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The Competencies and Characteristics Required of an Effective Project Manager: A Web-Based Delphi Study

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Abstract

This study explores the competencies required for a project manager to be effective in the workplace. We used a Web-based Delphi method to lead experienced project managers through an anonymous consensus-building process consisting of two rounds of surveys. The Round I analysis of 147 respondents, all with 20 or more years of project management experience, yielded 117 project management success factors, 78 of which were identified as "trainable" competencies. The Round II analysis confirmed 42 of the 78 competencies (53.8%) as "very important" to "extremely important" to project manager success. Important contributions of this study include: (a) reporting on project manager competencies that can inform the literature and guide the development of educational programs for instructional designers and other professionals and (b) demonstrating the Web-based Delphi technique to be an efficient methodology for conducting a front-end analysis, a core process of instructional design work.

Introduction

Institutions of higher education are striving increasingly to implement innovative programs that address the real-world needs of contemporary workers (Klein, 1999). Further, colleges and universities face growing competition from other educational enterprises, commercial and non-profit, that target working adults (Graves, 1997). The informed and systematic development of new programs is vital to attracting and satisfying today's adult learners who not only have more options but also insist on value and flexibility (Meister, 2001).

In today's business world, adults often engage in work through multidisciplinary project teams rather than through individual effort. Effective project management is a critical competency for anyone participating in such teamwork and certainly, for today's instructional design (ID) professional (Gentry, 1994; Greer, 1992; Kerzner, 2001; Richey, Fields, & Foxon, 2001). In fact, in a recent survey by Cox and Osguthorpe (2003), instructional design professionals reported they spend *more* time involved in managing and administrating projects (35%) than they spend engaged in original design work (30%). In recognition of its importance, the International Board of Standards for Training, Performance, and Instruction (IBSTPI) includes project management in its 23 competencies for instructional designers and identifies "project manager" as one of four "established or emerging specialist roles in the field of instructional design" (Richey, Fields, & Foxon, 2001, p. 109). Likewise, the Association for Educational Communications and Technology (AECT) identifies project management as one of the accreditation standards for educational programs in the field (*Accreditation Standards for Programs in Educational Communications and Instructional Technology*, 2001). Thus, project management is an essential part of work for instructional designers as members or leaders of multidisciplinary work groups. As such, it is imperative that instructional designers, and those

who prepare them professionally, understand project management, as both a significant component of their work and that of other professionals with whom they team.

Project Management Across Disciplines

The Project Management Institute describes project management as "the application of knowledge, skills, tools, and techniques to project activities to meet project requirements" and characterizes "high quality projects [as those that] deliver the required product, service, or result, within scope, on time, and within budget" (Project Management Institute, 2004, p. 8). Tinnirello (2000) defines project management as "the knowledge, tools, and techniques for controlling requirements, setting a realistic scope, creating feasible schedules, defining responsibilities, and managing expectations" (p. 306). Similarly, Kerzner (2001) characterizes project management success as the completion of an activity within the allocated time, at or under budget, to specified performance levels and the satisfaction of the client. Morris (2003), critiquing these definitions as focusing too strongly on implementation tools and processes, argues for an expanded definition of project management that emphasizes the importance of a broader business context and strategy as well as the leadership of people. For the purposes of this study, our definition of project management (and therefore the supporting research and survey questions) embraced such a broader conception as put forth by Morris and others (Blackburn, 2002; Cleland, 1995; Crawford, 2004).

Project management is a complex process targeting multiple outcomes. Project management competency is just as complex, requiring the acquisition of a variety of knowledge and skill sets that often cross areas of expertise, including instructional technology, management, information technology, engineering, and manufacturing (Cleland, 1995; Greer, 1992; Kerzner, 2001; Tinnirello, 2000). Institutions offering educational programs in project management must

address this complexity in order to ensure that these programs are attractive and, more importantly, useful to working adults across disciplines; an argument for informed, systematic program development that takes into account the needs of diverse learners.

Although instructional design professionals recognize the importance of project management to ID work (Cox & Osguthorpe, 2003; Gentry, 1994; Greer, 1992; McDaniel & Liu, 1996; Yang & et al., 1995), little can be found in the instructional design literature on empirically-identified project management competencies which might then be used to develop and evaluate ID educational programs and ID practitioners. Rather, the ID literature tends to offer recommendations (Phillips, 2001), checklists (Brown, 1978), templates (Yang & et al., 1995), and even models (Allen & Erickson, 1986; Greer, 1992; Gustafson & Branch, 2002) for addressing project management as part of the instructional design process. These resources, however useful, are not grounded in research. McDaniel and Liu (1996) did conduct an interview study of five ID project managers to identify project management techniques. However, their study was limited to the management of instructional interactive multimedia projects and interview questions derived from two existing ID project management models. For a more comprehensive understanding of empirically-grounded project management competencies, we expanded our literature review to include disciplines beyond instructional design.

In turning to a broader literature base on project management/manager competencies, we noted two significant strands of ongoing work that may prove useful to ID professionals, the establishment of standards for project management by a number of national and international professional organizations (*Global performance based standards for project management*, 2003) and reports of empirical research into project management competencies, although often bounded by discipline and diverse in their focus (Crawford, 2004).

First, a number of national and international organizations have identified, and periodically review and update, professional standards of performance in project management. In fact, an international working group aimed at developing global standards for project management recently identified 11 major guides to project management standards (*Global performance based standards for project management*, 2003). Most prominent, PMI in the United States has established the Project Management Body of Knowledge (PMBOK) through its PMBOK® Guide (*A guide to the project management body of knowledge*, 2004), a document that serves as the foundation for all project management training programs in the United States endorsed by PMI as meeting its standards for certification. The Association for Project Management (APM) in England has published the APM Project Management Body of Knowledge (APMBoK) (Dixon, 2000), a standard that has been adapted and adopted by at least five other European nations and the International Project Management Association (IPMA) (Morris, 2001). The Australian Institute of Project Management (AIPM) has developed its National Competency Standards for Project Management (*National competency standards for project management*, 2004), which are derived in part from the knowledge base of the PMBOK® but reframe this knowledge base in terms of performance.

Although Morris, Crawford, and others (Blackburn, 2002; Cleland, 1995; Crawford, 2004; Morris, 2001, 2003; Morris, Patel, & Wearne, 2000) recognize the efforts of project management organizations to collect, organize, and convey best practices in project management as useful, they criticize these bodies of knowledge for promoting confusion within the profession and putting forth inadequate models of project management competence. Morris, in particular, questions the validity of the PMBOK® in terms of breadth, noting that it "contains nothing detailed on project strategy, nothing on project definition, little on value management, nothing on

technology management,…nothing on leadership and minimal on team-based development" (Morris, 2003, p. 2). Morris and his colleagues view these inadequacies in current project management standards as significant in that they impact how we conceptualize project management and project management competence which has implications for how we learn and teach about it (Morris, 2003; Morris et al., 2000). In fact, rather than begin with standards such as the PMBOK®, Morris (2001) recommends one "to start with a clean sheet of paper and to seek to discover…what are the competencies required of professional project managers" (p. 27).

Crawford (2004) also identifies recognized project management standards as inadequate for developing and assessing project managers for two main reasons. First, she criticizes recognized standards for representing insufficient models of competence. Drawing on the work of Boyatzis (1982) and Spencer and Spencer (1993), Crawford puts forth a model of competence that integrates knowledge, skills, demonstrable performance, and core personality characteristics, noting the last, personality characteristics, as challenging to develop and assess through training. She argues that two of the most influential project management standards, the PMBOK® and APMBoK, address only the knowledge aspect of competence while a third, Australia's National Competency Standards, draws from knowledge but focuses only on demonstrable performance. Second, Crawford notes that most standards are not based in empirical research but rather in an "assumption that there is a positive relationship between standards and effective workplace performance" (p. 7). Clearly, there is a need to look beyond currently established project management standards and investigate further, through empirical research, the core competencies of the effective project manager in the workplace. Given our professional understanding of learning and performance and processes for comprehending and influencing them, ID practitioners seem particularly qualified to contribute to this work.

Following Morris' "clean sheet of paper" recommendation and in an effort to answer Crawford's call for empirical data, a good source for identifying a discipline's critical competencies are its experienced practitioners (Ford & Sterman, 1998; Rossett, 1999). In the case of requisite project management competencies, individuals who work (or have worked) as project managers and, as such, have developed expertise in this area should be highly useful informants. Further, in keeping with Morris' advocacy for a broader conception of project management and recognizing that instructional design managers must work across disciplines, project managers from varied fields should be most helpful. Thus, the purpose of this research was to identify the essential competencies of an effective project manager with a diverse group of professionals who are practicing (or have practiced) project management in the field. The primary research question was: What competencies do experienced project management professionals believe are necessary for the effective project manager?

Methodology

We chose the Delphi technique as the data collection strategy for this study for two reasons. First, it is a particularly good research method for deriving consensus among a group of individuals having expertise on a particular topic where information sought is subjective and where participants are separated by physical distance (Borg & Gall, 1979; Dalkey & Helmer, 1962-63; Linstone & Turoff, 1975). In fact, since its inception, the Delphi method has been demonstrated in the literature as a reliable empirical method for consensus-reaching in a number of areas including distance education (Thach & Murphy, 1995), journalism (M. A. Smith, 1997), visual literacy (Brill, Kim, & Branch, 2000), electronic commerce (Addison, 2003), health care (Whitman, 1990), and numerous others (Cochran, 1983; Linstone & Turoff, 1975). Second, the Delphi technique is also a prescribed methodology for cases when participants hail from

different professions, since anonymity provides a layer of protection for individual voices (Melpignano & Collins, 2003). Thus, the Delphi technique met our goal to collect data from individuals with project management expertise across locations and disciplines.

Procedure

Delphi study procedures call for the collection of data from identified experts in response to an open-ended initial question based on a particular subject area. Those data are then analyzed for themes, compiled, and fed back to the panel of experts through a second round in questionnaire form for additional ratings or rankings. This process is repeated until consensus – general statistical agreement among the data– is achieved (Linstone & Turoff, 1975).

Often, Delphi procedures are slightly modified in some way in order to accommodate the needs of the situation (Linstone & Turoff, 1975; Murray & Hammons, 1995). This study might be characterized as a "modified Delphi" for two reasons. First, we used our first round survey not only to pose our initial questions to a considerably larger sample but also to help us identify our panel of experts, as will be discussed in detail below. Second, because we were most concerned with what field practitioners had to say, we chose to interpret "panel of experts" broadly, querying, as Geier (1995) advocates, "the individuals involved in the work rather than a selected panel of experts" (p. 390), such as standards-setting committee members from a professional organization.

For ease of communication and time efficiency, we chose to administer all of our Delphi surveys via the World Wide Web (WWW). The WWW not only serves as an efficient means for survey research (Dillman, 2000; Rossett, 1999; Zhang, 2000) but also readily supports an intent of the Delphi technique for the *anonymous* interaction of respondents (Linstone & Turoff, 1975).

Participants were contacted via e-mail, with a link to the appropriate survey's Web site address embedded in the e-mail for easy access.

Round I

Particular areas of concern when conducting a Delphi study include developing the initial question(s) and selecting the expert panel. The initial question(s) in a Delphi study must be carefully written in order to aim responses toward the desired outcome yet not so directive as to bias experts' responses (Linstone & Turoff, 1975). Given the complexity of project management and reflecting on its varied definitions, we decided the initial question of our Delphi should represent project management broadly as both an art and science. Thus, we prefaced our questions with both a more bounded definition (similar to the Kerzner, 2001, definition discussed earlier) and a more fluid conception, as represented by Miller's (1990) description of project management as analogous to conducting an orchestra. In order to get at specific competencies, we also felt we needed to be directive by asking participants for project management "declarative knowledge" as well as "procedural skills." The definition and initial questions we presented survey respondents in Round I can be found in Figure 1.

[INSERT FIGURE 1 ABOUT HERE.]

Choosing a qualified expert panel in a Delphi study requires carefully matching the expertise of the individual with the topic under study (Delberg, Van de Ven, & Gustafson, 1975). Mismatches lead to outlier responses that decrease the Delphi study's validity and threaten consensus building. While there are many ways to select an expert panel (those with experience in "publishing," "conference presentation," "practice," and/or who have been "nominated by peers," see Long, 1991; Raskin, 1994; Ritchie & Earnest, 1999), for this study we reasoned that individuals with informed opinions about necessary project management competencies would

have 6 or more years of experience in project management themselves. Therefore, rather than identify published researchers who may be removed from practice or seek out practitioners we deemed to be "expert," we decided to use the Round I survey and the six-years experience criterion to help us identify experienced project managers. So, in addition to the open-ended initial questions discussed above, the Round I survey incorporated a series of demographic items including years of project management experience.

We sent emails about the Round I survey to a large, convenience sample derived from Lehigh University's institute responsible for executive education and project management leadership programs (n=493) and a listing of relevant, pre-retirement university alumni from the Colleges of Education, Business and Economics, and Engineering (n=11,022). The sample came from Lehigh University because we were developing a project management certificate program for this institution.

We also asked respondents to identify, by referral, additional experts in project management who could be included in the pool. That is, at the end of the Round I survey, we asked participants to identify others with project management expertise by e-mail address (n=357). An email invitation to participate, including a link to the Round I survey, was then automatically forwarded to these individuals. Thus, in total, the Round I survey was sent to a sample of 11,872 individuals. We had 598 (5.0%) total respondents to the Round I survey, 54 (15.3% of all referrals) of whom were recommended by other participants. The low response rate to the Round I survey is likely due, at least in part, to our decision to encourage participants in the Round I email to self-select out of the study if they felt that they lacked relevant project management experience.

An initial scan of the Round I data revealed two circumstances that influenced the data analysis process and, therefore, require comment. First, the data indicated that many participants did not distinguish between knowledge and skills in responding to these two separate survey questions. We therefore agreed that the data need not be analyzed separately for each question but would be analyzed in total. Second, the demographic data revealed that 147 of the 598 Round I respondents reported 20 or more years of project management experience. Thus, we agreed that we would analyze these 147 responses first and then determine if it would be necessary to analyze additional respondent data to ensure reliable findings.

We used the constant comparative method of data analysis. This method involves an iterative process of collecting data, identifying major and recurring themes in the data, developing categories for these themes, and working with and coding the data to reveal representations of the identified categories (Bogdan & Biklen, 1998; Merriam, 1998). We also used investigator triangulation as a means to enhance the internal validity of the study (Merriam, 1998). Thus, the three-member research team independently analyzed the 147 Round I survey responses, hand coding them for recurring themes. Then, each one of us went back through the data again, checking for similarities, redundancies, and omissions. Next, each person condensed initial codes into more refined categories representing higher-level themes. For example, initial raw codes of "outcomes," "end-results," and "objectives" might be condensed later to one code, such as "goals," that captured the common theme as expressed by respondents.

After we completed our independent analyses, we met to compare and discuss identified themes, turning back to the raw data for guidance when needed. As a result of these discussions, we negotiated our independently derived themes into a final, mutually agreed upon list of 117 core project management "success factors." At the same time, we determined that it would not be

necessary to analyze more than the selected data set of 147 respondents with 20 or more years of project management experience because it was clear from our analyses and discussions that no new success factors were emerging, indicating a saturation of categories (Merriam, 1998). As a final step in the Round I data analysis, we used word frequencies of the raw data to check the validity of researcher-identified success factors, confirming that the language of the respondents, rather than the researchers, was captured and preserved in the final list of factors.

Further discussion and analyses of the data revealed that certain success factors were more closely aligned than others. Thus, as a research team, we then organized the 117 success factors into nine categories, eight of which we determined included competencies that could be addressed effectively in an educational program, such as the one we were charged with developing for Lehigh University (Appendix A). Specifically, 78 of the 117 success factors (67.5%) involved "trainable" knowledge and skills such as "have strong verbal communication skills" and "create a project plan" and fell into the following eight categories: problem-solving expertise (9 success factors), leadership expertise (16 success factors), context knowledge (18 success factors), analytical expertise (4 success factors), people expertise (8 success factors), communication expertise (8 success factors), project administration expertise (12 success factors), and tools expertise (3 success factors). We categorized the remaining 39 success factors (33.3%) as items that clearly were important to survey respondents but would be difficult to develop through an educational program. These factors, such as "be flexible" and "have a sense of humor" formed the ninth category, personal characteristics. Interestingly, this distinction of "trainable" characteristics aligns with Crawford's (2004) model of competence, as described previously.

Round II

For Round II we used a combination of criterion, stratified, and random sampling techniques to identify a 100-member panel from among the 598 Round I survey respondents. First, we included all 405 of the 598 total respondents to the Round I survey who reported 6 or more years of project management experience. The gender breakdown for this sub-group was 56 (14%) female and 349 (86%) male. From this group of 405, all 39 "referrals" (female=4, male=35) were set aside for guaranteed inclusion in the Round II sample. From the remaining group of non-referred respondents with 6 or more years of project management experience, 10 women and 51 men were randomly selected to complete the desired expert panel size of 100 and support the gender stratification figures of the larger sub-group (14% female and 86% male).

As specified by the Delphi method, the Round II survey gave our 100-member panel the opportunity to empirically validate the importance of the success factors identified in Round I. We asked respondents to supply ratings for all 78 items in the eight "competencies" categories using a 5-point Likert scale (1=not important, 2=somewhat important, 3=moderately important, 4=very important, 5=extremely important); however, being mindful of respondents' time, we labeled the final "personal characteristics" category as optional. In addition to supplying the Likert-scale ratings, we gave respondents an opportunity to make open-ended comments after completing each of the nine survey categories.

Of the 100 panelists contacted, 79 completed the Round II survey (66 initial responses and 13 more after a follow-up reminder). Of these 79 respondents, 50 chose to rate the success factors in the optional "personal characteristics" category. The three Round II respondent groups (non-respondents, n=21; partial respondents, n=29; and complete respondents, n=50) did not differ at a statistically significant level on years of experience $F(2, 99) = 0.83$, $p = .44$, gender

$\chi^2(2, N=100) = 0.74$, $p = .69$, or the number who were referred as experts $\chi^2(2, N=100) = 2.68$, $p = .26$. Thus, in addition to a relatively high response rate for Round II, there were no discernable differences between non-, partial, and complete respondents. Due to the complexity of our samples and response rates across both rounds, Table 1 is included as a summary.

[INSERT TABLE 1 ABOUT HERE.]

The main goal of the Round II data analysis was to determine the degree of consensus among respondents regarding the importance of each of the 117 project management success factors in the nine categories. As such, descriptive statistics (range, mean, and standard deviation) were produced for each success factor using SPSS statistical software. Respondents' open-ended comments, although few in number, were also read to ascertain nuances that could not be gained purely from reviewing descriptive statistics. Round II respondents rated 53.8% (42 out of 78) of the competencies as "very important" to "extremely important" ($4.00 \leq M \leq 5.00$) and they rated 98.7% (77 out of 78) as "moderately important" or higher ($3.00 \leq M \leq 5.00$). Thus, with the exception of "be able to apply contract law" (rank=78, $M=2.66$, $SD=1.03$), mean scores for the competencies fell entirely within the "moderately important" to "extremely important" range ($3.24 \leq M \leq 4.87$), indicating that our panel was in fairly close agreement that the findings from the initial survey did represent important competencies for the successful project manager. Given this level of consensus among the panel members, we decided that it would not be necessary to proceed to a third Delphi round.

Before discussing results, it might prove useful to summarize who the 79 Round II respondents were so that a reader may judge the degree to which they represent an expert panel in project management. First, regarding on-the-job experience, 30.4% (24 of 79) of respondents reported over 20 years of project management experience, 32.9% (26 of 79) reported 11-19

years, and 36.7% (29 of 79) reported 6-10 years. Second, regarding education, 75.9% (60 of 79) of respondents reported receiving formal training in project management. Finally, 79.9% (63 of 79) of respondents reported working in private industry, 8.9% (7 of 79) in education, 8.9% (7 of 79) in government, and 2.5% (2 of 79) in the non-profit sector. Table 2 provides a more detailed breakdown of respondents' major job description by sector.

[INSERT TABLE 2 ABOUT HERE.]

Results

Mean scores for all 117 success factors ranged from M=2.66 to M=4.87. Of the 78 competencies, the experts rated "know the goals of the project" (rank = 1, M=4.87, SD=0.33), "know the scope of the project" (rank = 2, M=4.76, SD=0.49), and "conduct business ethically" (rank = 3, M=4.72, SD=0.53) as the top three most important. Conversely, they rated "have strong graphical communication skills" (rank=77, M=3.31, SD=0.83), "understand the decision-making process outside the organization (clients, vendors, other outside stakeholders)" (rank=78, M=3.24, SD=0.96), and "be able to apply contract law" (rank=78, M=2.66, SD=1.03) as the three least important of the 78 competencies. Table 3 reports rankings, means, and standard deviations for the top 10 and bottom 10 rated competencies.

[INSERT TABLE 3 ABOUT HERE.]

Another way to consider the data from Round II is through the lens of the nine categories that emerged out of Round I data analysis. In addition to supplying the 117 success factors organized by category, Appendix A reports total rankings, mean scores, and standard deviations for each of the nine success factor categories. Category means of 3.55 and higher again suggest strong agreement among the expert respondents that the categories and corresponding factors represent important keys to project management success. Within each competency category

except "Tools Expertise," respondents rated at least one item as "very important" or better ($M \geq 4.00$). Among the 8 competency categories, leadership and problem-solving had the highest percentages of items rated "very important" or better, 68.7% (11 of 16) and 66.6% (8 of 9) respectively. Table 4 supplies percentage of importance ratings by competency category.

[INSERT TABLE 4 ABOUT HERE.]

Discussion

This study contributes to research and practice in two noteworthy ways. First, we identify and report on core project management competencies, competencies that can be used to guide the development of new project management educational programs, such as a university-sponsored certificate program, as well as inform the improvement of existing programs. The identified competencies also contribute to the literature, enriching what has been characterized as an insufficient empirical research base (Crawford, 2004; Morris, 2001; Morris et al., 2000; Ruuska & Vartiainen, 2003). Of secondary import, this research illuminates the Web-based Delphi study design as a useful methodology for not only distilling knowledge efficiently but also supporting a core process of the instructional designer, front-end analysis (Rossett, 1999; Walker, Brill, & Bishop, 2004).

Project Management Competencies, Informing the Literature and Educational Programs

Overall, respondents agreed that project management requires much more than just knowing how to define scope, create timelines, and manage budgets. These findings support the argument made by Morris (2003) that project management must be reconceptualized beyond the "on time, in budget, to scope" (p. 2) perspective represented by the PMBOK®. Of particular note, respondents indicated that a project manager must possess problem-solving expertise, leadership skills, context knowledge, and analytical, people, and communication expertise in

addition to the more commonly emphasized project administration expertise (i.e. setting and managing scope, timelines, and budgets).

In this study, participants ranked leadership expertise as the second highest category, behind only problem-solving expertise. This finding is the most patently consistent with the other empirical studies on project management competencies reported in the literature. In their goal to update the APM BoK through an empirical study of project management professionals, Morris, Patel, and Wearne (2000) found that 100% of study participants felt leadership should be included in the new version of this body of knowledge. Leadership is now included in the most recent version of the APM BoK in one of seven sections entitled "People." In Lampel's (2001) study of core competencies of effective project execution for large projects in engineering-construction-procurement firms, practitioners identified particular elements of leadership expertise, namely negotiation and team work, to be of critical importance. Similarly, the McDaniel and Liu (1996) study of ID project managers also identified certain leadership elements (motivating team members, knowing when to provide space or structure) as critical to the project manager role.

Other studies provide additional evidence that leadership is a critical competency area in project management (El-Sabaa, 2001; Sotiriou & Wittmer, 2001; Zimmerer & Yasin, 1998). However, leadership is conceptualized slightly differently across studies, making it challenging to think, write, and speak about it. Further, although integrated into the latest version of the APM BoK, the 2004 edition of the PMBOK®, still the most influential set of standards, does not include leadership as a core competency (*A guide to the project management body of knowledge*, 2004). Mounting empirical evidence indicates that leadership should be recognized as a core project management competency. The implication of this finding is that a consistent definition of

leadership, as it relates to project management, should be constructed, empirically validated, and included in project management bodies of knowledge, certification requirements, and educational programs. In the interim, ID professionals can strive to incorporate leadership as an important aspect of project management. For example, as a result of this study, one of the authors has designed and implemented a project management course for ID graduate students that incorporates leadership as a key competency.

In addition to leadership, this study identified other project management success factors that also have support in the literature, although to a lesser degree. The need for problem-solving expertise, the top-ranked success factor, is also evidenced in the Morris, et. al. (2000) and Lampel (2001) studies as well as, to a lesser degree, in the McDaniel and Liu (1996) study. The importance of the project manager to possess context knowledge, the third-ranked success factor, is supported again by Lampel, by McDaniel and Liu, and strongly corroborated by Morris, et. al. (2000), with 87% of participants in that study agreeing that project context should be represented in the APM BoK. The need for people and communication expertise, the fifth- and sixth-ranked success factors, also appear in the empirical findings as yet additional project management competencies of import (El-Sabaa, 2001; Lampel, 2001; McDaniel & Liu, 1996; Morris et al., 2000; Ruuska & Vartiainen, 2003).

When it comes to educational programs, the challenge comes in how to facilitate the learning of competencies such as leadership, problem-solving, communication, and people skills in meaningful, authentic, and transferable ways. Such “softer” skill sets, if addressed at all in project management programs, are often taught separately from project management administration skills, with learners participating in discreet learning experiences around such topics as team building or conflict resolution. As such, these disembodied skills can seem

irrelevant or nebulous, leaving learners unable or unmotivated to apply them effectively in real world situations (Dannels, 2000; Maznevski & Distefano, 2000; P. Smith, 2003)

One way to avoid decontextualizing the softer skill sets might be to give students the opportunity to master project management administration competencies (i.e. project analysis, planning, executing, control/assessment) while *concurrently* mastering leadership, problem-solving, communication, and people skills as well. For example, participants might progress through a project management program as a cohort so that, over time, they could experience dynamics of leadership, problem-solving, communication, and the like through facilitated interactions situated within the context of project management case studies.

In summary, the paradox is that project management standards like the PMBOK® have established a strong position in influencing how project management is thought about, practiced, and learned. In fact, in the case of the PMBOK®, its influence grows with the number of project management educational programs seeking legitimacy by tailoring programs to meet the criteria set by PMI for endorsement as aligning with certification requirements. But research into project management competencies suggests that project management standards are insufficient in portraying a comprehensive view. In particular, this and other studies suggest that competencies such as leadership, problem-solving, context knowledge, people expertise, and communication skills are critical to project management competence and, therefore, must be more adequately addressed in project management bodies of knowledge, standards, certifications, and educational programs. The fact that current bodies of knowledge are not as well aligned with empirical findings as they might be is not trivial. As Morris, et. al. (2000) argued, a project management body of knowledge reflects “the ontology of the profession: the set of words, relationship and meanings that describe the philosophy of project management” and drives professionals in how

they develop themselves - what knowledge, experiences, certifications, continuing education, and ethical standards they pursue (p. 156). It seems reasonable that instructional design professionals would want to draw from empirically-based competencies in learning, thinking about, and practicing project management. But, more research into project management competencies is needed. In fact, perhaps a useful follow-up to this study might be conducting a similar study with members of the instructional design community to ascertain the degree to which the competencies identified here resonate with ID project managers. Given that ID professionals spend over one third of their time managing and administrating projects (Cox & Osguthorpe, 2003), such a line of research is arguably relevant.

Web-based Delphi as an Efficient Method for Conducting Instructional Design Work

When the goal is to identify knowledge through the consensus of experts, the Delphi technique has already been established in the literature as a useful empirical method across diverse disciplines (Addison, 2003; Brill et al., 2000; Cochran, 1983; Linstone & Turoff, 1975; M. A. Smith, 1997; Thach & Murphy, 1995; Whitman, 1990). Further, consistent with Linstone and Turoff (1975) and (Geier, 1995), a modified Delphi technique whereby an "expert panel" is interpreted to mean practitioners has been established as well. The World Wide Web extends the functionality of the Delphi technique by providing an efficient means for surveying a large group of experts from around the world, anonymously and repeatedly, via the just-in-time convenience of the electronic desktop. Instructional designers are regularly faced with collecting and analyzing data to inform their understanding of current and desired practices in learning and performance. To be sure, Rossett (1999) identifies such front-end analysis as fundamental to professional practice. Yet, front-end analysis is labor-intensive and time-consuming and, therefore, often receives only superficial treatment or, even worse, is entirely overlooked. As

such, combining the Delphi technique and the efficiency of the WWW provides a potentially useful tool for the instructional designer to engage in front-end analysis more efficiently (Walker et al., 2004).

In a special issue of Educational Technology Research and Development on computer-based tools for instructional design, Gustafson (2002) argues that the identification of simple, easy-to-use tools that make the work of instructional designers faster and cheaper is critical to the future of the field. For example, he points to the value of tools that make better use of subject matter experts while, at the same time, being easy for subject matter experts to use. In this study, we used a Web-based Delphi methodology to support a needs assessment, a critical process for instructional designers committed to developing programs based in meeting systematically-identified gaps in understanding and performance (Kaufman, Rojas, & Hanna, 1993; Rossett, 1987). We suspect that a Web-based Delphi technique could be used likewise to support other core instructional technology practices, including audience analysis and formative evaluation. Further, the efficiency of Web-based Delphi may help convince otherwise reticent individuals to commit to these unfamiliar instructional technology processes.

Although, as ID practitioners, we did experience Web-based Delphi as a useful process tool, we also came across a number of cautions as a result of our work. In fact, we identified three major limitations to this study. First, the participant pool was largely restricted to alumni of Lehigh University, a small, private institution with a tradition of strong engineering programs. Our research team was concerned about the potential bias of such a participant pool early on as we designed the study and realized it might limit the generalizability of our results. However, given our charge to develop a certificate program in project management for this university and given our criteria to engage respondents with project management experience (per Delphi

method guidelines), we agreed that we were comfortable with this restriction and decided to forge ahead. As it turns out, our sample was biased toward project managers working in the industrial sector (79.7% of Round II respondents) and in the engineering discipline (46.8% of Round II respondents). A useful follow-up to this study would be sensitive to minimizing such bias at the outset, planning for a participant pool with more balanced representation by sector and by discipline. Such a study would even allow for the comparison of respondent perceptions between subgroups to determine if project management competencies vary significantly between work contexts.

Second, an aggressive rollout schedule for the certificate program meant a compressed timeframe to complete the study including limited time available for data analysis. That said, whereas the rollout schedule prohibited us from employing more time-intensive strategies, such as focus groups, the efficiencies afforded by the Web-based Delphi study at least allowed us reach beyond simply analyzing existing project management programs. Thus, it was a "best choice" given the real-world constraints of the project, even if the aggressive schedule did limit what the research team could achieve.

A third limitation of the study is that the design of the Round II instrument supported confirmatory data but not discriminatory data. That is, the tendency of participants to rank almost every item as important to very important confirmed factors but provided little opportunity to differentiate between them. Perhaps if we had designed the survey to not only enable respondents to rate each item but also supply rankings between items, the data collected would have allowed for richer analyses and interpretation. Moreover, a revised survey could include brief descriptors for all items to further facilitate respondents' consistent differentiation between items. A follow-up study incorporating such a modified survey might enhance the ability to

distinguish between competencies.

That said, based on our experience it seems that a Web-based Delphi is certainly a method that instructional designers might add to their arsenal of more common techniques, such as observations, individual interviews, and focus groups, particularly in executing the analysis and evaluation processes fundamental to the field. Although Gustafson (2002) advocates for the identification of such tools, he also cautions that these tools, as they are identified and used, must be studied to determine their actual contribution to practice. We agree. Thus, yet another recommendation for future work is to study the use of the World Wide Web and the Delphi technique by instructional designers as they attempt to engage in their practice in more efficient and effective ways.

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Figure 1. *Round I Preface and Initial Questions.*

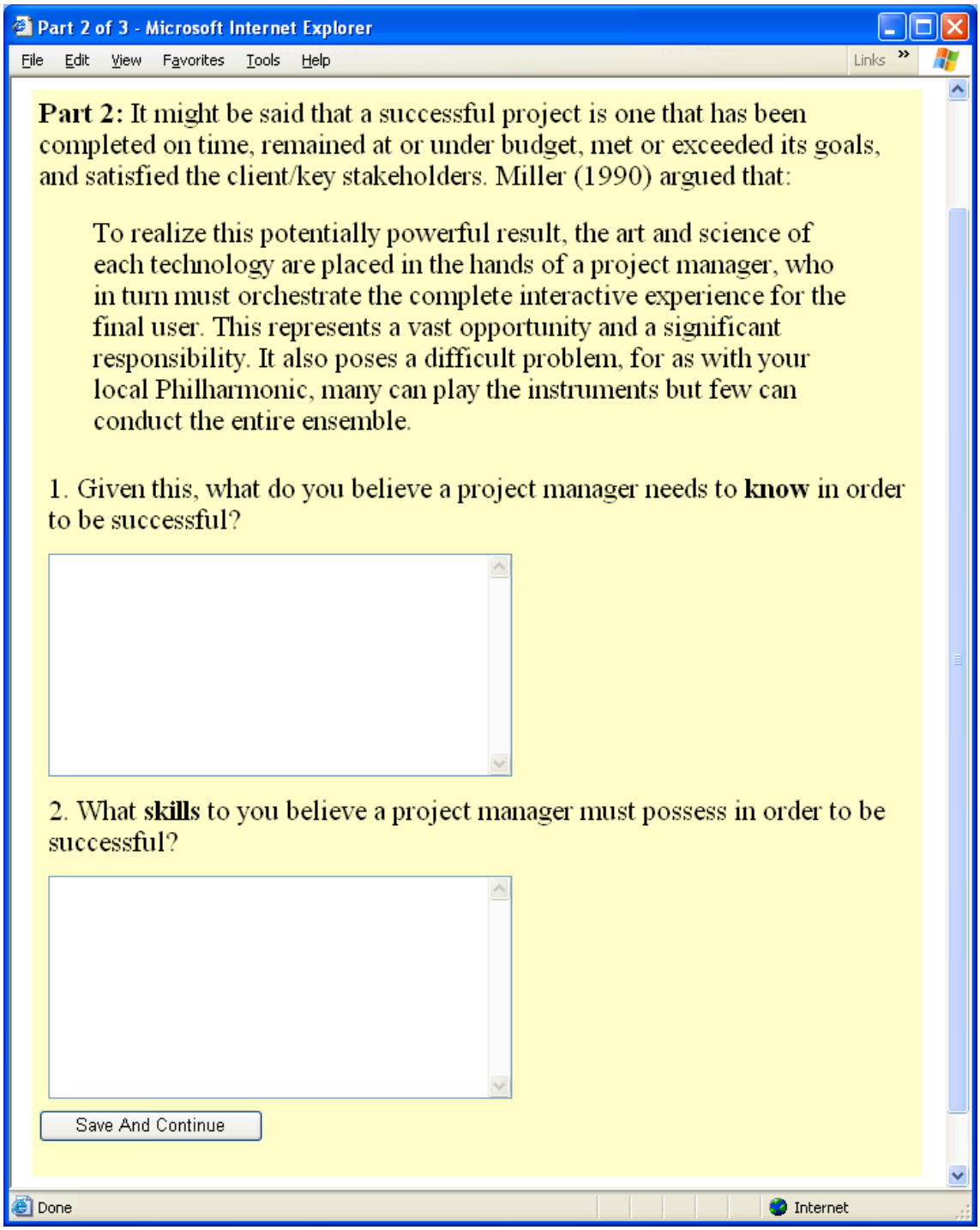

Table 1. *Sample Size (n), Response Frequency (f) and Response Rate by Survey Round*.

Source	Sample *n*	Response *f*	Response Rate
Round I			
Targeted sample of Lehigh University alumni	11515	544	4.7%
Referrals from other participants	357	54	15.1%
Round I total	11872	598	5.0%
Round II			
Stratified sample of experts	100	79	79.0%

Note. Although the Round II response rate based on the initial Round I sample of 11,872 is only 0.7% this is largely by design, since the expert sample of 100 dropped 498 of the Round I respondents.

Table 2. *Major Job Description of 79 Round II Respondents by Sector.*

Sector Job Description	Round II Respondents
Industry	**63**
Engineering	33
Information Systems	13
Financial Services	11
Marketing Research and Development	4
Sales	1
Training	1
Education	**7**
Teaching/Instructional Program Development	4
Information Systems	3
Government	**7**
Engineering	4
Information Systems	1
Legal Services	1
Military Command	1
Non-Profit	**2**

Table 3. *Top 10 and Bottom 10 Competencies.*

Rank	Statement	*f*	*M*	*SD*	Category
1	know the goals of the project	79	4.87	0.33	Context Knowledge
2	know the scope of project	79	4.76	0.49	Context Knowledge
3	conduct business ethically	78	4.72	0.53	Problem-solving Expertise
4	know the mission of the project	79	4.71	0.56	Context Knowledge
5	know how project success is measured	79	4.65	0.58	Context Knowledge
6	listen effectively	79	4.57	0.55	Communication Expertise
7	share credit for successes	77	4.52	0.72	Leadership Expertise
8	know the available resources (funds, equipment, people, and the like)	79	4.48	0.71	Context Knowledge
9	have strong verbal communication skills	79	4.47	0.60	Communication Expertise
10	be able to recognize a problem	78	4.47	0.60	Problem-solving Expertise
69	know and use project management tools	78	3.62	0.91	Tools Expertise
70	know the vendors	79	3.52	0.86	Context Knowledge
71	know the politics/culture outside the organization (clients, vendors, other outside stakeholders)	79	3.51	0.85	Context Knowledge
72	use project management methodologies (process analysis, systems design, and so on)	78	3.50	0.88	Analytical Expertise
73	be able to write proposals	78	3.40	0.89	Project Administration Expertise
74	understand fields related to the project	79	3.38	0.82	Context Knowledge
75	know and use financial management tools	78	3.36	0.84	Tools Expertise
76	have strong graphical communication skills	78	3.31	0.83	Communication Expertise
77	understand the decision-making process outside the organization (clients, vendors, other outside stakeholders)	78	3.24	0.96	Context Knowledge
78	be able to apply contract law	77	2.66	1.03	Project Administration Expertise

Note. *F* indicates frequency of responses for each statement. The scale for the statement means (*M*) ranged from 1=not important to 5=extremely important.

Table 4. *Percentage of Importance of Ratings by Competency Category.*

Category	Not Important to Somewhat Important 1.00≤*M*<2.00	Somewhat Important to Moderately Important 2.00≤*M*<3.00	Moderately Important to Very Important 3.00≤*M*<4.00	Very Important to Extremely Important 4.00≤*M*≤5.00
Problem-solving Expertise (*n* = 9)	0.0	0.0	33.3	66.6
Leadership Expertise (*n* = 16)	0.0	0.0	31.3	68.7
Context Knowledge (*n* = 18)	0.0	0.0	44.4	55.6
Analytical Expertise (*n* = 4)	0.0	0.0	75.0	25.0
People Expertise (*n* = 8)	0.0	0.0	62.5	37.5
Communication Expertise (*n* = 8)	0.0	0.0	50.0	50.0
Project Administration Expertise (*n* = 12)	0.0	8.3	33.3	58.4
Tools Expertise (*n* = 3)	0.0	0.0	100.0	0.0
TOTALS (*n* = 78)	**0.0**	**1.3**	**44.9**	**53.8**

Appendix A. *Project Management Success Factors Organized by Category and Ranked by Importance Within Category.*

		f	*M*	*SD*
#1	**Problem-Solving Expertise**	**--**	**4.20**	**0.53**
1	conduct business ethically	78	4.72	0.53
2	be able to recognize a problem	78	4.47	0.60
3	manage crises	78	4.42	0.69
4	manage risk	78	4.17	0.71
5	be able to frame a problem	78	4.13	0.80
6	assess risk	78	4.12	0.70
7	plan contingencies	77	3.99	0.75
8	know the escalation point	78	3.92	0.85
9	understand and apply alternate methods	78	3.91	0.72
#2	**Leadership Expertise**	**--**	**4.14**	**.048**
1	Share credit for successes	77	4.52	0.72
2	make time-sensitive decisions effectively	78	4.42	0.69
3	delegate and follow-up effectively	78	4.40	0.57
4	develop and execute a project plan	78	4.40	0.63
5	take responsibility for failures	78	4.37	0.77
6	align/focus team members	78	4.27	0.71
7	know when to take control and when to back off	78	4.24	0.76
8	motivate team members	78	4.17	0.78
9	promote teamwork	78	4.17	0.73
10	lead/facilitate a meeting	78	4.09	0.78
11	manage group dynamics	78	4.05	0.80
12	be diplomatic	77	3.99	0.75
13	negotiate effectively	78	3.94	0.78
14	be persuasive	78	3.87	0.76
15	Coach/mentor/teach	78	3.86	0.92
16	build esteem in others	78	3.71	0.87
#3	**Context Knowledge**	**--**	**4.10**	**0.40**
1	know the goals of the project	79	4.87	0.33
2	know the scope of project	79	4.76	0.49
3	know the mission of the project	79	4.71	0.56
4	know how project success is measured	79	4.65	0.58
5	know the available resources (funds, equipment, people, and the like)	79	4.48	0.71
6	know oneself	79	4.38	0.87
7	know the team members	79	4.33	0.61
8	understand the decision-making process within the organization	78	4.28	0.70
9	know the client	79	4.20	0.79
10	know the goals of the organization	79	4.00	0.93
11	know the politics/culture within the organization	78	3.94	0.83
12	understand the workflow of the organization	78	3.94	0.78
13	know the mission of the organization	79	3.86	1.02
14	understand the industry in which he/she works	78	3.71	0.76
15	know the vendors	79	3.52	0.86
16	know the politics/culture outside the organization (clients, vendors, other outside stakeholders)	79	3.51	0.85
17	understand fields related to the project	79	3.38	0.82
18	understand the decision-making process outside the organization (clients, vendors, other outside stakeholders)	78	3.24	0.96
#4	**Analytical Expertise**	**--**	**4.02**	**0.54**
1	Prioritize	78	4.45	0.66
2	capture and use knowledge	78	3.91	0.72

		f	*M*	*SD*
3	be able to research (gather information, ask the right questions, and so on)	78	3.83	0.86
4	use project management methodologies (process analysis, systems design, and so on)	78	3.50	0.88
#5	**People Expertise**	**--**	**4.00**	**0.49**
1	manage expectations	79	4.29	0.77
2	resolve conflicts	79	4.28	0.68
3	establish mutual trust	79	4.28	0.73
4	understand human nature	78	3.99	0.81
5	understand and overcome resistance to change	78	3.94	0.78
6	help others achieve their goals	79	3.81	0.80
7	manage stress in self and others	79	3.75	0.79
8	build consensus	79	3.65	0.88
#6	**Communication Expertise**	**--**	**3.99**	**0.47**
1	listen effectively	79	4.57	0.55
2	have strong verbal communication skills	79	4.47	0.60
3	have strong written communication skills	79	4.09	0.74
4	deliver good and bad news effectively	79	4.09	0.66
5	have strong presentation skills	79	3.91	0.70
6	be able to liaise among stakeholders	79	3.76	0.87
7	have strong networking skills	78	3.74	0.95
8	have strong graphical communication skills	78	3.31	0.83
#7	**Personal Characteristics**	**--**	**3.96**	**0.46**
1	have integrity	50	4.74	0.53
2	be honest	50	4.56	0.61
3	be good under pressure	50	4.48	0.58
4	have common sense	50	4.40	0.70
5	be clear	50	4.38	0.60
6	be committed	50	4.38	0.60
7	be focused	49	4.24	0.63
8	be results-driven	50	4.22	0.65
9	have persistence	50	4.20	0.76
10	be flexible	50	4.18	0.85
11	have confidence	50	4.16	0.62
12	be proactive	50	4.16	0.74
13	be accessible/visible	50	4.14	0.61
14	control his/her temper	50	4.10	0.76
15	be fair	50	4.10	0.79
16	have a positive attitude	50	4.10	0.71
17	be resilient	50	4.08	0.85
18	have a strong work ethic	50	4.08	0.85
19	be disciplined	50	3.96	0.67
20	be able to learn on-the-fly	49	3.94	0.88
21	pay attention to detail	50	3.92	0.88
22	be a realist	50	3.92	0.78
23	be open	50	3.90	0.86
24	deal well with ambiguity	50	3.88	0.80
25	be logical	50	3.86	0.73
26	be reasonable	50	3.86	0.70
27	have a sense of urgency	50	3.86	0.90
28	have tact	50	3.82	0.80
29	be creative	50	3.76	0.98
30	have high energy	50	3.76	0.94
31	be innovative	50	3.72	0.78
32	have a sense of humor	50	3.58	0.97
33	be courageous	49	3.53	0.94

		f	*M*	*SD*
34	be patient	50	3.52	0.76
35	be a visionary	50	3.52	1.09
36	have empathy	50	3.44	0.97
37	have an outlet to keep work in perspective	50	3.42	1.14
38	be curious	50	3.40	0.93
39	be charismatic	50	3.02	0.91
#8	**Project Administration Expertise**	**--**	**3.93**	**0.50**
1	Create a project plan	79	4.38	0.67
2	set milestones/deadlines	79	4.38	0.65
3	manage a budget	79	4.33	0.73
4	set a schedule	79	4.30	0.67
5	manage time	79	4.20	0.67
6	manage quality	79	4.11	0.64
7	be able to forecast/estimate (time, budget, resources, and the like)	79	4.10	0.79
8	keep records/document	79	3.80	0.79
9	set performance metrics	79	3.75	0.90
10	execute performance metrics	78	3.67	0.94
11	be able to write proposals	78	3.40	0.89
12	be able to apply contract law	77	2.66	1.03
#9	**Tools Expertise**	**--**	**3.55**	**0.69**
1	have computer skills	77	3.66	0.98
2	know and use project management tools	78	3.62	0.91
3	know and use financial management tools	78	3.36	0.84

Note. *f* indicates frequency of responses for each statement. The scale for the statement means (*M*) ranged from 1=not important to 5=extremely important.