

## Research and Management Insights

### **Tolerance for Failure and Incentives for Collaborative Innovation**

Jeremy Hutchison-Krupat, Raul O. Chao

Collaborative innovation teams are at the core of most innovation projects today. While the use of collaborative innovation teams is a good starting point, an organization's ability to innovate can be enhanced through incentive systems and through an organizational culture that tolerates failure. Jeremy Hutchison-Krupat and Raul Chao report the results of two controlled experiments aimed at understanding how tolerance for failure and financial incentives impact the decisions of individuals engaged in a collaborative innovation initiative. Financial incentives are the easiest lever for the firm to alter in the short term.

If the organization is one that tends to discount an individual's failed efforts (e.g. by not reducing or limiting bonuses), then complementing such actions with additional financial rewards will have little effect on managerial actions. Within such a context, managerial actions are better influenced through the organization's choice of project structure. In other words, faced with the choice of assigning a project to a single (heavyweight) or multiple (lightweight) managers, the firm should consider that managers will take less risk if the responsibility over decisions is shared as opposed to the case in which responsibility is held by a single individual. On the other hand, and organization's culture and norms, which often dictate its tolerance for failure, are difficult to change in the short run. With this in mind, the authors' results offer a framework that provides the firm with insight as to how projects should be structured and when specific types of incentives should be implemented.

If the firm exhibits high tolerance for failure (for example by having flexible rules and low levels of bureaucracy, or creating policies to continue investing in promising projects despite early failures) then it makes little difference whether or not projects are organized as lightweight or heavyweight. In both cases, project managers will feel safe to explore and take risks. If, however, the firm exhibits low tolerance for failure, then heavyweight project management will lead to increased risk appetite while lightweight project management will lead to reduced risk appetite.

The key take away for senior executives is that financial rewards/penalties are the preferred levers to use, particularly if the firm's culture is one of low tolerance for failure.

### **Incentives for Stage-Gate Processes**

Raul O. Chao, Kenneth C. Lichtendahl Jr., Yael Grushka-Cockayne

Raul Chao, Kenneth Lichtendahl Jr., and Yael Grushka-Cockayne consider how the firm should structure wages and incentives to ensure that managers reveal relevant information and invest the effort necessary to create value in a stage-gate process. An important insight highlighted by the authors is the existence of "idea risk", or uncertainty regarding early-stage idea quality in a stage-gate process. They discuss how the presence of idea risk can alter the incentives offered to managers and may lead the firm to reject projects that otherwise seem favorable in terms of positive net present value. They go on to show how the firm can mitigate the negative effects of idea risk by encouraging breadth of search and high tolerance for failure during ideation stages.

### **Managing Cost Salience and Procrastination in Projects: Compensation and Team Composition**

Yaozhong Wu, Karthik Ramachandran, Vish Krishan

In the current knowledge economy, firms often organize their business activities in the form of projects for delivering new products and value-added services to their clients. Owing to the trend of increasing specialization and autonomy of project professionals that makes command-and-control methods less applicable, project managers face new challenges arising from workers' procrastinating behavior and must develop behavior-oriented project managerial skills. Yaozhong Wu, Karthik Ramachandran, and Vish Krishan suggest several prescriptive management policies when project quality is adversely impacted by workers' procrastination. These suggestions are related to compensation and diversity and fluidity of project teams. Specifically, managers should provide higher incentives in early stages of a project to motivate workers to smooth their execution rather than cram for the deadline. Managers should also prefer a

project team of greater differentiation in the degree of procrastination of workers when the average degrees of procrastination of project teams are the same. Furthermore, project managers should create fluid teams with unfamiliar members when the pool of workers contains many procrastinators.

### **Realizing the Need for Rework: From Task Interdependence to Social Networks**

Manuel E. Sosa

Manuel Sosa studies a core phenomenon in new product development: the act of realizing that “rework” needs to be done. He shows that realizing the need for rework is not only driven by technical considerations but also by organizational factors. Both formal and informal organizational structures play a significant role in influencing how social interactions at work help (or hinder) one’s realizing the need for rework. The empirical evidence presented by the author suggests that managers of new product development organizations must pay particular attention on monitoring the patterns of social interactions among their developers in order to identify the people that are more likely to recognize the need for rework during any new product development effort.

### **Knowledge Diversity, Turnover and Organizational Unit Productivity: An Empirical Analysis in a Knowledge Intensive Context**

Sriram Narayanan, Jayashankar M. Swaminathan, Srinivas Talluri

Increasing productivity in knowledge intensive contexts is challenging. In knowledge intensive contexts where team members are colocated individuals are likely to seek inputs from a person rather than consult documentation. Sriram Narayanan, Jayashankar Swaminathan, and Srinivas Talluri emphasize the importance of managing the collective knowledge composition of an organizational unit (or a team) to achieve an agile and productive workforce. They show that managing this collective knowledge is not only important for productivity improvement, but it is also important for managing the impact of employee turnover. In this context, two dimensions of diversity are considered, differences among knowledge elements of unit members and the breadth of knowledge possessed by an average member of the unit. The findings of the study suggest the following insights: (a) units where members have “highly similar” or “highly different” knowledge bases are less productive in problem solving as compared to those that have moderate differences (b) when unit members have knowledge elements that are very different from one another, the negative effects of the differ-

ences can be mitigated by training an average individual to be a generalist, as opposed to a specialist (c) productivity drop due to employee turnover (both due to employee entry and exit) in teams where individual knowledge elements are very different from one another is significantly greater than teams where individual knowledge elements are similar and (d) effects of employee exit in reducing productivity is significantly higher than the effect of employee entry.

### **System dynamics Understanding in Projects: Information Sharing, Psychological Safety and Performance Effects**

Elliot Bendoly

In the assembly of project teams, planners take into account many factors. Unfortunately they may have been missing one of the most critical: the ability of project members to think about the holistic nature of problems including the stock, flows, constraints and other interdependencies. This understanding of system dynamics is an aspect of broader systems thinking, and arguably an additional and ostensible indispensable form of project worker expertise. According to this study, teams not only benefit from such expertise but also from an ability to relate to one another when similar levels of this expertise exist among them. Specifically these features increase the willingness of individuals in the group to share the most crucial of information during project work, and ultimately heighten group project performance. There are likely multiple training tactics that can be applied to increasing and leveling system dynamics understanding across workers. Even relatively minor exposure to systems discussions appreciably benefits the ability to think about the dynamics of real world systems. Targeted instructional tactics may prove rather useful to firms interested in using internal training activities to elevate system dynamics understanding within sections of an organization.

### **Opt-Out Options in New Product Co-Development Partnerships**

Nicos Savva, Stefan Scholtes

Much of the innovation in such science-based industries as pharmaceuticals or consumer electronics takes place in small start-up companies, often spun out of universities. These firms lack the capabilities and financial resources to develop their innovations all the way to the market and will have to enter alliances with large incumbent firms. Designing effective deals between such firms on route to commercialization is challenging. Based on their work on such an alliance contract in the biopharmaceutical sector, Savva and Scholtes show how option clauses can be used effec-

tively in such agreements to offer the partners flexibility that allows them to manage their respective risks and facilitate successful commercialization of profitable projects. In addition, intelligently designed option clauses can align future project continuation decisions with the different business models of asymmetric partners.

### **Getting what you pay for – strategic process improvement compensation and profitability impact**

Jasper Veldman, Warse Klingenberg, Gerard J.C. Gaalman, Ruud H. Teunter

In many modern manufacturing firms, operations managers are rewarded through bonuses that focus on indicators other than firm profits, such as quality improvement, inventory turnover or cost reduction. Although this is done with the intention to become more profitable, these bonuses are seemingly misaligned with the firm's main profit maximization objective. Veldman, Klingenberg, Gaalman and Teunter explain that, contrary to popular belief, an intentional misalignment of the firm owner's profit maximization objective and management's focus on cost reductions realized through process improvements is indeed the best course of action in light of a potential response by a rival firm. However, even though the use of such bonuses is the best choice for a firm owner, the same holds for his rival and this will eventually lead to reduced profits for both firms. Results indicate that even in a setting where firms significantly differ in terms of their process improvement abilities, it is still the best course of action for both firms to make use of process improvement bonuses. However, in such an asymmetric situation it remains difficult to make bonuses profitable, even for the firm with better process improvement abilities. These conclusions do not drastically change when investments in cost reduction have uncertain outcomes, or when a manager is risk averse.

### **The Payback of Effective Innovation Programs: Empirical Evidence from Firms That Have Won Innovation Awards**

G. Peter Zhang, Jifeng Yu, and Yusen Xia

Innovation is widely acknowledged as the key for achieving and sustaining a firm's competitive advantage. Despite the growing importance of innovation to business success, few companies seem to innovate well. Senior managers are often unsure of the financial return on R&D spending, nor are they satisfied with the efficacy of their innovation programs. Zhang, Yu, and Xia provide an empirical assessment of the returns of an effective innovation program, which is

defined as an innovation program that can generate high-impact commercial output and offer substantial value to customers or the market. They use the winning of innovation awards as a proxy for the effectiveness of the innovation process. Based on data from publicly traded firms that won innovation awards between 1998 and 2003, they find strong evidence that an effective innovation program improves organizational profitability. In addition, their results show that beside its direct influence, implementing an effective innovation program can also indirectly contribute to an increase of profitability by improving R&D efficiencies.

### **Collaborative Product Development: The Effect of Project Complexity on the Use of Information Technology Tools and New Product Development Practices**

David Xiaosong Peng, Gregory R. Heim, Debasish N. Mallick

New product development (NPD) projects inherently involve some degree of complexity. Collaboration is an important means to cope with project complexity. While various NPD practices and information technology tools are available to NPD teams today, they represent considerably different means to facilitate collaboration. NPD practices are formal design methodologies and information organizing frameworks whereas IT tools serve as technology-enabled exchange and sharing media. Given these differences, project managers need to identify the right NPD practices and IT tools for their teams to collaborate effectively in project environments with different complexity characteristics. David Xiaosong Peng, Gregory Heim, and Debasish Mallick investigate the impact of four types of NPD IT tools and several representative NPD practices on collaboration within the context of three project complexity dimensions: product size, project novelty, and task interdependence. Their findings suggest that NPD practices tend to impact collaboration to a greater extent for projects with high information ambiguity as a result of novel and interdependent project tasks, whereas IT tools tend to impact collaboration more for large size projects with clearly defined tasks.

### **The Effect of Competition on R&D Portfolio Investments**

Mark S. Zschocke, Benny Mantin, Beth Jewkes

Firms engaged with portfolio investment decisions must carefully contemplate not only their own actions, but also those made by their competitors. In allocating an investment budget between incremental innovation projects targeting a mature market and

radical innovation projects targeting an emerging market, a monopoly firm can solely base its decision on the marginal returns of the projects' respective markets, whereas competing firms—as they account for their counterparts' actions—must also account for the respective markets' average returns. This drives competing firms, in particular those with the smaller budgets, to invest larger portions of their budgets into incremental innovation projects to the detriment of radical innovation projects.

**The Path Dependent Nature of R&D Search:  
Implications For (and From) Competition**  
Nektarios Oraopoulos, Stylianos Kavadias

In light of strategic considerations, a firm's R&D choices need to account for the technologies already developed by rival firms. Nektarios Oraopoulos and Stylianos Kavadias address the following question: Should a firm undertake technology development in already explored technological domains, or should it direct its R&D efforts towards unexplored domains? The authors show that competitive search exhibits a threshold structure: the firm benefits from exploiting the same technological domain when past outcomes lie above a technology improvement threshold. The threshold exhibits a counter-intuitive property. It is optimal to forgo the previously explored domain even when past improvements exceeded the a priori expected technology improvement. The result stems from the critical trade-off between uncertainty reduction and remaining upside potential. The former is higher for the previously explored domain, but the latter is higher for the unexplored. Moreover, the authors' analysis reveals that different sources of

learning about the domains may have opposite effects on the direction of search. Higher ability to infer the potential of an explored domain prompts the clustering of searches, whereas the ability to learn across domains prompts diversification. Lastly, the authors find that higher product substitutability makes high technology realizations more imperative, therefore directing the firm towards the riskier unexplored domain. Their results lay the groundwork for several testable hypotheses regarding competitive R&D search, as they account for the interplay between competitive dynamics and the properties of the technological domains at hand.

**Defining Problems Fast and Slow: The U-shaped  
Effect of Problem Definition Time on Project  
Duration**

Adrian S. Choo

Firms often struggle with problem solving. Does taking time to define problems always help? Adrian Choo addresses this question by focusing on investigating the relationship between problem definition and project duration among Six Sigma projects in an organization. He finds that slower projects allocated either too little or too much time in the early phase of defining their quality improvement problems. The balancing of the time spent in problem definition was more demanding in complex projects but less challenging in projects with experienced individuals. Managers should encourage experienced project teams to spend more time in the early phase of their projects. Project teams, however, need to pay more attention to balancing time spent in problem definition for those projects that are more complex.