Critical Skills for IT Project Management and How They are Learned

Hazel Taylor
The Information School
University of Washington
Box 352840
Seattle, WA 98195 USA
+1 206 616 6110
hztaylor@u.washington.edu

Jill Palzkill Woelfer
The Information School
University of Washington
Box 352840
Seattle, WA 98195 USA
+1 206 616 6110
woelfj@u.washington.edu

ABSTRACT
What do IT project managers consider to be the critical skills necessary for project success, and how have they developed those skills? The aim of this research has been to answer these questions. We interviewed thirteen experienced IT project managers from five organizations, focusing first on what the managers perceived as their most critical project management skills, and then on how they had developed those skills. We also discussed their exposure to a wide variety of organizational development interventions. By focusing on how project managers actually learned critical skills, we have been able to uncover the importance of informal learning channels, often involving project experiences, for the development of IT project management skills.

Categories and Subject Descriptors
K.6.1 [**Management of Computing and Information Systems**]: Project and People Management – *management technique.*

General Terms
Management, Performance.

Keywords
Project Management.

1. INTRODUCTION
Organizations make substantial investments in the development of their IT project managers in the expectation that those managers, and the projects they lead, will be successful. This paper addresses the question of how organizations can best support their IT project managers in gaining critical project management knowledge and skills. Traditionally, management development initiatives have included interventions such as formal training programs, performance appraisals, 360-degree feedback, and management coaching. Additionally, in the project context, post-project reviews provide a significant occasion for an organization to facilitate the learning of project managers and team members from their project experiences [4].

In this study, we focus on the key knowledge and skills that experienced IT project managers view as critically important in order to manage their projects effectively, and we explore the avenues by which these managers have developed these skills and knowledge in the course of their careers. By examining both what the critical skills are from the perspective of experienced project managers, and how these managers have acquired these skills, we are able to provide recommendations on effective development and training programs for the next generation of IT project managers. Key objectives of this study were to identify avenues of learning that organizations can utilize for improved facilitation of training for less-experienced project managers, and to examine the extent to which post-project reviews contribute to IT project managers' development. This latter objective relates to the implicit assumption embedded in the use of post-project reviews, which is that such reviews are one of the more effective ways to transfer experiential learning across teams within an organization. In fact, project managers and team members may learn best through other avenues that have yet to be fully exploited by organizations.

In the next section, we overview the key knowledge areas and competencies identified in the literature as important for project managers, and then discuss both general management and leadership development interventions and the potential of post-project reviews as a training and development tool. Following this, we present the method for the current study, and results and discussion.

2. LITERATURE REVIEW
2.1 IT Project Management Skills
There is now an extensive professional literature providing guidelines and frameworks for best practice in project management. The Project Management Institute [27] provides a series of professional certifications based on the standards set out in its Project Management Body of Knowledge (PMBOK). The PMBOK is a detailed framework of nine knowledge areas, broken down into activities across five stages or process groups of the project life cycle, that are claimed to encompass the sum of knowledge generally recognized as good practice in the project management profession. In addition to these detailed knowledge areas, tools and techniques, PMBOK also notes that effective

SIGMIS-CPR'09, May 28–30, 2009, Limerick, Ireland.

project management requires an understanding of the application area, the project environment, general management knowledge and skills, and interpersonal skills.

Building on the knowledge standards in the PMBOK, the PMI has developed a detailed framework of project management competencies [28]. Specifically, the project manager competency development framework sets out three dimensions of competency required for effective performance in the project management profession. These three dimensions comprise the detailed declarative knowledge required i.e. the nine knowledge areas of the PMBOK, the procedural knowledge needed to apply the declarative knowledge i.e. performance standards for each knowledge area, and the behavioral competencies necessary for effective project management performance. The competency framework is comprehensive and the declarative and procedural knowledge competencies are generally accepted as essential components of any project manager's skill set. However, the 19 behavioral competencies, shown in the left hand column of Table 1, have been drawn and adapted from general managerial competencies listed in the competency dictionary developed by Spencer and Spencer [30], and have not been empirically tested for their specific applicability to project management work.

There is still little *empirical* research into the question of the specific behavioral competencies required by project managers in order to do their jobs [24]. One particularly useful program of research in the construction industry [8, 9] has led to the development of an empirically derived competency model, reporting a more tightly focused group of 12 core behavioral competencies, shown in the center column of Table 1, that are regarded as critical for effective construction project management performance. We have been unable to find empirical work testing the applicability of these competencies to project managers working in the IT field, and while it seems reasonable to assume that the Dainty et al. [8, 9] set of skills would be required, additional competencies from the PMI list may also be important in the IT project context.

In addition to these studies examining overall competencies of project management, a handful of studies have examined the importance of specific skills for IT project management. Jiang, Klein and Margulis [18] looked at the extent to which a set of skills previously identified as important for systems analysts were also important for IT project managers, and identified directing, managing and information seeking, all three of which are represented in Table 1, as key skills. A subsequent study by Jiang, Klein and Chen [17] focused on the importance of leadership skills for successful project outcomes, reinforcing the importance of the team leadership competency in Table 1. In a study that examined competencies of IT professionals in general, Bassellier and Benbasat [2] found that business competence, defined as organization-specific knowledge together with interpersonal and management knowledge was a key skill for those IT professionals whose work involves substantial contact with business clients. The organization-specific knowledge aspect of Bassellier and Benbasat's business competence category is broader than the definition of organizational awareness competence derived from Spencer and Spencer's [30] competency dictionary, which refers simply to an understanding of the power relationships in the organization. Bassellier and Benbasat's [2] definition also encompasses an understanding of organizational structure and of the business impact of IT and IT projects. Since IT project management work typically requires significant interaction with clients and other stakeholders in the organization, this broader view of organizational awareness is likely to be an important aspect of the knowledge and competencies needed by IT project managers, and we adopted the expanded definition shown in the right hand column of Table 1 for the organizational awareness competency.

The declarative and procedural knowledge and behavioral competencies outlined in the PMI's competency framework, together with Bassellier and Benbasat's business competence, provide a starting point for examining the knowledge, skills and abilities required for IT project management. However, it is likely that at least some of the required knowledge and competencies are industry and role-specific [8, 24] and so further investigation of the requirements for effective performance in the IT field is required. We do not yet know which aspects of the declarative and procedural knowledge and competency framework are critically important for IT project success. Thus, one aim of the current research was to investigate which knowledge and skills experienced project managers regard as critically important components of their project management toolkit.

2.2 IT Project Management Skill Development

Understanding the specific knowledge and skills required for effective IT project management is only the first step. We also need to learn more about how best to support the development of project managers in these areas. Two surveys of experienced project managers across a range of industries report that very few organizations have implemented in-house training development programs in the project management area, relying instead on on-the-job experience to develop their project managers [5, 7]. Indeed, there has been a somewhat unquestioning assumption in industry that project managers can be promoted based on their technical ability and that they will have somehow absorbed the necessary project management skills during their time on projects in a more technical capacity [5, 25]. Yet managerial and inter-personal skills are generally rated of higher importance than technical skills for project managers across all industries [13]. This is of particular concern in the IT arena because the special nature of IT projects - in particular, their high levels of uncertainty, their primary focus on conceptual work, the wide variety of stakeholders, and the lower levels of continuity of project personnel from one project to the next – means that managerial skills are likely to be essential for effective project management.

While organizations may not be initiating project management training, the dramatic increase in project managers holding the PMI Project Manager Professional certification noted by Gray and Larson [16] – from fewer than 3,000 in 1996 to over 200,000 in 2005 - suggests that individual project managers are taking an increasingly proactive approach to their own professional development. The extensive training and certification opportunities provided by professional associations such as the

Table 1. Behavioral competencies for project managers

[*Expanded definition encompassing Bassellier and Benbasat's [2] business competence]

Project Management Institute [28]	Dainty et al. [8, 9]	Definition for the current study (derived from Spencer & Spencer [30])
Self control	Composure/self control	Maintains control over emotions and avoids negative actions under stress
Team leadership	Team leadership	Leads others in a team; is able to develop the sense of team purpose and direction to achieve team goals
Directiveness/assertiveness	Directiveness/assertiveness	Shows ability to make others comply with own wishes through direction, setting of performance standards, and confrontation of non-performance
Achievement orientation	Achievement orientation	Sets own standards for excellence in works and strives to meet them
Analytical thinking	Analytical thinking	Systematically understands situations by breaking them into smaller parts in a step-by-step causal way
Flexibility	Flexibility	Is able to adapt to and work effectively with a variety of situations, individuals, or groups
Teamwork & cooperation	Teamwork & cooperation	Works cooperatively as part of a team and fosters teamwork
Initiative	Initiative	Is proactive in taking action to avoid problems or create opportunities
Information seeking	Information seeking	Actively seeks out in-depth information through research and with others
Conceptual thinking	Conceptual thinking	Builds a larger understanding of a situation by identifying patterns that are not obviously related, seeing the larger picture
Impact & influence	Impact & influence	Demonstrates ability to influence others to support own agenda
Customer service orientation	Focus on client needs	Focuses efforts on understanding and meeting the client's needs
Interpersonal understanding		Is sensitive to, listens to, and wants to understand other people
Relationship building		Works to build relationships with people who are, or might someday be, useful in achieving work-related goals
Developing others		Shows the intent to teach others or foster their work development
Organizational awareness		Understands the organizational structure and power relationships in own and client organizations; understands business impact of IT and IT projects*
Self confidence		Expresses confidence in ability to deal with challenging situations and in handling failures constructively
Concern for order, quality and accuracy		Strives to maintain or increase order in the work situation
Organizational commitment		Is able and willing to align with the needs, priorities and goals of the organization

PMI can address the development of the declarative knowledge base, but procedural knowledge and behavioral competence typically require a more situated learning approach, embodying practice, feedback and reflection [14]. In this context, post-project reviews have the potential to play a key learning and development role in terms of identifying key declarative and procedural knowledge gaps, and potentially surfacing behavioral competency weaknesses, as well as identifying more systemic organization-wide project management issues that require corrective action [1, 4]. However, there is increasing evidence that such reviews are often not carried out or are used primarily to ensure compliance to standards [1, 32]. Even when lessons learned are captured and stored, the learning process either fails to occur [26] or is shallow and superficial [4].

It might seem that project managers are receiving little organizational support for development of project-specific procedural knowledge and competencies, but most of the required competencies discussed earlier are similar to generic management competencies rather than being specific to the project

management job, and thus organizations may rely on more general management and leadership interventions to provide the necessary development training for their project managers. Organizational interventions for developing management and leadership skills in employees typically include both formal training programs to develop key management and leadership competencies and on-going developmental support initiatives aimed at supporting continuous individual development [22]. Formal management training programs typically cover a range of generic competencies, such as general management skills and interpersonal skills, believed to be important for managers to develop. On-going developmental practices, such as 360-degree feedback, coaching and mentoring, modeling and apprenticeship, developmental job assignments, and communities of practice, are aimed at supporting employees in their continuous development in the workplace, and are particularly useful for supporting change in behaviors and transforming understanding in order to guide future action.

In contrast to the formal approaches to management and leadership development, some researchers [6, 19, 21] argue that leadership skills must be learned through on-the-job experience. However, as McCall Jr. [21] notes, "People don't automatically learn from experience." Thus the challenge is to provide support to ensure that managers do in fact learn as much as they can from their normal work experiences [10]. Thus, apprenticeship opportunities coupled with support and feedback to encourage reflection and sense-making of the leadership apprenticeship are regarded as valuable approaches for leadership development [11, 19].

2.3 The Current Study

The research reviewed above has highlighted a framework of knowledge, skills and behavioral competencies that are required for project managers, but it is still unclear which aspects of this framework are of critical importance for effective project management. In addition, we know little about how best to support project managers in developing the required knowledge, skills and competencies. One tool, post-project reviews, could be expected to provide a significant learning opportunity for project managers, but the challenge seems to be ensuring that managers do in fact learn from the review process. Thus in the present study, we focused both on exploring the knowledge and skills that experienced IT project managers regard as critically important components of their project management toolkit, and how they developed these skills during their careers. Our key objective was to understand how individual learning from project experiences can best be facilitated, and we used the following questions to guide our investigation:

- Which of the knowledge and skills that experienced project managers have gained during their career do they see as critically important for their project success?
- How have experienced project managers learned these key skills and knowledge?
- What organizational developmental interventions (including interventions such as training programs, coaching, and mentoring, as well as participation in post-project review processes) have managers experienced and how have these contributed to their learning.

3. METHODOLOGY

The main emphasis of this research was an in-depth, case study investigation, with the objective of exploring individual project managers' learning. The nature of this research is exploratory and descriptive, because, while there is plenty of literature on learning and development of generic management and leadership skills, little attention has been paid to the specific challenges of developing IT project management knowledge, skills and competencies. The PMI's project manager competency development framework [28] with the expanded definition of organizational awareness shown in Table 1, provided us with an initial research model.

3.1 Sample

Table 2. Respondent demographics and experience

Partic-ipant	Age Group	Gender	Education	Experience
A1	30-39	M	Masters	2-5 yrs; 10 projects
B1	50-59	M	Bachelors	15 yrs; 60 projects
B2	30-39	M	Certificate	6 yrs; 50 projects
B3	40-49	M	Masters	6 yrs; 10 projects
B4	40-49	F	Masters	12 yrs; 120 projects
B5	50-59	M	Masters	25 yrs; 10 projects
B6	30-39	M	Bachelors; Prince 2	16 yrs; 45 projects
C1	50-59	F	Bachelors	10 yrs; 5 projects
C2	20-29	F	Bachelors	4 yrs; 5 projects
D1	30-39	M	Masters	4 yrs; 5 projects
D2	30-39	M	Masters	4 yrs; 10 projects
E1	40-49	F	Certificate; PMP	22 yrs; 50 projects
E2	50-59	M	Bachelors; PMP	31 yrs; 35 projects

We used a two-stage purposive sampling approach to identify experienced IT project managers for this study. Five organizations representing wide variation in terms of type of organization (both specialist IT firms and organizations with IT departments carrying out internal projects), type of IT project (for example, software development, package implementation, infrastructure upgrades, and internet and intranet projects) and types of project review processes (formal, ad hoc, or none) were invited to participate. Within each organization, we identified key informants at the CIO, program executive, or senior project manager level and sought nominations from these key informants of one or two expert and experienced project managers within their firm. We then used a snowball approach to seek further participants from the initial set of nominated project managers.

In total, we interviewed 13 project managers from the five organizations. As can be seen from Table 2, the respondents spanned a large range of age and experience. Those who had more years in the profession had typically worked for two or three different companies during their project management career, and drew their learnings from across their experiences with these different companies. All respondents except A1 and D2 had wide experience, with projects including in-house development, infrastructure upgrades, and package implementation work, and varying team sizes, budgets and durations. A1's projects were all small web development projects for clients, while D2 had worked primarily on consulting projects for clients.

3.2 Data Collection Procedures

The interviews with individual project managers relied largely on the critical incident method [15], which has been demonstrated to be effective in surfacing tacit knowledge and in getting beyond respondents' espoused theories (in the present case, about what and how they have learned) to reveal actual practice (in the present case, practice about actual learning) [12, 20, 31]. The interviews were semi-structured and we provided the interview guide to participants ahead of time, because we believed that they would be able to give more meaningful responses if they had time to reflect on the questions. In addition to collecting basic demographic data and details about project experience, the interviews covered three main areas. In the first stage of the interview, we encouraged respondents to focus on key incidents in their current projects where they had applied knowledge or skills differently from the way they would have approached these incidents early in their careers. We examined these incidents with the respondents to understand specifically what knowledge or skills were now being applied and what, specifically, these experienced project managers now do differently from what they did earlier in their careers. The second stage of the interviews focused on how the respondents learned the key knowledge and skills they have identified. Again, we focused respondents on identifying the specific learning events that first triggered a change in the way they approached the area under discussion. Finally, we asked project managers about a variety of interventions that are often used by organizations to develop and improve personnel performance. For each intervention we discussed respondents' experience with the intervention, and how helpful it had been in terms of their overall development as a project manager. Interviews lasted approximately 45-60 minutes. Interviews were tape recorded with the permission of the participants and transcribed. One participant requested no recording and extensive notes were taken during that interview. The completed record of each interview was returned to the participant for checking and confirmation. All respondents confirmed their transcripts.

3.3 Analysis Procedures

The initial research model, derived from the PMI's project manager competency development framework [28], provided support for an interpretive prior-research-driven thematic analysis [3, 23, 29]. Thus, the analysis proceeded in three stages, corresponding to the three research questions that guided our investigation. We first extracted the key learnings identified by each project manager as critical elements in their efforts to ensure project management success, and derived a definition for these learnings, couched in the participant's own words. Respondents typically spoke of three or four key learnings that they had found critical, providing a total of 47 learnings from this set of project managers. We used the framework of competencies shown in Table 1 to categorize the learnings into the underlying competencies that they reflected. Some of the key learnings encompassed more than one competency, and four of the learnings related to two competencies – personal management and IT technical knowledge - not covered by the framework. Thus we expanded the framework to include 21 competencies with 85 instances of these competencies.

For the second question, examining how managers had learned their critical skills, we allowed the categories of methods of learning to emerge naturally from the data. Finally, for the third question about the organizational development interventions experienced by the respondents, we summarized those interventions experienced by each participant, and their ratings of the usefulness to their overall development.

4. RESULTS

4.1 Critical Competencies and Learning Methods

Table 3 shows the number of critical learnings linked to each competency, and the number of project managers describing at least one learning related to each competency. Table 4 shows the number of project managers reporting acquiring a skill with each learning method, and Table 5 shows the methods reported for acquiring a skill related to each competency. Note that several of the respondents described multiple methods for acquiring some of their critical skills.

Six of the competencies in Table 1 were evident in skills described by at least a third of the project managers in the present study, namely team leadership; concern for order, quality and accuracy; flexibility; impact and influence; relationship building; and initiative. The remaining competencies in Table 1 could be identified in only three or fewer of the respondents, suggesting that these areas are of lesser importance for most IT project managers.

The two competencies containing the most critical learnings were team leadership, with 12 related learnings and mentioned by 10 of the 13 respondents, and concern for order, quality and accuracy, also with 12 related learnings and mentioned by 8 of the 13 respondents. These two competencies together can be seen as representing the key dimensions of project management skills, as described by E2: "*Hard skills get you into the business. Soft skills keep you in the business.*"

Not surprisingly, the concern for order, quality and accuracy competency relies heavily on declarative and procedural knowledge about project management methodologies, primarily in the planning and monitoring/controlling process groups. Four of the eight managers reporting a skill related to this competency, actually described two critical skills in their toolkit both drawing on this competency, suggesting that concern for order was a foundational project management skill for these respondents. More surprising was how these respondents reported learning about these foundational skills. Only four of the eight managers describing formal training as the primary learning method, and these managers described supplementing their formal learning

Table 3. Critical learnings and number of respondents describing at least one learning related to competencies

Competency (as defined in Table 1)	Number of critical learnings linked to the competency (out of a total of 85 learnings)	Number of PMs describing at least one learning linked to the competency (out of a total of 13 respondents)
Self control	1	1
Team leadership	12	10
Directiveness/assertiveness	4	2
Achievement orientation	3	3
Analytical thinking	6	3
Flexibility	6	6
Teamwork & cooperation	6	3
Initiative	6	5
Information seeking	0	0
Conceptual thinking	1	1
Impact & influence	8	6
Focus on client needs	3	3
Interpersonal understanding	2	2
Relationship building	6	6
Developing others	0	0
Organizational awareness	3	3
Self confidence	0	0
Concern for order, quality and accuracy	12	8
Organizational commitment	2	2
Personal management	3	3
IT technical knowledge	1	1

with extensive active reflection on their experience, observation of other project managers, interaction in communities of practice, independent learning, and being coached. Of the remaining four, three learned this skill primarily through performance feedback, while one reported learning this skill completely through active reflection on experience and interaction in communities of practice.

The team leadership competency was also clearly an area that respondents regarded as critically important and on which they focused much on-going energy in honing their skills. However, all respondents reported only a single learning method for this competency. Reflection on experience was reported by six of the ten respondents describing this skill. One of these six respondents described getting feedback as the trigger for his reflection on experience and subsequent learning. Of the remaining four respondents, one described a formal training, one learned through coaching, one learned by observation, and the fourth attributed her skill to her personality.

Three competencies, flexibility, impact and influence, and relationship building, were mentioned by six of the 13 respondents. The relationship building and impact and influence competencies were linked, in that four of the six relationship building learnings were also coded to impact and influence, with the managers describing the need to build relationships on a continuous basis in order to have impact and influence to promote the needs of their projects. In each of these competencies, five of the six managers described reflection on experience as the only learning method. The flexibility competency was also learned primarily through experience, although two of the respondents described receiving performance feedback that helped them to recognize the need to develop this skill.

Table 4. Learning methods and number of respondents learning with each method

Learning method	No. of PMs learning a critical skill with method
Reflection on experience	12
Formal training	5
Coach or mentor	3
Observation of other PMs	3
Performance feedback	5
Communities of practice	2
Independent learning	2
Personality (not learned, innate)	1

Table 5. Methods reported for acquiring each competency

[Note: Some respondents reported multiple methods for learning critical skills]

Competency (as defined in Table 1)	Methods reported for acquiring a skill related to this competency (Number of respondents out of 13 reporting this method for this competency)
Self control	Reflection on experience (1)
Team leadership	Reflection on experience (6); formal training (1); coach or mentor (1); observation of other PMs (1); performance feedback (1); personality (1)
Directiveness/assertiveness	Reflection on experience (3); coach or mentor (1)
Achievement orientation	Reflection on experience (2); coach or mentor (1)
Analytical thinking	Reflection on experience (2); formal training (1); observation of other PMs (1); performance feedback (1); independent learning (1)
Flexibility	Reflection on experience (4); performance feedback (2)
Teamwork & cooperation	Reflection on experience (3); performance feedback (1); personality (1)
Initiative	Reflection on experience (4); performance feedback (2); independent learning (1)
Information seeking	-
Conceptual thinking	Performance feedback (1)
Impact & influence	Reflection on experience (5); performance feedback (1); personality (1)
Focus on client needs	Reflection on experience (3)
Interpersonal understanding	Reflection on experience (2); personality (1)
Relationship building	Reflection on experience (5); personality (1)
Developing others	-
Organizational awareness	Reflection on experience (3); communities of practice (1)
Self confidence	-
Concern for order, quality and accuracy	Reflection on experience (5); formal training (4); coach or mentor (1); observation of other PMs (1); performance feedback (3); communities of practice (2); independent learning (1)
Organizational commitment	Reflection on experience (2)
Personal management	Reflection on experience (3); coach or mentor (1)
IT technical knowledge	Reflection on experience (1)

Initiative was the only other competency found in the skills described by more than a third of the respondents, occurring in five of the project managers' skill sets. Once again, reflection on experience was the primary learning method, although two managers described performance feedback as a learning trigger.

Two competencies emerged that were not contained in the original framework, although neither figured highly in the critical skills described by respondents. Three of the project managers described critical skills related to their personal management which enabled them to continue to function effectively as project managers. Another respondent considered that her high level of technical skill contributed greatly to her effectiveness.

4.2 Organizational Development Interventions

In the second portion of the interviews we focused on examining what formal learning opportunities the respondents had experienced, and how useful they found these learning occasions. We have seen that, except for the concern for order, quality and accuracy competency, respondents overwhelmingly identified active reflection on experience as the primary learning mechanism for their critical skills, and even though formal training was important for the concern for order, quality and accuracy competency, reflection on experience also played a big part in the respondents' perceptions of their skill development here. We were interested to compare respondents' perceptions of the learning mechanisms that had been effective for their critical skills development with their views on the usefulness of their organizations' development interventions.

Table 6 shows the number of respondents reporting experience with the listed development interventions and the average rating of the helpfulness of the intervention for their development as a project manager. As can be seen from Table 6, the respondents had experienced a wide range of training interventions.

Table 6. Development interventions experienced by respondents and average ratings of usefulness

Development intervention	Number of respondents (out of 13) reporting experience with the intervention	Average rating of helpfulness (1-3 scale: 1 not helpful, 2 somewhat helpful, 3 very helpful)
Formal project management training	13	2.6
Other management training	12	2.6
Doing post-project reviews on own projects	10	2.5
Developmental assignments	8	2.5
Performance appraisals	12	2.3
Participating in communities of practice	12	2.2
Coaching or mentoring	12	2.1
360-degree feedback	9	2.1
Reading post-project reviews on other projects	5	2.1
Doing post-project reviews on other managers' projects	5	1.8

All respondents had participated in formal project management training, and this was generally rated highly (average 2.6), although one respondent considered it not helpful. Nine of the respondents had either done in-house project management training or received organizational support to do outside training, while the remaining four had sought outside qualifications or training at their own initiative. Four of the nine who had received organizational support for their project management training also went on to do further training independently. It is interesting to note that even though all respondents had received formal project management training, only four of the eight who had identified skills related to the concern for order, quality and accuracy competency attributed their skill to their formal training.

Twelve of the thirteen respondents had also received a variety of other management trainings, including general management, leadership, team building, conflict and negotiation, interpersonal, intercultural and presentation skills, and these trainings were also generally rated as very helpful (average 2.6). Looking at the ten project managers who identified team leadership as a critical skill, seven had experienced formal management training related to leadership, team building, conflict and negotiation, or intercultural skills – all types of training which might be expected to contribute to a manager's overall team leadership skill development. However, even though the average rating from these seven managers for these training interventions was high (2.8), only one of these managers cited formal training as a major learning method for her team leadership skills.

We were particularly interested in the possible role that post-project reviews might play in IT project managers' learning, and it was interesting to note that the ten managers who had conducted such reviews on at least some of their projects rated them highly (average 2.5). While none of the respondents referred, in the first part of their interviews, to post-project reviews as a means by which they learned their critical skills, respondent D1 did recognize, when we specifically discussed post-project reviews, that such reviews had contributed to his learning: *"A lot of the things that I mentioned earlier … some of them are coming through these reviews."* Similarly, when noting how helpful such reviews were, D2 commented: *"It allows you to stop and look back and say, 'Well did we do it right, and how could we do it better?'"* However, three managers commented that they had found peer reviews conducted *during* the course of their projects much more helpful and useful to their learning than the reviews held after the project had been completed.

The opportunities to do a review on another manager's project, or to read reviews on other projects, were much less common, with only five managers reporting experience with these interventions, and these opportunities were perceived as only somewhat helpful.

Developmental assignments – where managers were deliberately assigned by their superiors to project situations in order to develop specific skills – were only experienced by eight of the 13 respondents, but these assignments were rated highly (average 2.5). Other on-going development initiatives – performance appraisals, communities of practice, coaching or mentoring, and 360-degree feedback – received mixed ratings about their helpfulness, being generally considered somewhat helpful with averages just over 2. The perceptions of how helpful these initiatives were seemed to depend very strongly on the skills of the supervisors or colleagues involved, and in the case of performance appraisals and 360-degree feedback on the extent of debriefing and follow-up support provided.

In addition to the initiatives listed in Table 6, one manager noted that her technical background was particularly helpful for her effective project management performance, while a second commented that his complete lack of technical background was a great advantage for him, since he was able to focus on the management issues of the project and delegate the technical issues to technical specialists.

5. DISCUSSION

The two types of training that were experienced by all except one of our respondents and also received the highest ratings – formal project management training and formal leadership skills-related training – correspond to the two most highly mentioned behavioral competencies discussed earlier – concern for order, accuracy and quality, and team leadership. Yet the formal

trainings the project managers had received did not feature prominently in their descriptions of their learning methods for these competencies. Those managers that did mention formal project management training as a learning method for the concern for order, accuracy and quality competency, typically described two or three additional experiential methods for their development in this skill, and reflection on experience was the primary learning method for team leadership skills.

Indeed, we were particularly struck by the descriptions from some of the respondents of the extent of their self motivation for learning and their on-going active reflection on their experiences. Two managers (B1 and B5) described their practice of maintaining a journal, while B2 described his own reflective practices: *"I make a mindmap and notes for myself."* Respondent B6 commented that he actively sought out developmental assignments in a spirit of continuous learning: *"Even if you crash and burn, which I have as well, you learn why."* And B5 commented: *"I believe I'm still learning, and probably always will be. If I ever think I've learned it all I think I'll be in trouble."* We also noted that those managers who rated post-project reviews most helpful described a very reflective approach to these reviews.

We were, however, surprised at the disconnect apparent in these results between the high rating of certain organization-initiated training experiences and the lack of mention of these training experiences in the methods of learning identified in the earlier section of our interviews. While our interview protocol was designed to avoid any possible prompting of learning mechanisms in the first part of the interview and thus may have contributed to the disconnect, further investigation is warranted. A second stage of this research is planned to explore in more depth the contribution that formal training makes to overall project manager learning and development.

We speculate that while formal training alone is not enough to foster the development of a particular skill, it may provide the necessary foundation for subsequent experiential learning to occur. As noted earlier, procedural knowledge and behavioral competence are more likely to develop in a situated learning environment, where trainees have the opportunity to practice the skills that have been addressed in the formal situation and to get feedback and reflect on their practice [14]. Thus, organizations wishing to foster the development of project management skills in their personnel may be well advised to plan trainings that are supported with follow-up practice opportunities and constructive feedback on performance. Encouraging self reflective practices such as journaling could also be a productive development route. In a similar vein, in view of the high level of reflection evidenced in the present respondents, it seems that the most effective use of project reviews as a learning tool could occur if they are structured to support and promote that reflection both during and at the end of projects.

6. ACKNOWLEDGEMENTS

This research was funded in part by the Institute for Innovation in Information Management (I3M) at The Information School, University of Washington, under the Transfer of Learning Across IT Projects project.

7. REFERENCES

[1] Anbari, F. T., Carayannis, E. G., and Voetsch, R. J. 2008. Post-project reviews as a key project management competence. Technovation 28, 633-643.

[2] Bassellier, G. and Benbasat, I. 2004. Business competence of information technology professionals: Conceptual development and influence on IT-business partnerships. MIS Quarterly 28(4), 673-694.

[3] Boyatzis, R. E. 1998. Transforming Qualitative Information: Thematic Analysis and Code Development. Sage.

[4] Busby, J. S. 1999. An assessment of post-project reviews. Project Management Journal 30(3), 23-29.

[5] Carbone, T. A. and Gholston, S. 2004. Project manager skill development: A survey of programs and practitioners. Engineering Management Journal 16(3), 10-16.

[6] Conger, J. A. 2004. Developing leadership capability: What's inside the black box? Academy of Management Executive 18(4), 136-139.

[7] Crawford, L. and Gaynor, F. 1999. Assessing and developing project management competence. In: Proceedings of the 30th Annual Project Management Institute 1999 Seminars & Symposium, 10-16 October, Sylva, NC: Project Management Institute

[8] Dainty, A. R. J., Cheng, M.-I., and Moore, D. R. 2005. A comparison of the behavioral competencies of client-focused and production-focused project managers in the construction sector. Project Management Journal 36(2), 39-48.

[9] Dainty, A. R. J., Cheng, M.-I., and Moore, D. R. 2004. A competency-based performance model for construction project managers. Construction Management and Economics 22, 87-886.

[10] Davies, J. and Easterby-Smith, M. 1984. Learning and developing from managerial work experiences. Journal of Management Studies 21(2), 169-183.

[11] Day, D. V. 2001. Leadership development: A review in context. Leadership Quarterly 11(4), 581-613.

[12] DuBois, D. A. 2002. Leveraging hidden expertise: Why, when, and how to use cognitive task analysis. In Creating, Implementing, and Managing Effective Training and Development: State-of-the-art Lessons for Practice, K. Kraiger, Ed. Jossey-Bass, San Francisco, CA, 80-114.

[13] El-Sabaa, S. 2001. The skills and career path of an effective project manager. International Journal of Project Management 19, 1-7.

[14] Eraut, M. 2000. Non-formal learning and tacit knowledge in professional work. British Journal of Educational Psychology 70, 113-136.

[15] Flanagan, J. C. 1954. The critical incident technique. Psychological Bulletin 51, 327-358.

[16] Gray, C. F. and Larson, E. W. 2008. Project Management: The Managerial Process. McGraw Hill Irwin.

[17] Jiang, J. J., Klein, G., and Chen, H.-G. 2001. The relative influence of IS project implementation policies and project leadership on eventual outcomes. Project Management Journal 32(3), 49.

[18] Jiang, J. J., Klein, G., and Margulis, S. 1998. Important behavioral skills for IS project managers: The judgments of experienced IS professionals. Project Management Journal 29(1), 39-43.

[19] Kempster, S. 2006. Leadership learning through lived experience: A process of apprenticeship. Journal of Management and Organization 12(1), 4-23.

[20] Klein, G. A., Calderwood, R., and MacGregor, D. 1989. Critical decision method for eliciting knowledge. IEEE Transactions on Systems, Man, and Cybernetics 19(3), 462-472.

[21] McCall Jr., M. W. 2004. Leadership development through experience. Academy of Management Executive 18(3), 127-130.

[22] McCauley, C. D. and Hezlett, S. A. 2001. Individual development in the workplace. In Handbook of Industrial, Work and Organizational Psychology (Vol. 1), N. Anderson, D. S. Ones, H. K. Sinangil and C. Viswesvaran, Eds. Sage, London, 313-335.

[23] Miles, B. M. and Huberman, A. M. 1994. Qualitative Data Analysis: An Expanded Sourcebook. Sage.

[24] Morris, P. W. G. 2001. Updating the project management bodies of knowledge. Project Management Journal 32(3), 21-30.

[25] Nellore, R. and Balachandra, R. 2001. Factors influencing success in integrated product development (IPD) projects. IEEE Transactions on Engineering Management 48(2), 164-174.

[26] Newell, S. 2004. Enhancing Cross-Project Learning. Engineering Management Journal 16(1), 12-20.

[27] Project Management Institute 2004. A Guide to the Project Management Body of Knowledge (PMBOK Guide) (3rd ed.). Project Management Institute.

[28] Project Management Institute 2002. Project Manager Competency Development (PMCD) Framework. Project Management Institute.

[29] Ritchie, J. and Spencer, L. M. 1994. Qualitative data analysis for applied policy research. In Analyzing Qualitative Data, A. Bryman and R. G. Burgess, Eds. London, Routledge, 173-194.

[30] Spencer, S. M. and Spencer, L. M. 1993. Competence at Work: Models for Superior Performance. John Wiley.

[31] Taylor, H. 2005. A critical decision interview approach to capturing tacit knowledge: Principles and application. International Journal of Knowledge Management 1(3), 25-39.

[32] Williams, T. 2008. How do organizations learn lessons from projects - and do they? IEEE Transactions on Engineering Management 55(2), 248-266.