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ABSTRACT

This research provides a benchmark from the comparison of project management processes. Interviews were conducted with seven organizations: Avista, Bonneville Power Administration (BPA), Con Edison, Intel, Portland General Electric (PGE), National Renewable Energy Lab (NREL), and Samsung-Techwin and consisted of 20 questions broken into four subjects; project selection, project manager (PM) training, PM performance, and project termination. Survey results are compared with literature reviews and "take-aways" are provided with future research.

INTRODUCTION

A recent article from Business Week concluded that "...It's the process, not the pocketbook". [1] In other words, it doesn't matter how much an organization spends on R&D, success of the investment depends on how the R&D is managed. The article goes on to say that superior results seem to be a function of the quality of an organization's innovation process rather than either the absolute or relative magnitude of its innovation spending. This notion is supported by statistics which suggest there is no significant difference between financial results of average and above-average R&D spenders. For example, most successful firms spent a significant portion of their sales dollars on R&D ranging from a low of 1~2% in some mature industries to a high of 15~20% in high tech industries while Apple only invested a portion of 5.9% in 2004 [2].

This benchmark project focuses on how leading R&D firms manage projects, with an emphasis on the process, not an effort to determine how much to invest in an R&D program. Four focus areas were selected based on areas with development potential in the current project management methodology of the sponsoring organization. These focus areas are: project selection, PM training, PM performance, and project termination. Table 1 shows objectives for each area.

Process: A total of 7 companies (4 utilities and 3 non-utility) were asked to complete a 20 question survey. The survey was completed during phone interviews and lasted for approximately one hour each. In addition to the questionnaire, some organizations

provided sample templates (provided in Appendix B). The interview results were summarized and supplemented with related literature research.

Section	Objectives
Project selection (Project and Portfolio Evaluation)	 Understand how the companies evaluate individual R&D projects and the complete portfolio of projects What tools and processes are most effective
PM Training	 Understand the significance of certification and training What are the major challenges with training a PM
PM Performance	 What characteristics define a good project manager? How to manage competing priorities
Project Termination	 Understand how companies track completed projects What tools and process are most effective

Table 1: Questionnaire design

FOCUS AREA 1: PROJECT SELECTION

The first focus area was project selection method. The objectives were to determine what methods are used in selecting a project and what criteria are considered in the decision process.

Selecting the proper projects to undertake is an extremely important activity for organizations. Selecting the right projects (or wrong ones) can be the difference between success and failure. The project selection process can be as simple as a ranking method or a more complex method using criteria like return on investment (ROI) or assessing the strategic value. In general, a project selection method is any systematic approach used to analyze the value of a proposed project. The evaluation may be formal or informal.

Examples of project selection methods include:

- Feasibility analysis may be conducted using a formal study or informal brainstorming session
- Cost Benefit Analysis compares the predicted cost and benefits of a project.

The survey consisted of three questions for the Project Selection Focus Areas:

Q1: What Project Selection Methods are being used by the participating organizations?

Q2: What factors are being considered for project selections in those organizations?

Q3: How often does the participating organizations review and re-evaluate their projects?

Q1: Key findings for project selection methods

- Selection methods are very project specific and it also depends on amount of funding – response from two organizations
- Participant 3 uses a methodology that they refer to as "Circle of Life". The organization core values are consensus and initiative. They encourage participation in project selection from all levels.
- Participant 2 requires a business case proposal for all projects
- A review panel is the most common project selection method between all the participants.
- Financial and other decision models are used 25% of the time
- Other methods were identified as a result of the literature search to include comparative methods (benefit measurement method) or constrained optimization methods [3]
- In general, decisions are made based on the best information available at a given point in time



Figure 1: Project SelectionMethods

The business proposal is used as a comprehensive tool to select projects and includes financial elements as part of the justification. A business proposal is a formal way of proposing a project to include an explanation of how the organization would benefit from investing in the project.

Q2: Criteria for selecting a project

Pay off and strategic fit are the two criteria that are used by the participating organizations. Synergy between projects and political factors has the least percentage of importance. In fact two of the participants are not considering the Political Factors in their Project Selection Method.

Figure 2 shows the percentage of importance of the 11 criteria considered in this survey.



Figure 2: Project Selection Criteria

Project selection factors vary by the type and strategic direction of the organization – some universal criteria is suggested to ensure a project meets administrative and technical requirements. These include:

- Eligibility criteria
- Core selection criteria
- Content-related criteria
- Implementation criteria [4]

The eligibility and core selection criteria are tied to administrative requirements and the content related and implementation criteria are relative to the technical requirements.

Q3: Project evaluation process

Finally, the participating organizations were asked about the frequency of project reviews to ensure they fit with the strategic goals. Table 2 shows the summary of the participant's re-evaluation process:

	Project Review / Re-evaluation Program (number of Review per year)
Participant 1	Annual Lab Directed Research Review - 5 years strategic review - 20 years road map review
Participant 2	Nothing in place at this time – probably quarterly review
Participant 3	Random – no formal board review – Quarterly budget review
Participant 4	Bi – Annually
Participant 5	Quarterly Review within organizations – annual budget review to prioritize
Participant 6	Project dependent - Monthly - Quarterly - different between groups but consistent across organization
Participant 7	Projects are reviewed monthly – informally

 Table 2: Project review cycles

To ensure the project aligns with the strategic direction of the organization and will provide the anticipated return on investment, projects need to be reviewed frequently. Based on the participant's responses, project re-evaluation is a product dependant process. In all cases the organizations are reviewing projects against cost, performance, and schedule requirements AND meeting the overall strategic goals of an organization.

FOCUS AREA 2: PROJECT MANAGER TRAINING

After selecting the project, a project manager is assigned. By definition a project is a one-time activity which is temporary and unique. Because of the uniqueness of each project, there is a level of uncertainty. Therefore, it is important to train a project manager not only about basic knowledge of project management but ongoing processes, models, terminology and language, especially he/she is from outside of the organization [5].

There are three types of external project manager training options; certificates, universities, and certificate institutions. Getting a certificate is the surest way to prove experience and knowledge about project management. The most widely known certificates are PMP (Project Management Professional), CISSP (Certified Information Systems Security Professional), and MCSE (Microsoft Certified Systems Engineer.) It is another option to get a project management degree from the university. Many universities are providing BS, MS, and Ph.D programs on project management (see Table 3). The other way for project management Institution) or IPMA (International Project Management Association.)

While having theoretical knowledge from external training organizations is important, literature suggests it is more important to customize according to the organization's work environment. For instance, a project might be more technically oriented versus market oriented. In this case, project management tools should be able to deal with technical information flow more so than budget or time control. Another example would be managing a software development project versus a construction project where knowledge of a pilot test is important. In general, there is some unique emphasis, depending on the type of project. In some cases it might be more appropriate to assign multiple PMs, at various stages of the project, based on the specific needs. [6] On occasion, a project manager is chosen late in the project life cycle, usually to replace another project manager who is leaving the project for other work. Or a project manager may be purposely switched during the project life cycle to facilitate the

transition to application. As an example, large agricultural product firms regularly use a senior scientist as project manager until the project's technical problems are solved and the product has been tested. Then it replaces the scientist with a middle manager from the marketing side of the firm as marketing becomes the focal point of the project. Table 3 List of universities providing PM degree [7]

Degree	University
Bachelor	Ashford University, University of Phoenix, Colorado Technical University, Columbia Southern University, etc.
Masters	Boston University Online, Jones International University, University of Maryland, University College, Walden University, etc.
Ph.D	Capella University, Northcentral University, etc.

Table 3: University's with a PM degree program

Q1: PMP certification

The first question we asked the 7 participants was if they require PMP certificates when they hire project managers. As shown in Table 2, only one participant requires a PMP certificate, the other organizations put more emphasis on a technical or engineering background. This result is consistent with literature survey in 2008 which says that, nationwide, only 6.4% (813 out of 12,764) of organizations required PMP certification. This was similar to the rate of CISSP (5%) and MCSE (4%) [8]. A project manager must be able to inspire a team, bring confidence to a customer, manage a multi-million dollar project, answer to executive management, keep the CEO happy and do this on several projects at once. The rationale is that these soft skills are not validated by a certificate. This belief supports the low survey rates [9]. However, although most organizations don't require PMP certificates, it was also identified that they still prefer a person who has the certificates because it is an indication that they have a proven and solid foundation of knowledge from which he/she can practice project management with competence and confidence [10].

Do you require PMP certification when you hire project manager?		
Participant	Do you?	Comment
1	No	Culturally, our priority is technical expertise
2	Yes	•
3	No	Mainly engineering based company so necessity of PMP certificate is not felt
4	No	We put more emphasis on field experience/expertise in market/social/industry
5	No	Not aware of PMP certificate
6	No	•
7	No	•

Table 4: PMP certification

Q2: Formal training

The next question was whether the organizations provide formal training for project managers. As shown in Table 3, most participants answered that they have certain types of training course but only three of them were running formal programs provided by internal/external facilitators. The major subject of training courses were project management basics, advanced project management skills, and project management software tool training [11]. The other four participants answered that they had informal courses to help acclimate the assigned project manager. From the questionnaire and literature, it was identified that most organizations expect their project managers to be problem solvers, posses certain technical qualifications, and have a network of professional contacts – qualities that cannot be taught by from general training curriculum [12][13].

Do you have formal training for project manager?		
Participant	Do you?	Comment
1	No	We have some courses that explain how to work in the environment
2	Yes	It is provided by internal facilitator
3	No	We have informal courses for project selection practice
4	No	•

5	No	•
6	Yes	It is provided by internal and externally (university courses) facilitators
7	Yes	It is provided by external facilitator

Table 5: Formal training

Q3: Project management template

The third question was whether the organizations require a project manager to use templates. As shown in Fig. 3, all participants emphasize a project plan template (42% averaged weights of responses.) There were some interesting facts that one of participant doesn't use standardized template for project level, they only keep records for program level, and one was using e-mail for informal documentation tools. There were two participants who were implementing their own project management information system called 'myPLM' and using 'MS project.' Literature results reinforce the need for specific templates quite similar to the participant's responses: scheduling (27%), resource control (25%), issue tracking (20%), portfolio management (18%), and others (10%) [14].



Figure 3: Project management template

Q4: Major challenges

The last question was about what are the major challenges in training a project manager. Results are summarized in Fig. 4. The biggest concern was identified as handling multiple priorities (33%); multiple priorities are defined as responsibilities in addition to managing a project versus priorities specific to the project (e.g. scope change, resource deprivation, or lack of stakeholder engagement). The second biggest issue was the "other" category (26%) which included lack of interest, difficulties of training soft skills including business acumen, leadership, communication, and cost. Statistics show that organizations spent an average of \$142,305 on project manager training in 2003, which amounted to \$1,734 per project management employee [12]. Such a low dollar figure can be understood by the fact that more than one project manager is assigned in a big project and multiple projects are on-going within an organization. Other reasons for such a small investment were organizational barriers. The most significant impediment was a conservative culture which made it hard to change or apply new knowledge or skills [11]. The participating organization's responses and the literature results are complementary: Handling multiple priorities is the biggest issue for the participating organizations while the literature suggests a supportive environment is essential. Therefore, if an organization is supportive, it will set the priority, essentially eliminating the cause of competing priorities.



Figure 4: Major challenges in project manager training

FOCUS AREA 3: PROJECT MANAGER PERFORMANCE

The third focus area was about how to measure a PM's performance. The sponsoring organization is trying to establish criteria for measuring performance that can be consistently applied. One way the assessments would be used is to distribute monetary performance awards. In addition, a common concern among the PMs within the organization is that managing an R&D project is an additional responsibility, above and beyond their current job description. How do they manage competing priorities? Their direct manager is asking them to meet a deadline at the same time the R&D sponsor is asking them to provide a status report or follow-up on invoices. Both are important, so which one do they chose? The questions in this focus area aim to find solutions to navigating these "waters". As well, the questions help to define criteria and the necessary skills for measuring the performance of a successful PM.

Q1: Dedicated PMs and handling competing priorities

"Dedicated project leaders are as important to a project team as a conductor is to a symphony" [15]

Approximately 70% of the respondents do not have dedicated PMs. The results suggest that it is very common for an organization to assign multiple responsibilities to a person, thereby setting up an environment for competing priorities and distractions from the project. Of those organizations that did not have dedicated PMs, how did they suggest resolving this situation?

- If a PM is unable to meet the deadlines then the project sponsor is asked to intervene. One participant noted that this was a particularly helpful technique, not only to negotiate deliverables, but also to improve overall PM performance.
- The second approach was to include criteria as part of their performance assessment, with the objective of keeping the PM engaged and focused on the project and its goals. While this could be successful, a few participating organizations expressed concern that the because of the way performance evaluations were completed, they have no direct influence on the evaluation.

 A couple of organizations find that regular meetings with the PM and stakeholders to set priorities is constructive. The interaction encourages a freeflow of information about project details and challenges and often times leads to effective and creative problem solving.

The literature search indicates that a dedicated PM increases the project's probability of success for the following reasons: 1. a dedicated PM is effective at motivating a diverse group because of their vast experience working with multiple types of projects, 2. an unencumbered PM can focus and protect day-to-day operations without the distractions of other, non-project responsibilities, and 3. the problem of "...too few resources with too many projects..." is resolved by hiring a dedicated PM [15]. The participating organizations agree that a dedicated PM is ideal but, due to funding constraints, it is not practical.

After a PM is identified and is working on the project, the sponsor was interested in knowing how different organizations assessed a PM's performance. The participating organizations were asked to assign weights to the following measures: meeting targets, general project engagement, communication, ability to manage the project team, presentations, or they were given the opportunity to list other criteria.

Q2: Assessing a PM's performance

The majority of organizations weighted "meeting targets" as the most important performance criteria. These results are consistent with the literature search: performance measures need to be objective. It is difficult to measure a "soft-skill" such as communication. Whereas, measuring if a project was on time, on budget, and met performance objectives is easier. The literature search identified one company that is doing a pilot study of establishing a point system to measure performance. A PM starts the project with 100 points. Points are deducted for missing a deliverable, being late, being over, or under, budget, and for not providing expected performance. At the end of the project the PM has a "final score" of their performance. Another approach used by one of the participating organizations was to develop a hierarchical decision model as a

way of identifying outstanding PMs. However, this model uses several subjective criteria. Based on the results of this project, the model could be modified to reflect more objective measures.

The final question aims to identify the PM extraordinaire! The participants were asked to assign weights to skills that may define a successful PM. These skills were technical experience, communication, facilitation, negotiation, leadership, decision making, previous PM experience, financial, and organizational skills.

Q3: Most important skills for a PM

The participating organizations had a technical emphasis. Therefore it was no surprise that technical experience was the overwhelming skill required for a successful PM. However, it is interesting to note that communication, facilitation, and negotiation were within a couple of points of each other, and came in as the second most important skill for a PM.



Figure 5: Average weight assigned to PM skills

Again the participant's responses were consistent with the literature results – successful PMs are equally proficient in soft skills such as communication, facilitation, and negotiation. An expert in Human Resource Project Management, Dr. Wilfred Wu, gave a lecture on the impact of soft-skills and a PM's ability to successfully manage a project team. According to Dr. Wu, almost 40% of PMs surveyed believe that human resource management is the most challenging part of a project. Dr. Wu provided insight into this statistics and used several motivational theories to describe the challenge of how to motivate and manage a project team, or people in general. For reference these theories include Intrinsic vs. Extrinsic, Herzberg's Theory, Maslow's Hierarchy, McGregor's X/Y theory, and the Ouchi Theory. The overwhelming theme was clear: don't underestimate the significance of soft-skills in managing a successful project! Specific to this project the recipe for success appears to be a technical background and experience in human resource management.

FOCUS AREA 4: PROJECT TERMINATION

In order to stay ahead in a competitive market corporations need to be innovative and develop new products or processes on a regular basis. However, quite often, the end product does not meet the original requirements, and at some point, it behooves the organization to terminate the project before completion. This is one of the most difficult and challenging tasks for a manager but such a decision, made at the right time, can save time and money. Also, the resources can be redirected towards more promising and potentially successful projects.

For example, in 1992, nearly 16,000 new products were introduced, of which, nearly 90% did not meet their business objectives [16]. Most of these looked attractive from a business perspective when the projected started, but they were not completed for various reasons. These reasons include overly optimistic initial estimates of the ROI, the underestimation of resources and technical problems that must be solved. While the execution stage of an R&D project is the most active part of a project, more serious efforts should be given to the importance of R&D project termination. ETM 545 - PROJECT MANAGEMENT

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Survey Questionnaire

The final focus area was related to the different aspects of R&D project termination. The participant's responded to reasons why a project is terminated, the tools and archival techniques, to include documentation of lessons learned. They also responded to they transfer to application and track completed projects.

Q1: Termination criteria

Termination decisions are important and the reasons may be due technical, market demand, high R&D costs, lack of funds or resource constraints. Technical reasons for project termination are due to low probability of achieving technical objectives or commercializing results. Projects with higher priority can starve the current project of R&D labor or funds [17]. Economic termination could be due to low profitability or ROI. Market reasons are mainly low market potential, or change in competitive factors or market needs. Also, if the product is taking too long achieve commercialization, the project should be terminated. As an example, in the Smartphone industry the market changes very rapidly and identifying the latest requirements can be quite challenging. Consequently accurately predicting the demand of a product or ROI could be very tricky.

Based on the participant's responses from Fig. 1 we find that lack of market demand is the most important followed by the technical challenges which cause projects to terminate. The other major reasons why projects are terminated are due to lack of resources or due to poor planning on the part of the project manager.



Figure 6: Project termination criteria

Q2: Project close out and tracking

There are four ways in which a project can close out: extinction, addition, integration and starvation. Typically, **extinction** happens when the project is successful and delivered to the client. This also happens when the project is unsuccessful or when it is superseded by other better, cheaper, or competitive options available in market. Termination by **addition** happens when successful in-house projects are institutionalized as a part of the parent organization. Both extinction and addition cause projects to stop but in case of addition, the resources and equipment are merely shifted from the stopped project to new projects. The most common way of termination is by **integration** where the successful project's property and personnel are distributed among the parent organization. The output of the R&D project is merged into the operating system of the client or end user. The final type is more of a slow **starvation**

by imposing budget and resource cuts. Project starvation happens when upper management does not want to terminate a project due to political reasons and so they 'starve' the project of resources and personnel, followed by a "no progress" report, filed annually [6].

Once a decision has been made to terminate a project, the next step would be to determine the appropriate documentation and tracking processes. Project tracking varies by organization and is done sometimes as a project closure report or with a report meeting. One of the survey participants mentioned that they seldom complete projects - the direction and scope changes such that it "morphs" into another project. Therefore, tracking these becomes an indefinite process. Some of the survey participants indicated that they let the individual project members take ownership and conduct survey or meetings with their teams to gather and document project information. The results of the post project evaluation could be documented and included with archived set of documents. Sample checklists are included in Appendix B.

Q3: Archival tools and documentation:

The various documents and research material that have been used in the project become a part of the project asset and need to be organized for future retrieval. Often times, the information could be useful to another team for planning and implementation of similar projects or to continue the project if it was placed on "hold". Past projects serve as templates for future projects and so documentation and tracking of these are important. Documentation for patent or trademark applications can be useful from a legal standpoint as well.

90% of our participants said they make use of software, tools or project termination documents to keep track of the lessons learned. Project Management software packages make use of templates for future use. Some participants indicated the use of an electronic central repository where all the documents and research material are stored. Auditing is also reason for comprehensive project documentation as indicated by one of the participating organizations.

Q4: Project transfer to application integration/commercialization:

Implementation of R&D projects or integration with the end user is one measure of the project success. In these cases success is measured in the form of a financial return on the research investment. One of our participants indicated that their commercialization or deployment department interacts with industry partners who are tied to their R&D organization in order to facilitate the transfer to application. Otherwise most participants indicated that during their deployment stage they interact with the application teams or product groups for a successful transfer of the research. For relatively larger companies, dedicated technology transfer managers liaise between the research and product groups to assist a smooth transfer.

Literature results indicate that the failure rates of R&D projects is high. Studies show that 40% of R&D projects haven't been finished technically. Of those that finished, 45% have not been developed into products yet. 60% of projects cannot make a profit which shows that the majority of projects fail and are terminated in the R&D process [18]

SUMMARY of RESULTS: The Take - Aways

After reviewing the project management processes from each of the participating organizations and comparing the results with information from research, the "take-aways" for each focus are summarized below.

Project Selection

- A business proposal is a comprehensive tool for making project selection most organizations used a template (examples in Appendix B).
- Factors which affected project selections vary by organizations and they depend on the organization strategy and culture.
- Organizations review and re-evaluate their project at a minimum of once a year. ETM 545 - PROJECT MANAGEMENT

Project Management Training

- PMP certifications are not required but the value of this certification is recognized by most participating organizations.
- Project manager focus of training should be to orient the PM to an organization's PM methodology which could be formal or informal.
- Project templates improve the consistency of project information.
- Managing multiple priorities is a major training challenge

Project Management Performance

- Dedicated PMs are preferred. The suggestion is that this using dedicated project manager is more effective
- Project management assessment criteria should be objective (vs. subjective)
- Organizations should not underestimate the value of "soft skills" and their effectiveness to manage a project

Project Management Termination

- Market demand is the most common reason to terminate a project.
- Completed project tracking varies greatly by organization but is necessary to document lessons learned.
- Successful transfers of R&D projects appear to integrate the application team into the R&D project process.

FUTURE RESEARCH and RECOMMENDATIONS

One of the objectives of this project was to identify best practices such that some might be used by one of the participating organizations to improve their current project management methodology – remember it is about the process not about how much is invested. Future research might include contacting the participants to see how the information presented in the report was used. Did they hire dedicated project managers? If so, what was the impact on meeting project targets? Were changes made to their training programs and what was the impact on performance? and similar measures identified within the four focus areas.

As discussed in the PM Training focus area, the concept of multiple PMs assigned to a project and swapped out at various points could be further developed for future research. It would be interesting to understand if multiple PMs are more effective versus having the same PM throughout the project, relative to meeting deadlines, or staying within cost and performance targets. Is application transfer handled more effectively (as was the case for agricultural companies) when PMs with specific skills are used?

Specific to the sponsoring organization, the recommendations would include:

1. Put more emphasis on the importance of soft-skills to manage a project and project team.

2. Revise the performance hierarchical model to include more objective measures. Longer term considerations:

- Allocating FTE to hire dedicated project managers who work with the sponsoring group's technical experts; the technical experts are currently fulfilling the role of PM and technical expert.
- 4. Include criteria as part of performance evaluations.

ACKNOWLEDGEMENTS

The project team would like to thank the organizations who participated in our questionnaire. The discussions were instrumental in understanding how some of the leaders in R&D manage projects. We hope the information provides useful insight to your organization and processes. Thank you!

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APPENDIX A

PROJECT MANAGEMENT BENCHMARKING QUESTIONNAIRE

Tell Us About Your Organization

- 1. Amount of investment in R&D and the basis for investment (e.g. typical of the industry, strategic, historic, etc.). It would be helpful to have the level investment for the past five years.
- 2. Number of current R&D projects
- 3. Maturity of R&D department:
 - a. 0 3 years
 - b. 5 10 years
 - c. Longer than 10 years
- 4. Structure of the R&D organization:
 - a. Project
 - b. Matrix
 - c. Functional
- 5. Number of R&D direct employees

Focus Area 1: Project Manager Training

- 1. Do you require a PMP certification? If not why?
- 2. a. Does your organization provide formal training for PMs to explain company specific adaptation of PM practices?

____ Yes ____ No

b. If "Yes", is the training provided by an internal or external facilitator?

____ External

____ Internal ETM 545 - PROJECT MANAGEMENT 3. Do you train PMs to use specific templates, checklists, etc. to standardize project reporting? If you had 100 points to allocate among different templates or reporting tools, how would the points be allocated among the following:

Template/Tool		Points (must sum to 100)
Project change request		
Project plan		
Progress report		
Stage gate review		
Project termination checklist		
Other		
	Total	100

(if appropriate, please provide example of the templates or checklists)

4. What are major challenges in training a PM? If you had 100 points to allocate among different training challenges, how would the points be allocated among the following:

Challenge	Points (must sum to 100)
Time commitment	
Communicating fundamental PM concepts	
Meeting deadlines	
Handling multiple priorities	
Other	
Total	100

Focus Area 2: Project Manager Performance

1. Does your organization have dedicated PMs?

____ Yes ____ No

If PMs are not dedicated (e.g. they manage an R&D project, while fulfilling other roles as an engineer, supervisor, manage multiple projects, etc.), please answer questions 2 - 4, otherwise skip to question 3

2. a. How does your firm enforce/encourage PM participation in the face of competing priorities?

- b. Are responsibilities included as part of performance evaluation?
- 3. Measures you use for assessing a PM's performance If you had 100 points to allocate among different performance measures, how would the points be allocated among the following:

Performance Measure	Points (must sum to 100)
General project engagement	
Presentations	
Communication	
Meeting targets (Time, Cost, Performance)	
Ability to manage project team	
Other	
Total	100

Please specify "Other": -

4. Important skills for a PM - If you had 100 points to allocate among different skills, how would the points be allocated among the following:

Skill	Points (must sum to 100)
Negotiation	
Communication	
Decision making	
Leadership	
Technical experience	
Facilitator	
Previous PM experience	
Financial	
Organizational	
Other	
Total	100

Please specify "Other": -

Focus Area 3: Project Termination

1. Most important factors contributing to the termination of a project - If you had 100 points to allocate among different factors, how would the points be allocated among the following:

¥	
Factor	Points (must sum to 100)
Market demand no longer exists	
Funding	
Resource constraints	
Poor PM	
Technical	
Other	
Total	100

Please specify "Other": -

- 2. How does your organization track completed projects? (for example do you only track projects that will be transferred to application or do you also track R/D projects that show potential in a few years?)
- 3. Do you have specific tools or processes in place to archive research material and lessons learned?

____ Yes ____ No

If "Yes", please specify: _____

4. How do you integrate practices relating to moving research into application / adoption / commercialization with project management expectations?

Focus Area 4: Project Selection

1. The R&D project selection requires the allocation of resources to a set of competing project proposals.

What methods do you use to support the selection of projects in a research and development (R&D) environment? If you had 100 points to allocate among different factors, how would they be allocated among the following:

Method	Points (must sum to 100)
Review Panel (include level of participants)	
Project selection model (NPV financial model,	
other decision models)	
Preparation of a business case proposal	
Other	
Total	100

Please specify "Other": -

(if appropriate, please provide example of the types of decision models or proposal templates)

2. On a scale from 1 to 5, with 5 being most influential, 3 being average influence, and 1 being the least influence, please rate the relative influence of the factors normally used to evaluate new R&D projects:

Factor		Ir	nfluence (Circle One	e)	
	Least				Most	
Strategic fit	1	2	3	4	5	N/A
Pay off	1	2	3	4	5	N/A
Start-up costs	1	2	3	4	5	N/A
Project resource constraints	1	2	3	4	5	N/A
Probability of success	1	2	3	4	5	N/A
Market timing	1	2	3	4	5	N/A
Technological capability	1	2	3	4	5	N/A
Protectability	1	2	3	4	5	N/A
Political	1	2	3	4	5	N/A
Synergy between projects	1	2	3	4	5	N/A
Other	1	2	3	4	5	N/A

Please specify "Other": -

3. Does your organization have any schedule to review the projects to re-prioritize or re-evaluate (e.g. quarterly, bi-annually, yearly)?

APPENDIX B

Project Tracking Applications

Templates

Checklists



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Report Provided By: Date:	
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TI Project No:	
Project Objectives	the original objectives correct? Where they changed?
	what were the reasons for differences, if any, between planned
Planned vs. Actuals	and actual cost, schedule and deliverables.
	what is the value added as a result of the project ? Compare
Project Value	actual benefits to expected benefits.
Project Plan	How well did the project plans guide the project ? Did the project plan meet the objectives? Are the customer needs met, are they satisfied? Did the project plan change? Were these changes documented? What happened to change your original plans, how did you end up with what you did? What seemed minor but actually ended up being a major issue? Looking back, what were the signs that could have told you this before you made the change?
	Did the technical solution prepared to produce the project
Technical Approach	deliverables achieve the overall objectives? Have all the
	technical activities been accomplished? How could the
	technical approach have been improved? Are there any
	deterred technical decisions or features that are unresolved? If
	so, what should be done (i.e., closed it out or moved on to the next phase)?
Contingency Plan	what happened that you did not anticipate - Looking back are
	there signs that if you had been aware of them sooner you

	could have anticipated it and implemented a contingency plan before it happened. What totally unexpected events impacted the project? Was it a result of poor planning or just an off the wall event of which you had no control over. How could contingency planning be improved?
Quality Assurance Plan	How effective were the project quality assurance plan, associated tests and acceptance plans and quality control procedures? How could the quality assurance plan be improved?
Communication Plan	How good was the communication between the project team members? Did team members have the information they needed to make decisions? Was the project sponsor adequately informed? Was the project stakeholders adequately informed of product changes, delays, etc? How could communication be improved?
Team Performance	How well did the project team perform as a team? What was there about team dynamics and interpersonal behaviors that helped or hindered project performance?
Lessons Learned	What are the top three lessons learned from this project that you would like to share with others?
Outstanding Issues	Are there deferred decisions or features that need to get closed out or moved on to the next phase? If so, what do you recommend to do?



- □ □ How well did the project team as a whole perform?
- □ □ How did you do as a project leader?
- □ □ Any advice for someone about to undertake something similar?

PROJECT CLOSE OUT CHECKLIST

Project Name: Project Manager: Project Contact No(s): Non Disclosure Agreement No(s):				
CONTRACT Submit appropriate documents to Contracting Officer Checklist for Closeouts	Assigned To	Date Complete	Document Archived Sharepoint	Comments
NON DISCLOSURE AGREEMENT Confirmation Appendix A data destroyed by Vendor				
INTELLECTUAL PROPERTY Patents Data Licensing requirements, agreements Royalty agreements				
PROJECT Final project report Tech transfer report Post project evaluation				
EQUIPEMENT PURCHASES Warranties need to be filed Maintenance is addressed for life of equipment. Software license are set up for renewal.				
FINANCIAL ACCOUNTING All invoices paid for contract and material Work Order Closed (need to find out process)			nła	
CONDUCT CLOSING CEREMONIES Thank all team members Have meeting to discuss lessons learned Recognize exceptional team members to their supervisor			nla nla nla	