The Financial Benefits of Innovation Management: Scrutinizing the Innovation Management Maturity Assessment

Center for Innovation Management Studies Working Paper

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Introduction

The CIMS Innovation Management Maturity Assessment (IMMA) framework breaks innovation into five organizational competences (idea, market, portfolio, platform, project) and five management dimensions (strategy, organization & culture, processes, techniques & tools, metrics). These ten total elements can be learned, measured and improved upon – thus they provide a useful framework to managers. Firms vary in their level of “maturity” or innovation capability on each of the ten IMMA elements. This research project attempts to assess the impact that each of these elements has on financial returns over time, thereby demonstrating the value that these innovation elements have for the organization.

Prior research on new product success factors has relied on managers’ self-reported levels of success (Cooper and Kleinschmidt, 1995) and not examined whether the effects of these “success factors” are lasting. When these “success factors” and performance are evaluated simultaneously, it is not possible to address questions of causality. For instance, are high performing firms performing well because of their use of innovation metrics, or do managers tend to make greater use of metrics when they are performing well? Other research has relied on groupings of successful and unsuccessful projects, which has the drawback of not allowing analysis of factors that impact the larger organization (Ernst, 2002). Research pertaining to new product success factors has been criticized as methodologically weak (Brown and Eisenhardt, 1995; Ernst, 2002); for instance, the effect of past organizational performance has not been considered. Thus, researchers often cannot predict the effect of these “success factors” into the future, since past performance has not been controlled for. This research project addresses these concerns by drawing on both a wide ranging survey of innovation behavior within business units, as well as secondary financial performance data over time. We can thereby analyze the longer-
term financial impact associated with an organization’s IMMA maturity level on the ten elements.

This white paper begins by briefly examining the research literature pertaining to each element of the IMMA framework (the five management dimensions and five competences). We then discuss our empirical test of these innovation elements using secondary financial data over a 5 year time horizon with data from the PDMA’s Comparative Performance Assessment Study survey (CPAS). We conclude with a discussion of our findings.

**IMMA Framework**

The five competences and five management dimensions of the IMMA framework reflect a systematic way to manage innovation. Our goal is to relate financial metrics (specifically ROA and R&D Spending) to the IMMA’s ten individual innovation elements. The data we utilize include secondary financial data from Compustat, and primary data from the CPAS survey. A key element of the project therefore requires that we link IMMA elements to specific CPAS survey measures. Doing so required a careful examination of the CPAS survey items and how each IMMA element is generally operationalized in order to identify the most appropriate CPAS measures for each IMMA element. In this section we review each IMMA innovation element and its importance in light of relevant research, and describe how it is operationalized.

**MANAGEMENT DIMENSIONS**

**Strategy**

Barczak (1995) finds that no single NPD strategy is universally superior. Superior performance is a result of matching product strategy to corporate goals and capabilities. The
development of products that build on existing firm resources engenders higher success rates (Song and Parry, 1996, 1997), and the use of a more focused product strategy (as opposed to unrelated diversification) allows firms to have a more “focused scope of attention” (Harmancioglu et al., 2009, p. 270). Choosing projects that are related to the firm’s technological, marketing and organizational resources will lead to superior performance (Cooper and Kleinschmidt, 1995; Zirger and Maidique, 1990). Of course, the first step in having a focused product strategy is to develop an explicit strategy that dictates resource allocation, diversification and prioritization.

In the IMMA framework, strategy defines the specific goals of the organization and how the organization sets about to achieve those goals in the marketplace. Higher levels of maturity are achieved by organizations possessing a specific and continuous strategic process that can direct strategic priorities for innovation activities.

**Organization & Culture**

Generally, corporate cultures supportive of innovation are conducive to financial performance. Innovative culture includes entrepreneurship, risk taking, openness to new ideas and rewarding creativity (De Brentani and Kleinschmidt, 2004). Specific aspects of an innovative culture that have been found to benefit innovation include employees’ ability to devote free time in their work week to pet projects and the availability of small amounts of seed money to explore creative projects (Cooper and Kleinschmidt, 1995). Willingness to take risks has been shown to be related to effectiveness in SBUs trying to grow (Gupta and Govindarajan, 1984), though more research is needed to examine the elements of culture that impact innovative success (Ernst, 2002). Organizationally, maintaining a dedicated process to handle new product ideas from employees promotes new product success (Barczak, 1995). Organizational incentives
and rewards are therefore important to encourage creative innovation within the organization (Sarin and Mahajan, 2001).

More mature organizations on this innovation management dimension exhibit training programs to embed critical skills into the organization’s innovation processes, and embrace innovation within the organization. Besides basic beliefs and values of the organization, higher maturity also involves motivation and rewards that promote innovation, consistent with findings in the innovation research literature.

**Processes**

Past research strongly suggests that a structured, professional NPD process contributes to product success (Cooper and Kleinschmidt, 1993; Ernst, 2002). For instance, de Brentani (1989) finds that a structured development process is related to both market based financial performance and to lowering costs. Despite widespread findings that a structured process is advantageous, 38.5% of firms report using no formal process for NPD (Griffin, 1997). There may be limitations to structured processes; for instance, Veryzer (1998) notes that disruptive innovators generally do not employ a structured, formal NPD process for discontinuous innovations.

Firms with higher maturity levels on the IMMA processes dimension exhibit coordination and communication for effective decision making. This requires clear definitions of tasks and roles for the innovation project, and the use of appropriate process models. Documentation and benchmarking are also components of good coordination and communication in the setting of a cross-functional team, and a project team may take much of the decision authority onto itself under an “optimized” maturity level.
Tools & Techniques

Several types of tools have been examined by researchers to determine whether they are effective in improving the performance of NPD teams. There are a host of different tools used in practice (Achiche et al., 2013 identify 57 such tools in their review); these tools generally consider both necessary inputs as well as likely outputs from new product projects. Investments in information technology (IT) can benefit new product project teams by improving speed to market and, ultimately, market performance (Barczak et al., 2008). When working in virtual teams, communication technology is even more important. Furthermore, it has been shown that engendering positive attitudes towards virtual tools in training is important to ensuring that these tools are used (Montoya et al., 2009). Decision support tools are also in place within many product development organizations.

Maturity on this dimension in the IMMA should engender positive innovative performance, consistent with the above research. Tools and techniques should facilitate communications and analysis to aid decision making. Sophisticated and relevant IT tools that enhance collaboration (such as groupware and decision-support tools) are routinely utilized by more mature organizations on this innovation dimension.

Metrics

Increased thought has been given to metrics by marketing researchers in recent years (MSI, 2006). Innovation metrics have also been given increased consideration, as scholars have considered questions such as, “what are the best metrics to track open innovation efforts” (Chesbrough, 2004). While financial goal setting and measurement regarding both the process and outcome of innovation efforts are considered critical for NPD success, there are a variety of approaches taken to innovation metrics. Based on a survey of experts, Adams, Bessant and
Phelps (2006) propose seven areas for measurement: Inputs, Knowledge Management, Innovation strategy, Organization and culture, Portfolio management, Project management and Commercialization. While there have been several calls for new measurement approaches (e.g., Muller et al., 2005), the use of metrics throughout the innovation process has long been held as a best practice within innovation management (Griffin, 1997). However, the use of metrics has not been as widely adopted as other NPD best practices (Dooley et al., 2002). The most commonly used new product metrics at the business unit level (in order of popularity; Cooper et al., 2004) were 1) the percentage of revenue from new products, 2) percentage of growth in sales from new products, 3) overall profit generated by new products, 4) number of major launches per year and 5) percentage of profits from new products. All but the fourth are financial metrics related to innovation outcomes.

Higher maturity levels on the metrics IMMA dimension reflect the firm’s use of key performance indicators gauging outcomes from innovation projects. This can be through a “balanced scorecard” approach, but organizations with an optimized maturity level convey performance through annual reports and analyst meetings such that financial metrics will be important.

ORGANIZATIONAL COMPETENCES

Idea Management

The “fuzzy front end” (FFE) of innovation is generally deemed the span between the time an opportunity is first conceived and when this idea is ready for development (Kim and Wilemon, 2002). Ideation (i.e., producing new ideas for the firm) is one aspect of the FFE; 18 ideation methods were classified by Cooper and Edgett (2008) into three categories: voice of the
customer, open innovation, and other (such as internal idea capture). The FFE tends to be much more uncertain, prone to ambiguity and generally non-routine when compared to the development phase (Kim and Wilemon, 2002). The best performing teams are able to reduce uncertainty quickly during the FFE (Moenaert et al., 1995). Failure to properly manage the FFE can result in issues such as delays and budget escalation, as well as a failure to harness potential fruitful ideas. The implication is that idea screening is critical as firms try to devote resources to their most promising ideas. The way in which ideas are managed can also have a dramatic effect on the people within an organization (for instance the level of intra-team conflict) (Ruekert and Walker, 1987). A formal process for idea management within the FFE that incorporates an FFE information system is considered best practice in innovation management (Kim and Wilemon, 2002).

Idea management in the IMMA framework focuses on an ability to identify ideas that can lead to differentiated and successful new products, whether incremental or radical. Assessing the suitability of an idea for the organization to pursue, and its potential attractiveness in the market, are critical components of this fuzzy front-end competence.

**Market Management**

Targeting market opportunities that are attractive and consistent with the firm’s resources (e.g., brands, channel relationships) is critically important to successful new product development. Cooper (1988) notes that winning product developing organizations tend to target large, high growth, uncompetitive segments with a high need level. Having a highly developed market orientation leads to better differentiated products, allowing firms to be focused and effective with their new product development investments (Kim and Atuahene-Gima, 2010).
This results in effective product line planning, whereby the product portfolio reflects the market realities of products meeting needs of customers in competitively advantageous ways.

Higher maturity levels are characterized by an organization that proactively meets market needs through the breadth and depth of its product line offerings. This applies to new products that may be more incremental, more radical, or somewhere in between as part of the firm’s overall set of product lines.

**Portfolio Management**

Portfolio management involves administering the firm’s investments in new product development to ensure consistency with the firm’s strategy. Paraphrasing Cooper et al. (2000), while much new product development research focuses on “doing projects right”, portfolio management focuses on “doing the right projects”. Essentially, a firm must allocate its personnel and capital to operationalize its strategy. Ideally, portfolio management ensures a balance between short- and long-term projects and considers risk tolerance and market trends. Several tools are commonly used in portfolio management, including financial metrics, bubble diagrams and scoring models; Cooper et al. (2001) show that firms using non-financial metrics for portfolio management enjoy superior performance.

Failure to manage the portfolio can lead to several common issues including pipeline gridlock (too many projects for available resources) and a tendency to over-focus on incremental projects (Cooper et al., 2000). Chao et al. (2009) show that when funding for product development is dependent upon current revenues, managers tend to overpopulate the portfolio with incremental projects, illustrating the conflicting priorities at play in making these portfolio management decisions. Formal portfolio management processes aim to understand and optimize resource management within NPD, ensure balance in the product portfolio across multiple
dimensions (time horizon, risk) and ultimately ensure that the firm’s strategy is consistent with the new products developed (Blau et al., 2004).

In the IMMA framework, a greater maturity level in portfolio management obviously requires a portfolio perspective, rather than isolated assessments of individual new product projects. Maturity implies a structured process is utilized whereby relevant goals are defined and the organization strives to reach a portfolio balance that achieves those goals.

**Platform Management**

The intense use of reusable subsystems (or architectures) has been shown to have positive performance implications in terms of increasing both the number of products developed and product revenue while lowering development costs (Meyer and Dalal, 2002). Sourcing can also be more cost effective and simplified for modular products. Design quality can be improved when fewer modular components are developed (due to reuse within the platform), and the reuse of trusted components is preferred from a risk management approach. Modular design also makes upgrading particular product components faster and less costly. Given the rising interest in product modularity, scholars have put forward different approaches to measuring modularity as well as to determine the optimal level of modularity given a firm’s environment.

Higher maturity levels on platform management reflect strategic consideration of product architecture and usage of platforms to achieve strategic goals. An important management consideration is the review process of product architectures, and an ability of project teams to not only consider but also leverage and integrate their activities to implement platform strategies.

**Project Management**

Managing innovation projects from idea through to commercialization has long been acknowledged as a driver of new product success. Given the interdisciplinary nature of many
innovation projects, the coordination between areas (such as R&D, manufacturing and sales) is particularly important to new product success (Troy et al., 2008; Zirger and Maidique, 1990). The style of project management (e.g., participative vs. authoritative) as well as project management skills and support from senior management are critical determinants of cross-functional integration within the product developing organization (Thieme et al., 2003). Well managed projects should have well defined risk tolerances, project checkpoints with well managed bottlenecks, and resource allocation consistent with the firms strategy (Cooper, 1996). Project management becomes even more important when multiple development activities are happening in parallel, with a greater emphasis on delegated authority rather than instructions (Thieme et al., 2003). Supporting tools and systems play a key role as NPD teams manage and execute projects.

Effective platform management in the IMMA framework entails reliably and predictably guiding projects through development. This requires not only an integrated approach to project and portfolio management, but also the utilization of critical information about the market as projects are reviewed. Relevant planning and decision tools are therefore critical for an organization to achieve maturity in platform management.

Method

To test the effects of each of these management dimensions and competences, we draw on the PDMA’s Comparative Performance Assessment Study (CPAS) data. This dataset was gathered from innovating firms mainly in late 2003 with some responses from early 2004, which allows for examination of impending performance effects from 2004 onward. Surveys were requested from multiple business units of firms organized with multiple units. To examine the
persisting financial effects of these management dimensions and competences, we match the CPAS data for each firm with secondary financial data from the Compustat database. We were able to match Compustat data to fully completed CPAS surveys (i.e., no missing data for any IMMA element) for 147 firms for analysis using ROA as the dependent variable (with a slightly smaller sample when considering R&D spending as a dependent variable, as will be discussed below). For 20 of these firms, data were collected from multiple business units (with the mean of business unit responses making up the firm level response).

The management dimensions and competences were matched to survey items gathered in the CPAS study, according to the principles and concepts described earlier for all ten elements. The resulting CPAS survey items used for the IMMA management dimensions and organizational competences are indicated in Table 1. Table 1 also notes the relevant scales for each item. CPAS survey items using a 5-point scale reflect the degree an innovation practice is followed in NPD, where 1 is “never,” 3 is “about 50% of the time,” and 5 is “virtually always.” An indicator variable for service vs. manufacturing industries is also used with service industries coded as 1.

We note that Table 1 reflects the final set of CPAS survey items that are matched to the ten IMMA innovation elements. In many cases, multiple items in the CPAS survey could have been utilized as measures of an IMMA element. The items shown in Table 1 reflect our best judgment in terms of the CPAS item a) capturing the maturity level for the IMMA element, and b) being relevant to ultimate innovation outcomes.

-- INSERT TABLE 1 ABOUT HERE --
DEPENDENT VARIABLES

Since innovation projects are evaluated by a variety of metrics, we assess the impact of the ten innovation elements on both return on assets (ROA) and R&D spending. To examine the lasting financial impact of the ten IMMA elements (operationalized with the CPAS survey as described in Table 1) on each of these dependent variables, we take the mean of each variable considering each year of the five year period following the survey (t=1 to t=5). Specifically, the ROA dependent variable reflects the average of the annual ROA for the firm for 2004 through 2008, or the mean 5-year ROA. The R&D Spending variable reflects the average of the annual R&D spending for the firm for 2004 through 2008, or the mean 5-year R&D Spending. In the few instances in which ROA or R&D spending are not available through the Compustat database for all five years, the mean of the available years from 2004 through 2008 is used. To control for the effect of current performance, the contemporaneous (t=0, or 2003) version of the dependent variable is used as a control variable. As is common practice in research using financial data, the log of R&D spending dollars is used.

ROA ANALYSIS

Regression analysis using mean 5-year ROA is first conducted (see Table 2). The regression analysis explains a substantial portion ($R^2 = .310$) of the variation in five year mean ROA.\(^1\) The highest variance inflation factors (VIF) is 1.54, indicating that multicollinearity is not a concern for this analysis (Neter et al., 1996).

As expected, idea management, processes, and metrics have positive and significant effects on ROA ($p < .05$), with platform management’s effect being slightly less significant ($p$

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\(^1\) Note that firm size (either sales or number of employees) is non-significant when included in this analysis as predictor variables.
Surprisingly, project management has a negative effect on 5-year mean ROA (p < .05). To investigate this further, we add a squared term of project management, which proves positive and significant (column two; p < .05), and improves $R^2$ to .332. Thus, we can conclude that there is a non-linear effect of project management, such that at low levels an increased level of project management is actually harmful to ROA, until after a point at which increased levels of project management are beneficial to future ROA (i.e., a U-shaped relationship). Given that the project management variable is connected to the degree to which various project management systems are utilized, there appears to be a threshold effect. Too little utilization does not allow the potential benefits of such systems to be realized until a certain degree of usage expertise is reached.

Several IMMA elements do not have a significant relationship to the mean 5-year ROA. The non-effect for market management is perhaps the most curious. As discussed below, it is possible that limitations in linking IMMA elements to the measures used in the CPAS survey account for some of the non-significant findings.

--- INSERT TABLE 2 ABOUT HERE --

R&D SPENDING

The second dependent variable used in our analysis is R&D spending (see Table 3). The log of the mean of R&D spending from t=1 to t=5 is used as a dependent variable, with R&D “baseline” spending at t=0 used as an independent variable. The sample for this analysis is slightly smaller (n=120) compared with the previous analysis, since R&D spending data are not available for all firms. This set of independent variables predicts the large majority of the variance in future R&D spending ($R^2=.965$). As would be expected, R&D spending at t=0 has a
significant impact (p < .01) on future R&D spending. Several of the IMMA dimensions also have significant impacts on future R&D spending: portfolio management (p < .05) and platform management (p < .01) positively impact R&D spending. As might be expected, firms with structured portfolio management and platform management approaches may have more ambitious R&D plans for the future. Strategy and tools and techniques (both p < .05) have negative effects on R&D spending. Firms with an established NPD strategy that make use of development tools and techniques will perhaps need to spend less on R&D into the future.

-- INSERT TABLE 3 ABOUT HERE --

Discussion

Our study shows that several factors have significant effects on future ROA even when past returns are controlled for. Idea management has a positive effect on ROA; soliciting, storing and managing a volume of new product ideas helps make the front end of innovation more effective. Possessing a structured product development process is also positively related to future ROA, as is the use of metrics on ROA. Firms that use a structured process, setting goals and measuring progress along the way will outperform firms that do not into the future. We also find that project management has a U-shaped relationship with ROA, such that when project management practices are not often utilized, adding incrementally some utilization will actually worsen future ROA. However, once past a certain point in terms of the use of project management practices, projected ROA will improve with more utilization. Further analysis shows that 72.4% of our sample of firms is on the downward slope (i.e., incrementally more use of project management tools would be expected to lead to lower future ROA), with the
remaining 27.6% of firms in our sample past the point where projected ROA will improve with additional use of project management practices.

Platform management is found to be a positive, significant predictor of future ROA but also to be associated with higher R&D spending. While the efficiency that comes with a well-managed platform management approach aids ROA, the existence of these plans are also likely a strong signal of future intent to pursue R&D. Portfolio management is also found to be associated with greater future spending on R&D.

The presence of a well-defined strategy tends to lower future R&D costs, since R&D efforts can be more focused and rely on the firm’s existing resources. The use of R&D tools and techniques is also associated with lower future R&D costs, perhaps due to more efficient use of technical personnel.

No significant effects are found for either dependent variable related to either market management or organization/culture. With respect to market management, it is possible that the yes/no nature of the measure does not fully capture the competitive aspects of effective market management. The CPAS measure also focuses on analysis of the firm’s current product portfolio, which is a more narrow concept than the IMMA market management concept conveys. For organization/culture, the CPAS items used may similarly be too narrow in capturing the full innovation culture of the firm. This reflects the overall challenge of this study to comprehensively match IMMA elements to the CPAS survey. Despite the analytical challenges, this research project has confirmed the financial benefits of several important IMMA elements. Managers can thus more confidently achieve innovation management maturity with respect to those elements shown to be associated with future financial success.
Table 1: Matching IMMA Dimensions with CPAS Survey Items

<table>
<thead>
<tr>
<th>IMMA Management Dimension/Competence</th>
<th>CPAS Survey Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Idea Management</td>
<td>For each of radical, more innovative and incremental innovations, respondents were asked whether their process includes “sort and rank solutions, eliminate unsuitable and unattractive options”. The number of yes responses from the three product categories serves as our indicator.</td>
</tr>
<tr>
<td>Market Management</td>
<td>For each of radical, more innovative and incremental innovations, respondents were asked whether their process includes “Analyze the breadth and depth of the Business Unit’s current product portfolio vis-à-vis the competitive arena”. The number of yes responses from the three product categories serves as our indicator.</td>
</tr>
<tr>
<td>Portfolio Management</td>
<td>Does your Business Unit have a well-defined, structured process for managing its overall portfolio of new product development projects? (yes/no)</td>
</tr>
<tr>
<td>Platform Management</td>
<td>5-point scale: “What degree is this practice followed: Interlocking teams (multiple component teams linked through an integrating team)”</td>
</tr>
<tr>
<td>Project Management</td>
<td>5-point scale: “What degree is this practice followed” (mean score from the following practices): Project Management Systems, Knowledge Management Systems, Document Management Systems, Project Management Tools: Critical Path, PERT, GANTT</td>
</tr>
<tr>
<td>Strategy</td>
<td>Does your Business Unit have a specific strategy for its new product activities that directs and integrates the new product program? (yes/no)</td>
</tr>
<tr>
<td>Organization and Culture</td>
<td>5-point scale: “What product development-based incentives and rewards are provided for NPD teams? Please estimate the degree to which each type of reward is used for teams” (mean score from the following practices): Recognition in organization newsletters, Recognition at award dinners, Plaques, pins, project photographs, Project completion celebration lunches, dinners</td>
</tr>
<tr>
<td>Processes</td>
<td>Which most closely describes your Business Unit’s product development process:</td>
</tr>
<tr>
<td></td>
<td>1. No standard approach to new product development</td>
</tr>
<tr>
<td></td>
<td>2. While no formally documented process is followed, we follow a clearly understood path of the tasks to be completed in product development</td>
</tr>
<tr>
<td></td>
<td>3. We have a formally documented process where one function completes a set of tasks, then passes the results on to the next function, which completes another set of tasks</td>
</tr>
<tr>
<td></td>
<td>4. We have a formally documented process where a cross-functional team completes a set of tasks, management reviews the results and gives the go-ahead for the team to complete the next set of cross-functional tasks</td>
</tr>
<tr>
<td>Tools and Techniques</td>
<td>5-point scale: “What is the percentage of projects that involve supporting information technology tools (such as shared web-sites/groupware)”</td>
</tr>
<tr>
<td>Metrics</td>
<td>In the course of developing a new product, does your Business Unit develop formal financial objectives by which the product’s actual performance will later be measured? (yes/no)</td>
</tr>
</tbody>
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Table 2: ROA Regression Analysis

<table>
<thead>
<tr>
<th></th>
<th>Mean ROA(_{t=1\text{ to } t=5})</th>
<th>Mean ROA(_{t=1\text{ to } t=5})</th>
</tr>
</thead>
<tbody>
<tr>
<td>Idea Management</td>
<td>.172 ((p=.028))</td>
<td>.191 ((p=.014))</td>
</tr>
<tr>
<td>Market Management</td>
<td>.102 (NS)</td>
<td>.095 (NS)</td>
</tr>
<tr>
<td>Portfolio Management</td>
<td>-.087 (NS)</td>
<td>-.077 (NS)</td>
</tr>
<tr>
<td>Platform Management</td>
<td>.155 ((p=.056))</td>
<td>.179 ((p=.028))</td>
</tr>
<tr>
<td>Project Management</td>
<td>-.182 ((p=.043))</td>
<td>-.198 ((p=.026))</td>
</tr>
<tr>
<td>Strategy</td>
<td>.042 (NS)</td>
<td>.037 (NS)</td>
</tr>
<tr>
<td>Org. and Culture</td>
<td>-.039 (NS)</td>
<td>-.061 (NS)</td>
</tr>
<tr>
<td>Processes</td>
<td>.322 ((p=.000))</td>
<td>.320 ((p=.000))</td>
</tr>
<tr>
<td>Tools and Techniques</td>
<td>-.009 (NS)</td>
<td>-.013 (NS)</td>
</tr>
<tr>
<td>Metrics</td>
<td>.176 ((p=.021))</td>
<td>.189 ((p=.013))</td>
</tr>
<tr>
<td>Industry (Service Dummy)</td>
<td>-.180 ((p=.020))</td>
<td>-.199 ((p=.010))</td>
</tr>
<tr>
<td>ROA(_{t=0})</td>
<td>.191 ((p=.012))</td>
<td>.210 ((p=.006))</td>
</tr>
<tr>
<td>Project Management Squared</td>
<td>--</td>
<td>.154 ((p=.039))</td>
</tr>
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<table>
<thead>
<tr>
<th>F</th>
<th>5.021</th>
<th>5.084</th>
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<tr>
<td>(R^2)</td>
<td>.310</td>
<td>.332</td>
</tr>
<tr>
<td>Adjusted (R^2)</td>
<td>.248</td>
<td>.267</td>
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<td>(n)</td>
<td>147</td>
<td>147</td>
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Standardized coefficients shown
Table 3: R&D Spending Regression Analysis

<table>
<thead>
<tr>
<th></th>
<th>Log Mean R&amp;D Spending&lt;sub&gt;(t=1 to t=5)&lt;/sub&gt;</th>
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</thead>
<tbody>
<tr>
<td>Idea Management</td>
<td>-.016 (NS)</td>
</tr>
<tr>
<td>Market Management</td>
<td>-.002 (NS)</td>
</tr>
<tr>
<td>Portfolio Management</td>
<td>.044 (p=.027)</td>
</tr>
<tr>
<td>Platform Management</td>
<td>.056 (p=.008)</td>
</tr>
<tr>
<td>Project Management</td>
<td>.033 (NS)</td>
</tr>
<tr>
<td>Strategy</td>
<td>-.043 (p=.032)</td>
</tr>
<tr>
<td>Org. and Culture</td>
<td>.004 (NS)</td>
</tr>
<tr>
<td>Processes</td>
<td>-.012 (NS)</td>
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<tr>
<td>Tools and Techniques</td>
<td>-.059 (p=.012)</td>
</tr>
<tr>
<td>Metrics</td>
<td>-.024 (NS)</td>
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<tr>
<td>Industry (Service Dummy)</td>
<td>-.017 (NS)</td>
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<tr>
<td>Log R&amp;D Spending&lt;sub&gt;(t=0)&lt;/sub&gt;</td>
<td>.983 (p=.000)</td>
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<table>
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<tr>
<th></th>
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<th>R²</th>
<th>Adjusted R²</th>
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<tr>
<td></td>
<td>245.731</td>
<td>.965</td>
<td>.961</td>
<td>120</td>
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Standardized coefficients shown
REFERENCES


