative terms—from 98 in 2008 to 67 in 2009—is notable.

### *Participation metrics*

Table 6 summarizes participation metrics for the three-year period from 2009 – 2011. During this time, a minimum of 34% of the corporation's staff members clicked into the Idea Market, meaning that they at least entered the site and browsed. The first year of the Idea Market saw the most page views of the three years, which we attribute to a novelty effect (Rogers, 1995). While the number of page views has decreased over the three years, the percentage

of staff members who viewed those pages has increased.  It seems that more staff members are viewing fewer pages, which may mean that they have started to restrict their browsing to the technology areas of most interest to them, rather than engaging in a broad sampling of different ideas.

"Clicking in" and browsing is distinct from "participating," however.  For purposes of our analysis, a participant is defined as someone who enters written content: that is, ideas and/or comments on ideas.

**Table 6. Participation metrics**

| Type of participation | 2009 | 2010 | 2011 |
|---|---|---|---|
| Percent of staff who clicked in | 34% | 37% | 39% |
| No. of locations from which staff participated | 57 out of 72 | 39 out of 75 | 54 out of 81 |
| No. of ideas submitted | 840 | 760 | 722 |
| No. of comment threads initiated | 750 | 1200 | 508 |
| Total no. of comments | 1719 | 1867 | 2249 |
| No. of votes cast | 5564 | 3011 | 1521 |
| No. of page views | 118,672 | 104,017 | 94,438 |
| Percentage of ideas submitted on the last day | 19% | 13% | 16% |

The number of proposals submitted decreased somewhat over the three-year period.  In 2009, the Idea Market was presented to staff members as a place to brainstorm ideas, with unusual ideas or ideas that were not yet fully developed being explicitly welcomed.  The RP leaders were surprised, however, by the large number of ideas they received in year one, which may have been due to a novelty effect (Rogers, 1995).

For a variety of reasons, a tremendous number of ideas are posted on the last day of the competition, which limits the behavior we are actually trying to foster.  Unfortunately, the number of ideas submitted on the last day is trending in the wrong direction.  Nineteen percent of total ideas were submitted on the last day in 2009, 13% in 2010, 16% in 2011, and 28% in 2012 of total ideas were submitted on the submission deadline day.

Having a broad cross-section of staff members review and comment on ideas continues to be warmly welcomed.  In response to this encouragement, the total number of comments has increased over the three years.  In particular, 2011 saw the most dialogue of the three years, meaning that there were fewer comment threads initiated but more comments made within each thread, leading to over 2200 comments total.  However, we see a significant drop-off of commenting once the idea submission deadline passes – broad engagement on ideas ceases.

In addition to commenting, staff members reading the proposal ideas are also given the opportunity to vote on whether they think a particular proposal should be funded.  The first year saw the most votes, over 5500, with nearly 50% year-to-year decreases occurring over the next two years.  We believe there are at least two reasons for the decreases.  Comments indicated that staff members initially thought their votes would be taken into account by RP leadership, but then they later felt that the votes were being ignored.  Also, the policy for votes changed for the 2010 competition to one of non-anonymity.  The idea was that proposers should be able to follow up with their colleagues to determine suggested improvements.  Not surprisingly, the number of "no" votes fell precipitously, strongly affecting the total number of votes cast.  Of the 1521 votes cast in 2011, only 26 were "no" votes.

Table 5 also shows that there was substantive participation from multiple locations.  Per-capita participation was fairly evenly distributed among different geographic locations.  Participation by staff at our Mid-Atlantic campus, North Eastern campus, and aggregately from domestic and global sites was 18%, 16%, and 14.5% respectively, during the 2009 – 2010 period.  In these two years, almost 22% of staff members who are officially categorized as teleworkers (working full-time from home) participated in the Idea Market.  While we do not have participation figures for earlier years, we received comments that indicated that this percentage represents a large positive increase.  This change makes sense in light of the contrast between the on-line Idea Market and the pre-2009

proposal competition process, which was largely carried out via briefings to leadership in our two major campuses. Under the earlier process there were limited participation opportunities for teleworkers, or even people located at our smaller sites or it was so perceived by staff.

Other changes occurred during this period beyond the changes to idea solicitation and voting. In 2009, the Idea Market was open for posting new ideas for 37 days. Due to feedback that this process was too compressed, 68 days were allocated for posting new ideas in 2010. Further, our Corporate Communications department coordinated an advertising campaign to promote more commenting on ideas in 2010 that included short feature articles accessible from the corporation's intranet home page and mentions of the competition in the weekly news email message that is sent to all employees.

## EXTENDING THE PROCESS

As part of the process changes during the study period, innovation area leaders were required to have their objectives be accessible from a standard place within the RP web site so that all proposers can easily find them and articulate how their research ideas might align to the objectives. At least in part because the objectives were easier to access, a broad conversation began taking place about these objectives. The project leaders who work with our sponsors raised concerns regarding the perceived relevance of some of the research objectives to our sponsors' work programs. They expressed the opinion that we need to couple the research program more closely to forecasted sponsor needs.

Once again, we felt that enterprise social media could help. If project leaders and other senior stakeholders helped to prioritize research objectives and/or suggest new objectives, then the ensuing research program competition should have a better chance of yielding relevant and useful outcomes.

Accordingly, in early 2012 we devised the "Strategy Market" using the same Spigit enterprise social media platform that hosts the Idea Market. Strategy Market uses another feature of the same social media platform: prediction markets. Prediction markets are used to forecast the outcome of a future event, and are commonly used in predicting election outcomes. One example of how prediction markets in social media are being used in business environments is to determine when to roll out new products or technologies. We used prediction markets to enable senior staff members to prioritize strategic objectives based on the likelihood that they will produce relevant and useful results. The predictions were used by RP area leaders to finalize their strategies and articulate research objectives just prior to the start of the 2012 proposal competition.

We invited 1160 people to participate: all those at the Senior Principal, Director, and Vice President levels plus all people – regardless of level – who are identified in our financial system database as being owners of projects with fiscal responsibility and sponsor funding (as opposed to research or overhead funding). The RP leadership was also invited to participate primarily to provide opinions on each other's research objectives. All participants were told in an emailed invitation from the CTO that their participation could:

- Help shape RP's future strategy by betting on the innovation areas and core technologies that will be most valuable to MITRE and their customers in the future.
- Help set priorities for each innovation area by betting on the research objectives that, if achieved, will be of most value to their customers in a 3-10 year timeframe.
- Suggest new objectives, innovation areas, or core technologies that would address the problems that they feel their customers will face in the future.

Participants "bet" on research objectives (expressed as outcomes) by allocating 1,000 tokens among the outcomes articulated for each of the 21 innovation areas. They could bet in all of the innovation areas or just those that pertain to their customers. The tokens represent their predictions for the future and how much a research outcome would benefit their customers. Participants were further informed that they could suggest an entire new portfolio or outcome if they felt that such a thing was missing, along with some rationale. They were offered an incentive for participating: a drawing was held from among the top 10% of participants (as determined by their activity level) for an all-expenses-paid trip to a conference.

The Strategy Market was open for five days approximately one month prior to when the Idea Market was scheduled to open. The results were provided to the RP leadership immediately upon the Strategy Market's closure so that they could add, delete, or adjust research objectives prior to the start of the Idea Market. In this way, the Strategy Market became a precursor process to the proposal competition process.

Twenty-three percent of eligible people participated in the Strategy Market (n = 271), and allocated an average of 30% of their available tokens among an average of seven innovation areas. 155 people allocated their tokens to the portfolio with the most activity, with 50 people betting their tokens in the least active portfolio. Participants suggested nine new portfolio areas and 17 new objectives within existing portfolios. At least partially because of the Strategy Market, objectives were added, deleted, or modified in 15 of the portfolios.

While strategy market participants were not given a questionnaire soliciting feedback, some participants were moved to provide unsolicited feedback. This feedback indicated that they had welcomed the chance to influence the research program objectives. The strategy market also had the effect of making the RP objectives more widely known among the population that is in a position to recommend that customers take advantage of the research program outcomes.

## DISCUSSION

We made noteworthy progress on the five goals set by the CTO:

1. We improved the ability of staff members to have insight into the process and collaborate across the company by providing process-related information and searchable research proposals in a single location.
2. We improved knowledge management by collecting all proposals in one place using one template.
3. We supported stakeholder decision-making by providing broad and searchable views of submitted proposals, and by managing the workflow of the decision-making process.
4. We gathered metrics and analytics of ideas and people; for the first time we captured information about who was and was not participating in the proposal competition.
5. We quickly provided mechanisms for broader engagement, as evidenced by the 2012 activity on strategies.

### Goal 1

The survey taken the year before (2008) versus the one administered just after Idea Market was implemented (2009) showed significant differences regarding the transparency of the competition process. The percentage of respondents who stated they understood the research goals almost doubled from 32% to 61%. The percentage of people saying that the process and procedures were easy to understand increased from 12% to 58%; and those who agreed that the process and procedures were well explained increased from 14% to 54%. Free text comments also became much more positive after Idea Market was instituted.

The new process helped to increase broad engagement and collaboration in several ways. As expected, Idea Market enabled idea generators to find others who had submitted similar ideas, and enabled those interested in particular ideas to contact the proposer to obtain more information and/or express interest in becoming a team member on that project if funded. Another process change was not as obvious. The old process was hierarchical: ideas were reviewed by multiple layers of managers who eliminated ideas at successive stages, allowing only a limited number of proposals to be presented to the ultimate decision makers. This had the effect of eliminating excellent ideas that were not aligned with a sub-organization's goals or strategy, even though the idea might have been of interest to those in another part of the company. With Idea Market, all ideas can be viewed and commented on by anyone in the company. This process change has made it easier to run a single research competition that is truly company-wide, as opposed to running an activity akin to multiple, smaller competitions run by each of the operating centers.

As was predicted during the participatory design sessions, however, we have the subjective impression that staff members are still reluctant to be totally candid in commenting on others' ideas in the open forum. This impression is based on recent informal conversations with RP leadership members, coupled with survey responses. Some staff members commented in the 2009 survey that Idea Market functions as a document repository for proposal ideas, rather than as a mechanism for facilitating meaningful discussion on proposed ideas beyond the simple comment of

"nice idea." In the future, we plan to encourage greater openness and interactivity by experimenting with different incentives for engaging in candid conversations via the Markets.

Part of the process mentioned in Goal 1 is the subtask of providing feedback to idea generators. The 2008 and 2009 survey results both cited the need for more timely written feedback, so the leadership team imposed standards on themselves for 2010 and beyond regarding delivering feedback via Idea Market. While the CTOs had always encouraged leadership to provide feedback in the past, and leaders almost unanimously advertise an "open door" policy regarding conversations about feedback, absent written feedback there was a perception by staff members answering the surveys that feedback is difficult to obtain.

Aside from feedback, by 2009 we were successful in resolving or at least improving a number of the other issues regarding the competition process. Having a pre-published schedule in a place that could be found easily, in particular, was greatly appreciated. In fact, a chart depicting the steps and interdependencies of the new process schedule that was created as a guide when customizing Idea Market became a popular artifact often requested by leadership and referenced by staff during the competitions.

### Goal 2

The Idea Market was seen as a successful document repository. Rather than the many different customized proposal templates that existed in 2008 and earlier, the Idea Market enforced a common template and provided a common, searchable idea repository.

### Goal 3

Decision makers are now able to ask questions of proposers via Idea Market and view the comments and questions entered by others. RP leaders have told us that they do take others' comments into account when making their funding decisions: information that they did not have prior to Idea Market since locating proposals was difficult and no mechanism for commenting on ideas was available.

### Goal 4

Using the new platform has enabled us to measure proposal development-related activity level for the first time. We are now using the resulting 2009 baseline to compare year-to-year participation levels. We were encouraged by the increase in the number of comments in 2011.

We are also encouraged by the number of teleworkers and staff members at sites who have participated in the research competition since Idea Market was instituted. Approximately 25% of MITRE employees are either at sites or are teleworkers, so now their participation in the RP competition is representative of their population. As evidenced by comments we received from this group, the online environment presents a level playing field and that staff working remotely no longer feel they are at a disadvantage based on their location away from a main campus.

### Goal 5

The experiment of using Strategy Market resulted in the RP leaders succinctly articulating their strategies in a manner that was consistent across the innovation areas. We had been unable to attain this level of focus and consistency since the new CTO started requiring strategic plans as a precursor to the annual competition in 2009. Strategy Market was designed to be a forcing function for capturing a draft set of strategies by a date that was early enough to be influenced and refined by corporate stakeholders who have customer contact responsibilities. Once refined, the strategies were available to idea generators early enough to influence their proposals. The Strategy Market was conceived, designed, implemented, and results were obtained within a five-week period: achieving our goal of quickly providing mechanisms for broader engagement.

The CTO's vision includes all MITRE staff members acting as sales people for the research program (that is, "selling" the value of the RP and its research outcomes to our customers), and so having information on strategies and research ideas in one, easy-to-find location, can go a long way towards enabling the vision. Using the technology thus acts as a forcing function to accomplish longer-term corporate objectives.

**FINAL THOUGHTS**

We are continuously looking for ways to exploit technologies to support the CTO's vision of creating a unified RP that benefits the company as a whole. The RP is one of the few examples of a work program that cuts across all of the business units in the company. In the past, a lot of the responsibility for running the RP competitions was delegated in a piecemeal fashion to different business units. This decentralized focus spawned multiple competition processes. The social media technologies we introduced in 2009 provided a unification of these multiple processes by virtue of the standardization they enforced throughout the competition cycle. Suddenly, all stakeholders needed to abide by a common schedule, place their supporting materials in a common location, and use a common research proposal template. Even if the social media is enforcing a process that is suboptimal, it still facilitates greater standardization.

Beyond standardization, social media platforms facilitate transparency and both active and passive participation. In our case, prior to 2009 research proposals were either not available to be viewed by people outside of the RP leadership or were very difficult to find. If proposals were located, these *uninvited* readers did not feel empowered to call the proposers to offer suggestions or partnering opportunities. Idea Market made it clear that everyone was not only invited to read any proposals in any area (not just their own area of expertise), they were also *invited* to comment, engage in discussions, read others' comments, and volunteer to collaborate. Even staff members who proposers did not know or would never think to ask for input voluntarily provided pointers to others' research, opinions on the viability of research approaches, and encouragement to develop ideas further. One challenge this transparency raises, however, is the fact that the domain experts and leaders who are responsible for reviewing and growing ideas have an additional burden of sifting through the additional comments and participation of the community (Baez and Convertino, 2012).

We feel that this increased transparency was instrumental in improving satisfaction levels. We achieved a new steady-state level of satisfaction with the process when compared to 2008. It is not reasonable to expect that all people will be happy with any given process, but the process changes supported by Idea Market have yielded much more positive evaluation statistics than the old process. Currently we are pleased with the level of satisfaction evidenced overall. While they are still changing as we make refinements, the satisfaction levels are fluctuating within a range we consider to be acceptable.

For the future, we are currently developing a means to evaluate the effects of Strategy/Idea Markets and new competition procedures on the quality of the research program outcomes. Also, we continue to experiment with the platform in different ways. Up to this point, we have only engaged with our own staff. Soon, we will launch another experimental social media site for both MITRE and non-MITRE research thought leaders. The primary purpose will be to better communicate to customers our understanding of their research needs and how they are represented in our research strategy. We anticipate using the two-way communication afforded by social media to enable a continuing conversation instead of a one-way data transmission. While the current social media platform may be a temporary environment until we are able to implement an enterprise production solution, its ability to support adding new capabilities quickly enables us to use it for flexible experimentation.

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