Assigning new product projects to multiple-project managers:
What market leaders do

Peerasit Patanakul a,*, Dragan Milosevic b

a Howe School of Technology Management, Stevens Institute of Technology, Castle Point on Hudson, Hoboken, NJ 07030, USA
b Department of Engineering and Technology Management, Portland State University, Portland, OR 97201, USA

Available online 21 June 2006

Abstract

One of the most important questions in project management is how to assign new projects to project managers. This question is especially challenging when a project manager already leads multiple, concurrent projects, e.g., a multiple-project manager of new product development projects in typical high-tech industries. To address this question, we explored the project assignment process of six market-leader companies in these industries. We found that in effective project assigning, management assigns projects first by prioritizing projects based on their contribution to the organization’s strategic elements such as organizational mission and goals; second, by matching projects to multiple-project managers by using project requirements and the competencies of multiple-project managers; and third, by recognizing any organizational or personal limitations. Such effective project assignments likely lead to better performance of the project and of the organization.

© 2006 Elsevier Inc. All rights reserved.

Keywords: Project manager assignments; Theoretical framework; Project assignment process; Project assignment criteria

1. Introduction

The idea about this research project was born during the course of another research project. Specifically, we asked managers of project managers in the high-tech industries: “What are the burning issues in your work?” One of frequent answers was that their companies lacked a designed process for project assignments. In this study, we explored the process of assigning new product projects to multiple-project managers (also called project assignment) of several market leader organizations, in particular those that implement new-product projects in multiple-project management environments (see Appendix A for definitions of terms used in this paper). Project assignments in these environments are considered as a critical management challenge (Meredith & Mantel, 2005), for at least three reasons:

➢ The choice of project manager: Deciding who will be managing a project is one of the critically important decisions in project management (Badiru, 1996). Some researches claim that the success or failure of a project to a large degree depends on who manages it (Brown & Eisenhardt, 1995).
➢ Too many projects in the pipeline: Organizations in multiple-project management (MPM) environments often implement too many projects at the same time; correspondingly, their multiple-project managers regularly lead
simultaneous projects (Payne, 1995). Assigning new projects to these multiple-project managers always poses the risk of assigning a project to an inappropriate or overloaded manager, a factor often blamed for project failure (Kuprenas et al., 2000).

➢ Lack of assignment guidelines or process: Even though project assignment is a critical decision in project management and multiple-project management is a current common practice, limited information exists in the literature on an effective project assignment process, and especially so as concerns new-product projects in MPM environments.

The critical importance of assigning new-product projects to multiple-project managers and the almost complete lack of information in the literature about such processes has prompted us to explore a framework for understanding project assignments. We found that an effective assignment begins with certain mediating steps, which create criteria that the project assignment maker can apply to the real-company situation, thus converting the steps to a basis for assignment decision. These mediating steps are project prioritization, multiple-project manager/project matching, and the recognition of organizational/personal limitations. When applied in an integrated way, these steps can, in general, encourage assigning those projects with higher priority and higher project requirements to a multiple-project manager with higher competencies while observing the organizational/personal limitations. As an implication, this framework could be deployed down to a systematic project assignment process. This process could lead to effective project assignments, which could in turn impact project success and eventually the performance of the organization.

2. Background

2.1. Literature review

In the literature, several studies suggest that a project manager is one of the success factors in project management (Brown & Eisenhardt, 1995; Cooper & Kleinschmidt, 1994; Pinto & Slevin, 1988, 1989; Souder & Jenssen, 1999). Also, an assignment of a project to a project manager is recognized as one of the more critical project decisions by several researchers (Adams et al., 1979; Balachandra & Friar, 1997; Shenhar, 2001a). In essence, with an appropriate assignment, a project manager is more likely to manage a project to its success (Hauschildt et al., 2000; Meredith & Mantel, 2005; Souder & Jenssen, 1999) and, eventually, the success of that project likely contribute to organizational performance (Adler et al., 1996; Shenhar, 2001a; Whitson, 1992). This issue is particularly important for organizations in high-tech industries that tend to use projects as a vehicle to their business success. With the significance of project assignments to the project performance and organizational performance, project assignment is a relevant research area. Also, the review of the relevant literature showed that the studies on project assignments are limited. However, in such low-researched area, we are able to identify two literature streams. The first stream includes assignment criteria and the second steam focuses on the assignment process and methodology (see Table 1). Very little in these literature streams are dedicated to studies that focus on high-tech industries’ projects, and project assignments.

| Table 1
| Summary of the literature review |
|-------------------------------|--------------------------------------------------|
| Researched/Not                  | Literature stream: Criteria for assigning projects to project managers | Literature stream: Process for assigning projects to project managers |
| Researched                     | Project requirements (e.g., Adams et al., 1979) Competencies of project managers (e.g., Adams et al., 1979; Archibald, 1975, 1992; Frame, 1999; Gaddis, 1959; Pettersen, 1991; Thamhain, 1991) | Assignment based on matching project characteristics and the capabilities of project managers (e.g., Adams et al., 1979) Assignment based on comparing project managers according to their skills (e.g., Mian & Dai, 1999) Assignment based on matching types of projects and types of project managers (e.g., Hauschildt et al., 2000) |
| Not Researched, literature gap | Other criteria that are applicable to the assignments of new-product projects to multiple project managers in multiple-project management environments | Process based on a comprehensive list of criteria that are applicable to multiple-project management environments |
2.1.1. Criteria for assigning projects to project managers

Although the first stream of literature is not specific to a project assignment context and was not done in MPM environments, it somehow recognizes the skill sets of project managers and project requirements as assignment criteria. In this stream, several studies propose successful project managers’ skill sets (Archibald, 1975, 1992; Frame, 1999; Gaddis, 1959; Pettersen, 1991; Thamhain, 1991) and often imply that these skills can be used as criteria in an assignment process. Besides the skill sets, several studies also recognize project characteristics as important criteria (Birnberg, 1997; Duncan, 1999). Shenhar (2001b) emphasizes that project characteristics such as technological uncertainty, system complexity and pace are important factors determining management styles of project managers.

2.1.2. Process and methodology for assigning projects to project managers

The second stream of studies proposes some methodologies (or processes) for project assignments. The literature in this stream is more specific to project assignments. It suggests that the assignment methodology should be based on criteria regarding project requirements as well as project managers’ skills in order to identify good matches between projects and project managers (Adams et al., 1979; Hauschildt et al., 2000; Mian & Dai, 1999). An assignment methodology that worth mentioning is the Scoring Model of Adams et al. (1979). Their assignment process starts with first, identify the demands of the project based on its economic, organizational, technological, and behavioral characteristics and second, search for the project manager who appears to possess those qualities needed to meet the identified demands.

2.2. Observation and conceptual thinking

As discussed earlier, in high-tech industries, projects are often important to the business success of an organization (Bowen et al., 1994). In addition, several projects are implemented in an organization at the same time (MPM environments). Project assignment is, therefore, considered an important management decision. Our observation after reviewing the extant literature was that first, the literature is rather limited in this area and the studies were not done in MPM environments. Second, since the studies were not done in the environments, the assignment criteria presented in the literature may not comprise a comprehensive (the entire set of necessary) list of criteria applicable to the environments. Third, along the same line with assignment criteria, processes for the assignment may not be based on a comprehensive list of criteria. In addition, no theoretical framework for the assignment is offered in the extant literature. Project assignments should have a theoretical framework that integrates the assignment process and criteria. The benefit of the framework is the explanation of the relationships among the elements in the project assignment activity.

When we closely look at the assignments in the context of new product projects in multiple-project management environments of high-tech industries, we realize that the assignment criteria and process in the literature may be inadequate. The literature simply proposes using criteria and process with regards to project characteristics and project manager’s skill sets. Some criteria such as the organizational strategic elements and limitations, and additional steps in the process should be included. The reasons are:

1) In current business practices, some organizations, especially in high-tech industries, view projects as the engine of corporate success, survival, and renewal (Bowen et al., 1994). Usually, these projects are selected according to the strategic elements of an organization (Pennypacker & Dye, 2002), with an eye to selecting those that will provide the highest value to the company’s strategy (Cooper et al., 1998). Therefore, assigning these projects without any consideration of the organization’s strategic elements may eventually make the organization vulnerable.

2) Also, in many organizations, several projects are implemented at the same time; which we referred to as MPM environments (Fricke & Shenhar, 2000; Ireland, 1997; Kruglianskas & Thamhain, 2000; Milosevic & Patanakul, 2002; Pennypacker & Dye, 2002; Platje & Seidel, 1993). In such environments, firms may over commit their resources (in this case, project managers who manage multiple, simultaneous projects); that is, they may have more active projects than their resources can support. As a result, projects take longer to get to a market as emphasized by (Harris & McKay, 1996). The cure may lie in resource capacity planning, that is, matching the resources required for active projects with the resources that are available (Wheelwright & Clark, 1992). Assigning projects to project managers without considering resource capacity of project managers as a limitation
may lead to an ineffective project management (Adler et al., 1996). From literature reviews and our observation, our conceptual thinking that broadly guided our research was stated as follows.

Conceptual Thinking 1: Organizational strategic elements and limitations are likely to be used as additional criteria for project assignments in MPM environments of high-tech industries.

Conceptual Thinking 2: Project assignment process is likely to include additional steps that incorporate organizational strategic elements and limitations in making assignment decisions.

3. Research methodology

Prompted by the project managers’ answers mentioned earlier and noting the above literature gaps and our conceptual thinking, we conducted this study to understand a process of how new product projects are assigned to project managers in MPM environments, especially the assignment of project managers who simultaneously lead multiple projects. We studied the assignment process in market-leader organizations in high-tech industries. We expected these market-leader organizations to have the assignment processes in place from which we can learn and respond to the gaps.

3.1. Research questions and theoretical framework

To guide our research, we formulated two research questions with the goal of addressing our conceptual thinking discussed earlier:

(1) What are the comprehensive criteria for assigning product projects to project managers?

(2) How is the assignment process based on the comprehensive criteria performed?

In addition, with our intention to integrate project assignment criteria and process to develop a theoretical framework for understanding project assignments, we formulated the third research question:

(3) What is the theoretical framework of the assignment process based on the comprehensive criteria?

3.2. Method

Our research was conducted in three phases.

In the first phase, we chose six companies in the high-tech industries, three computer-related hardware manufacturing and three software developing companies, that implement new product projects in MPM environments (see Appendix B for company descriptions). Each company is a market leader, i.e., first or second in market share in its respective markets. We studied the process of project assignment in each company through 90- to 120-min semi-structured interviews (Eisenhardt, 1989; Glaser & Strauss, 1965, 1968; Yin, 1984), interviewing people on two organizational levels—a multiple-project manager and his/her superiors—to obtain information from different perspectives. Each interview was conducted by using a guiding questionnaire, deployed from our conceptual thinking and research questions. All interviews were taped with the consent of the interviewees. In many cases, the companies were kind to provide us with documents, e.g., strategic goals, project priority, competency sets, process flow charts, progress reports, etc.

In the second phase, we analyzed what we heard in the company interviews and compared them for accuracy with their documents. Each interview was transcribed, yielding 15–29 pages transcripts (Eisenhardt, 1989; Miles & Huberman, 1980; Strauss & Corbin, 1990). Then we analyzed each company’s case, followed by cross-case analyses (Yin, 1984). We stopped interviewing new companies when our incremental learning on the process of project assignments had diminished. At this stage, we preliminary developed our framework for understanding project assignments, an initial list of assignment criteria, and assignment process.

The third phase, the validation phase, included two steps: (i) validation with a panel of experts and (ii) validation with a company. First, we identified a panel of experts and asked them to validate our extended list of assignment criteria by rating their importance (1—not important; 7—most important). In doing so, we implemented the Delphi method (Linstone & Turoff, 1975). The panel consisted of distinguished experts with knowledge and experience in new-product project management, high recognition in the new-product project management community, and no potential gain from the expected outcome of our study. To achieve a balanced mix of perspectives, we selected six
experts from different professions: two researchers, two consultants, and two practitioners, to help minimize the impact of prejudice, if any (Kocaoglu, 1983).

The second step of phase three was validation of the preliminary process in a high-tech, market-leader company, working with the director of project management group for new product development. We began by offering the company a choice of assignment criteria. Then, they picked the projects to assign and project managers. Next, we guided the director to use our proposed project assignment framework and learned from the director whether our framework is applicable to MPM environments.

The result of our three research steps is a theoretical framework for understanding project assignments, including the propositions for future research. Project assignment criteria and process are integrated in the framework. In this study, “theoretical framework” is primarily defined as a model or system composed of set of well-developed concepts related to each other through statements of interrelationships, including an integrated structure that can be used to describe or predict phenomena, similar to the concept of “theory” defined by Strauss and Corbin (1990). According to Dubin (1978), the characteristics of a theoretical framework should include variables or units of analysis, the laws of interaction among units of the framework, boundaries within which the theory is expected to hold, system states, and propositions of the framework. These characteristics match the theoretical framework of the study and are explained briefly here.

First, variables are units of analysis whose interactions comprise the focus of the study. Second, the framework indicates the manner in which these variables/units interact with each other. Third, the boundaries within which the framework is expected to hold need to be determined. In particular, the anticipated application of the framework is with respect to various projects need to be defined. Fourth, system states are domains in which units of analysis interact differently with each other. Fifth, the study aims at developing propositions—conclusions that represent logical and true inductions about the framework in operation. These propositions explain the interactions between units of analysis. For every term in the proposition there will be empirical indicator(s). According to Christensen (2006), steps we described in building our theoretical framework correspond to building a descriptive theory—observation, categorization, and defining relationships.

4. Findings and discussion

The research results and evidence are summarized in Appendix C. Based on the results and evidence, we propose a theoretical framework for understanding project assignments. This theoretical framework was developed using Dubin’s methodology (Dubin, 1978). See Appendix D for the summary of the characteristics of the theoretical framework.

4.1. A theoretical framework for understanding project assignments of market-leaders

Fig. 1 illustrates the theoretical framework for understanding project assignments including project assignment process and criteria. We learned from the market-leader companies interviewed that their overall assignment process of the organizational product development projects starts with the identification of criteria for project assignments in four specific categories of criteria: organizational strategic elements, project requirements, multiple-project managers’ competencies, and organizational/personal limitations. Then these criteria are used to drive the three mediating steps of the assignment process: prioritizing projects and then matching multiple-project managers with the projects to be assigned while abiding by organizational/personal limitations.

These processes are integrated, meaning that they best function together. When done effectively, this leads to increased performance of the projects and the whole organization. Within this theoretical framework, for simplicity’s sake, we have sequentially described the mediating steps in the assignment process and related assignment criteria together.

4.1.1. Project prioritization

The first mediating step is project prioritization (see Appendix A). Here, management prioritizes projects based on the degree to which they contribute to the accomplishment of the organization’s strategic elements. Included are all projects, both new and existing ones. When the strategic elements of an organization serve as a basis of project prioritization, the projects that contribute more will be ranked higher than those that contribute less. In other words, a
higher ranked project is strategically more important than a lower ranked one. This also means that the importance of the higher ranked project to organizational performance is higher than that of the lower-ranked one.

Our finding, that *organizational strategic elements* are often used as criteria by the management of market-leader organizations in project prioritization before a project is assigned, is a new and different view. Even though these elements have been extensively recommended in use for project selection (Adler et al., 1996; Eisenhardt & Brown, 1998; George, 1999; Maruca, 2000; Meyer & Seliger, 1998; Meyer & Utterback, 1993; Tatikonda, 1999), to the best of our knowledge, they have almost never been recommended as criteria for the process of project assignments. Based on our case interviews, the organizational strategic elements that are specifically used in project assignments are the organization’s mission and goals. From the list of goals gathered from the interviews, we divided them into their business, operation, and technology aspects. Increased profitability, increased revenue, new markets created, increased market share, improved customer satisfaction, and new business alliances created are the business-related goals most often used by market leaders in our study. Among operation-related goals are accelerating time-to-market, enabling staff development, and balancing resource capacity. The last group of technology-related goals includes strengthening/leveraging technological competence, supporting technological innovation, and facilitating technological knowledge transfer. In fact, these goals are similar to the ones the literature recommended for project selection. To strengthen the findings from the interviews, our panel of experts validated all of these goals across the three groups by using Delphi method. Fig. 2 shows a short list of the top five goals that our experts considered important for prioritizing new-product projects in high-tech industries.

From these findings, it was not surprising to learn that market leaders use these organizational strategic elements in making project assignments. Their reasoning: 1) The companies often aim at launching their products to market as fast as they can in order to gain a high profit margin, increase sales revenues, and satisfy their customers. 2) They have to maintain or improve their technological competence in order to be ahead of their competitors. Since these goals are so important to their survival in these dynamic environments, they want to ensure that their new product-development projects are managed according to these strategic elements. What we found from our study was that market leaders deploy these strategic elements in the assignment process and thus ensure that important projects are assigned to the
most competent project managers. In particular, projects are most often prioritized based on their relative contribution to the success of these strategic elements. From this prioritization, management will know the degree to which the project is critical to the performance of the organization and will pick that multiple-project manager to lead the project who is best qualified, provided that organizational/personal limitations are met. One interviewee stated, “If it [a new project] is something that is more critical, you [management] obviously have to use the most experienced person that you can afford to put on the project.” To formalize this approach, we state:

**Proposition 1.** The more a new-product project contributes to the organizational strategic elements, the more likely it is to assign the project to the most competent multiple-project manager.

### 4.1.2. Multiple-project manager/project matching

A project’s priority appears to be just one form of input in project assignment decision-making. Our findings reveal that the next input comes out of the mediating process of multiple-project manager/project matching that is based on the project’s requirements and project managers’ competencies (see Appendix A). The purpose of this step is to achieve the best match between the degree of a multiple-project manager’s competencies and the degree of difficulty of the project requirements. To make finding this match possible, the project requirements have to be clearly spelled out. Also, the competency levels of multiple-project managers have to be assessed to identify those managers whose competencies correspond to the requirements. In other words, the competencies can be used as good indicators of an appropriate match between projects and multiple-project managers.

*A project’s requirements*, in general, can be derived from the complexity of the project, the project size, duration, level of technological uncertainty, interdependencies and interactions among projects, the experience and sophistication of the clients, and the degree of stakeholder involvement, among other things (Birnberg, 1997; Duncan, 1999; Shenhar, 2001b). In addition, the project requirements can be assessed in terms of project characteristics, namely economic, organizational, technological, and behavioral (Adams et al., 1979). When looking at project requirements as assignment criteria, we discovered from the interviews that the following were most important: the degree of technical and commercial risk, the level of organizational complexity, how critical the schedule was, the degree of technology novelty, task complexity, and team dispersion. The project size and project duration, including performance and quality requirements, were also important assessments to make. From all of these requirements, the top five that our experts recognized as most important in project assignments are shown in Fig. 3. From the experts’ ranking, what is perhaps unique to managing new-product project is the level of risk and the critical nature of the schedule, both of which were ranked high by our experts. In addition, rapid and discontinuous changes in customer demand, competition, and technology, which are drivers to a fast project schedule and uncertainty of information, also lead to the risk involvement in a project. In these industries, it is common for a company to view risk as a factor to capitalize on (Lengnick-Hall & Wolff, 1999). In fact, this reflects what we heard from one interview. Our interviewee mentioned, “I look at the project and if I see that this is a really high-risk project and that we have never worked with this technology, then if I know I have a project manager who is really strong on risk management, I will assign the project to him... [Or] if the schedule looks a little bit aggressive, and I know we are going to compete for resources, I will assign a project to a project manager who is really proactive....”

![Fig. 2. Organizational strategic elements as assignment criteria.](image-url)
In terms of the competencies of multiple-project managers, it has been recognized both in the literature and market leaders in our study that knowing the level of competencies is important for project assignments (Adams et al., 1979; Hauschildt et al., 2000). Such knowledge helps identify the multiple-project managers who appear to possess the competencies needed to meet the identified demands of the project. In the literature, although not specific to project assignment, the competencies of successful project managers have been widely discussed (Archibald, 1975, 1992; Einsiedel, 1987; Frame, 1999; Gaddis, 1959; Pettersen, 1991; Posner, 1987). These competencies can be categorized into technical, administrative/process, human/interpersonal, and business/strategic competencies.

What we learned from the interviews was a slightly different list of competencies. In particular, we discovered that a multiple-project manager who leads multiple, simultaneous projects should possess two sets of competencies. The first set, for leading an individual project, is similar to the one in the literature. Several of the interviews in our study noted that administrative/process and people skills (interpersonal and intrapersonal competencies) are very important: “You [project manager] should have a solid foundation in project management...You should be able to communicate and influence people...You have to be very organized, thoughtful, and methodical.” Business/strategic competencies are also important: “Project managers should be able to make the right trade-off decisions on the project.” However, some market leaders do not require their project managers to have a strong technical expertise; they prefer skills with the big picture of the technical aspects of the project. For example, one interviewee noted: “They [project managers] should understand when we are talking about the importance of the system architecture being defined, how critical that is to the project.”

A delineation of the second set, those competencies that would help multiple-project managers coordinate multiple, simultaneous projects, has not yet been described in the literature. We have termed it “multiple project management competencies.” The competencies include obvious experience in managing multiple projects plus interdependency management, multitasking, simultaneous team management, and interproject process. In project assignments, both sets of competencies are important as criteria. From a long list of competencies gathered from the interviews, Fig. 4 shows the top three competencies in each category, as validated and ranked by our experts.

We discovered from the interviews that when the project requirements and competencies of project managers are used in multiple-project manager/project matching, the project that has higher project requirements, for example, is riskier or has a “faster” schedule, calls for more competent multiple-project managers than those with lower requirements. Additionally, a higher-requirements project, also termed as “more demanding,” is more difficult to manage than one with lower requirements. Logically and preferably, then, a more difficult to manage project is assigned to a multiple-project manager with a higher degree of competencies, and an easier to manage project to a competent multiple-project manager with a lower degree of competencies. Thus, not surprisingly, it is preferable that a project manager with proven competencies corresponding to the identified requirements of a project is assigned. As one of our interviewees observed, “If I [management] have a complex project, I’d be looking at the experience level of the project managers, their skills, their versatility, and their track record...I’d try to get the best match up of their backgrounds with the needs of the project.” In essence:

**Proposition 2.** The higher a product project’s requirements are, the more likely it is to assign the project to the multiple-project manager with high degree of competencies.
4.1.3. Recognition of organizational/personal limitations

Besides considering the organizational strategic elements in prioritization and in matching project requirements/competencies of managers, our findings from the interviews show that management also recognize the organizational/personal limitations in project assignments (see Appendix A). Organizational/personal limitations in project management have been recognized as being important in the literature, although not specific to project assignments. Such limitations include the organization’s resource capacity (Adler et al., 1996), interdependencies and interactions among projects (Platje & Seidel, 1993; Platje et al., 1994), and the project manager’s workload (Kuprenas et al., 2000). In terms of project assignments, one often-mentioned limitation in our market-leader organizations was the resource capacity of multiple-project managers. Their concern was that management should not assign so many projects to one multiple-project manager up to the point where she cannot be effective. One interviewee noted: “I [management] don’t want to load them [project managers] with too many projects. In our organization, with four projects, I think, a project manager is going to lose a lot of effectiveness and a lot of efficiency because he is changing gears too much. This is really inefficient.” In fact, one technical report showed that a multiple-project manager of four simultaneous projects may lose up to 20% of her time switching between tasks (Kapur International, 1993). This is called “switchover-time loss” (Rubinstein et al., 2001). Given this, we learned from the interviews that management does not have the luxury of assigning projects only to experienced multiple-project managers. They must consider whether a multiple-project manager has sufficient resource capacity to take on an additional project; that is, are they available? It is important that the switchover-time loss from multitasking is included when determining a multiple-project manager’s resource capacity. In general, the resource capacity is measured roughly in a unit of number of projects or, as in some organizations, in a unit of number of person-hours per
time period (Harris & McKay, 1996). In the prior case, depending on the complexity and technical difficulty of those projects, the limited number of projects that a multiple-project manager can simultaneously lead was set, e.g., not more than five. In the later case, the planned load of each multiple-project manager was identified, e.g., 40 person-hours per week, and the assignments were done accordingly.

The type and phase of projects are also important factors in project assignments. Some multiple-project managers may not be able to lead several projects of a certain type or in a certain phase, simultaneously. An interviewee mentioned to us that “It is very difficult to handle a breakthrough product development project and a platform project at the same time,” It is because of the technical difficulty and system complexity of those projects. Also, one consideration that we discovered is that multiple-project managers often spend more time in the initial phases of a project. Having too many projects in those phases may lead to ineffective project management. We termed these limitations as project type mix and project phase mix constraints.

In some organizations we interviewed, the strength of the project team and the availability of support staff are also considered during project assignments. Our interviewees mentioned that “a strong project team can release a project manager from managing details” and the help of support staff can “increase a project manager’s time spent on value-added activities.” Also, interdependencies and interactions among projects are important. In several cases, this limitation leads to the assignment of several projects that have strong interdependencies and interactions to the same multiple-project manager for more efficient and effective management (we referred to it as a project interdependency constraint). We also found from the interviews that the career path of a multiple-project manager, including personal preferences, is often considered during project assignments. However, management always prefers to assign a project to a multiple-project manager whom they can trust to lead a project to success (a preference assignment constraint). Fig. 5 illustrates the top five organizational/personal limitations as validated and ranked by our experts.

In sum, in the step of recognizing limitations, market leaders measure to what degree the multiple-project manager is the right person to assign the project to, given the limitations of his/her circumstances. This assumes that the multiple-project manager’s competencies match the project’s requirements and the project’s priority. We learned from the interviews that the logic here is that multiple limitations act as criteria for determining whether the multiple-project manager is a right fit with regards to multiple limitations. In this step, it may happen that a certain multiple-project manager can unload her existing projects (to eliminate some limitations) and take on the new ones. The interviewees told us that the driving point in this occurrence is the best interests of the organization (given organizational limitations) and of the multiple-project manager (given personal limitations). In summary:

**Proposition 3.** It is more likely that a project is assigned to the best multiple-project manager while organizational and personal limitations are considered.

### 4.2. Formality of the assignment process and the use of management tools

This section dedicates to the discussion on the degree of formality of the assignment process of market leaders in our study comparing with our proposed theoretical framework (Fig. 1). This also includes the discussion on their use of management tools in project assignments.
The formality of the process—the degree of documenting the process—varies from company to company, primarily depending on the industry and corporate culture. Today, many industries and corporate cultures generally operate at high velocity, where all business activities are in tune with the dynamic nature of the complex environment and fast speed-to-market (Brown & Eisenhardt, 1997). This approach generally promotes a not-so-formal industry culture, where some companies, especially smaller and younger ones, tend to be less formal than others, which are typically bigger and older. To contrast these degrees of variation of the process formality, it may be helpful to visualize a continuum. At one end is a very informal process without any degree of documentation; on the opposite end is a very formal process, with a high degree of documentation.

Observed from our study, the most formal assignment process in our group of market leaders was in a computer-related manufacturing company (Company ITC) that documented organizational strategic goals and multiple project manager competencies. That is, they had implemented two of the total four categories of assignment criteria in our process (undocumented but verbal assignment criteria of project requirements and organizational/personal limitations were also in place). Out of the three mediating steps (project prioritization, multiple-project manager/project matching, and recognition of organizational/personal limitations), only the project prioritization was formalized. To give a rough sense of formality, we rated this company’s process as “medium” formal. The least formal was the process in a software development company (Company CSD), where the assignment process did exist but was entirely “informal”. On our continuum, the formalization of the companies we interviewed ranged from low to medium, or close to the informal end of the continuum.

As for the management tools used by the market leaders, the systematic procedure used to produce a management deliverable, we found that multiple tools are used in the project prioritization step. These varied from formal scoring models (Cooper, 2001) to zero-based budgeting (Meredith & Mantel, 2005) to very informal brainstorming and a decision matrix. Some companies reported the use of such complex models as the Analytic Hierarchy Process (Englund et al., 2003).

The mediating step of multiple-project manager/project matching was informal in all of our market leader companies but some management tools were used. Typically, based on informal project requirements, a matrix of the required multiple-project manager competencies for each project to be assigned was developed. Then, the competencies of actual managerial candidates were analyzed and compared with the matrix of the required competencies for each project. This led to actual matching of multiple-project managers and the projects, with the hope that it was good enough. This matching method was considered as a very complex informal procedure, which required a detailed knowledge of the projects and the candidate managers. At times, despite the desire of our market leaders to have a multiple-project manager run a project from inception to completion, some multiple-project managers were asked to unload existing projects and take on difficult, new ones or vice versa.

MS Excel was used most often as a management tool in what we termed an “entirely informal” third mediating step of the recognition of organizational/personal limitations. This proved to be the case because the primary limitation was the resource capacity of the multiple-project managers. MS Excel was used to track the actual load of each multiple-project manager in person-hours per week; that figure was compared with the planned load of multiple-project managers per week, which varied from 32 to 50 person-hours per week to whatever hours it would take to get the project done well. Other major limitations in use were project type mix and project phase mix constraints, total number of projects, and preference assignment and project interdependency constraints.

In summary, in our market-leader organizations, the assignment process is more informal than formal, which seems to be rather common (Kerzner, 2000). Also there is a high use of management tools in these informal processes. To summarize this finding, we state:

**Proposition 4.** Even though some management tools and techniques are used, it is more likely that the project assignment process of an organization in high-tech industries is rather informal. This may reflect the lack of theoretical framework that integrates process and criteria for project assignments.

### 4.3. Project assignments and the performance of organizations

According to our theoretical framework (Fig. 1), after establishing the project assignment criteria and going through the three mediating steps, management should be able to effectively make informed decisions. The outcome of that process is the assignment of all new and existing projects to members of the pool of multiple-project managers.
However, special attention should be given to strategically important projects, those that may make or break organizational performance. Indeed, this is very important since many organizations use new product development projects as engines of organizational performance and business growth (Pennypacker & Dye, 2002).

Since project performance often has a direct impact on organizational performance, in project assignment, the projects should go to those competent multiple-project managers who are available to lead them. In addition, when reassigning an existing project, we learned from the cases that a multiple-project manager’s ability to manage the continuity of the project should be considered, especially when the project is assigned to a different multiple-project manager from its original one. In fact, a project reassignment is rather a common practice in our market-leader companies when management wants to assign a more critical project to a fully loaded, competent multiple-project manager. The way to increase the manager’s availability is to unload his existing project and put it up for reassignment. In practice, changing the project manager of a project often leads to project delay, cost overruns, or quality problems (McDonough & Spital, 2003; Pennypacker & Dye, 2002), which will in turn hurt the project and organizational performance. We observed from our study that when assigning a project, it is important to keep in mind that the final outcome of the overall process is an expected increase in project and organizational performance. We refer to this approach as “effective” project assignments. Hence, we propose:

Summary of Assignment Framework: In order to accomplish effective project assignments and to enhance project success and organizational performance, when assigning projects, it is important to prioritize projects accurately, match project complexity with the multiple-project manager’s competencies correctly, and assess pertinent organizational/personal limitations appropriately.

5. Managerial implications

In this paper, we propose a theoretical framework for understanding project assignments of market-leader organizations in high-tech industries. Besides some propositions presented in this study for future research opportunity, the framework including assignment process and criteria implies some managerial implications to the practitioners, especially the way to assign projects to project managers.

5.1. How to develop a company-specific assignment process

To develop a project assignment process, an organization should use a contingency approach, meaning that the developed process should reflect the culture and strategy of the organization and industry (Oliver et al., 2004), whatever the industry it is in. The organization might adapt the assignment process proposed in this study to its existing process. This adaptation should begin with the establishment of the project assignment criteria, continue with the three mediating steps, and culminate in the project assignments. When done effectively, this process may lead to the increased performance of projects and the whole organization. In sum, the process might include:

➢ Listing all the projects to be assigned, including new and existing projects.
➢ Identifying the strategic elements of the organization for project prioritization.
➢ Prioritizing projects based on their contribution to those strategic elements.
➢ Identifying project requirements and translating them into the level of multiple-project manager competencies that a project requires.
➢ Identifying multiple-project manager candidates and their level of competencies.
➢ Identifying the corresponding level (match) between a project and a multiple-project manager based on the level of competencies the project requires and the level of competencies the project manager possesses.
➢ Identifying the organizational/personal limitations regarding project assignments.
➢ Assigning a project to a multiple-project manager with respect to project priority, the multiple-project manager/project match, and the organizational/personal limitations. Also considering the ability of a multiple-project manager to manage the continuity of a project if an existing project is assigned to a different multiple-project manager than its original one.

An organization should also select appropriate criteria that are pertinent to its organization’s strategy and culture. To do so, the organization may start by using our proposed criteria and include their level of importance as guidelines in
order to develop its own assignment criteria. Because our study focused on the process of assigning new product projects to multiple-project managers of several market-leader organizations, the process that grew out of our findings could be considered as a best practice. In addition, to ensure its applicability, our proposed process and criteria were validated both with experts and in a company. Even though our intention is to suggest that our process and criteria can be generalized across industries, the contingency approach should be applied to assignments in different settings.

6. Conclusion

This study proposes a theoretical framework for understanding project assignments. Developed from the case study research with market-leader organizations, the framework, providing an integrated view of project assignments, presents a process and criteria for use in project assignments in multiple-project environments of high-tech industries. In addition to the theoretical framework, the study proposes a set of propositions for potential future research. For practitioners, in using the assignment framework including process and criteria proposed in this study, project assignment can be done with consideration to both project performance and organization performance since project-related elements and organizational strategic elements are both integrated in the assignment activity. With this consideration, the assignment process is likely to help facilitate the alignment between business strategy and project management.

Appendix A. Terms and definitions

Mediating Steps—These are intermediate steps that convert information from project assignment criteria into information for decision-makers to decide which multiple-project manager a project will be assigned to. These steps include project prioritization, multiple-project manager/project matching, and recognition of organizational/personal limitations.

Multiple-project Manager—In some organizations and in multiple-project management environments, a project manager simultaneously leads several concurrent projects. In this situation, projects are grouped together to achieve more efficiency in the use of resources.

Multiple-project Manager Competencies—Competencies are the behaviors adopted in competent performance. They are influenced by knowledge and skills, experience, and personal attributes. Examples are administrative/process competencies, business/strategic competencies, or multiple-project management competencies. Our process makes use of the competencies as criteria to decide which multiple-project manager a project will be assigned to. See examples in Fig. 4.

Multiple-project Management (MPM) Environment—An environment within an organization where multiple projects are managed at the same time. Some projects are managed individually as single projects, others as programs, and still others as groups of multiple projects. The projects vary in size, importance, required skills, and urgency; are in various stages of completion; and use the same pool of resources. In this paper, we focus on the process of assigning projects to multiple-project managers (project managers of a group of multiple projects).

New-product Projects—Our process for project assignments includes two types of projects that occur frequently: new-product development and software development projects. We termed them both “new-product projects.” While this approach may not be fully grounded in theory, the practicing project managers in a high-tech industry often see a difficulty in separating product development from software development projects. Often times, many new products include both hardware and software components, generating the need for their integration and the appointment of one project manager for both components. This reflects a pragmatic need for our new-product projects approach.

Organizational/Personal Limitations—These include two parts. The first part concerns organizational policy rules that define the boundaries under which the multiple-project manager operates. Personal limitations are constraints of a personal nature of the multiple-project manager, such as career goals or personal interests that may not coincide with organizational ones. Our overall assignment process uses the organizational/personal limitations as one group of criteria to decide which multiple-project manager a project will be assigned to. See Fig. 5 for examples.

Organizational Strategic Elements—These elements include the organizational mission and goals. For examples, see Fig. 2. Their role in the assignment process is to serve as a criterion for deciding which multiple-project manager a particular project will be assigned to.

Project Assignments—Specific projects assigned to specific multiple-project managers.
**Project Assignment Process**—This is the process of assigning projects to project managers. Because our process deals with multiple-project management environments and multiple-project managers, the assignment focuses on the process of assigning multiple projects to multiple-project managers, where multiple projects include existing and new-product projects. It has three mediating steps of: project prioritization, multiple-project manager/project matching, and recognition of organizational/personal limitations.

**Project Requirements**—These are project variables that characterize the nature of the project. Examples can be seen in Fig. 3. In our overall process, project requirements are used as a criterion to decide to multiple-project manager a particular project will be assigned to.

**Process**—This is a streamlined sequence of activities or steps that are intended to create added value for customers. Here we propose an overall process for project assignments, which includes multiple steps. See Fig. 1.

### Appendix B. Companies included in the study

<table>
<thead>
<tr>
<th>Company</th>
<th>Company LCD</th>
<th>Company EI</th>
<th>Company CSD</th>
<th>Company DS</th>
<th>Company ITC</th>
<th>Company MG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company’s market standing (ranking)</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>N/A</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Department name</td>
<td>Project Management Group</td>
<td>Project Management Group</td>
<td>Project Management Group</td>
<td>Eng. Management Department</td>
<td>Project Management Group</td>
<td>Corporate Engineering</td>
</tr>
<tr>
<td>Department purpose</td>
<td>Product development management</td>
<td>Project development management</td>
<td>Product development management</td>
<td>Support software development</td>
<td>Product development management</td>
<td>Product development management</td>
</tr>
<tr>
<td>Number of projects per year</td>
<td>30–40</td>
<td>40–50</td>
<td>&gt;50</td>
<td>&gt;100</td>
<td>10–15</td>
<td>10–12</td>
</tr>
<tr>
<td>Number of project managers</td>
<td>12</td>
<td>18</td>
<td>8</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Average number of projects per project manager</td>
<td>2–4</td>
<td>2–4</td>
<td>4–8</td>
<td>10–12</td>
<td>2–4</td>
<td>2–3</td>
</tr>
<tr>
<td>Typical project budget (M: million, h: person-hours)</td>
<td>Small: $0.5–3 M</td>
<td>Med: $2–5 M</td>
<td>Large: &gt;$5 M</td>
<td>Small: &gt;$300–400 h</td>
<td>Med: 1000–3000 h</td>
<td>Large: &gt;1000 h</td>
</tr>
<tr>
<td>Typical # of participants per project</td>
<td>Small: 20</td>
<td>20–60</td>
<td>8–25</td>
<td>20–56</td>
<td>5–20</td>
<td>2–4</td>
</tr>
<tr>
<td>Typical projects</td>
<td>New product development</td>
<td>New product development</td>
<td>Software Development</td>
<td>Hardware support for software development</td>
<td>New product development</td>
<td>Product/Software Development</td>
</tr>
</tbody>
</table>

### Appendix C. Evidence from the research

<table>
<thead>
<tr>
<th>Company</th>
<th>Organizational strategic elements</th>
<th>Project requirements</th>
<th>Competencies of project managers</th>
<th>Organizational limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company LCD</td>
<td>Product Approval Committee (PAC) uses an in-house ISO9000 standard process to select and prioritize projects based on organization’s</td>
<td>Manager of project managers assigns projects based on their requirements, e.g., types, complexity, and projects’ priority (from PAC).</td>
<td>Assign a project to a project manager based on his/her track record, skills, experience, etc. Emphasize on soft skills more than technical skills.</td>
<td>Pay attention to workload of project managers, e.g., if his/her projects start to ramp down, size and phase of projects s/he currently has.</td>
</tr>
</tbody>
</table>
strategy and market info. Company EI Senior management puts together a 3-year product roadmap during strategic planning process. The roadmap shows projects’ priority and time to implement. Based on product roadmap, product line manager assigns projects. Projects’ complexity, size, team dispersion, etc. are considered. Experience of project managers, background, versatility, track record, etc. are especially looked at when assigning complex projects. Focus is on technical skills. Focus on effectiveness of project manager in managing projects. Try not to assign too many projects to one project manager. Career path of project managers is also looked at.

Company CSD Product roadmap is developed featuring new product projects, enhancement projects, and maintenance projects. Project requirements, e.g., schedule, scope of work, new vs. existing features, level of product integration, level of testing, are emphasized. Identify what skill set of each project manager is and what is needed for the project, and match them. Among other factors, workload of project managers and their personal interest are considered.

Company DS Projects are selected by a committee led by R&D and marketing departments. Senior executives set priority of top 10 projects but the priority changes occasionally. Project size, duration, and its criticality, etc. are assessed before assigning a project to a project manager. Experience and skill level of project managers are always crucial especially during an assignment of a critical project. Workload in terms of project size or phase composition (in which phase is each of their projects), career path and personal interest of project managers are considered.

Company ITC Technology and product roadmaps are developed by senior executives during strategic planning process. ZBB (zero-based budgeting) method used for project ranking. Project technology and organizational complexity, and strategic importance are primary factors in defining level of criticality of project requirements. Two project managers appointed to co-manage major projects called two-in-the-box. One is a technologist; the other is a people-manager. In smaller projects, project management skills/experience matter. Track record and time availability of project managers is the key. Current location on the “rate-and-rank” ranking list of project managers also considered.

Company MG Corporate projects develop platforms shared by multiple business units. They are selected and ranked based on how high is their contribution to the units. Projects’ requirements are assessed in terms of scope of work, product technology, and technological uncertainty, etc. Match a project to a project manager who has either some related skills/experience to that project or some knowledge about product technology. Workload of project managers is among the first factors to look at. Two projects per project manager is a preferred number of projects per project manager.

Appendix D. Characteristics of the theoretical framework

<table>
<thead>
<tr>
<th>Characteristics of the theoretical framework (Dubin, 1978)</th>
<th>Characteristics of our proposed theoretical framework</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variables or units of analysis</td>
<td>• Assignment criteria</td>
</tr>
<tr>
<td></td>
<td>• Assignment (mediating) process</td>
</tr>
<tr>
<td></td>
<td>• Project assignments</td>
</tr>
<tr>
<td>The laws of interaction among units of analysis/variables</td>
<td>Assignment criteria drive the assignment process which drives project assignments</td>
</tr>
<tr>
<td>Boundaries</td>
<td>New product projects in high technology business organizational business units</td>
</tr>
<tr>
<td>Propositions</td>
<td>The competitive attributes of the business strategy drive the focus and content of:</td>
</tr>
<tr>
<td></td>
<td>Proposition 1: The more a new-product project contributes to the organizational strategic elements, the more likely it is to assign the project to the most competent multiple-project manager.</td>
</tr>
<tr>
<td></td>
<td>Proposition 2: The higher a product project’s requirements are, the more likely it is to assign the project to the multiple-project manager with high degree of competencies.</td>
</tr>
<tr>
<td></td>
<td>Proposition 3: It is more likely that a project is assigned to the best multiple-project manager while organizational and personal limitations are considered.</td>
</tr>
<tr>
<td></td>
<td>Proposition 4: Even though some management tools and techniques are used, it is more likely that the</td>
</tr>
</tbody>
</table>
project assignment process of an organization in high-tech industries is rather informal. This may reflect the lack of theoretical framework that integrates process and criteria for project assignments.

Empirical indicators
- Assignment criteria
  - Strategic elements
  - Project requirements
  - Multiple-project managers’ competencies
  - Organizational and personal limitations
- Assignment (mediating) process
  - Project prioritization
  - Multiple-project managers/project matching
  - Recognition of limitations
- Project assignments
  - Specific product projects assigned to specific multiple-project managers

References


Peerasit Patanakul is an Assistant Professor of Technology Management at Stevens Institute of Technology (New Jersey). His research interests in the area of project management include project manager appointments, strategic project management, and standardization. Several of his works were presented in well-recognized international conferences and were published as book chapters and articles in peer-reviewed journals. Dr. Patanakul holds a BE in Chemical Engineering from Chulalongkorn University (Thailand), and a MS in Engineering Management and a PhD in Systems Science/Engineering Management from Portland State University (USA).

Dragan Milosevic is an Associate Professor of Engineering Management at Portland State University (Oregon). Dr. Milosevic has written extensively, and his work has been published in major academic and management publications around the world. His book, *Project Management Toolbox* received the prestigious The 2004 David I. Cleland Project Management Literature Award. Professor Milosevic holds a BS, an MBA, and a PhD in management, all from the University of Belgrade, Serbia and Montenegro. His current research interests in project management are: standardization, critical success factors, and the alignment of business strategy with projects.