

CHAPTER 8

# Postcompletion Auditing of Capital Investments\*

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## INTRODUCTION

Success in capital investment greatly affects the extent to which a company can achieve its strategic objectives. Academic researchers posit that postcompletion auditing (PCA) of capital investments can provide valuable feedback for current and future investments, and consequently make capital investment more effective (Neale, 1991a; Pierce and Tsay, 1992). Other synonymous terms for PCA are *postaudit*, *postcompletion review*, and *postappraisal* (of capital investments). *Postcompletion audit* and *postaudit* seem to be the two most often presented terms in recent studies. PCA is a formal process that checks the outcomes of individual investment projects after the initial investment is completed and when the project is operational (Chenhall and Morris, 1993; Huikku, 2007). It can be regarded as one formal control system within a company's management control system (MCS) package, which consists of various formal and informal controls (Otley, 1999; Malmi and Brown, 2008). According to Merchant and Otley (2007, p. 785), MCS is a system that is "designed to help an organization adapt to the environment in which it is set and to deliver the key results desired by stakeholder groups."

Researchers particularly emphasize that PCA information can facilitate organizational learning (OL) with regard to planning future investment projects (e.g., Huikku, 2009). In other words, PCA information has the potential to help a company avoid previous mistakes and to systematically identify successful processes that can be repeated (Shapiro, 2005; Northcott and Alkaraan, 2007). Additionally, scholars suggest that PCA can be used to measure the performance of an investment, to provide feedback to aid control of current investments, to enhance the integrity of investment appraisals, and to evaluate management (e.g., Huikku, 2008). Researchers examining PCA emphasize the fact that the appropriate design of PCA systems, particularly regarding PCA reports and aspects of their communication, is a prerequisite for effective knowledge transfer and sharing, and hence for

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organizational learning (Mills and Kennedy, 1993; Azzone and Maccarrone, 2001; Huikka, 2010). Commonly referred-to aspects of PCA design are related to the selection of projects for PCA, the timing of PCA, the location of responsibility for a PCA system, the persons conducting PCA, and the format and communication of a PCA report (e.g., Neale and Holmes, 1991; Pierce and Tsay, 1992; Kennedy and Mills, 1993). The use of PCA is very common among large companies in the United States and the United Kingdom, and many companies in other countries have also adopted the approach (Neale, 1994; Arnold and Hatzopoulos, 2000).

The recent empirical PCA research is not voluminous (for a literature review, see Haka, 2007). This chapter provides a synthesis of academic empirical research on PCA. First, it discusses the definition of PCA and adoption rates. The chapter continues by addressing managerial uses of PCA, its perceived problems, reasons for adoption/nonadoption, and the design of PCA systems. The final section provides a summary and conclusions including suggestions for future studies.

## Definition of PCA

Capital budgeting can be understood as a process consisting of distinct stages. There are many different capital budgeting process models (e.g., Mukherjee and Henderson, 1987; Northcott, 1992; Pike and Neale, 2003). Their common feature is that the control phase (i.e., PCA) is always presented as the final and concluding phase. Northcott proposes that the capital budgeting process comprises the following stages: (1) project identification, (2) project definition and screening, (3) analysis and acceptance, (4) implementation, and (5) monitoring and postaudit. Such a presentation suggests dividing the concluding phase into two stages. Monitoring refers to the control that takes place during the implementation of a capital investment project (i.e., the phase before completion of a project). In this phase, a typical approach is to follow up on the cost budget, scheduling, and technical specifications to see that they are progressing according to plan.

PCA can be described as a formal review of a completed investment project fulfilling the following criteria: (1) PCA takes place after an investment has been completed (commissioned) and has begun to generate cash flows (or savings); (2) PCA reporting is at least partly focused on a comparison between the pre-investment estimates of an investment project and the actual figures and achievements after completion; and (3) PCA is a systematic, regular, and formalized process with instructions that provide guidance. This description is congruent with that suggested by Gadella (1986), Pierce and Tsay (1992), Chenhall and Morris (1993), and CIMA (2005), but is more explicit with regard to criterion (3). In practice, monitoring of the implementation phase and PCA are overlapping concepts because monitoring is, to some extent, a prerequisite for PCA. Nevertheless, monitoring alone cannot be considered as fulfilling the criteria for PCA. In a monitoring phase, estimating whether an investment project will achieve its targets typically occurs too early. Besides monitoring, this PCA description rules out routine reporting as well as informal ways of controlling capital investments. Internal and external routine reporting such as monthly, quarterly, and annually do not usually fulfil all the criteria required for PCA. For example, routine reporting is typically (1) profit-center or cost-center focused, not investment project-focused; and (2) does not compare the preinvestment objectives of an investment project with the

actual achievements. Neale and Holmes (1991), Azzone and Maccarrone (2001), and Huikku (2007) provide discussions about the distinction between PCA and other control mechanisms.

## PCA ADOPTION RATES

The adoption rates of PCA have been much studied in the United States and the United Kingdom. According to the latest studies, most large companies within these countries use PCA. In the United Kingdom the following adoption rates have been reported: 98 percent (Arnold and Hatzopoulos, 2000) and 79 percent (Neale, 1991b). Correspondingly, in the United States reported adoption rates are 88 percent (Farragher, Kleiman, and Sahu, 1999), 76 percent (Gordon and Myers, 1991), and 90 percent (Klammer and Walker, 1984). Neale (1994) provides a list of older PCA adoption studies. In other countries, adoption rate studies have been rare. Examples of such studies include Neale (1994) in Norway and Azzone and Maccarrone (2001) in Italy. Neale finds that 41 percent of large Norwegian companies use PCA. The corresponding figure in large Italian companies is 71 percent. Furthermore, Huikku (2007) reports that 20 out of the 30 largest Finnish manufacturing companies (i.e., 67 percent) conduct PCA at least to some extent. The remaining 10 companies do not formally compare preinvestment estimates of investment projects with the actual outcomes after the projects have been commissioned and have started to generate cash flows. Interestingly, a "grey area" appears within PCA adopters; namely, companies that conduct formal PCA but do so only irregularly and unsystematically. Consequently, Huikku suggests that the inclusion of ad hoc adopters tends to drive adoption rates upward.

Besides the inclusion of ad hoc adopters, other issues may challenge the comparison of different adoption studies. The concept of PCA and the criteria for adopters is not necessarily the same in all studies. The potential "grey areas" include, at a minimum: monitoring vs. PCA; routine reporting vs. PCA; and informal control vs. PCA. Also, companies with less sophisticated capital investment procedures may not be eager to respond to surveys. Consequently, these findings may challenge the reliability of mail surveys. Furthermore, due to different types of population and different sized companies, comparing these adoption rate figures is problematic. Some studies concentrate on the largest companies, others use only industrial companies, while still others selectively include firms from manufacturing and nonmanufacturing sectors.

## MANAGERIAL USES OF PCA

Prior studies have examined both the objectives of PCA (Neale and Holmes, 1991; Neale, 1994; Azzone and Maccarrone, 2001; Huikku, 2010) and the benefits accruing from applying PCA (Neale and Holmes, 1991; Neale, 1994; Pierce and Tsay, 1992; Mills and Kennedy, 1993; Huikku, 2008). These studies suggest that enhancing organizational learning (OL) is the major reason for conducting PCA. Also, the major perceived benefits of PCA for the adopters are related to organizational learning. Nevertheless, further objectives/benefits have also been proposed.

Based on evidence from the empirical literature, the next section reviews the relevance of PCA to various managerial uses. The review covers PCA's role in

measuring performance, assisting correction/abandonment decisions, enhancing the integrity of investment appraisals, evaluating and rewarding personnel, and enhancing organizational learning. Besides these managerial uses of PCA, Neale (1989) has studied whether companies use the approach to reduce management autonomy at a local level. The findings indicate, however, that the companies studied consider this kind of usage to be trivial. Furthermore, Neale (1991a) examines whether companies perceive PCA to be beneficial for improving corporate performance, but this is ruled out as an ultimate, catch-all use in this chapter.

## Measuring Performance

Performance measurement (evaluating the success of a completed investment) is a core function of PCA. In practice, companies measure performance by comparing and analyzing the ex-post outcomes of an investment project with its ex-ante objectives (Neale and Holmes, 1991). Huikku (2007, 2008) maintains that performance measurement is not perceived to be beneficial per se, but rather it is a prerequisite function supporting other PCA uses. According to Huikku (2008), technical difficulties such as the separation of incremental cash flows, changes in the business environment, and estimation of future cash flows do not dramatically challenge the appropriateness of PCA for measuring investment project performance.

## Assisting Correction/Abandonment Decisions

PCA has the potential to be of value with regard to current underperforming investment projects by providing early warning or helping companies to analyze different correction/abandonment alternatives. Busby and Pitts (1997) and Shapiro (2005) provide discussions about the various choices for companies dealing with underperforming projects. The beneficial role that PCA plays in providing feedback to assist in decision making for corrections is perceived within companies to be of minor, but not negligible, importance (Neale, 1989; Pierce and Tsay, 1992; Huikku, 2008). Neale (1991a) proposes that the earlier the first PCA, the greater the ability of a company to successfully modify an investment project.

Another suggestion is that benefits regarding modifications might primarily come from regular monitoring of projects before commissioning rather than from PCA (Neale and Buckley, 1992). Huikku (2008) posits that the potential for PCA to contribute to decisions concerning the course of an investment can be marginal for two reasons. First, making any changes after commissioning an investment project can be too late. Second, triggers for change are likely to come from alternative mechanisms such as routine reporting.

Howe and McCabe (1983) suggest that a company should abandon a commissioned investment if the abandonment value exceeds the net present value for the remaining lifetime of the investment. Smith (1993) finds a positive association between abandonment decisions and firm performance in companies with a PCA system. That is, the existence of a PCA system in a company increases the probability of timely abandonment decisions and of avoiding unjustified ones. Nevertheless, consistent with Corr (1983) and Neale (1991a), who report the limited importance of PCA for assisting abandonment decisions, Huikku's (2008) findings indicate that the approach can be perceived as insignificant in this context. One

reason for the low importance may be that the main focus in cases of an underperforming investment is on improving its performance and not on terminating it (Neale, 1989). Likewise, as with corrections, triggers for change are likely to come from other sources (Huikku, 2008).

## **Enhancing the Integrity of Investment Appraisals**

Investment project appraisals can include intentional upward biases (and less often downward) because managers may exaggerate project cash flows in order to gain approval for their proposals (e.g., Pruitt and Gitman, 1987; Pohlman, Santiago, and Markel, 1988). Pierce and Tsay (1992) suggest that companies consider PCA beneficial for enhancing the integrity of investment project appraisals. Similarly, Neale (1989, 1991a), and Mills and Kennedy (1993) propose that PCA encourages greater realism in project appraisals. In a similar vein, Lumijärvi (1990) argues that PCA is the only factor diminishing harmful game-playing behavior in capital investment processes. Because of asymmetric information distribution, managers may be in a position to play games in the capital investing process. They may use their information advantage to enhance their self-interest, for example, by focusing only on certain aspects of information, by filtering information, or by manipulating information.

In addition to intentional biases related to game playing, project appraisals may include unintentional biases by managers who believe that they are acting in the best interest of shareholders (Roll, 1986). Managers may be overconfident and/or overoptimistic about investment decisions and therefore overestimate the returns of their investment projects. According to Huikku (2008), the perceived status of the integrity of investment appraisals seems to affect whether companies consider PCA to be relevant. That is, if the status is good, the approach is not considered relevant for enhancing integrity of appraisals. Furthermore, Huikku suggests that the existing alternative methods for evaluating the success of an investment and preapproval reviews seem to diminish the relevance of PCA for these purposes.

## **Evaluating and Rewarding Personnel**

Some propose that facilitating evaluation and rewarding of the personnel involved in the capital investment process is one of the purposes for carrying out PCA (Neale, 1989; 1994). Nevertheless, according to research, few companies use PCA in formal evaluation of managers (Smith, 1994; Huikku, 2008) or consider it beneficial to evaluation (Neale, 1994). Huikku (2008) suggests that some basic challenges may discourage companies from integrating PCA into their formal evaluation systems such as incentive systems.

One problem in trying to connect PCA and personnel evaluation can be the lengthy time interval between investment appraisal and PCA. This may mean that the people involved in the appraisal phase may already be in other positions. Another difficulty is that formal evaluation systems are often related to the financial year, and this frequency is not necessarily optimal for the aims of PCA. Moreover, the interim character of PCA reports may discourage companies from relying on these in formal evaluation. That is, PCA is typically conducted at the beginning of the life cycle of an investment and may consist of uncertain forecasts. In practice,

an informal evaluation of personnel occurs through the process of PCA when management compares the investment plan and the actual outcome and attempts to explain the reasons for the deviations from that plan (Huikku, 2008).

## Enhancing Organizational Learning

Research suggests that the major objective for companies to implement PCA is the enhancement of organizational learning for future capital investments (Neale, 1989, 1994; Azzone and Maccarrone, 2001; Huikku, 2009). Similarly, the major perceived benefits from PCA within companies are related to its enhancement of organizational learning (Corr, 1983; Neale, 1991a, 1994; Pierce and Tsay, 1992; Huikku, 2008). Organizational learning is a process whereby an organization responds to changes in its environment by detecting errors and correcting them in order to maintain the central features of the organization (Argyris, 1977, 1990). OL is not merely the sum of individual learning in an organization. It is a process involving the sharing of knowledge, beliefs, or assumptions among individuals, influenced by a broader set of social, political, or structural elements (Marquardt and Reynolds, 1994).

Argyris (1977, 1990) distinguishes between two types of OL: single-loop and double-loop learning. Single-loop learning focuses on problem solving but does not address the causes of the problems. In double-loop learning, organizations not only detect and correct errors but also question underlying policies and goals. In its ultimate form, double-loop learning may lead to resolving incompatible organizational norms by setting new priorities or restructuring norms, and to creating a new operational paradigm (Senge, 1990).

Huber (1991) proposes that OL processes include four constructs: (1) knowledge acquisition, (2) information distribution, (3) information interpretation, and (4) organizational memory. Knowledge is first obtained in a knowledge acquisition process. Thereafter, information from various sources is shared and new information (or understanding) is created in an information distribution process. In the next step—the information interpretation phase—commonly understood interpretations are attached to information. Finally, in the organizational memory phase, knowledge is stored for later use.

The effective reuse of knowledge assets that exist within a firm is essential to the realization of a competitive advantage (Teece, Pisano, and Shuen, 1997; Jensen and Szulanski, 2007). Communication plays a major role by enabling knowledge transfer and knowledge sharing (Ghoshal and Bartlett, 1988; Ghoshal, Korine, and Szulanski, 1994; Tucker, Meyer, and Westerman, 1996). Similarly, Garvin (1993) emphasizes the importance of the quick and efficient transfer of learning experiences as a prerequisite for OL. Kolb (1984) emphasizes the vital role of concrete experiences in the learning process.

Management control systems can play a pivotal role in facilitating or hindering OL (Kloot, 1997; Carmona and Grönlund, 1998). More specifically, some suggest that the information resulting from PCA has the potential to aid a company in avoiding previous mistakes and in systematically identifying successful processes that can be repeated in future investment projects (Neale, 1989; Northcott and Alkaraan, 2007). According to Huikku (2008), companies perceive PCA to be relevant to the double-loop type of learning because it helps them address why problems

arise in the first place. Specifically, PCA can help companies improve the accuracy of underlying assumptions and goals in their planning material.

In a similar vein, Chenhall and Morris (1993) maintain that PCA feedback can enhance managerial learning at the project definition stage, particularly in relatively certain operating situations, whereas environmental uncertainty can moderate learning. At the project definition stage, PCA feedback can potentially enhance the development of proposals for new projects, improve the understanding of key factors affecting investment projects, and develop knowledge related to strategy formulation. Furthermore, Mills and Kennedy (1993) maintain that PCA can be conducive to learning for capital investment processes in general—not merely for project-specific investment activities. PCA information may, for example, trigger improvements in capital investment procedures and instructions.

## PROBLEMS ASSOCIATED WITH PCA

The difficulties and drawbacks associated with PCA may diminish its power as a management tool and in extreme cases discourage firms from adopting the approach or even encourage its abandonment. Pierce and Tsay (1992) classify problems further into three groups: (1) technical, (2) organizational, and (3) economic problems. Studies by Neale (1989), Mills and Kennedy (1993), and Huikku (2001) also report problems associated with PCA. The technical problems can, for example, be related to the separation of incremental cash flows of an investment project, changes in business environment, estimation of future cash flows, and difficulties in planning material. Organizational problems include reluctance of people to conduct PCA, the lack of top management interest, the lack of personnel resources, and increased risk aversion. Economic problems are related to the costs of implementing and conducting PCA.

According to Neale and Holmes (1991), managers consider changes in the business environment and the presence of qualitative factors to be principal difficulties for PCA. As Azzone and Maccarrone (2001) note, however, companies consider the incompleteness or inadequacy of data and insufficient resources to be the most relevant difficulties likely to be encountered in PCA. In a study of Norwegian companies, Neale (1994) mentions the difficulty of separating incremental cash flows of investment projects as the primary problem of PCA. Similarly, Linder (2005) finds, in his review of empirical PCA studies, that this is the most often mentioned and first-ranked problem. Based on the empirical evidence, however, companies do not necessarily perceive that technical difficulties jeopardize PCA's measurement ability to a great extent (Huikku, 2008). For example, companies seem to be able to reduce the difficulties related to separating incremental cash flows by using sophisticated cost accounting systems and by regarding integrated investments as an investment bundle, that is, a package of investments (Miller and O'Leary, 1997).

## EXPLAINING ADOPTION AND NONADOPTION OF PCA

Empirical studies maintain that the likelihood of PCA adoption is associated with the size of the company. A larger company is more likely to adopt the approach

(Scapens, Sale, and Tikkas, 1982; Neale, 1989, 1994; Huikku, 2007). Furthermore, Huikku suggests that companies having a critical mass of absolute tangible assets combined with a high tangible assets/turnover ratio have a tendency to adopt PCA more often than other companies. This is plausible because implementing and running a PCA system is not without cost, and from a cost-benefit viewpoint, capital-intensive companies are more likely to find PCA useful.

Studies examining PCA adoption rates report, however, that despite the apparent benefits, some large companies still do not consider PCA adoption appropriate to their organization. Little empirical research on PCA nonadoption exists *per se*. A few comprehensive surveys (Ghobadian and Smyth, 1989; Neale and Holmes, 1991; Pierce and Tsay, 1992; Azzone and Maccarrone, 2001) provide a discussion of nonadoption, but it has not been the primary interest of any study. Taken together, these studies report three overlapping groups of reasons for PCA nonadoption: (1) scarcity of investments; (2) difficulties of PCA; and (3) alternative ways to achieve the benefits expected from PCA. Scarcity of investments can be considered an obvious reason for nonadoption.

With regard to difficulties, Pierce and Tsay (1992) and Azzone and Maccarrone (2001) report changes in the technologies/business environment and the uniqueness of projects as among the main reasons for PCA nonadoption. The utility of PCA can be diminished if feedback is irrelevant to future investments. Other major difficulties that have been reported to influence nonadoption are the separation of project-specific profit (Neale and Holmes, 1991; Pierce and Tsay, 1992) and the difficulty of employing PCA to modify ongoing projects (Neale and Holmes, 1991; Azzone and Maccarrone, 2001). Furthermore, all four studies mentioned above note a lack of resources required to carry out PCA as a reason for nonadoption.

The third main explanation for PCA nonadoption relates to alternative ways to achieve the benefits thought to accrue from the use of PCA. Neale and Holmes (1991) and Azzone and Maccarrone (2001) suggest that personal contacts between corporate and divisional managers (or operating managers and controllers) are one reason for nonadoption.

Huikku (2007) explicitly addresses the types of alternative capital investment controls in a field study, and examines if and how companies can evaluate their completed investments and enhance organizational learning by using them. The investigation results in the discovery and mapping of controls that discretely or as a package enable companies to achieve PCA benefits. Regarding the evaluation of success, Huikku finds that companies use many different means to help them understand whether or not the targets of an investment are being met. These means include formal systems for routinely following up key production figures, sales, and profit centers. Also, visiting investing sites, presentations, and discussions can be formally arranged for investment control purposes, but typically the practices seem to be more informal. Huikku also discovers that companies acquire relevant capital investment knowledge for organizational learning purposes in many ways. In particular, the utilization of central expertise and experienced internal resources seems to be crucial. The author suggests that smaller companies without major strategic, complex, and repetitive investments in particular perceive that the package of different simultaneous alternative control mechanisms yields a performance that is equal, or close to equal, to formal PCA. Consequently, these companies do not adopt PCA.



## DESIGN OF A PCA SYSTEM

This section presents commonly referred aspects of PCA design and discusses how these aspects could be taken into consideration in designing a PCA system for organizational learning.

### Aspects of PCA Design

Common aspects of the design of PCA concern the selection of projects undergoing PCA, timing of PCA, location of responsibility for the PCA system, persons conducting PCA, and content and communication of a PCA report (e.g., Neale and Holmes, 1991; Pierce and Tsay, 1992; Kennedy and Mills, 1993; Huikku, 2010). Gordon and Smith (1992) suggest that using sophisticated PCA procedures is positively correlated with firm performance.

Regarding the selection of projects undergoing PCA, Mills and Kennedy (1990) propose that the greatest benefit can be achieved by focusing on major investment projects, making such projects worthy of inclusion. This is especially true for projects that provide the company with substantial potential for learning, such as pilot projects and repetitive investments. Project size is by far the primary selection criterion for PCA (e.g., Gordon and Myers, 1991; Pierce and Tsay, 1992, Huikku, 2010), and few if any companies conduct PCA for all their investments (e.g., Ghobadian and Smyth, 1989; Neale, 1994). According to Kennedy and Mills (1993), size can be the only selection criterion, or it can be combined with unexpected outcomes or degrees of investment risk.

The appropriate timing of a PCA depends upon the objectives set for it (Gadella, 1986). Neale (1991a) suggests that timing has an important bearing on the benefits related to the control of ongoing investments, whereas timing is not so critical for obtaining learning-related benefits for future projects. Accordingly, if a company uses PCA to assist in detecting underperforming investment projects and in analyzing the appropriate actions required (correction/abandonment), a sufficiently early PCA after commissioning the investments is essential. Nevertheless, with regard to enhancing learning for future projects, the prerequisite for obtaining reliable PCA data is that it will be conducted in a suitably timely period after commissioning such investments when stable working patterns are discernible. In other words, firms conduct PCA after they resolve any teething troubles identified at the start of the project and after the investment is operational (Neale, 1995).

The decision regarding the timing of PCA is a trade-off between PCA's role in providing well-timed assistance for planning subsequent investment projects and the accuracy of PCA data. Consequently, PCAs that are conducted earlier may be appropriate for providing valuable learning experiences for projects under consideration, whereas later PCAs can provide more comprehensive and accurate feedback about the success factors of an investment. On the other hand, late timing may cause PCA reports to be irrelevant due to radical changes in premises of capital investments such as changes in technology and the business environment (Huikku, 2010). Neale and Holmes (1991) report that two-thirds of the companies studied conducted their first PCA at around one year after project completion, and only a minority of the firms undertook more than one PCA per investment project (see also Mills and Kennedy, 1993; Neale, 1994; Gordon and Myers, 1991; Huikku, 2010).

The location of responsibility for the PCA system can reside centrally at the corporate level or locally in divisions or in their subsets (e.g., business units). The unit responsible for the PCA system has ownership of PCA activities and is in charge of tasks such as the development of the system and the general functioning of PCA activities including providing policies, giving instructions, and ensuring that the company adheres to them (Huikku, 2010). Furthermore, such tasks may include selecting investment projects to be included in PCA, choosing PCA auditors, and checking draft PCA reports. Azzone and Maccarrone (2001) report that in more than 80 percent of the large Italian companies they studied, the responsibility for the PCA system resides at the corporate level, and that the responsibility was more centralized in companies stressing OL as their PCA objective. These authors suggest that aspects of communication such as the need for generalization and dissemination of PCA results can explain this phenomenon. Huikku (2010) finds that managers in highly diversified companies delegate responsibility for the PCA system to a divisional level. This may indicate that there is no immediate need to disseminate investment experiences across the whole corporation. In other words, capital investment can vary considerably between the divisions and transferring division-specific investment knowledge to the other divisions may be inappropriate.

Researchers have different opinions about who would be the most suitable person or team to conduct PCA. According to one approach, objectivity can be achieved by using outsiders or a team that has not been involved in the investment project (Gulliver, 1987). Other researchers such as Dillon and Caldwell (1981) contend that the compilation of a PCA report requires the contribution of people with detailed knowledge. Yet obtaining objectivity could be difficult if the investment project group members are allowed to review their own investments. The members may present the situation subjectively or even be tempted to use their information advantage to manipulate figures or exaggerate performance estimations, thereby downgrading the potential for PCA reports to contribute to OL.

In practice, the persons and teams conducting PCA appear to vary widely among firms, although studies report controllers in business units making the investments to be the key resource (Kennedy and Mills, 1993; Azzone and Maccarrone, 2001; Huikku, 2010). According to Azzone and Maccarrone, using "hybrid" PCA review teams including both fully external persons and those with prior involvement with the project is common. In larger companies, Scapens et al. (1982) and Corr (1983) find that responsibility for conducting PCA is more likely to be delegated to divisional management, whereas in the smaller companies corporate staff is more involved. Additionally, Farragher et al. (1999) report that few companies use individuals or teams with no prior involvement in the project to conduct PCA. Nevertheless, the companies allowing an investing unit itself to conduct PCA do not necessarily consider it problematic from the objectivity point of view if divisional or head office staff is checking draft PCA reports and "objective" controllers are involved in carrying out PCA (Huikku, 2010). Furthermore, Huikku suggests that connecting people from the business unit making the investment with outside persons can enhance the quality of PCA reports in terms of objectivity.

A company can consider the following aspects of the content of a PCA report (e.g., Mills and Kennedy, 1990; 1993; Azzone and Maccarrone, 2001; Huikku, 2001, 2010): (1) the language used; (2) a standard versus nonstandard format for

reporting; (3) an analysis for both monetary and nonmonetary targets; (4) ex-post calculations, including or excluding future estimates; (5) the inclusion of detailed ex-post calculations; and (6) proposals for action such as suggestions, helpful hints, and lessons learned. Although proposals are likely to be conducive to learning, few PCA reports include proposals (Azzone and Maccarrone, 2001; Huikku, 2010). Even when they do include a proposal, few companies have a formal mechanism for following up. The prerequisite for ex-post performance evaluation is the existence of documented investment appraisal material and the availability of such material to those conducting the PCA. Moreover, using the same ex-ante and ex-post capital budgeting calculation methods enables the required comparisons to be made. Farragher et al. (1999) report, however, that companies do not always use the same methods.

PCA scholars emphasize the fact that an appropriate communication of PCA reports is a prerequisite for effective knowledge transfer and sharing, and hence for organizational learning (Mills and Kennedy, 1993; Azzone and Maccarrone, 2001). The communication aspects of PCA reports can be described in terms of their forum of presentation, dissemination, and storage. According to Azzone and Maccarrone, companies typically have common meetings of PCA auditors and other staff involved in the investment process in which they discuss PCA results and implement potential actions.

A common forum can be valuable for three principal reasons: (1) disseminating knowledge among the attendees, (2) facilitating the interpretation of the results, and (3) generating shared understanding (Huikku, 2010). Such a forum can also help to confirm that the results and proposals in a final PCA report represent shared understanding in an organization. Without a forum, the readers of the reports may become suspicious about the reliability and general acceptability of the reports; for example, relevant proposals may be omitted. Huikku finds that although almost all the companies he studied have a formal forum, this forum is usually not intended for interactive discussion and interpretation. The dominating noninteractive forums in these companies are executive group meetings, which characteristically feature one-way reporting of performance measurement issues to decision makers rather than an interactive discussion of issues for the purposes of organizational learning.

Mills and Kennedy (1993) emphasize the importance of effective dissemination of PCA reports to ensure enhanced organizational learning. Huikku (2010) reports that a common practice is to disseminate PCA reports to those responsible for initiating, planning, and implementing the project, whereas less than half of the companies studied automatically communicate PCA results back to the ultimate approvers of investments—the executive group and board of directors. According to Kennedy and Mills (1993), the distribution of final PCA reports tends to be relatively limited, and routine distribution to other divisions is rare. In a similar vein, Azzone and Maccarrone (2001) report that companies pay little attention to the dissemination of PCA results.

According to Walsh and Ungson (1991), companies should appropriately store information from the organization's history so that it can be brought to bear on present decisions. Studies pinpoint turnover of personnel (Levitt and March, 1988; Huber, 1990) and organizational forgetting (Carmona and Grönlund, 1998) as major threats leading to a loss of the information itself and what that information

conveyed. Studies also identify formal control systems and their documents (i.e., information repositories within a company including codified explicit knowledge) to be essential for developing organizational memory (Levitt and March, 1988; Huber, 1991). Little empirical research focuses on storing and retrieving aspects of PCA reports. According to Huikku (2010), few companies have comprehensive databases or archives for PCA data that permit conveniently retrieving valuable learning experiences. Consequently, companies may repeat past mistakes or, even in the best case, may search for the same data again (Huber, 1991; Walsh and Ungson, 1991).

### **Designing a PCA System for Organizational Learning**

The design of a PCA system can play a major role in enabling effective reuse of learning experiences relating to capital investment. Azzone and Maccarrone (2001) suggest that the design of a PCA system is associated with the main objectives set for it—OL vs. decision-making support for current investments. They find, for example, that responsibility for the PCA system appears to be more centralized to the headquarters in firms in which organizational learning is cited as the most important PCA objective. Additionally, Neale (1991a) examines the association between the objectives and design of PCA on the one hand and the perceived benefits of PCA on the other. He states that benefits are associated with the degree of emphasis placed on the objectives (e.g., companies stressing OL-related objectives are more likely to reap the benefits of OL). Furthermore, he finds that the companies selecting only major investment projects for PCA are more likely to generate OL benefits than those investigating all the projects.

In his study, Huikku (2010) focuses on examining the relationship between PCA design and organizational learning. Based on a synthesis of the OL and PCA literature, he proposes an OL-conducive PCA design as shown in Exhibit 8.1. Drawing on Huber's (1991) subphases of organizational learning, the properties of PCA design are presented under the following headings: knowledge acquisition, information distribution/interpretation, and organizational memory. Furthermore, Huikku suggests that problems in conveying capital investment experiences can be related to PCA design. In particular, issues relating to organizational memory such as inappropriate filing and difficult access to PCA reports appear to hinder the effective conveyance of investment experiences to new projects. Other aspects related to the communication of PCA reports may also hinder OL such as the lack of improvement proposals and their systematic follow-up, a lack of interactive forums for interpretation of results, and restricted dissemination. Additionally, these findings provide support for the contention that sophisticated PCA designs help companies to transfer and share learning experiences more effectively. Furthermore, in line with the management control system literature such as Chenhall (2003), evidence suggests that the smaller the size of a company, the lower is the likelihood of a sophisticated PCA system (and vice versa). Other means of managing capital investment knowledge such as the use of central expertise and experienced internal resources also seem to affect the degree of sophistication. Thus, in smaller companies, some may perceive that a sufficient OL outcome can be achieved by relying on the combination of less sophisticated PCA systems and alternative means for controlling investments.

**Exhibit 8.1** The Proposed Organizational Learning Conducive PCA Design

<b>Organizational Learning Subphases/Design Properties</b>		<b>Proposed Criteria for PCA Design</b>
<b>Panel A. Knowledge Acquisition</b>		
Selection of projects for PCA	Timing of PCA	All major capital investment projects selected After an investment has reached a relatively settled state, but not too late to ensure that lessons learned are still useful
Location of responsibility for PCA system		Centralized; corporate level, or alternatively in highly diversified corporations also division level (not business unit level)
PCA auditor		Can be from business unit making the investment or outside (both expected to be involved in making PCA reports)
<b>Panel B. Information Distribution and Interpretation</b>		
Content of PCA report		The same capital budgeting calculation methods used ex ante and ex post Detailed comparisons of ex-ante and ex-post calculations Comments on the achievement of objectives Common PCA reporting language Standard format Proposals for future investing
Presentation forums for PCA reports		At least one formal forum for interactive discussion and presentation of the reports Executive group meeting (if investment approved by it) Board of directors (if investment approved by them)
Dissemination of final PCA reports		Extensive dissemination at least to all people involved in the project (planning, approval, implementation, and PCA)
<b>Panel C. Organizational Memory</b>		
Archiving and filing of PCA reports		Database or archive of PCA reports exists and its existence and content is known to relevant persons Relevant persons can conveniently find and retrieve appropriate reports from the database/archive

## SUMMARY AND CONCLUSIONS

The empirical findings lend support to the notion that enhancing organizational learning is the major reason for conducting PCA and that the major perceived benefits of PCA relate to OL. Specifically, PCA appears to help companies enhance the accuracy of assumptions and goals in planning future capital investments.

PCA can also be marginally beneficial to problem detection and solving for current investments (Huikku, 2008). Although studies show that the evaluation and reward of personnel is a fundamental element of functioning control systems (Otley, 1999), coupling PCA with formal evaluation and reward appears to be rare due to timing-related difficulties.

Studies report difficulties in separating the incremental cash flows of differing investment projects as the primary problem of PCA. Nevertheless, companies do not necessarily perceive that technical difficulties jeopardize the measurement ability of PCA to a great extent (Huikku, 2008). Although the use of PCA is very common among large companies, many such companies have not adopted the approach. Scarcity of investment is an obvious reason for this, but existing alternative control mechanisms may also discourage companies from adopting PCA (Huikku, 2007). Specifically, smaller companies that do not have major strategic, complex, and repetitive capital investments can perceive that alternative controls are sufficient for their purposes and do not adopt PCA. An appropriate design of a PCA system appears important for organizational learning. In particular, improved methods of communication, such as appropriate filing and convenient access to PCA reports, improvement proposals and their systematic follow-up, and interactive forums for interpretation of results may enhance the effective conveyance of investment experiences to new projects (Huikku, 2010).

Despite the widespread diffusion of PCA and its suggested usefulness for enhancing OL, empirical research focusing on PCA is not voluminous. Many research gaps still need to be addressed. With regard to issues of PCA adoption/nonadoption, research addressing the reasons for adoption could also cast more light on nonadoption. A worthwhile study would be to investigate the role of human factors such as key decision makers or teams in connection with adoption (Miller, 1987). Researchers could further investigate the circumstances (e.g., capital-intensity, the characteristics of investments, size, technology, strategy, and organization structure) in which companies perceive alternative control mechanisms to be insufficient and adoption of PCA to be appropriate.

Adoption studies could also be based on approaches from theories of institutional sociology (e.g., Meyer and Rowan, 1977; Powell and DiMaggio, 1991) and management fashions (Abrahamson, 1991, 1996). Researchers could use the lens of institutional sociology to examine how companies attempt to legitimize their PCA (non)adoption decisions and whether coercive, normative, and mimetic pressures (or lack of them) can explain their behavior. Furthermore, by applying the notions of management fashion theory, researchers could examine to what extent the motives relate to managerial fads/fashions or efficient-choice affects PCA (non)adoption decision.

Prior studies indicate that companies having a more sophisticated PCA design, specifically one related to aspects of communicating PCA results, are more successful at achieving OL benefits. Nevertheless, more research is needed to deepen knowledge of the design-benefit relationship. Additionally, with regard to PCA design, there is still no consensus about who would be the most suitable person or team to conduct PCA. From an accountability or organizational learning point of view, is this lack of consensus relevant? As Northcott and Alkaraan (2007) suggest, more studies could address the issue of what managers actually learn from PCA. In a similar vein, following Neale's (1991b) call, investigating the concrete effects of

PCA would be a worthwhile endeavor. For example, researchers could analyze in more detail how tacit investment knowledge is acquired and transferred to future capital investment and the role that PCA plays in this process. These research gaps provide examples of research questions that might benefit from using case-study methods.

Evidence suggests that alternative methods of managing capital investment knowledge discourage the development of PCA systems. By drawing on notions in the management control package literature (e.g., Otley, 1999), further examination could address the complementarity issues of formal PCA and alternative control mechanisms (Fisher, 1995). Furthermore, inspired by the results of alternative controls in the PCA context, future management control research could explicitly investigate the role of alternative controls in the (non)adoption of management accounting innovations (e.g., activity-based costing, balanced scorecard, and value-based management). Clearly, important avenues exist for further research in this field.

## DISCUSSION QUESTIONS

1. What kinds of organizational learning can PCA facilitate?
2. For what reason might PCA have only a minor role in assisting correction/abandonment decision making of ongoing investment projects?
3. Who would be the most suitable person or team to conduct PCA? What are the pros and cons of the different alternatives?
4. Discuss how alternative formal and informal control mechanisms can affect the adoption of PCA and the sophistication of PCA systems.

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