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Mapping management accounting: graphics and guidelines for theory-consistent empirical research

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Abstract

This paper provides a summary graphic representation (maps) of the theory-consistent evidence about the causes and effects of management accounting, as presented in 275 articles published in six leading journals. The maps highlight connections and disconnects in the diverse streams of management accounting literature, in terms of what has been researched, the direction and shape of the explanatory links proposed, and the levels of analysis. Some of these connections and disconnects seem likely to be artifacts of the historical development of management accounting research, while others are more consistent with the natural links around and within management accounting. Based on criteria from social-science research, we offer 17 guidelines to help future research capture natural connections, avoid artifactual connections, and develop a more complete and valid map of the causes and effects of management accounting.

Contents

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1. Introduction

As empirical research in management accounting has grown in recent decades, it has employed an increasing variety of theoretical perspectives and research methods to address an increasing range of substantive questions. Separate streams of research have developed, each with its own distinctive set of questions and choices of theory and research method (Merchant, Van der Stede, & Zheng, in press; Shields, 1997). The various streams have matured sufficiently that numerous reviews have appeared, each assessing the accomplishments and prospects of a stream of research (e.g. Chenhall, in press; Baxter & Chua, in press; Covaleski, Dirsmith, & Samuel, 1996; Ferreira & Merchant, 1992; Fisher, 1995; Hartmann & Moers, 1999; Ittner & Larcker, 1998, 2001; Shields & Shields, 1998; Waller, 1995; Young & Lewis, 1995). Questions that remain unanswered are how, if at all, these different streams relate to each other and how complete and valid an explanation of the causes and effects of management accounting the literature as a whole provides.

In this review article we take an initial step toward answering these questions. We provide a graphic representation of the theory-consistent empirical management accounting research as exemplified by articles published in six leading journals. This representation summarizes the theory-consistent empirical evidence in 275 studies in nine graphics (maps), providing a compact visual overview of these diverse streams of research.

The maps provide answers to three questions about each study:

1. *What is researched*? For example, some studies research activity-based costing (ABC) implementation, others research the weighting of nonfinancial measures in executive compensation contracts, and others research the symbolic value of accounting.
2. *What are the direction and shape of the explanatory links proposed*? For example, some studies show management accounting as the effect of organizational characteristics, and other studies explain manage-

ment accounting as the cause of organizational characteristics, and still others explain management accounting as both cause and effect (different directions of explanatory links). Some studies show that a particular management accounting practice improves performance, while others show that it improves performance up to a point and then makes it worse, or improves performance only in certain contexts or for certain kinds of individuals (different shapes of explanatory links).

3. *What is the level of analysis—individual, organizational subunit, organization, or beyond-organization*? For example, some studies show how individual attitudes explain individual behavior with respect to accounting (an individual-level explanation), while others show how organizational structure explains properties of management accounting throughout an organization (an organizational-level explanation), and others show how a combination of national culture and subunit management accounting explains management behavior in subunits (a cross-level explanation).

The patterns of explanatory links in the resulting maps are far from uniform and unambiguous. Large dense clusters of explanation appear around some management accounting practices and small isolated explanations around others. Explanations of a particular management accounting practice are not always consistent across or within maps. Some explanatory links that might be expected—for example, between specific individual actions and the organizational-level outcomes of such actions—are absent or ambiguous.

Problems of this kind are inherent in the study of complex systems. As Simon (1973, p. 23) observes, ''To a Platonic mind, everything in the world is connected with everything else—and perhaps it is. Everything is connected, but some things are more connected than others. The world is a large matrix of interactions in which most of the entries are very close to zero.'' It is not necessarily the case, however, that dense clusters of explanation in the literature always correspond to natural phenomena that are ''more connected than others'' in the world; nor does the absence of connections in the literature always correspond to the connections that are naturally ''very close to zero.''

Some of the connections and disconnects on the maps may be artifacts of the historical development of the field. Some studies, for example, investigate causes and effects of individuals' beliefs about how much their compensation depends on performance compared to budget. Other studies investigate causes and effects of the weight on financial performance compared to a target as specified in organizations' formal incentive-compensation contracts. These two types of studies seem to be addressing very similar phenomena, but they represent different research streams, employing different social-science theories and research methods, and it is not clear to what extent we should expect explanations in these two types of studies to be the same. Should a sufficient explanation of organizations' formal incentive contracts also be a sufficient explanation of individuals' beliefs about how their compensation depends on performance compared to budget, or should we expect the explanations to differ substantially, and if so, how? Without answers to such questions, it is difficult to be sure what are the areas of genuine common ground across different streams of research, what are conflicts and inconsistencies ripe for resolution, and what are irreconcilable epistemological differences.

In order to discuss these issues, we return to the three questions that were used to create the maps: What is researched? What is the direction and shape of the explanatory links proposed? What is the level of analysis? We show how these questions have been answered in the management accounting literature and how the answers have sometimes given rise to conflicting and problematically related explanations. We also suggest 17 guidelines for answering these three questions in future research, in order to develop a more complete and valid map of theory-consistent empirical research in management accounting, representing natural and not artifactual connections and disconnects around and within management accounting.

The remainder of this paper is organized as follows. Section 2 describes the criteria used to select the studies included on the maps and to construct the maps. Section 3 provides an overview of the maps. Section 4 presents criteria for answering question 1 (what is researched). Section 5 presents criteria for answering question 2 (what is the direction and shape of explanatory links). Section 6 presents criteria for answering question 3 (what is the level of analysis); because the answers to the three questions are not always independent of each other, these criteria include variable-identification and causal-model form issues. Section 7 discusses the issues related to the intersection of the three choices described in Sections 4–6 and the choice of explaining management accounting as the cause or effect of other phenomena or both. Section 8 concludes.

2. Selection of studies and construction of maps

To provide answers to the three questions in Section 1, we developed a data set of selected attributes of many studies and a visual representation of the studies' data in the form of the maps that appear in Appendices A–I. The selection of studies and development of the maps are described in this section.

2.1. Criteria for selection of studies

The studies are chosen based on the following criteria:

1. The study appeared in one of the following six journals before 2002: *Accounting, Organizations and Society, Contemporary Accounting Research, Journal of Accounting and Economics, Journal of Accounting Research, Journal of Management Accounting Research*, or *The Accounting Review*. These six journals provide a large and representative sample of the theory-consistent empirical evidence in management accounting research that is published in scholarly journals. While as a practical matter we had to limit the studies included, we believe this selection criterion allows inclusion of a wide diversity of theory-consistent empirical management accounting research published in English.
2. The study provides empirical evidence about accounting in the management of organizations, not capital markets, taxation, etc. These organizations include for-profit, not-for-profit, and government.
3. The study explains causes or effects of variation in management accounting. For example, the study explains causes of variation in organizations' use of more aggregated accounting information or individuals' use of opportunity costs in decision-making; or the study explains performance differences as the effect of variation in performance-measure choice; or the study explains change (temporal variation) in production systems as both a cause and effect of management accounting change. Archival econometric studies on cost drivers provide an example of an important group of studies that are not included because they do not examine variation in observed management accounting practice but instead examine how a characteristic of operations (e.g. product complexity) explains resource use. Similarly, studies of management accountants (e.g. accountants' job satisfaction or promotion determinants) without a causal link to variation in management accounting are not included; nor are studies of management control without an explicit management accounting practice (e.g. use of personnel controls or operational audits not involving management accounting).
4. The study provides empirical evidence consistent with the theory put forward in it. Sources of empirical evidence include archival data (both quantitative and qualitative), field and laboratory experiments, field-based and mail surveys, and qualitative case/field studies. The consistency of evidence with theory can be demonstrated by either testing hypotheses specified ex ante for quantitative evidence or

showing ex ante or ex post the explanatory value of a particular theory for qualitative evidence. Studies without clear theoretical bases are not included, nor are empirical studies that do not support the theory put forward. Although studies that do not support the theory they put forward are sometimes important in the literature, they are not included if their evidence is not unambiguously consistent with a theory.

5. If some portions of a study met the criteria above and others did not, the portions that met the criteria are included and the portions that did not meet the criteria are omitted. For example, if a study explains causes or effects of management accounting and also non-management-accounting practices, only the results related to management accounting are included.

2.2. Construction of maps

The maps are constructed in two steps. First, as explained in Section 2.2.1, we construct a graphic representation of each study that met the criteria described above. Second, we group these graphic representations into maps as explained in Section 2.2.2.

2.2.1. Constructing graphic representations of individual studies

As described in Section 1, we asked three questions of each study: First, what is researched—that is, what sets of variables did a study include? Second, what are the direction and shape of the explanatory links proposed—that is, what is the causal model? Third, where does variation in the variable of interest occur (e.g. individual, organization)—that is, what is the level of analysis? Because the terms "variable," "cause," "causal model," and "level of analysis" have been used in different ways in the literature, we clarify here how the terms are used in the present paper.

Variable. The term variable has both generalized and specialized meanings. In the general sense, a variable is "...a factor whose change or difference you study." (Simon, 1969, p. 31).[1] The specialized meaning arises from research method debates in sociology (Abbott, 1997; Blumer, 1956), in which variable denotes a decontextualized abstraction, for which the same observable indicators are always associated with the same meaning, causes, and effects. For example, "change in competition" would be a variable in the more specialized sense if researchers identified changes in competition as changes in the pattern of market shares (e.g. Herfindahl-index scores[2]) and expected changes in these scores always to correspond to the same changes in subjective experience of competition and always to cause the same changes in behavior. In contrast, researchers who see competition as socially constructed would expect that in different settings, different meanings could be associated with the same changes in Herfindahl-index scores, resulting in different effects. In constructing and discussing the maps, we use the more general meaning of variable, that is, "what a study is about." When we refer to the subject of a study as a variable, this does not imply that the authors (or we) believe that it is independent of context and interpretation.

Cause. The term cause also has both generalized and specialized meanings in different streams of social-science discussion. In the more general usage, cause refers to explained relations between variables, as opposed to observed but unexplained associations. Specialized uses of the term causal explanation may imply determinism (Blalock, 1964),[3] physical-science-like causation independent of both human intentionality and evolutionary selection processes (Elster, 1983), or the treatment of abstract constructs (e.g. education, competition, bureaucracy) as actors that "...could 'do things' in the social world ..." (Abbott, 1997,

[1] Kerlinger (1986, p. 27) provides a similar definition: variables are whatever "...constructs or properties [researchers] study."

[2] The sum of squared market shares.

[3] Cf. the description of causality in early quantitative sociology as a "...sufficient combination of necessary causes..." (Abbott, 1997, p. 1159), so that identifying causality would allow prediction without uncertainty.

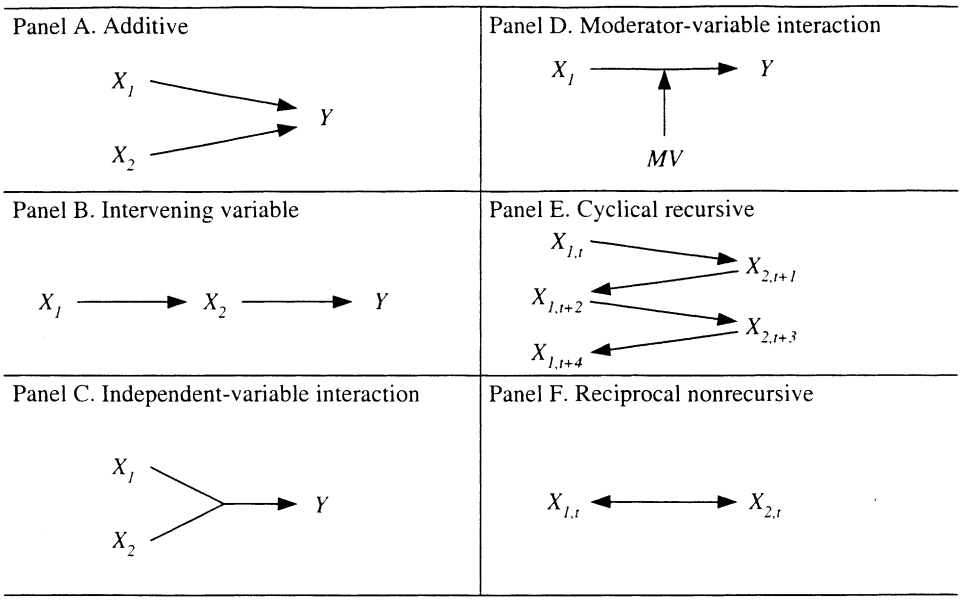


Fig. 1. Causal-model forms.

p. 1164), independent of specific human actions.[4] Hereafter, when we say that studies use causal models we retain the more general meaning (i.e. that the studies provide explanations), without implying that these explanations are, or should be, deterministic, non-intentional, or otherwise limited in scope.

Causal-model form. When one variable is used to explain another, the scope of the explanation is often restricted by specifying conditions or contexts in which the explanation is valid. The simple causal-model forms shown in Fig. 1 represent several types of restrictions that appear in the management accounting literature.

In the **additive** model (Fig. 1, Panel A), each independent variable (X_i) has an effect on the dependent variable (Y) that is not conditional on the value of any other X_i, and the value of X_i itself is not conditional on Y or on any other X_i.[5] In the **intervening-variable** model (Panel B; Asher, 1983; Davis, 1985), the effect of X_1 on Y occurs on the condition that X_1 affects X_2 and X_2 in turn affects Y.[6] However, X_2 does not affect X_1, and Y does not affect either of the X_i's. Moreover, once the value of X_2 is determined, its effect on Y does not depend on X_1.

In **interaction** models (Panels C and D), *how much* X_1 affects Y is conditional on the value of X_2 and *how much* X_2 affects Y is conditional on the value of X_1 (Hartmann & Moers, 1999). However, X_1 and X_2 do not influence each other, and Y does not influence either X_i. These interaction models represent different causal relations. In the **independent-variable interaction** model (Panel C), each X_i has a causal influence on Y. In contrast, in the **moderator-variable interaction** model (Panel D; Sharma, Durand, & Gur-Arie, 1981), MV (the moderator variable) has no influence on Y in the absence of X_1, as well as no influence on X_1: its influence operates only by changing the effect of X_1 on Y.

In the models in Panels A–D, the value of X_1 itself is not conditional on any other variable in a model; thus causation is **unidirectional** from X_1 to

[4] Causality has been given numerous other more specific definitions in the social sciences: for example, American sociology in the 1950s tended to restrict "causal assessment" to individual cases not general regularities, but the position reversed in the 1960s (Abbott, 1998).

[5] For convenience, we have classified studies with only one independent variable and one dependent variable as additive.

[6] If X_1 influences Y both directly *and* through X_2, the models in Panels A and B can be combined into more complex models.

other variables. In Panels E and F, however, causation is bidirectional: X_1 affects X_2 *and* X_2 affects X_1. In the **cyclical recursive** model (Panel E) there is an identifiable time interval between the change in X_1 and the corresponding change in X_2, as well as between the change in X_2 and the corresponding change in X_1 that follows. In contrast, in the **reciprocal nonrecursive** model (Panel F) the X_is are determined simultaneously or at intervals too short for the causal influences in different directions to be distinguished empirically (Berry, 1984).

Any of the explanations represented in these causal-model forms can be further restricted by specifying **linear** or **curvilinear** relations. If the relation is linear, a one-unit increase in X_i leads to a given change (e.g. a three-unit increase) in Y, regardless of the initial value of X_i. If the relation is curvilinear, however, the effect of a one-unit increase in X_i is conditional on the initial value of X_i (e.g. a one-unit increase in a small X_i may lead to a three-unit increase in Y, while a one-unit increase in a large X_i may lead to a six-unit increase or a two-unit decrease in Y, depending on the shape of the curve).

Level of analysis. Each variable on the maps is assigned to one of four levels of analysis: individual, subunit, organization, or beyond organization. In principle, the beyond-organization and subunit levels could be subdivided further: beyond-organization variables include characteristics of markets, states, societies, and cultures, while subunits include units of widely differing size and complexity, from interacting dyads to multidivision groups within an organization. For the sake of simplicity and consistency with related literature, however, we did not make these further subdivisions on the maps. The four levels, from individual to beyond organization, parallel the four-level structures proposed by Hopwood (1976, Fig. 1.1) and by Collins (1981) as the basis for sociological analysis.

The level of a variable is defined *at the level at which the variation of interest occurs* (Hannan, 1991; Klein, Dansereau, & Hall, 1994; Kozlowski & Klein, 2000; Rousseau, 1985).[7] For example, an individual incentive system is an individual-level variable if the study examines causes and/or effects of the use of different incentive systems for different individuals, and the researcher is interested in individuals per se, not in individuals as proxies for subunits or organizations. The incentive system is a subunit (organization)-level variable if the study examines causes and/or effects of the use of different systems in different sub-units (organizations), and the researcher's goal is to relate this variation in incentive systems to variations in technology, structure, or performance across subunits (organizations). Some studies are ambiguous with respect to level of analysis and the classifications are therefore necessarily tentative (see Section 6 for further discussion of this issue).

2.2.2. Constructing maps

We use the following conventions on the maps presented in Appendices A–I. One-to-three-letter abbreviations designate the variables, and the legend for each map provides a key to the abbreviations. Some variables appear more than once on a map because they are causally linked to so many other variables that these links had to be represented in separate sets for visual clarity. The abbreviations for these variables are italicized to indicate their multiple appearances on a map.

A causal model that links variables is represented by an arrow that shows the direction of the causal influence. Different arrow types are used to identify different causal relations (e.g. positive versus negative, additive versus interactive), as described in Appendix J. Each causal link is identified by a number that references the studies that provide theory-consistent evidence on that link. Levels of analysis are indicated on each map. Some maps include causal links almost exclusively at one level; if more than one level is included, the map is divided into vertical sectors in descending

[7] This use of the term levels differs from two others that occasionally appear in the literature. First, levels of analysis are not identical to hierarchical levels. A CEO is not a higher level of analysis than a shop-floor worker: both are individuals. Second, the level of analysis of a variable is not necessarily the level where it appears to belong because it is internal to or controllable at that level. For example, environmental uncertainty, even if it is external to and uncontrollable by organizations, can be an organizational-level variable in studies that focuses on cross-organization differences in this uncertainty.

order, from beyond-organization variables at the top of the map to individual variables at the bottom.

In principle, given sufficient space, all the variables and causal links could have been arrayed on a single map. This map would show some clusters with many causal links (connections) between variables and some blank spaces (disconnects) where few or no links join the distinct clusters. For clarity of presentation, we have split up the one big map into nine smaller ones, relying primarily on these blank spaces (disconnects) between clusters of links as the dividing lines. The great majority of variables that appear on any given map do not appear on any other map (453 out of the total 495 variables appear on only one map). Variables that do appear on more than one map are listed in Appendix K, for convenience in tracing possible cross-map connections. Although within-map connections are relatively dense, most maps include a few isolated links that have only limited connections to the majority of links on the map in which they appear.

Two potentially problematic decisions about where to draw the lines between maps—what to consider connected and disconnected—should be noted. First, when variables with the same name appear at different levels of analysis (e.g. performance at individual and organizational levels), we have represented them separately on the maps, thus limiting connections across levels. This is a provisional decision, based on the fact that when variables with the same name appear at different levels, it is not certain that they represent identical phenomena. Sections 6 and 7 provide further discussion of issues related to defining and connecting variables at different levels of analysis.

Second, while some maps consist of a few large dense clusters of links, other maps consist of many small unconnected clusters of links. It may be less obvious with the latter type of map than the former type that the studies on a map belong together. Maps with many small unconnected clusters represent studies that share a common set of (theoretical or practical) issues but investigate them independently. The map descriptions in Section 3.2 below highlight within-map similarities and across-map differences in variables.

3. Overview of maps

The overview of the maps is presented in three parts. Section 3.1 suggests how the maps can be used to find and compare results of management accounting research. Section 3.2 introduces each of the nine maps, describing the variable choices and social-science-theory antecedents that give each map its distinctive character. Section 3.3 briefly describes the distributions of causal-model forms and levels of analysis used on the maps and highlights questions raised by the observed distributions.

3.1. Using the maps

An examination of the maps in Appendices A–I serves two primary purposes. First, the maps provide a compact graphic summary of specific areas in the scholarly literature, enabling a rapid tracing of what has been researched, what theory-consistent empirical evidence has been reported about any given variable, and what unanswered questions might be suggested by the existing pattern of results. As an illustration of the first purpose of the maps, consider the relations between organizations' strategy and their management accounting. Appendix K shows that, for example, prospector strategy appears as a variable on three maps, B, D, and E. (Other strategies appear on individual maps.) These maps show three sets of results comparing the management accounting of prospector and non-prospector organizations. Prospector organizations place greater weight on nonfinancial relative to financial performance measures in incentive compensation (Map E, link 10). Prospector organizations are also more likely than other organizations to adopt ABC (Map D, link 5). Finally, they make less use of budget-based compensation but have more difficult budgets and make greater use of budget-based cost control and planning (Map B, links 8, 9, 12).

A comparison of these three sets of results raises interesting questions for further research. On the one hand, prospector organizations place less weight on financial measures in compensating managers, suggesting accounting is less important to prospectors. On the other hand, prospectors

refine their financial measures more (ABC) and use financial measures (budgets) more extensively in planning and control, suggesting that accounting is more important to prospectors. These contrasting implications suggest questions for further research. The cross-study difference in the role of accounting in prospector firms may be an artifact of the different research approaches in the three maps; or it may indicate different uses of information for planning and control on the one hand and for evaluating and rewarding managers on the other. If the latter is the case, further questions arise about the existence and management of conflicts when managers are evaluated and rewarded on a different set of measures from those they use in making decisions.

The second purpose of the maps, in addition to summarizing theory-consistent empirical evidence in a way that suggests further questions, is to identify more basic issues about how the different streams of research represented on different maps relate to each other. The subsections below show how different streams of research provide different answers to the three fundamental questions: What is researched (variables)? What are the direction and shape of the explanatory links proposed (causal-model forms)? What is the level of analysis?

3.2. What is researched

The diverse array of variables that appear on the maps comes from the multiple social-science antecedents of management accounting research, as well as from the diversity of management accounting practice. Fig. 2 identifies the subject of the management accounting research assigned to each map and some of the key social-science antecedents that shape the distinctive character of each map. The introduction to each map below describes these social-science antecedents, the characteristic management accounting variables on the map and the characteristic non-accounting variables to which they are linked, and a sample of typical results from studies on the map. Map A, which includes the earliest research represented in the paper, is the base case; the opening of each succeeding map introduction highlights the key differences between the new map and the preceding maps.

Map A, Causes and effects of budgeting at the individual level. The studies on Map A analyze individuals' encounters with budgeting. These studies use theories from the human relations school (Lewin, 1948; Mayo, 1933), which proposes that the design of an organization's social environment influences employee performance, and theories from the social psychology of organizations (Likert, 1961; McGregor, 1960; Vroom, 1964), which link the social environment with individual motivation, stress, and satisfaction. Following these theories, the Map A studies' non-accounting variables are often individual characteristics such as attitudes (e.g. link 5), motivation (e.g. links 5, 37), stress (e.g. links 15–17, 35), and performance (e.g. links 22–27, 38–40). The management accounting variables to which they are linked on this map capture individuals' sense of personal constraint and opportunity arising from budgeting systems: for example, how much participation individuals have in setting the budget (participative budgeting, e.g. links 7–8 and 33–36), how difficult their budgets are for them to achieve (budget difficulty, e.g. links 5 and 40–41), and what the consequences are for them of achieving or not achieving budgets (budget emphasis and budget-based compensation, e.g. links 3, 4, 11, 35). Typical Map A studies show that participative budgeting, task uncertainty, and budget emphasis jointly influence performance (link 24) and stress (link 15) and that participative budgeting and budget-based compensation jointly influence satisfaction (link 11).

Map B, Causes and effects of budgeting at the organization and subunit levels. Map B includes many of the budgeting variables found on Map A but uses them in a different theoretical context and relates them to a different set of non-accounting variables (e.g. technology or organizational structure rather than individual satisfaction or stress). Map B's principal social-science antecedent, the contingency theory of organizations (Burns & Stalker, 1961; Galbraith, 1973; Lawrence & Lorsch, 1967; Thompson, 1967), proposes that organizational or subunit structural characteristics such as size, technology, decentralization, and environmental uncertainty determine the management accounting that is the best fit for a particular

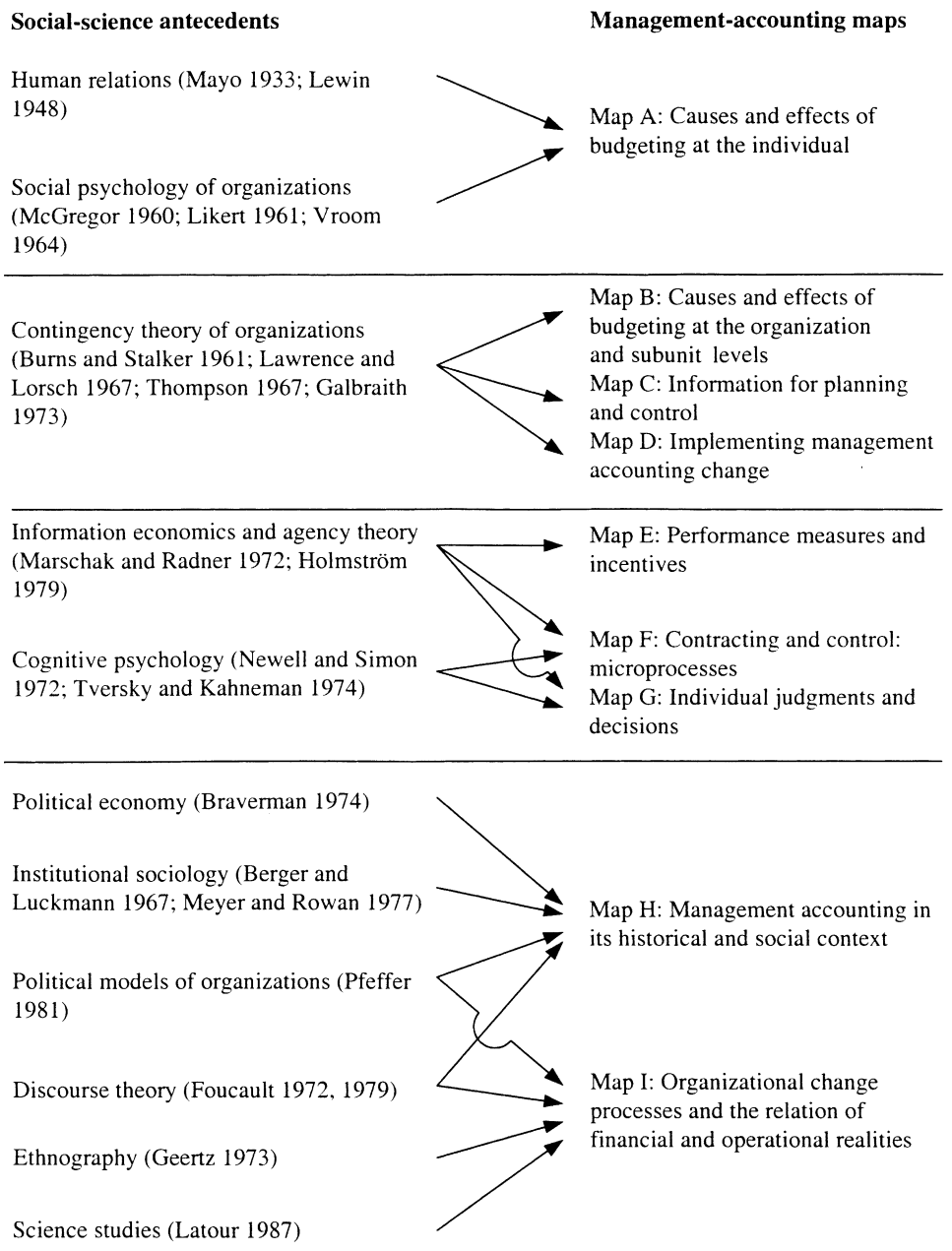


Fig. 2. Genesis of theory-based empirical research in management accounting.

organization (selection fit). Organizational or subunit performance then depends on the degree of fit (interaction fit).[8] Contingency theory is the source of many of the non-accounting variables on the map, such as organizational size (link 2), environmental uncertainty (links 5, 25), and technology automation (link 22). Management accounting variables are often the same budgeting variables that appear on Map A, such as participative

[8] See Donaldson (2001) and Van de Ven and Drazen (1985) for discussions of types of fit.

budgeting (links 1, 2, 10, 22, 24) and budget emphasis (links 14, 22). Typical Map B studies show that organizational size, diversification, and decentralization increase participative budgeting, and that participative budgeting has a larger influence on performance in larger organizations (link 2). They also show that higher levels of participative budgeting are associated with more budget-based compensation, which in turn leads to higher organizational performance (link 10).

Map C, Information for planning and control. On Maps A and B, the management accounting variables capture the intensity of use of the budgeting system (e.g. how much discretion individuals have over their budgets or how much budget performance is emphasized in evaluations). On Map C, in contrast, the management accounting variables capture variation in the specific accounting information employed in subunits and organizations and variation in the detail of how and where it is employed. Uses of the management accounting information on Map C include both planning (e.g. production decisions) and control (e.g. incentive compensation).[9]

The most common theoretical base for Map C studies is the contingency theory of organizations, and the contingency-theory framework of selection fit and interaction fit is clearly visible on the map. However, many Map C studies also draw on an eclectic mix of other theoretical perspectives, such as sociology, strategy, psychology, and economics. Thus, non-accounting variables from a variety of theories appear on the map: for example, asset specificity (links 14, 16) from transaction-cost economics, environmental uncertainty (link 25) from contingency theory, and differentiation strategy (link 23) from strategy. In contrast to Maps A and B, some of the non-accounting variable and many of the management accounting variables derive more directly from practice than from social-science theory: for example, ABC and management (link 23), advanced management practices (links 10, 29), balanced scorecard (link 4), and benchmarking (link 23). Typical Map C studies show that more subunit interdependence increases the usefulness of more aggregated, broad-scope, integrated, and timely management accounting information (links 24–25); and that the interaction of advanced management practices and advanced manufacturing technologies increases the importance of non-financial performance measures (link 10).

Map D, Implementing management accounting change. Map D resembles Map C in its focus on the use of specific types of information rather than the overall intensity of use of the budgeting system (as on Maps A and B). However, studies on Maps C and D ask different questions about these specifics. Map C studies tend to ask, "What specific management accounting is a good fit for a given set of organizations?" whereas Map D studies tend to ask, "How did a given set of organizations come to implement this specific management accounting?"

The theoretical antecedents of Map D, and thus the non-accounting variables, are diverse. Because potential improvements in fit can be one reason why organizations implement new management accounting, contingency-theory variables like environmental uncertainty, decentralization, formalization, and vertical differentiation appear on Map D (links 4, 5). Other theories, however, suggest the importance of additional variables. Institutional sociology suggests mechanisms like board of directors interlocks supporting the transmission of new practices between organizations (link 8). Process models of organizational change focus attention on the actions of stakeholders such as top management, consultants, unions, and champions/sponsors of the new practice (links 1, 3, 11, 15, 16). The management accounting variables on Map D are largely practice-defined: ABC (links 1–7, 11–16), ISO 9000 accreditation (link 8), and a set of management accounting changes that includes overhead allocation systems, the use of quality and customer satisfaction measures, and transfer pricing (link 9). Typical Map D studies show that product diversity and competition are associated with ABC implementation at the organizational level (links 6, 7), and top management support is associated with ABC implementation at both the organizational and subunit levels (links 1, 16).

[9] The terms planning and control are used here to designate decision-making and decision-influencing uses of management accounting, in the sense of Demski and Feltham (1976).

Map E, Performance measures and incentives. Studies on Maps A–D examine the use of management accounting both for planning and control, sometimes without clearly distinguishing the two. Map E, in contrast, examines only the latter use.

The key social-science antecedent of Map E is the economic theory of agency (Holmström, 1979), which defines optimal use of performance measures in incentive contracts, based on informativeness criteria. Agency theory also proposes that with imperfect information, achievable optima will be "second-best," allowing gaming behavior by individuals with private information. Non-accounting variables suggested by this theory include organizational characteristics that affect the informativeness of accounting measures like current earnings as indicators of managers' performance, such as prospector strategy (link 10) and length of the product life cycle (link 14). They also include organizational characteristics that affect the ease of or payoffs from gaming an incentive system, such as market power (link 3). Most of the management accounting variables on Map E are either weights on performance measures in incentive contracts (links 10–13, 15–17) or indicators of distortions in management accounting information that may be caused by gaming of incentive systems (links 3–7). Typical Map E studies show that the use of a prospector strategy or quality strategy is associated with more weight on nonfinancial relative to financial measures in executives' incentive compensation (links 10, 11); and that changes in regulation that make revenues from some products more sensitive to reported costs than others result in the shifting of reported costs to products with more cost-sensitive revenues (links 3, 4).

Map F, Contracting and control: microprocesses. On Maps A–E, the variables usually summarize the results of many actions that are not separately identified. For example, an individual's beliefs about his or her participation in setting budget targets (Map A) is usually the result of multiple events involving the individual and his or her superior (and perhaps peers); ABC implementation (Map D) is the result of many actions by many individuals; and weights on performance measures in executive compensation (Map E) are the results of multiple analyses and negotiations by the contracting parties and their advisers. Most Map F studies, in contrast, examine specific individual or small-group actions in contracting (e.g. specific offers, counteroffers, and impasses in contract negotiations).

Map F studies draw on and often contrast agency theory (Holmström, 1979) and theories from either social psychology (Likert, 1961; McGregor, 1960; Vroom, 1964) or cognitive psychology (Tversky & Kahneman, 1974). Many of the studies on Map F use these theories to identify influences on cooperation (e.g. influences on performance in tasks that require teamwork and negotiation, links 2–9) or influences on individual truth-telling versus misrepresentation in contracting decisions (links 20, 24–32). Non-accounting variables that influence cooperation and truth-telling in these studies include information asymmetry and risk aversion from economics (links 14, 24, 28–30); social pressure (link 24) and organizational commitment (link 26) from social psychology; and second-order uncertainty (i.e. ambiguity, link 10) and gain vs. loss framing of contract outcomes (links 13, 14) from cognitive psychology.

Management accounting variables in these studies include management accounting practices such as negotiated vs. centrally established transfer prices (links 3, 4), different product-costing methods (link 8) and incentive-system characteristics that determine the payoffs from cooperation or misrepresentation (links 7, 8, 20, 30, 31). Typical Map F studies show that individuals with higher performance capability choose more performance-contingent compensation, but that this effect is reduced by uncertainty in incentive pay (links 15, 16); and that while incentive systems with high payoffs for misrepresentation by the subordinate do induce such misrepresentation (link 31), the magnitude of the effect depends on the degree of information asymmetry (link 32) and the subordinate's risk aversion (link 30).

Map G, Individual judgments and decisions. Most Map G studies examine a single individual judgment or decision, while most Map F studies examine short sequences of judgments and decisions by individuals or small groups, and Maps

A–E examine variables that capture many judgments and decisions by larger numbers of individuals. A Map G study, for example, examines a single judgment by individuals entering a transfer-price negotiation (link 38), rather than overall characteristics of a set of transfer price negotiations (Map F, links 3, 4) or the transfer-pricing practice of an organization (Map C, link 16). Like Map A–D studies, however (and unlike Maps E and F), Map G studies address the use of management accounting for both planning and control, sometimes linking the two uses.

The theoretical underpinning of the Map G studies is the debate about individual rationality, often pitting predictions from information economics (Marschak & Radner, 1972) or agency theory (Holmström, 1979) against predictions from cognitive psychology (Newell & Simon, 1972; Tversky & Kahneman, 1974). The non-accounting variables on the map capture a variety of factors that influence individual judgments and decisions in economic or psychology theory or both: e.g. experience (links 12, 31, 48), time pressure (link 15), and role (superior versus subordinate or buyer versus seller, links 38, 43). Some management accounting variables on Map G capture characteristics of management accounting information such as the accuracy of product costs (links 1, 2), the variability of data used for a prediction (link 15), or the number of different information dimensions in a set of accounting data (link 45), which are expected to affect optimal and/or actual judgments and decisions. Other management accounting variables capture performance in variance investigation (links 22–25, 27, 30, 43), performance evaluation (links 26, 31–33), or prediction (links 15, 17–18, 46–48). Typical Map G studies show that individuals are less likely to use opportunity costs optimally in business decision making if they have high levels of accounting knowledge, low levels of management accounting experience, or an intuitive cognitive style (links 11–13); and they are less likely to ignore irrelevant reported cost allocations if they have prior experience using these irrelevant costs in decisions (link 7).

Map H. Management accounting in its historical and social context. While Maps A–G focus on parts of management accounting such as the intensity of budgeting control or the use of specific types of information, Map H emphasizes the *general* character of management accounting as a system of calculation-based control through financial standards. It identifies variables associated with increased emphasis on management accounting, compared to alternative bases for organizing and evaluating economic activity. Thus in Map H, the management accounting variable is the use of the management accounting system as such.

The social-science antecedents of Map H include political economy (Braverman, 1974), institutional sociology (Berger & Luckman, 1967; Meyer & Rowan, 1977), political models of organizations (Pfeffer, 1981), and discourse theory (Foucault, 1972, 1979). These theories are the source of the map's non-accounting variables, e.g. state mandates (link 8), societal conflicts and power struggles (link 1), and the discourse or individual subjectivity characteristic of particular societies or historical periods (links 6, 7, 11). Typical Map H studies show the effect of state support for management accounting through wartime economic controls and legal privileges for accountants (link 8) or the existence of a calculative discourse that makes the idea of management accounting control intelligible by the nineteenth century in a way that it might not have been earlier (links 6, 7). They also show how management accounting influences individuals' subjectivity and vice versa (link 11), how management accounting conceals political power (link 12), and how management accounting influences the visibility of individuals or processes (link 13).

Map I, Organizational change processes and the relation of financial and operational realities. Most studies in Maps A–C and E–G focus on static associations between management accounting practices and characteristics of individuals, organizations (subunits) and societies. In contrast, Maps D, H, and I, from different theoretical perspectives, focus on the dynamics of management accounting change. Map D shows influences on the implementation of recent practices such as ABC; Map H shows influences on the historical rise of management accounting; and Map I exam-

ines processes of change and stabilization in organizations that help explain the role of management accounting.

Map I studies draw on a variety of social science antecedents, including discourse theory (Foucault, 1972, 1979), ethnography (Geertz, 1973), and science studies (Latour, 1987). Following these theories, Map I studies often show management accounting as part of systems in which organizational structure, information technology, and production (key non-accounting variables) shift into and out of alignment with each other and with management accounting. A key management accounting variable on Map I is management accounting change as such: the upper part of the map (links 1–9) is a modification of Hopwood's (1987) model of management accounting change (Hopwood's model is shown in Fig. 3). In the lower part of the map (links 10–17), the focus is on the ways in which management accounting and other organizational features can mutually reinforce each other, either to maintain separate

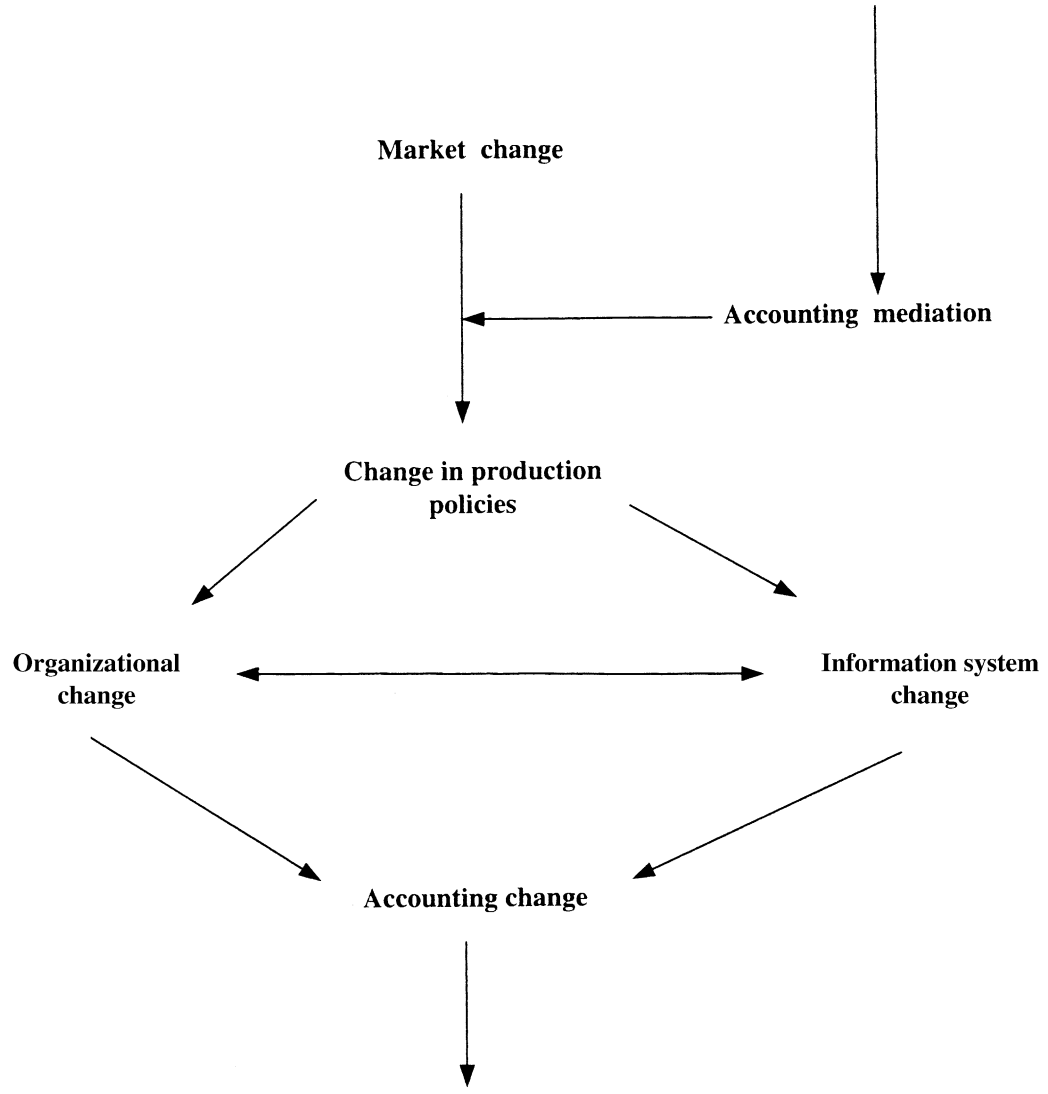


Fig. 3. Hopwood (1987) model.

financial and operational realities in organizations, or to privilege the financial as the ultimate reality and to integrate and subordinate operational concerns to it. Some typical Map I studies show that the accounting through which an external economic change is analyzed influences the organizational (e.g. responsibility structure, accounting control) response to the economic change (link 8), and organizational, production, information-technology and accounting (e.g. cost-system) changes influence each other (links 3–7, 9). Other studies show that operational and financial separation in the organizational structure is reinforced by the prevalence of mental models that represent the organization's activities in financial terms in some subunits and in operational terms in other subunits (link 11).

Summary. The introduction to the nine maps above show that the choice of variables is a primary reason for the observed pattern of connections and disconnects in management accounting research within and between maps. Different streams of research simply focus on different variables. If these different variables represent largely unrelated phenomena, then there is little reason to try to connect them. However, if these different variables describe the same phenomena from the viewpoint of different theories that divide up and name the phenomena differently, there is more reason for research in one stream to take account of analysis and evidence produced by research in other streams. Some portion of the different variables in management accounting research fall in the latter category. However, as the following examples illustrate, understanding the relations among these variables requires resolution of questions about levels of analysis and causal-model forms.

Level-of-analysis questions arise, for example, in a comparison of Maps A and B, which share variables such as budget emphasis, difficulty, and participative budgeting. On Map A the individual-level variation in budget emphasis or participative budgeting is unexplained, while Map B shows organizational-level causes of variation in these budgeting practices. The question naturally arises whether Map B provides explanations for the unexplained variation in budgeting on Map A, and the two sets of studies could be connected into longer causal chains. It is not at all clear that this is feasible, however. Budget emphasis and participative budgeting might have different meanings, and therefore different causes and effects, at individual and organizational levels. For example, the reasons why some individuals participate more in setting their budgets than other individuals within the same organization (individual-level participation) are probably not identical to the reasons why some organizations push budget participation down to a broader range of employees than other organizations do (organizational-level participation). More detailed consideration of levels of analysis is needed to determine whether similarly named variables at different levels of analysis are actually the same variable—or if they are not identical, how they relate to each other (see Section 6 below).

Questions about causal-model form arise, for example, in a comparison of Maps D and I. Although (unlike Maps A and B), the variables in these two maps are not identically named, they seem to address similar phenomena: Map D is entitled "Implementing management accounting change" and Map I is "Organizational change processes..." The two maps represent management accounting change in different casual-model forms, however. Map D is the simplest of all the maps in terms of causal-model form—all the relations are unidirectional linear additive—while Map I is perhaps the most causally complex of all the maps, showing lengthy bidirectional intervening-variable sequences, sometimes including interactions. It seems unlikely that both these representations of change can be equally valid if they are intended to describe the same or similar phenomena.

3.3. Causal-model forms and levels of analysis

Table 1 presents the frequencies of appearance of each causal-model form and level of analysis on each map and summed across all nine maps. These frequencies are the basis for the percentages reported below, where we comment on the uneven distribution of causal-model forms and levels of analysis across maps. The unit for the frequencies is a "link-study pair." A link is an arrow (causal

relation) on the maps, for example an arrow connecting organizational life cycle with the use of management accounting (Map C, link 12). If only one study provides evidence supporting the existence of this relation, there is one link-study pair. If three studies provide evidence supporting the existence of the same relation, there are three link-study pairs. Multiple arrows in an additive model are defined as separate links, but an interaction model with multiple variables at the tail-end of the arrow is one link, as is an intervening-variable model with multiple arrows. The maps in total include 589 link-study pairs.

Five striking features of the use of causal-model forms and levels of analysis are evident in Table 1: the rarity of curvilinear causal-model forms, the predominance of additive causal-model forms, the predominance of unidirectional causal-model forms, the predominance of single-level models (with levels unevenly distributed across maps), and the uneven distribution of models that explain the causes of management accounting (the dependent variable), models that explain its effects (the independent variable), and models that explain both. Each feature indicates an important limitation on what can be learned from the management accounting research represented on the maps. These five features and their implications are described briefly below and discussed at more length in Sections 5–7.

Curvilinearity. Only six of the 589 link-study pairs represent curvilinear relations. Linear

Table 1
Descriptive statistics of link-study pairs

Map	A–I[a]	A	B	C	D	E[a]	F	G	H	I
N	589	88	54	91	47	52	59	81	48	69
Causal-model form										
Unidirectional										
Curvilinear: U relation	4	0	0	1	0	1	0	2	0	0
Curvilinear: inverted-U relation	2	0	0	1	0	0	0	1	0	0
Linear:										
Additive	371	45	32	64	47	43	32	62	33	13
Intervening variable	56	9	9	10	0	3	5	5	0	15
Ordinal independent-variable interaction	100	28	10	12	0	3	17	7	12	11
Ordinal moderator-variable interaction	16	3	2	3	0	2	3	3	0	0
Disordinal independent-variable interaction	8	3	1	0	0	1	2	1	0	0
Disordinal moderator-variable interaction	0	0	0	0	0	0	0	0	0	0
Bi-directional										
Reciprocal nonrecursive	17	0	0	0	0	0	0	0	3	14
Cyclical recursive	16	0	0	0	0	0	0	0	0	16
Levels										
Single	523	87	46	81	46	51	56	80	42	34
Top-down	55	1	8	10	1	1	3	1	2	28
Bottom-up	8	0	0	0	0	0	0	0	4	4
Top-down and bottom-up	3	0	0	0	0	0	0	0	0	3
Single-level										
Individual	203	87	0	4	0	1	31	80	0	0
Subunit	101	0	26	25	18	4	25	0	0	3
Organization	177	0	20	52	28	46	0	0	0	31
Beyond organization	42	0	0	0	0	0	0	0	42	0
Management accounting										
Independent variable	220	73	16	12	0	13	30	51	21	4
Dependent variable	242	5	32	70	47	37	15	21	14	1
Independent and dependent variable	127	10	6	9	0	2	14	9	13	64

[a] For columns A–I and E, the number of observations for the causal-model form subsection is one greater than *N* because the model in Banker, Lee, Potter, and Srinivasan (2001) is counted twice, once as a disordinal interacting independent variable model and once as an inverted-U relation.

models can limit understanding by failing to show when the effect of a variable may diminish, intensify, or change direction at different levels of the variable. A model without curvilinearity identifies no limit, for example, to the performance improvements that can be achieved by setting more difficult budgets or providing more performance-contingent compensation. In theory there are certainly such limits (e.g. diminishing returns in economics), and managers in practice are likely to be concerned about where the limits are.

Additivity. The majority of the link-study pairs (79%) include no interactions: that is, they include no explicit recognition that the effect of one variable depends on the presence or magnitude of other variables. Additive models can limit understanding of management accounting by representing its causes and effects (e.g. organizational-structure causes and performance effects) as universal rather than conditional on a context of other variables such as markets, cultures, technologies, and government regulation.

Unidirectionality. Causal direction on the maps is almost always one-way: 95% of link-study pairs are unidirectional. For example, budget difficulty usually influences performance but not vice versa; production technology and organizational structure influence management accounting but not vice versa. Unidirectional models can limit understanding when they make the independent variables look like levers that can be pulled without generating recoil from the other end of the lever. The unidirectional models represent a world in which managers who want to raise performance can simply raise the level of budget difficulty or performance-contingent compensation or increase monitoring, without generating reverse effects or resistances. These unidirectional links are occasionally called into question, both by unidirectional links in the opposite direction (e.g. the effect of budget difficulty on performance on Map B, link 7, and the effect of performance on budget difficulty on Map B, link 14) and by the relatively few bidirectional links (33 link-study pairs, all on Maps H and I).

Single-level models. Management accounting research tends to examine individuals *or* organizations *or* society but not individuals *and* organizations *and* society: 89% of the link-study pairs are single-level. The distribution of levels is uneven across maps: Map A is almost entirely at the individual level, Maps B–E at the organization and subunit levels, Map F at the individual and subunit levels, Map G at the individual level, Map H at the beyond-organization level, and Map I mostly at the organization level. When similar variables are studied at different levels (e.g. the budgeting variables in Maps A and B, the incentive-contracting variables in Maps E and F), questions arise about the possible relations between levels. There are few cross-level models, however, and the majority of these (55 of 66 cross-level link-study pairs) are top-down. Studies on the maps thus provide some evidence about how organizations or subunits affect individuals but less about how individuals affect organizations or subunits.

Single-level models can limit understanding in a variety of ways. If they are higher-level (e.g. organizational-level) models, they often have no clearly specified causal mechanism—that is, no explicit set of individual actions and interpretations by which organization-level causes lead to organization-level effects, such as how prospector strategy leads to more difficult budgets (e.g. who does what to make this happen, and what motivation and reasoning causes them to do it?). If the models are only at the individual level, it is not clear how they relate to higher-level effects: knowing how a single judgment is made is not the same as knowing the effect of that judgment on the interpersonal interchanges and institutional structures that constitute management accounting practices. Finally, top-down models can limit understanding by failing to address higher-level problems as they appear to managers who, as individuals trying to steer organizations, often initiate bottom-up action.

Management accounting as independent or dependent variable. Some studies take management accounting as given and show its effects (management accounting as the independent variable only: 37% of link-study pairs), while other studies show only causes but not effects of management accounting (management accounting as the dependent variable only: 41% of link-study pairs). Moreover, explanations of causes and effects are

unequally distributed across maps, with A, F, G, and H mostly explaining effects and B, C, D, and E mostly explaining causes. These characteristics limit understanding of management accounting in two ways. First, if management accounting is studied only as the independent variable or only as the dependent variable, we learn something about how management accounting practices affect non-accounting variables and vice versa; but we do not learn how different parts of management accounting affect each other. Second, insofar as studies of the causes and the effects of management accounting appear on different maps, they also tend to identify different variables and provide different, sometimes incompatible, explanations, which make it difficult to link causes and effects of management accounting into valid longer chains of explanation.

In spite of the limitations noted above, linear additive unidirectional single-level models with management accounting as only the dependent variable or only the independent variable can provide valid understanding of management accounting under certain conditions. The following sections discuss the conditions under which different causal-model forms and levels of analysis are valid choices, as well as relating causal-model form and level-of-analysis choices to variable choices. The discussion is summarized in a set of guidelines that appears in Fig. 4.

4. What variables are researched: guidelines 1–4

Because management accounting research has used a variety of ways of categorizing and naming the phenomena it studies, variables that have the same names but are studied at different levels of analysis or identified and analyzed using different theoretical perspectives may capture similar but not identical phenomena. Moreover, variables with different names may capture similar though not identical phenomena. Identifying the meaning shared (and not shared) by these variables is an important part of identifying natural and artifactual connections in the research. Section 4.1 identifies three key types of partially shared meaning among variables that appear on the maps. Further discussions of one of these types is deferred until Section 6 because it involves level-of-analysis as well as variable-identification issues; the other two types are discussed in Sections 4.2 and 4.3.

4.1. Types of partially shared meanings

Management accounting practice does not categorize the world in the same way as any basic social science theory—for example, ABC and the balanced scorecard do not map one-to-one onto variables in economics, psychology or sociology—nor do the basic variables in these social science theories map one-to-one onto each other. The use of these multiple categorizations results in three distinct types of partially shared meanings among variables on the maps.

1. Some variables are derived directly from a particular social-science theory (e.g. calculative discourse on Map H, performance-measure weights in incentive contracts on Map E), while others are derived from management accounting practice (e.g. ABC or the balanced scorecard on maps C-D). A practice-defined variable is likely to share meaning with one or more theory-defined variables but not to have identical meaning with any of them. (See Section 4.2.)
2. Different theories define their variables more or less broadly, so that a variable derived from one theory captures a subset of the phenomena described by a variable derived from another theory: for example, general usefulness of specific types of information in contingency theory versus usefulness of the information in making specific production decisions or in compensating executives in information economics and agency theory. Different practice-based variables may also be defined more or less broadly: for example, in Map C, some studies combine practices like TQM and JIT into a single variable called advanced management practices, while other studies consider each practice separately (see Section 4.3).

Guidelines

1. If a practice-defined variable is used, then clearly define its underlying theoretical properties--not only those that are of particular interest in the current study, but also other properties that the practice-defined variable is likely to possess.
2. If a practice-defined variable can represent multiple underlying theoretical properties, then gather evidence that identifies their separate causes and effects.
3. If the theoretical property of interest belongs to only a definable subset of instances of the practice-defined variable (e.g., only some ABC systems or some nonfinancial information), then state this limitation explicitly.
4. A variable definition should not include content irrelevant to the research question and theory employed or exclude relevant content.
5. If theory predicts nonlinearities in the relation examined, then consider the value of capturing nonlinearities in the study.
6. If a linear model is used for the sake of simplicity, then be explicit about the resulting limitations.
7. If the causal model proposed is additive, then indicate both the reasons for assuming there are no important intervening-variable or interaction relations and the consequences of omitting these relations if they exist.
8. If the causal model proposed is conditional, then indicate the type of conditionality (intervening versus interacting).
9. For interaction models, indicate whether the interaction is ordinal or disordinal.
10. For interaction models, indicate whether the interaction involves independent variables only or independent variables and moderator variables.
11. If unidirectional causality is assumed, then indicate the reasons for excluding bidirectionality.
12. Align the time frame of the study (length and frequency of evidence collection) and the causal interval (the time required for the cause examined in the study to have an effect).
13. Indicate whether the variable of interest varies across individuals, organizational subunits, organizations, or beyond-organization entities like markets and societies.
14. Align the level of theory (what is being explained), level of variable measurement (source of evidence), and level of data analysis (unit of data).
15. If theoretical variables at multiple levels affect the observable measures, then separate the effects from multiple levels.
16. If cross-level effects are proposed, then use an interaction causal-model form, with at least one interacting (independent or moderator) variable at the level of the dependent variable.
17. If the variation of interest in a variable is variation in its value relative to a subset of other values in the sample, then use an individual-within-group-level model.

Fig. 4. Guidelines for theory-consistent empirical management accounting research.

3. Variables with the same or similar names sometimes appear at different levels of analysis, like the budgeting variables embedded in different social-science theories on Maps A and B. These similarly-named variables at different levels share meaning but are not necessarily identical (see Section 6)

These types of variables with partially shared meanings pose a dilemma in constructing the maps. Grouping similar variables under a common name would make the maps more compact and readable but also would risk loss of information or misrepresentation of some studies' results; and the studies themselves often do not clearly demarcate shared and unshared meanings between their variables and similar variables in other streams of research. In general we use the names in the original studies, but we sometimes group variables that are somewhat differently named in the studies under a common name on the maps, if the different names do not seem to capture unshared meanings that are important to the

studies' primary goals. For example, on Map F, subordinates' misrepresentation of private information to increase their own payoffs appears as a single variable, misrepresentation by subordinate, regardless of whether it is misrepresentation of individual skills, production costs, or signals about the favorability of the external environment. The primary goal of the Map F studies is to test specific theories about influences on misrepresentation of private information. These theories predict that misrepresentation depends on the payoffs it generates or on personality characteristics, not on the type of information misrepresented; therefore the misrepresentations of different types of private information are combined into a single variable.

Map E provides an example of why theoretically similar variables are sometimes *not* combined. The independent variables in most of these studies are indicators of the informativeness of specific performance measures about executives' actions. For example, a long product life cycle (link 14) is used as an indicator of the low level of informativeness of financial measures and thus a predictor that organizations will instead use individual, often subjective evaluations of executives to determine incentive pay. We do not combine all of the independent variables in these studies into one variable, informativeness, because we believe one of the primary goals of these studies is to show the contexts (e.g. strategies, product characteristics, organizational structures) in which particular measures are more or less informative. Results relevant to this goal would be lost if all the independent variables in these studies were collapsed into informativeness.

4.2. Practice-defined and theory-defined variables

Practice-defined and theory-defined variables each have distinctive advantages and disadvantages. Practice-defined variables have the advantage of capturing management accounting phenomena practitioners want to understand, in practitioners' own language. Studies using these variables may thus be attractive and accessible to a broader audience than studies using theory-defined variables. On the other hand, theory-defined variables are more likely to have well-defined, stable, unitary meanings, making it possible to identify consistent cause-and- effect relations. A single practice-defined variable, in contrast, can denote multiple phenomena with different causes and effects. Failure to distinguish these multiple phenomena has long been seen as a disadvantage of using practice-defined variables: as Weick (1969, p.23) observed, "...working within the constraints of managerial language is a severe deterrent to understanding."

Disentangling the multiple meanings of practice-defined variables such as ABC, TQM, and the balanced scorecard remains a significant challenge for management accounting researchers. A given practice-defined variable may represent variations in communication, reward structures, symbolic value, or information characteristics such as precision or sensitivity. The degree to which a particular practice has any of these underlying properties may vary across instances of the practice observed: for example, ABC in different industries, time periods, or countries can have substantially different underlying theoretical properties with different causes and effects. Moreover, even if instances of the practice are quite similar, each instance might represent *multiple* underlying theoretical properties: the introduction of a particular new management accounting practice could change the precision of information *and* the speed with which it is communicated *and* the set of individuals to whom it is communicated.

Failing to take the multiple properties of practice-defined variables into account can result in invalid conclusions from research. Nonfinancial information, for example, is a practice-defined variable; it is often identified as a leading indicator of financial performance and its causes or effects attributed to its greater timeliness in providing the performance information that financial measures provide only later. However, nonfinancial information *in general* is not necessarily more timely than financial information *in general*, and nonfinancial information can have important theoretical properties besides timeliness. Some nonfinancial information is more precise or sensitive than financial information or more easily

understandable, or it can give greater visibility to some individuals and support different power relations in an organization. Different subsets of nonfinancial information have more or less of these various theoretical properties; and thus, for example, the use of particular nonfinancial information that is not more timely than financial information but is more sensitive to managers' actions will have different causes and effects than the use of nonfinancial information that is more timely but less sensitive. Valid research on the causes and effects of nonfinancial information use depends on identifying the information as timely, precise, etc., rather than simply identifying it as nonfinancial.

Guidelines:

1. If a practice-defined variable is used, then clearly define its underlying theoretical properties—not only those that are of particular interest in the current study, but also other properties that the practice-defined variable is likely to possess.
2. If a practice-defined variable can represent multiple underlying theoretical properties, then gather evidence that identifies their separate causes and effects.
3. If the theoretical property of interest belongs to only a definable subset of instances of the practice-defined variable (e.g. only some ABC systems or some nonfinancial information), then state this limitation explicitly.

4.3. Breadth of definition of variables

The breadth of both practice-defined and theory-defined variables on the maps varies: see Appendix L for examples. The research question and theory determine the valid breadth of definition. For example, environmental uncertainty may be too broadly defined a variable if only a subset of the uncertainties in the environment influence the other variables in a given study; uncertainty of bonus pay may be too narrow a definition if other uncertainties (e.g. about other components of compensation or about nonmonetary payoffs) also influence the other variables studied (e.g. individuals' choice of incentive contracts or their investment and production decisions).

A variable too broadly defined relative to the underlying theory generates noise in the cause–effect relation and makes it less likely that the effects specified in the theory will be detected, even when they exist. Too broad a definition also makes it more likely that effects other than those specified in the theory will be detected and wrongly interpreted (e.g. mistaking precision effects for timeliness effects in the nonfinancial information example above). In contrast, a variable too narrowly defined captures only part of the proposed cause–effect relation and also makes it less likely that the effects specified in theory will be detected, even when they exist.

Guidelines:

4. A variable definition should not include content irrelevant to the research question and theory employed or exclude relevant content.

5. Causal-model forms: guidelines 5–12

The following sections discuss in more detail the issues of causal-model form that were initially raised in Section 3.3: curvilinearity (Section 5.1); additive, intervening-variable, and interaction models (Section 5.2); and directionality (Section 5.3).

5.1. Curvilinearity

Much of the theory underlying empirical management accounting research predicts curvilinear relations. The contingency theory of organizations, for example, predicts curvilinear relations between organizational size or technology and some other organizational characteristics (Donaldson, 2001). Economic theory predicts curvilinear functions for individual utility and for organizational costs and profits. Some cognitive-psychology theories predict U-shaped or inverted-U response curves. These relations are rarely

represented in empirical management accounting research, however: only 1% of the link-study pairs on the maps represent curvilinear relations.

Researchers often intentionally induce linearization by limiting the range of evidence collected (e.g. choosing typical cases rather than extreme cases for qualitative studies) or transforming quantitative data to meet the assumptions of linear statistical models. Although limited-range or linearized analyses of data can be consistent with theory, they represent only a portion of what many theories can in principle explain. For example, the studies of organizational size and management accounting on maps B, C, and E commonly omit very large and very small organizations; and the organizational size variable within the remaining sample is often linearly transformed for purposes of statistical analysis and not transformed back to the raw measure for purposes of interpretation. In consequence, we know little about management accounting in very small organizations, which are numerous, and in very large organizations, which are influential. Moreover, even within the middle range of organizational size, if the size variable is not back-transformed for purposes of interpretation, erroneous conclusions may be drawn from the findings. For example, if the size effect is positive but concave over the range studied but only the results of the linearized analysis are shown, it may be easy not to recognize the fact that at the lower end of the range, a given (raw) increase in organizational size can have a very large effect on management accounting, but at the upper end of the range the effect may be too small to be significant for practice.

Similarly for studies of performance measurement and incentives, a restriction to showing limited-range linear effects leaves important questions unanswered. For example, a number of studies on Maps D–G show that making compensation more dependent on performance increases performance. Incentive designers in practice are concerned with the exact shape of the curve: at what point do the expected costs of a further incentive increase outweigh the diminishing expected benefits? Linear-model studies, which can only say that bigger bonuses are better, do not answer this question about the shape of the curve. Understanding the shape of the curve is particularly important if the sign of the relation changes over the observed range, so that for low values of the independent variable the effect is positive but for high values it is negative or vice versa.

The few studies of curvilinear relations on the maps have the potential to generate unresolved inconsistencies with the linear studies. For example, link 20 on Map C shows a curvilinear relation between information asymmetry and the complexity of one part of the management accounting control system (sophistication of post-auditing in capital budgeting), while link 1 on Map B shows a linear relation between decentralization (often considered an indicator of information asymmetry) and overall management accounting control system complexity. It is not clear whether the difference in causal-model form between these two links occurs because different ranges of the variables are examined, because the relation is really curvilinear for complexity in one part of the management accounting control system but not in other parts, or because the analyses in the different studies are more or less sensitive to curvilinearity for other reasons (e.g. how the variables are measured[10]).

Guidelines:

5. If theory predicts nonlinearities in the relation examined, then consider the value of capturing nonlinearities in the study.
6. If a linear model is used for the sake of simplicity, then be explicit about the resulting limitations.

5.2. Additive, intervening-variable, and interaction models

The same sets of variables sometimes appear in different linear unidirectional causal-model forms: additive, intervening-variable, and interaction.[11]

[10] For example, if survey respondents treat a response scale as an ordinal scale rather than an interval scale, the data may not capture curvilinearities.

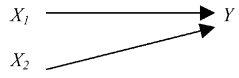
[11] Intervening-variable and interaction models can in principle include curvilinear components, but only one of the studies represented on the maps does so (see footnote to Table 1).

In Map A, for example, the relation between participative budgeting and satisfaction is represented with several different causal-model forms: additive (link 14), intervening variable (link 13), moderator-variable interaction (link 12), and an independent-variable interaction (link 11). Most of the maps include similar instances of a set of variables linked with different causal-model forms. Identifying valid connections among variables requires understanding when these causal-model choices are and are not in conflict with each other, and when they are in conflict, understanding the consequences of using an invalid causal-model form.

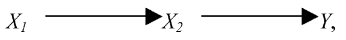
Causal-model forms describe qualitative narratives as well as statistical models. For example, if one observed action in a narrative is presented as the consequence of the occurrence of two other earlier actions, then this relation can be represented in a variety of ways. Perhaps the two earlier actions and their effects are independent of each other, and neither alone has a large enough effect to result in the occurrence of the third but both together do (an additive model); or perhaps the first action causes the second, which in turn causes the third (an intervening-variable model); or perhaps the influence of the first event on the third is much larger in the presence of the second than in its absence (an interaction model). The causal-model form guides the collection of evidence in both qualitative and quantitative studies (e.g. the decision whether to search for evidence on intervening and interacting variables); it also guides the analysis of evidence, determining the statistical tests that yield valid results with quantitative data and the descriptive language that most exactly represents the observed events in a narrative.

Additive versus intervening-variable models. A two-variable additive model that predicts $X_1 \rightarrow Y$ is not in conflict with an intervening-variable model that predicts $X_1 \rightarrow X_2 \rightarrow Y$ or $X_1 \rightarrow X_2 \rightarrow X_3 \rightarrow Y$. Examples of causal relations with and without intervening variables are Map A, links 20 and 39 (direct path from motivation to performance and indirect path via commitment to the budget goal) and Map C, links 24–25 (direct path from subunit interdependence to usefulness of aggregated information and indirect path via decentralization). The intervening-variable models, which identify links between the beginning and end of a causal chain, add supplementary nonconflicting information to the two-variable additive model, which explicitly represents only the beginning and the end of the chain. Including intervening variables can sometimes help to explain weak $X_1 \rightarrow Y$ relations. The $X_1 \rightarrow X_2$ relation may be strong while the $X_2 \rightarrow Y$ relation is weak or vice versa; or each separate step in a multiple-link causal chain may be moderately strong, but the total uncertainty accumulated in many links may be the source of weak results for the $X_1 \rightarrow Y$ model.

In contrast to the example above, an additive model that predicts



is in conflict with an intervening-variable model that predicts only



with no separate direct link from X_1 to Y. Suppose, first, that the intervening-variable model is a valid representation of the causal relations among the variables: there is no direct relation between X_1 and Y, but X_1 strongly influences X_2, which in turn influences Y. In this case, using the additive model and regressing Y on the two independent variables may show that neither X_i has an effect on Y—a completely misleading conclusion—because the strong $X_1 \rightarrow X_2$ relation creates multicollinearity in the additive regression model. Conversely, suppose that the additive model is a valid representation of the causal relations among the variables: X_1 and X_2 are independent of each other but both independently influence Y. If the intervening-variable model with no direct $X_1 \rightarrow Y$ path is used, then the result may show no effect of X_1 on Y—because there is no effect through X_2—even though the $X_1 \rightarrow Y$ effect is strong.

Additive versus interaction models. On maps that display complex causal relations, a pattern often appears in which two variables are linked both with and without an interaction with a third variable. For example, individuals' performance

capability influences their choice of performance-contingent compensation on Map F, link 16; on Map F, link 15, this effect depends on the uncertainty of incentive pay. (Similar examples can be found elsewhere on Map F, as well as on Maps, A, B, G, H, and I.) In these cases, do the interaction models like link 15 contradict the additive models like link 16 or can both be valid representations of the same phenomena?

Suppose, first, that the relation is interactive—the effect of X_1 on Y depends on the magnitude of X_2 and vice versa—and that an additive model including an $X_1 \rightarrow Y$ relation is used. (The model may also include an $X_3 \rightarrow Y$ relation, an $X_4 \rightarrow Y$ relation, and so on.) If X_2 is constant when the evidence is collected to support this additive model, then the resulting conclusion about the $X_1 \rightarrow Y$ relation is only valid at that level of X_2; the additive model is context dependent, with the level of X_2 as the relevant context. If X_2 is *not* held constant and is either omitted or included as an additive (not interacting) variable, then the detected effect of X_1 on Y is a weighted average of the different X_1 effects that occur at different levels of X_2.

How misleading it is to omit an interaction depends in part on whether the interaction is ordinal or disordinal. (These two types of interactions are represented differently on the maps; see Appendix J). If the interaction is ordinal, then changes in X_2 change the *magnitude* but not the *sign* of the effect of X_1 on Y.[12] Thus, if the sign of the X_1–Y relation is positive, then X_1 will increase Y at all levels of X_2; and individuals choosing more X_1 without regard for the level of X_2 will receive an increase in Y that is larger or smaller than expected but will not (on average) receive a decrease in Y. If the interaction is disordinal, however (e.g. Map F, links 8 and 26; Map G, link 1), then X_1 increases Y at some levels of X_2 and decreases it at other levels; thus, ignoring a disordinal interaction can have more unexpected effects (e.g. reducing performance when an increase in performance was expected).

[12] To limit the number of different models represented on the maps, we have included in the ordinal-interaction category studies in which X_i has a significant effect on Y at one level of X_j but has no significant effect on Y at another level of X_j, even if these relations were tested separately rather than in a single interaction test.

Intervening-variable versus interaction models. Intervening-variable and interaction models represent two kinds of conditional relations. For example on Map C, link 6, the use of efficiency-based performance measures in manufacturing is conditional on whether manufacturing organizations pursue a flexibility strategy. The use of efficiency-based performance measures in turn influences performance (an intervening-variable model), but *how much* the efficiency measures affect performance is conditional on the organizations' flexibility strategy (an interaction model). The more flexible their manufacturing strategy, the less the organizations will use efficiency-based measures, and the less beneficial these measures will be for performance when they are used. The intervening-variable and interaction relations are conceptually different, and using both with the same data can be problematic. If examining the link from strategy to performance-measure choice yields sufficiently strong results (i.e. most manufacturing organizations with flexibility strategies do not use efficiency-based performance measures), then there will be insufficient variation in the sample (too few flexible-strategy organizations using efficiency-based performance measures) to provide a powerful test of the interaction model (see Section 7.2 for further discussion.)

Interacting independent-variable versus moderator-variable models. These two models represent different causal relations that should be clearly described in the narrative of a qualitative study or the hypothesis motivation of a quantitative study, although the same statistical tests can be used for both in a quantitative study (e.g. ANOVA interaction tests). For example on Map B, a build strategy (link 26) is represented as a moderator variable. In such a model, a build strategy does not in itself cause higher-performance than other strategies; but it does affect the impact of subjective (versus formula-based) performance evaluation on subunit performance. In contrast, on Map C (link 28), customer-focused strategy is represented as an interacting independent variable, because the study assumes that customer-focused strategy causes superior new product development performance, although the magnitude of the effect depends on the use of cus-

tomer information in the management accounting control system. Whether strategy has any influence on performance or only moderates the effect of other variables on performance is an important theoretical and practical question; thus failing to distinguish between moderator and independent-variable interactions can be misleading.

Guidelines:

7. If the causal model proposed is additive, then indicate both the reasons for assuming there are no important intervening-variable or interaction relations and the consequences of omitting these relations if they exist.
8. If the causal model proposed is conditional, then indicate the type of conditionality (intervening versus interacting).
9. For interaction models, indicate whether the interaction is ordinal or disordinal.
10. For interaction models, indicate whether the interaction involves independent variables only or independent variables and moderator variables.

5.3. Directionality

Differing choices about causal direction lead to disconnects between maps and between individual studies within or across maps. Although some of the causal relations represented on the maps seem unambiguously unidirectional, others do not. For example, strategy choice affects management accounting (Maps B–E), but management accounting also influences strategy by affecting the information available as a basis for strategy choice (Gray, 1990). Support for ABC (whether by top management, unions or other employees) affects the success of an ABC implementation (Map D); but initial successes in the implementation process may also affect the degree of support that ABC receives (Cooper, Kaplan, Maisel, Morrissey, & Oehm, 1992). Organizational characteristics such as assignment of decision responsibility affect performance evaluations (Map G), but it seems possible that performance evaluations also affect future assignments of decision responsibility.

Given these uncertainties about actual causal direction, how should causal-model direction choices be made and what are the consequences of making invalid choices? The following examples from the maps suggest that choices of directionality depend on the time length for which evidence is collected. The unidirectional studies on Maps A-G are mostly cross-sectional while the bidirectional studies on Maps H-I are mostly longitudinal, in some cases covering decades or centuries. Similarly, the different signs and causal directions given to the budget difficulty-performance relations on Maps A, B, and F seem to depend on whether researchers are examining a single point in time (the cross-sectional budget difficulty $\rightarrow$ performance links on Map A, links 23, 25 and Map B, link 7), two distinct time periods (past performance $\rightarrow$ current budget difficulty, on Map B, link 14) or three time periods (performance $\rightarrow$ budget difficulty $\rightarrow$, performance in ratchet systems, Map F, link 20).

Valid research requires alignment of answers to two questions about time length. The first question is the time frame of the study, i.e. over how long a period and at what intervals within that period should evidence be collected. For example, evidence might be collected at a single point in time, at the beginning and end of 5 years, or at monthly intervals through 5 years. The second question is the causal interval of the relation studied, i.e. how long it takes for a change in X to cause a change in Y. As the remainder of this section shows, answers to these questions about time length determine whether a unidirectional or bidirectional model is valid; and if a bidirectional model is valid, answers to questions about time length also determine which bidirectional model—reciprocal or cyclical—is valid. When causality is bidirectional, unidirectional models can provide valid evidence in limited circumstances, with appropriate acknowledgment of their limitations. Just as a linear model can be a valid simplification of curvilinear phenomena within a limited range, a unidirectional model can be a valid simplification of bidirectional phenomena within a limited time frame.

A well-established way of conducting valid unidirectional empirical studies is to identify a

variable that can be treated as exogenous because its response to other variables is too slow to be captured within the time frame of the study—i.e. the $Y \rightarrow X$ causal interval is longer than the study's time frame but the $X \rightarrow Y$ interval is not (James, Mulaik, & Brett, 1982; Kozlowski and Klein, 2000; Simon, 1973). For example, if organizational structure changes much more slowly in response to management accounting than management accounting changes in response to organizational structure, then organizational structure can be treated as the exogenous variable within a limited time frame, since it is not significantly influenced by management accounting during the period under consideration. If changes in organizational structure have had time to cause changes in management accounting, but the changes in management accounting have not yet had time to cause new changes in organizational structure, then a unidirectional organizational structure → management accounting model can be valid (James et al., 1982).

If a researcher is interested in the slower effect (management accounting → organizational structure in this example) or if effects in both directions have similar causal intervals, then a bidirectional model is needed. A cyclical recursive model is valid if the causal interval and time frame are matched so that, for example, evidence collected about the period t to $t+1$ (the first interval in the study's time frame) captures the causal influence in one direction, and evidence collected about the period $t+1$ to $t+2$ (the second interval in the study's time frame) captures the causal influence in the other direction (e.g. the studies in the upper part of Map I). If the mutual influences of the two variables are simultaneous or if the causal intervals are shorter than the intervals at which evidence is collected, so that influences in both directions are captured by evidence gathered at t and $t+1$, then a reciprocal nonrecursive model is valid (Asher, 1983; Berry, 1984). In the lower part of Map I, studies that show how multiple attributes of an organization (e.g. acquisition strategy, decentralization) simultaneously affect each other are represented with reciprocal nonrecursive models.

Identifying the causal interval is therefore crucially important in choosing the valid causal-model form and in collecting and analyzing quantitative or qualitative evidence. In both longitudinal and cross-sectional studies, collecting evidence about an effect before its cause has had time to act fully, or after effects in the reverse causal direction have begun to occur (i.e. the proposed effect has begun to influence the proposed cause) can lead to invalid conclusions. Collecting evidence for a time frame shorter than the causal interval can yield misleading results, for example, with management accounting changes that generate short-term profit effects and longer-term resistance as employees eventually find ways of subverting them. Conversely, collecting evidence for a time frame that is longer than the causal interval can result in not detecting important short-term dynamics. For example, collecting evidence on an organization's management accounting at only two points in time, before a new practice is implemented and 3 years after implementation when the practice appears to be operating successfully, can give an impression of easy implementation even if costly problems occur in the intervening period.

The alignment of time frame and causal interval is important for both qualitative and quantitative studies. Identifying where a narrative begins and ends is as important as determining how long an experiment should run or how many years of archival data to collect. Additional issues arise with quantitative analysis, however, because different statistical methods are valid for causal models with different directionality and causal intervals. If the causal relation between two variables is bidirectional within the study's time frame, then the coefficient in a single-equation OLS regression relating the two variables will be biased. If bidirectional models are used, then different statistical methods are required for the two types of model: for example, two-stage least squares for reciprocal nonrecursive models and a system of regressions that treat $X_{1,t}$ as a different variable from $X_{1,t+1}$ for cyclical recursive models (Asher, 1983; Berry, 1984; Kennedy, 1998; see also Ittner & Larcker, 2001).

When the causal interval and time frame for a study are aligned, a unidirectional model can be valid even when the actual relation between the

phenomena studied is bidirectional. However, always using the simplifying strategy of making the slower-changing variable exogenous creates artifactual disconnects in the literature as a whole. First, slower-changing variables remain unexplained: we learn about their effects but not their causes. Second, even if the effects of the slower-changing variables are large, they may be undetectable in cross-sectional studies if the variables themselves vary less in contemporaneous cross-section than across longer periods of time. For example:

- Information technology may appear a less important cause of management accounting in a cross-sectional study of organizations in (say) 2000 than in a longitudinal study of changes between 1950 and 2000. Once variables like industry have been controlled for, there may be too little variation in the 2000 sample to detect much effect of information technology even if it is a very powerful cause of management accounting.
- Factors that explain why executive compensation is higher in some organizations than others in 2000 may not be equally successful in explaining why real executive compensation is higher in 2000 than in 1950. For example, would current relative levels of compensation have been socially acceptable in 1950? Are the institutional mechanisms for determining compensation the same in 1950 and 2000? Social norms and institutional mechanisms are relatively constant in the 2000 sample and so have no detectable effect, but a longitudinal study might show substantial effects.

Although cross-sectional variation in variables like information technology and social norms can be increased by increasing the heterogeneity of the sample (e.g. samples including countries with more diverse social norms or industries with diverse technologies), this sampling strategy also increases the possibility of confounds between the variable of interest and other variables.

Guidelines:

11. If unidirectional causality is assumed, then indicate the reasons for excluding bidirectionality.
12. Align the time frame of the study (length and frequency of evidence collection) and the causal interval (the time required for the cause examined in the study to have an effect).

6. Levels of analysis: guidelines 13–17

The following sections discuss in more detail the issues of level of analysis that were initially raised in Section 3.3. Section 6.1 introduces criteria for valid single-level studies and Section 6.2 identifies criteria for valid multi-level studies.

6.1. Single-level studies

As noted in Sections 3.2 and 4.1, variables with the same or very similar names are often studied at different levels of analysis, and it is not clear whether the meanings of the variables at different levels are identical. This phenomenon occurs elsewhere in the social sciences, as well as in management accounting research; for example:

> Is worker participation an individual-level phenomenon, describing the influence an individual exerts in unit decisions? Or is worker participation at the unit level, describing a set of formal structures and work practices (for example, quality circles) characteristic of units, not individuals? (Kozlowski & Klein, 2000, p. 27)

Similarly, subunit manager performance can be an individual-level variable if it captures performance differences among different managers in the same or similar subunits; or it can be a subunit-level variable if it captures performance differences among the same or similar managers assigned to subunits that differ with respect to characteristics such as technology or budget practices.

If the study is intended to examine causes and effects at a single level of analysis only, then care

needs to be taken to insure that these causes and effects are not confounded with causes and effects at other levels. These confounds are particularly hazardous when variables at different levels have the same name but have different causes and effects at different levels of analysis: in such cases, a theory explaining a variable at one level may not provide a valid basis for a study of the variable with the same name at another level. For example, the reasons why perceived uncertainty varies across industries (e.g. cross-industry variation in competition or technology) are different from the reasons why perceived uncertainty varies across individual managers within an industry or organization (e.g. individuals' knowledge or attitudes).

In order to provide valid theory-consistent empirical evidence, the following choices must be aligned (Hannan, 1991; Klein et al., 1994; Kozlowski & Klein, 2000; Rousseau, 1985):

- Level of theory: what is being explained?
- Level of variable measurement: what is the source of evidence?
- Level of data analysis: what is treated as an independent datum for purposes of analysis—an individual observation, a group mean, etc.?[13]

If a study does not align these three choices of level, a valid theory may not be supported or an invalid theory may appear to be supported because the variable measurement and data analysis do not provide evidence on the chosen theory (Klein et al., 1994).

At any level of analysis, evidence may be gathered *from* individuals: that is, individuals may be the source of the evidence. If the theory is at a higher level than the individual level, then various actions can be taken in collecting and analyzing evidence to insure that variable measurement and data analysis are aligned with the level of theory. For example, if the variation of interest is at the organizational level, evidence collection (e.g. interview or survey questions) should be designed to capture organizational, not uniquely individual, characteristics; and responses from one individual in an organization should be evaluated qualitatively in comparison to others. Quantitative responses from multiple individuals in an organization can be averaged to remove individual-level "noise," thus using the level of data analysis to insure that the level of variable measurement (individual) does not result in conclusions out of alignment with the level of theory (organizational).

The effective sample size can vary depending on a study's level of analysis. Consider, for example, 40 organizations in four industries with 4000 employees. If the use of management accounting varies systematically across individuals within organizations and the theory employed in the study explains these differences across individuals, then management accounting is an individual-level variable and the available sample size is 4000. If the use of management accounting varies systematically across organizations and the theory employed in the study explains these differences across organizations, then management accounting is an organizational-level variable and the sample size is forty. If the use of management accounting varies systematically across industries and the theory employed in the study explains these differences across industries, then management accounting is a beyond-organization (industry) variable and the sample size is four (Klein et al., 1994; Rousseau, 1985).

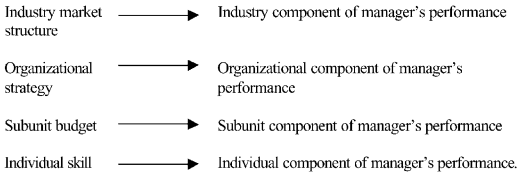
6.2. Multiple-level studies

Much of the evidence collected on management accounting (e.g. organizational performance) results from causes at multiple levels (e.g. individual, subunit, organization, beyond-organization). The observable measure that is available for a variable is therefore often an aggregate of theoretical effects at multiple levels. Researchers then depend on data analysis to distinguish effects at different levels, either because they are interested in more than one level or because they want to separate the effect at the level that interests them from the effects at other levels. Consider, for example, subunit managers' performance as indicated either by a subjective evaluation or by the profits of the subunits they manage. Subunit-manager performance may include an industry-level effect

[13] Level of data analysis is also called unit of analysis.

(performance common to all organizations or subunits in the industry due to industry-wide conditions) and an organizational-level effect (performance common to all managers in an organization due to the organization's strategy, size, structure, market position, etc.), as well as a subunit-level effect and an individual-level effect. Subjective evaluations may attempt, with more or less success, to partial out some of these effects (e.g. to eliminate industry-wide effects from an individual manager's evaluation through a subjective comparison of the subunit to others in the same industry), but the variable measure may still include effects from levels other than the one addressed by the theory employed in the study.

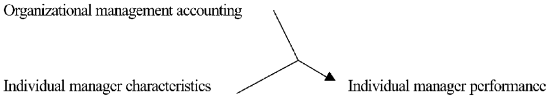
Effects on performance at different levels are sometimes additive. If the multi-level effects are additive, then the model is not *cross*-level by our definition: a variable as theoretically defined at one level does not affect a variable as theoretically defined at another level, although it may add noise to the measurement of variables at other levels. For example, no arrows cross levels in the model below:



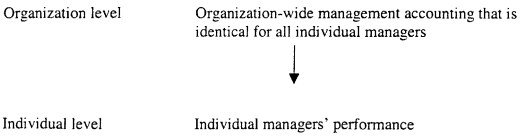
In statistical analysis, nested or hierarchical models including variables at multiple levels can be used to partial out additive effects at different levels—either to remove noise if some levels are not of interest to the theory being examined, or to identify the multiple-level effects separately if the theory is intended to explain variation at multiple levels (Bryk & Raudenbush, 1992; Kreft & DeLeeuw, 1998).[14]

[14] Hierarchical linear modeling is limited in that it requires the dependent variable to be measured at the lowest level of interest to the researcher, although predictor variables may be at higher levels. Latent variable structural equation modeling can be used, however, for multilevel models with predictors at lower levels and dependent variables measured at higher levels (MacKenzie, 2001).

Valid cross-level models, unlike a multi-level additive model where no arrows cross levels, must be interactive (Klein et al., 1994), as shown in Fig. 5 and the example below:



In this example, organizational management accounting which provides the same information to all individual managers can explain variation in individual-level performance only if there is some difference in individual managers (e.g. knowledge, preferences) that causes them to respond differently to the same management accounting information. In contrast, a cross-level theoretical model of the following form is invalid because uniformity in the cause cannot explain variation in the effect (Klein et al., 1994):



Qualitative studies can make clear through exactness of language, as quantitative studies do through statistical data analysis, whether differences across individuals or differences across organizations (or subunits or higher-level entities like markets or societies) are the focus of theoretical interest in the study. In studies addressing multiple levels, they can also make clear whether they are describing multi-level additive relations or cross-level interactions.

Some interactive top-down models appear on the maps, (e.g. Map E, link 1; Map F, links 19, 33; Map G, link 1; Map H, link 10; Map I, links 1, 8). Other management accounting studies, however, include language that implies cross-level non-interactive models, like the example above in which organizational management accounting causes individual performance. In these studies, it may be that the dependent variable of interest is actually at the same level as the independent variable (in the hypothetical example above, the dependent variable would be the organizational-

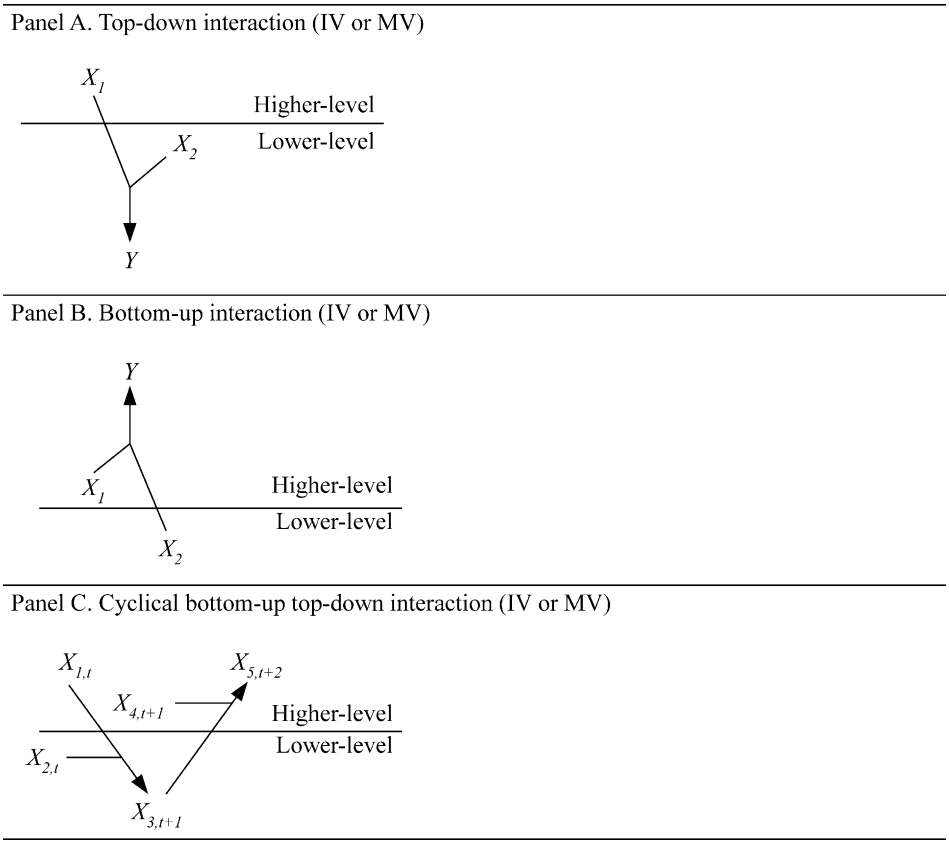


Fig. 5. Cross-level interaction models.

level component of individual managers' performance). Concerns arise about the validity of the research design in these studies, however. If the level of theoretical interest for the dependent variable is the organizational level, then multiple individuals within the organization do not constitute independent observations. If, on the other hand, observations of individual managers (one per organization) are being used as proxies to collect evidence on organizational effects, then the issue of adequacy of the proxy arises.

Some of the link-study pairs we have classified as single-level (especially individual-level) could arguably be cross-level: for example, the effects of participative budgeting and budget-based compensation on individual performance on Map A or the effects of incentives on individual performance on Maps F and G. Contracting and participative budgeting by definition require the involvement of more than one individual, which would appear to make them higher-level variables.

With these concerns in mind, we have classified the Map A studies as being at the individual level because they focus on individuals' constraints and opportunities arising from participation in budgeting, budget difficulty, etc., which are likely to vary across individuals in any given subunit or organization. In addition, the studies on Map A often use responses from multiple individuals within the same subunit or organization as independent observations. Subunit- or organizational-level effects are not typically partialled out, however, and there may be some doubt as to how much of the causes and effects captured are individual and how much are higher-level.

Similar reasoning determines the identification of levels of analysis in the incentive-contracting experiments on Map F. In this map, subunit-level

incentive-contracting variables capture variation across small groups of individuals, such as bargaining pairs or superior-subordinate pairs. In these studies, the variation of interest is variation in how a pair of subjects respond together to the experimental condition. In other Map F studies, however, values of incentive-contracting variables are assigned to individuals (rather than to pairs or larger groups) by the experimenter, and the variation of interest is variation in individual response to the experimental condition. In these studies, we have identified the variables as being at the individual level.

Like valid top-down cross-level models, valid bottom-up models are also interaction-form models with at least one of the interacting variables (independent or moderator) at the level of the dependent variable (Fig. 5, Panel B). Whether specified conditions in an organization or society lead to a particular effect depends on individual action (the bottom-up interacting variable; e.g. Map H, link 6). Similarly, how individual actions affect higher-level variables (e.g. by changing organizational structures or subunit management accounting) depends in part on higher-level variables such as the existing organizational designs. Top-down models are more common in the organizational literature than bottom-up models (Klein et al., 1999)—not necessarily because most causation is top-down but because top-down causal intervals are shorter. For example, individuals often react to organizations more quickly than organizations react to individuals (Kozlowski & Klein, 2000). If organizations influence individuals *and* vice versa, then causation is bidirectional; but if researchers want to simplify by using unidirectional models, then they need to choose the direction with the shorter causal interval (see Section 5.3), which will often be the top-down direction.

In the cross-level examples above, different variables (e.g. management accounting, performance) appear at higher and lower levels. A special kind of multi-level model, individual-within-group-level, that has not appeared in the management accounting literature, but arguably should, is one in which the higher-level variable is the *group* value of one of the lower-level (individual) variables (Klein et al., 1994; Kozlowski & Klein, 2000). Consider a contingency theory that predicts organizational performance will increase with improved fit of the organization's management accounting and production technology. A single-level study would relate fit and performance across organizations, perhaps with dummy variables for industry to eliminate performance effects from this source. However, an organization's performance may depend not only on the absolute fit between its management accounting and technology, but also on its fit compared to its competitors' fit. In this model the important point for an organization's performance is whether its fit is better or worse than that of its direct competitors, not whether it is better or worse than that of all organizations in the sample.

If this comparison to competitors drives performance, then regressing organizational performance on management accounting in a variety of markets—performing the analysis at an organizational level—could show no relation between management accounting and performance, even though *within* each market the relation is strong. Including dummy variables for markets is unlikely to solve the problem because these variables will only control for differences in average profitability across markets (e.g. the difference between profitability in the market for microchips and the market for groceries), not differences in average use of a management accounting practice. Two markets with similar average profitability could have different average use of a potentially beneficial management accounting practice. Thus a given level of use of this practice could be relatively low and therefore performance-decreasing in one market, while exactly the same level of use could be relatively high and therefore performance-increasing in a different market.

Guidelines:

13. Indicate whether the variable of interest varies across individuals, organizational subunits, organizations, or beyond-organization entities like markets and societies.
14. Align the level of theory (what is being explained), level of variable measurement

(source of evidence), and level of data analysis (unit of data).

15. If theoretical variables at multiple levels affect the observable measures, then separate the effects from multiple levels.
16. If cross-level effects are proposed, then use an interaction causal-model form, with at least one interacting (independent or moderator) variable at the level of the dependent variable.
17. If the variation of interest in a variable is variation in its value relative to a subset of other values in the sample, then use an individual-within-group-level model.

7. Management accounting as independent and/or dependent variable

Most studies on the maps explain only the causes of management accounting or only its effects (i.e. management accounting is only the dependent variable or only the independent variable; Table 1, Section 3.2). Section 7.1 introduces the issue of linking explanations of a variable's causes and explanations of its effects to create valid and more complete causal chains; it shows how these causal chains depend on the choices of variables, causal-model form, and levels of analysis discussed in Sections 4–6. Section 7.2 summarizes the conflicting views of different research streams on the feasibility of providing valid evidence on both explanations of the causes of management accounting and explanations of its effects on performance. Section 7.3 argues that knowing the length of a causal interval is key to choosing among these conflicting views and that identifying events within the causal interval will help to determine its length. Section 7.4 discusses linking attribute and event variables to create more complete and valid models of the causes and effects of management accounting, and Section 7.5 describes current theoretical constraints on creating such models.

7.1. Linking a variable's causes and effects

Quantitative studies typically examine one or two links in a causal chain (e.g. X_1 and X_2 cause Y) without examining the preceding or following links (the causes of the X_i's and the effects of Y), and typically management accounting is either X_i (the cause) or Y (the effect) but not both. Some qualitative studies examine longer causal chains, for example the multiple bidirectional causal links shown on Map I. When some studies explain only the causes of management accounting while others explain only its effects, questions can arise about whether the explanations of cause are consistent with the explanations of effect. The ABC studies on the maps provide an example, showing how issues of variable identification, causal-model form, and levels of analysis affect the validity and completeness of explanations of ABC's causes and effects.

Map D shows explanations of the causes of ABC implementation. These explanations often identify contexts in which ABC is assumed to be more successful or useful (e.g. higher competition, product diversity) and predict that ABC is more likely to be implemented in these contexts.[15] Thus in these studies explanations of the causes of ABC are based on assumptions about ABC's performance effects. If the assumptions about performance effects used to explain causes are correct, and if valid studies of the performance effects of ABC can be conducted (see Section 7.3), then causal-model forms should be consistent across studies of ABC's causes and studies of its effects. For example, suppose that higher competition causes more implementation of ABC, and this effect is not conditional on the level or type of competition or on other contextual variables (a positive additive linear relation, Map D, link 7). An explanation of performance effects consistent with this explanation of cause would show that ABC implementation has larger positive effects on performance in organizations facing higher competition, and this effect is not conditional on the level or type of competition or on other contextual variables (i.e. the explanation of performance

[15] Note that many but not all explanations of the causes of management accounting are based on assumptions about performance effects. The discussion in this section applies only to explanations that assume management accounting practices are adopted because of their performance effects.

effects has a positive additive linear form like the explanation of cause).

Studies of the causes and effects of ABC on the maps sometimes appear to have inconsistent causal-model forms. For example, Map D (link 7) shows that ABC is more likely to be implemented when competition is higher (a positive linear additive effect); Map G (link 1) shows that more accurate product costing increases profits under one kind of competition and decreases profits under another kind of competition (a disordinal interaction effect). Although studies of the causes of ABC on Map D often are based on assumptions of positive linear effects of ABC on performance, at least in some contexts, studies of the performance effects of ABC or similar variables do not show positive linear effects (e.g. the disordinal interaction effect of ABC on Map F, link 8; the curvilinear and negative effects of information quantity and dimensionality, which may be characteristics of ABC, on Map G, links 34, 35, 45).

Three explanations are possible for these causal-model form differences between cause and effect explanations. The first possible explanation is differences across studies in the meaning of similar variables. In this case, the assumptions about the performance effects of ABC that cause ABC implementation on Map D are correct but the actual performance effects of the variables on Maps F–G differ, because ABC on Map D means something different from ABC on Map F (link 8) and different from accuracy of product costs or quantity/dimensionality of information on Map G (links 1, 34, 35, 45). The second possible explanation is differences across studies in the levels of analysis. In this case also, the assumptions about the performance effects of ABC that cause ABC implementation on Map D are correct but there are systematic differences between the actual performance effects of ABC at different levels of analysis. For example, at the individual level, individuals might perform poorly in processing increased quantities of information (Map G, link 45), but at higher levels these effects might be mitigated through group information processing, market competition, etc. The third possible explanation is that the assumptions about performance effects of management accounting that explain its causes are not correct. For example, it might be that ABC is assumed to be useful in all kinds of increased competition (Map D, link 7) and is therefore implemented more when any kind of competition is higher, but in fact it is not more useful in all kinds of competition (Map G, link 1). This third explanation is controversial. Economics-based research often excludes it, because it assumes that organizations systematically use management accounting that is not optimal for them (e.g. they implement ABC more under conditions in which ABC does not maximize performance) (Ittner and Larcker, 2001). The following subsection describes the positions taken on this controversial issue by different streams of management accounting research.

7.2. *Causes, effects, and equilibrium*

Because of their theoretical antecedents, different streams of management accounting research take different positions on the validity of the third explanation above. The psychology-based research on Maps A, F, and G and the sociology-based research on Maps H and I assume that explanations of the causes of management accounting and explanations of its performance effects can differ. This research assumes that management accounting can be adopted for reasons other than performance maximization (e.g. because of its symbolic value, Map H, links 2–3). This research also assumes even when the goal is performance maximization, systematic judgment and decision errors can result in the use of management accounting in ways that do not maximize performance (e.g. Map G, links 11, 21, 31). The economics-based research on Map E and the contingency-theory-based research on Maps B–D make different assumptions which constrain the explanations of cause and explanations of effect that can be researched. The constraints imposed by these two theoretical perspectives are discussed in turn below.

Economics-based research depends heavily on assumptions of equilibrium. In this research stream, explanations of the use of a management accounting practice are explanations of why it is

an equilibrium solution to an economic problem. If management accounting is an equilibrium solution, then it is possible to provide nonexperimental evidence for explanations of its causes but not for explanations of its performance effects. Researching performance effects requires a comparison of organizations that perform differently because some are using the management accounting that is optimal for them and some are not. In equilibrium, all organizations are using the management accounting that is optimal for them. Thus, given the assumption of equilibrium, the relevant comparison is impossible to make because there is no variation in performance explained by optimal versus suboptimal management accounting choices (see Ittner & Larcker, 2001 for a discussion of this argument).

The contingency theory of organizations, like economics, assumes that organizations tend to use the management accounting that is best for them (i.e. the management accounting that fits). Unlike economics, however, contingency theory assumes that misfit also occurs in some organizations for extended periods (Donaldson, 1996). Under this assumption, it is possible to provide nonexperimental evidence on performance effects of management accounting (interaction fit) as well as on its causes (selection fit). However, these explanations of cause and explanations of effect cannot always be researched in the same settings.

Selection-fit predictions will be supported only if most organizations for which the management accounting practice is a good fit (as defined by the theory) have adopted it and most organizations for which the practice is not a good fit have not adopted it. If the results of these studies of cause are strong enough, then studying effects becomes impossible because there are too few organizations in misfit: there is not enough variation in performance due to the fit of the management accounting practice to provide a powerful comparison. *Both* selection and interaction fit can be examined only under one of the two following conditions. First, there may be a point in time at which a majority of organizations have achieved fit, thus providing valid evidence about selection fit, but a sufficiently large number of organizations remain that have not achieved fit, thus providing valid evidence about interaction fit. Second, interaction fit can be tested when only a moderate number of organizations have achieved fit and selection fit can be tested afterward. In order for either of these situations to occur, the events that cause misfit must occur later in some organizations than others and/or some organizations must move from misfit to fit more slowly than others.

The differences summarized above between economics- and contingency-theory-based research depend on assumptions about equilibrium: whether it exists in the social systems that include management accounting, and if so, how rapidly these systems return to equilibrium after being disturbed. The validity of these assumptions is largely unknown, however. Research in the social and natural sciences indicates that the dynamics of some complex natural systems (even when driven by the adaptive, evolutionary forces that are often represented as generating economic equilibria) can cause cyclical or chaotic dynamics rather than equilibria (Richardson, 1991).[16] In complex natural systems, the length of the causal intervals within a system determine whether the system's behavior is equilibrium, cyclical, or chaotic (Stewart, 1989).

The longer causal intervals that drive cyclical or chaotic dynamics in biological or physical systems often exist because the non-human actors in these systems cannot foresee the consequences of their actions and alter their behavior to stabilize the systems (Richardson, 1991). Thus it is sometimes argued that chaotic and cyclical dynamics will not occur in social and economic systems: because humans can foresee the consequences of their actions, they can prevent the maladaptations that cause chaotic or cyclical behavior. For example, the theory of rational expectations in economics (Muth, 1961) is intended to support predictions of equilibrium in markets and refute predictions of cyclical dynamics. Whether such unbiased foresight actually exists remains an open question.

Moreover, subsequent arguments have been made that cyclical and chaotic dynamics emerge

[16] The behavior of these complex natural systems has been represented by sets of nonlinear differential equations, like those used in systems-dynamics modeling of business situations (Ashton, 1976b; Richardson, 1991, pp. 36–38; Sterman, Repenning, & Kofman, 1997).

even *with* rational expectations, when there is a lag in the formation of expectations (a question of causal interval in individual judgments) or if supply and demand curves are curvilinear (a question of causal-model form) (Rosser, 1996, p. 203). Multiperson experiments have supported the prediction that time lags and curvilinearities, together with combinations of direct and indirect (intervening-variable) causal effects, generate cyclical and other non-equilibrium outcome patterns in laboratory economies (Diehl & Sterman, 1995; Sterman, 1989a, 1989b). Finally, the competition and learning processes that are often invoked to justify equilibrium assumptions in the absence of constant rational expectations (e.g. Alchian, 1950; Fudenberg & Levine, 1998) are not yet well understood: archival, experimental, and simulation data suggest that these processes sometimes result in optimizing equilibria and sometimes do not (Carroll & Hannan, 2000; Fudenberg & Levine, 1998).

Section 5 argued that knowing the length of a causal interval is important in choosing valid causal models (e.g. unidirectional, reciprocal nonrecursive, cyclical recursive). The discussion above shows that knowing the length of the causal interval is also important in understanding major differences among research streams in management accounting and assessing the likelihood that a theory will predict well in a particular setting: a theory that assumes a system is always in equilibrium will have limited explanatory power for a system that is mostly out of equilibrium and vice versa. The following subsection therefore discusses bases for understanding the length of causal intervals around and within management accounting.

7.3. Causal intervals, attributes, and events

Causal intervals appear to vary considerably, although current evidence is limited. Lanen and Larcker (1992; Map E, link 1) show electric utilities changing their incentive compensation in response to regulation changes as early as the year following the regulation change. In Banker, Potter, Srinivasan (2000) (Map E, link 28), performance responds to an incentive change within months. On the other hand, other studies provide evidence of much longer causal intervals—for example, Anderson's (1995) description of the seven-year history of ABC implementation at General Motors (Map D, links 1, 3, 4, 7) and Miller and O'Leary's (1994, 1997) description of Caterpillar's ten-year transition to modern manufacturing (Map I, links 1, 3–7, 9). Consistent with these longer intervals, contingency-theory research provides evidence that organizations move from strategy-structure misfit toward fit, but that most organizations take at least 10 years to change their structure (Donaldson, 2001). Thus, some change involving management accounting is rapid but some is not. If the causal interval for the relation being investigated is not known, the validity of the research is in question.

Although the existing management accounting literature provides some empirical evidence on the length of causal intervals, it does not appear to provide much theoretical basis for understanding why there is variation in the length of causal intervals. Abbott's (1992) distinction between attribute and event variables is helpful in understanding this issue. Some variables on the maps are examples of events: for example, a single decision whether to investigate a cost variance (Map G, links 22–25) or a single act of misrepresenting private information during participative budgeting (Map F, links 20, 24–32). Other variables on the maps are examples of attributes: for example, decentralization as an attribute of organizations (Map B, link 2), symbolic value as an attribute of management accounting information (Map H, links 2, 3), and attitude toward the job as an attribute of individuals (Map A, links 28, 29).[17]

The questions about causal-interval length raised above are often questions about the time required for a change in one attribute to result in a change in another attribute: for example, the time required for a change in environmental uncertainty to result in a change in the timeliness of management accounting information, and the

[17] Abbott (1992), using the narrower definition of variables cited in Section 2.2, identifies attributes but not events as variables. Using the broader definition of variables as what researchers study, we label both attributes and events as variables.

time required for a change in the timeliness of management accounting information to result in a change in organizational or subunit performance. Thus to say that environmental uncertainty causes the timeliness of management accounting information is "...a quick way of summarizing many narratives in which [environmental uncertainty] accounts for [timeliness]." (Abbott, 1992, p. 431).[18] These narratives consist of sets of events, which provide the causal mechanism by which attributes come into existence and change (Hedstrom & Swedberg, 1998). For example, individuals notice a change in uncertainty, make various judgments about it, agree or fail to agree on whether it is occurring, whether it calls for action, and if so what action. If there is sufficient agreement on making a change to management accounting, then additional specific events must occur for the change to happen and affect performance (e.g. particular individuals must purchase and install new software, other individuals must change the way they do their jobs).

The causal interval will be longer when the causal mechanism includes more events and/or the events are more time-consuming (e.g. if the event is production of one unit, it takes longer to produce one airplane than to produce one pair of socks). The link between any given pair of attributes will not always be composed of the same set of events: there is likely to be more than one way in which management accounting changes in response to changes in uncertainty, for example. But the sets of events that can link two particular attributes are probably not infinite in number and not equally likely; and understanding such events is likely to add to our understanding of the causal relations among the attributes.

7.4. Linking attributes and events

Some streams of research focus more on attributes (e.g. contingency-theory studies linking organizational structure to management accounting characteristics) while others focus more on events (e.g. sociology-based narrative studies, psychology-based studies explaining individual judgments or decisions). Connecting these streams to understand the causal links between attributes and events would be helpful in creating more complete explanations of management accounting's causes and effects, because events can explain the links between attributes and attributes can explain the links between events.[19]

Understanding the events that create the causal link between attributes supports more valid research about the attribute linkages because it helps to specify their causal intervals. Understanding these events can also help in assessing the plausibility of competing explanations of causal links between attributes because the sequence of events assumed by one explanation may be less likely to occur than the sequence of events assumed by another explanation. Conversely, attributes help to explain why one event follows another and thus to explain patterns of similarity among events. For example, an individual may refuse an offer in a compensation-contract negotiation (the offer and the refusal are two events) because he or she is risk-averse (an attribute of the individual). Similarly, attributes of management accounting or production systems or the individuals involved in them may explain why management accounting change and production change (events) occur in a pattern of repeated mutual adjustments rather than one large-scale completed change in production unidirectionally causing one large-scale change in management accounting.

Events as well as attributes can be defined at either the individual level or higher levels. Consider, for example, the events linking organizational-level environmental uncertainty to organizational-level management accounting. If all (or virtually all) the relevant individuals in an organization observe and assess environmental uncertainty in the same way and all decide on and implement the same management accounting in

[18] The original example in Abbott (1992) uses education and occupational achievement as the attributes.

[19] Some philosophical approaches to the social sciences do not ascribe causality to attributes while other approaches do not ascribe causality to events (Abbott, 1992, 1998). In this paper we use the term causal to describe the full range of explanations employed in management accounting research, which uses both attributes and events to explain other attributes and events.

response, then these events would be at the organizational rather than the individual level by the definition employed in this paper, since there is no individual variation of interest. If, however, different individuals in an organization observe and assess environmental uncertainty differently and take different actions in deciding on and implementing management accounting, these events are at the individual level. In the latter case, the interaction of the organizational-level attribute (environmental uncertainty) with the individual-level events or attributes produce further individual-level events (a top-down interaction relation between attributes and events). How these individual-level events result in a change in organizational-level management accounting is conditional on other organizational-level attributes (e.g. technology, structures of communication and authority in the organization) or organizational-level events (e.g. mass layoffs, mergers; a bottom-up interaction relation between attributes and events).

The causal chain in the environmental uncertainty—management accounting example begins and ends with attributes, but causal chains can also begin and/or end with events (cf. Map C, link 5, which begins with an event, management buyout, and ends with an attribute, increased reliance on the management accounting system). A higher-level event can interact with individual-level attributes to cause individual-level events that then interact with an organizational-level attribute to cause a new organizational-level event. The choice of beginning and end points of causal chains depends on the research question and the theory used to address it.

The cross-level causal relations described in the examples above are illustrated in Fig. 5, Panel C. More variables, more levels, and more points in time could be included; but at a minimum each cross-level link in a model must include an interacting variable at the level of the dependent variable in that link, as explained in Section 6.2. Unless individual-level and higher-level variation have no effects on each other, versions of this model offer more complete explanations of the causes and effects of management accounting than the other models shown in Figs. 1 and 5. We do not suggest that this is the best model for every (or perhaps any) individual study, but rather that the literature as a whole would ideally provide an understanding of management accounting consistent with this causal-model form.

Two constraints presently limit the creation of such an understanding. First, although the studies shown on the maps include both attribute and event variables at multiple levels, the variables of one type or at one level often belong to different causal chains than the variables of another type or at another level. Second, the different theories used in management accounting research address limited parts of a complete cross-level model of management accounting. None of these theories addresses all parts of such a model equally successfully, and combining multiple theories can be problematic because of the theories' incompatible assumptions. These two constraints are discussed in more detail in the following subsection.

7.5. Theoretical constraints

Variables in different causal chains. The individual-level events that appear on the maps often do not fit clearly into causal chains linking the higher-level attributes and events that appear on the same or other maps. For example, Maps B–E link higher-level attributes like strategy, management accounting and performance, and Map I links higher-level events like economic, organizational and management accounting change. Some set of individual-level events and attributes presumably helps to explain each of these higher-level links; but they may not be the individual-level events and attributes represented, for example, on Maps F and G, such as the use of opportunity costs, decisions to investigate cost variances, and risk aversion.

Similar issues arise within levels of analysis: for example, the studies of individual or subunit budget-negotiation events and attributes on Map F could in principle help to explain the relations among budgeting attributes on Map A. However, the variables on Maps A and F are often defined by different theories, and it is not clear whether they belong in the same causal chain. For example, a subordinate's act of misrepresenting private

information in participative budgeting is an important event on Map F because of the influence of economics (agency theory and bargaining-game theory). It is not clear without further theoretical development, however, how the act of misrepresentation and its causes, as shown on Map F, would form part of many of the causal chains linking social-psychology attribute variables on Map A (e.g. the link from participation to motivation). Disconnects between variables across maps—not only whether they are events or attributes, but also which particular events and attributes are studied—depends in part on the theoretical antecedents of these maps, which have guided research toward different specific questions.

Theories. Different theories employed in management accounting research address different parts of a model of management accounting that is based on the model shown in Fig. 5, Panel C. Psychology theories provide explanations primarily at the individual level and the small subunit level (i.e. groups of two or three individuals), including both attributes and events. In principle these theories can provide a basis for top-down models by explaining differential individual-level events resulting from higher-level attributes (e.g. Map F, link 19), but these theories do not provide a basis for bottom-up models showing how individual-level events (e.g. judgments, decisions) or attributes (e.g. attitudes) cause either higher-level attributes like characteristics of organizations and markets or higher-level events like organizational or societal change.

The contingency theory of organizations tends to explain attributes by other attributes at the organizational and large-subunit levels but does not include individual-level events. In contingency theory, "...little scope is seen for choice or human volition....There is thus the absence of an analysis at the level of the human actors,...their beliefs, ideals, values, interest, power, and tactics." (Donaldson, 1996, pp. 63–64). Contingency theory thus provides a basis for models that link attributes above the individual level but not for models of the relations between these attributes and individual-level events.

The economic theories employed in management accounting research provide explanations at both the individual level and higher levels. They also posit specific causal mechanisms by which higher level attributes or events like environmental uncertainty and competition, interacting with individual-level attributes like preferences, cause individual-level events; and these in turn, interacting with higher-level variables, cause other higher-level attributes or events (e.g. Milgrom & Roberts, 1992).[20] Thus, economic theories claim to address the individual level, higher levels of analysis, and the causal mechanisms of cross-level linkage, in a way that psychology and contingency theories do not. A principal limitation of using economic theories as a basis for complete cross-level models, however, is that existing economic theories often do not predict well at individual and small-subunit levels of analysis. Many of the Map F and G studies test predictions from economics against predictions from cognitive psychology and usually support the latter; economic theories' stringent assumptions of rationality and limited preferences (e.g. wealth and leisure only in agency models) seem to reduce their predictive validity for lower-level events.[21]

The sociology theories employed in management accounting often focus on beyond-organization variables, both attributes of societies (e.g. discourse, symbolic values) and events that occur similarly across a whole society (e.g. capital-labor conflict, resistance to management accounting). In some instances they also highlight organizational and individual differences as causes or effects of difference in the effects of beyond-organization variables (Map H, links 6, 10). Thus, sociology theories provide more explanation for the beyond-organization level of a complete model of management accounting than psychology and contingency theories do; they also provide some limited cross-level links. Some sociology theories

[20] For example, Abbott (1992) describes game theory as a way of modeling narratives that links events and attributes.

[21] Why the predictions are better supported at higher levels of analysis remains an open question: differences in predictive ability across levels may in part be artifacts of the research methods employed at different levels of analysis and in part be the results of how lower-level events combine to cause higher-level variables (e.g. different judgment errors canceling each other out) (Berg, Dickhaut, & McCabe, 1995; Luft, 1997).

focus on events while others focus on attributes, and linking events and attributes remains problematic (Abbot, 1992, 2001).

Each of the common theoretical perspectives for management accounting research supports only portions of a complete cross-level bidirectional interaction model, relating attributes and/or events. While it is not surprising that we do not have a "theory of everything" in the social sciences, it is important to note that the absence of a more complete understanding of the causes and effects of management accounting has implications for the conduct of more limited studies. When researchers use a unidirectional linear additive model to capture the effect of a particular management accounting practice on organizational performance (as well as many other causes and effects of management accounting), they are making assumptions about the form and content of a more complete model. For example, they are assuming that the causal interval in the direction they are studying is shorter than the causal interval in the direction they are not studying (Section 5.3) and that the causal interval in the direction they are not studying is different for different organizations (Section 7.2). These assumptions in turn (if they are not purely arbitrary) are based on assumptions about the sets of events that occur between a change in one attribute and a change in another attribute or between the two events being studied.

8. Conclusion

We have described three ways of identifying valid connections and disconnects among the multiple streams of theory-consistent empirical research in management accounting: identifying variables with partially shared meanings (Section 4), identifying conflicts among different causal-model forms linking similar variables (Section 5), and identifying relations among variables at different levels of analysis (Section 6). Dealing with all three issues simultaneously is required for a complete and valid explanation of management accounting and its effects, like that shown in Fig. 5, Panel C.

Higher-level attributes such as organizational decentralization and market competition influence individual-level events such as the evaluation of a subordinate or the decision about whether or how to use management accounting information—the top-down segment of the model. But these higher-level attributes are caused by individuals' enacting or reproducing them through specific events (cf. Giddens, 1976)—the bottom-up segment of the model. Thus top-down and bottom-up causation are inseparable from each other. As Douglas (1986, p. 43) observes:

> The entrenching of an idea is a social process...Conversely, the entrenching of an institution is essentially an intellectual process as much as an economic and political one...Half of our task is to demonstrate this [individual] cognitive process at the foundation of the social order. The other half of our task is to demonstrate that the individual's most elementary cognitive process depends on social institutions.

If cross-level models are necessary for a complete and valid explanation of the causes and effects of management accounting, then causal-model form is important. Consider a top-down segment of such a model in which organizational-level management accounting affects an individual's decision. If management accounting has the same effect on all individuals, then there would be no need to consider individuals per se in management accounting research. But the same management accounting often has different effects on different individuals. Some variation across individuals must cause this differential effect: thus, as noted in Section 7, the organizational-level variable (in this case, management accounting) must interact with an individual-level variable (e.g. knowledge, risk preferences) to produce individual-level effects. Similarly with bottom-up models: the effects of individual-level differences on higher-level attribute variables depends on other higher-level variables that determine how different individual-level events are combined with each other.

As described in Sections 5 and 7, understanding causation, especially bidirectional causation,

requires knowledge of causal intervals (i.e. the length of time from cause to effect). This in turn requires an understanding of the sets of events that explain the links between attributes or other events. In effect, this is the kind of explanation represented in Fig. 5, Panel C, in which the interaction of higher-level and individual-level attribute and/or event variables cause individual-level events; and these diverse events interact with existing higher-level variables to cause new higher-level attribute and/or event variables.

The research summarized in this paper does not yet provide such a complete and valid explanation of management accounting and its effects. We hope that the nine graphics in the Appendices and the 17 guidelines summarized in Fig. 4 will aid researchers in building such an explanation by creating individual studies that can be clearly situated with respect to the more complete explanation (Fig. 5, Panel C), in terms of variables, causal-model forms, and levels of analysis. Such studies would help to identify more of the natural connections and eliminate artifactual connections within and across the diverse streams of theory-consistent management accounting research.

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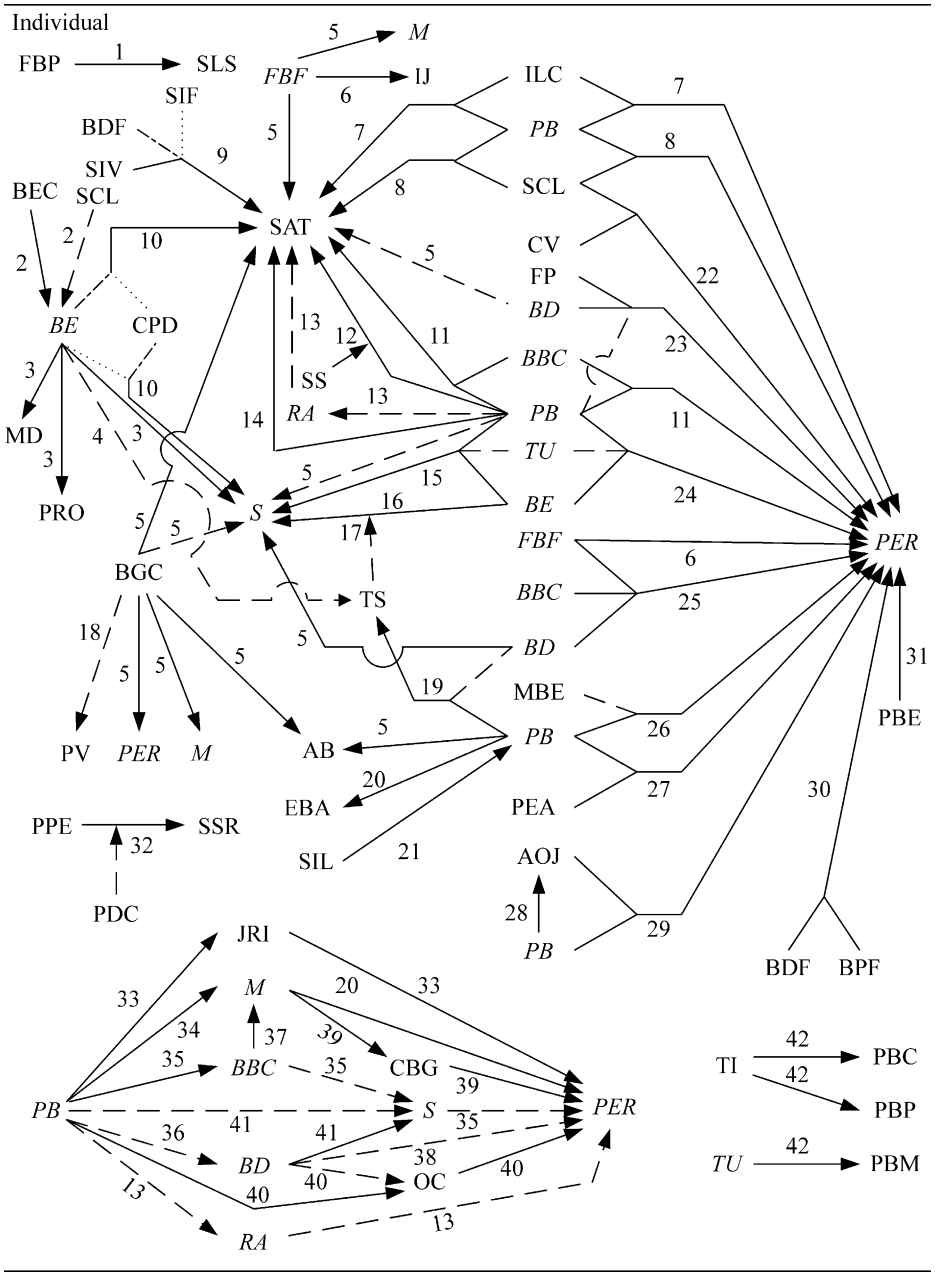
Appendix A. Causes and effects of budgeting at the individual level



Variable identification

AB Attitude that budget is useful
AOJ Attitude toward organization and job
BBC Budget-based compensation
BD Budget difficulty

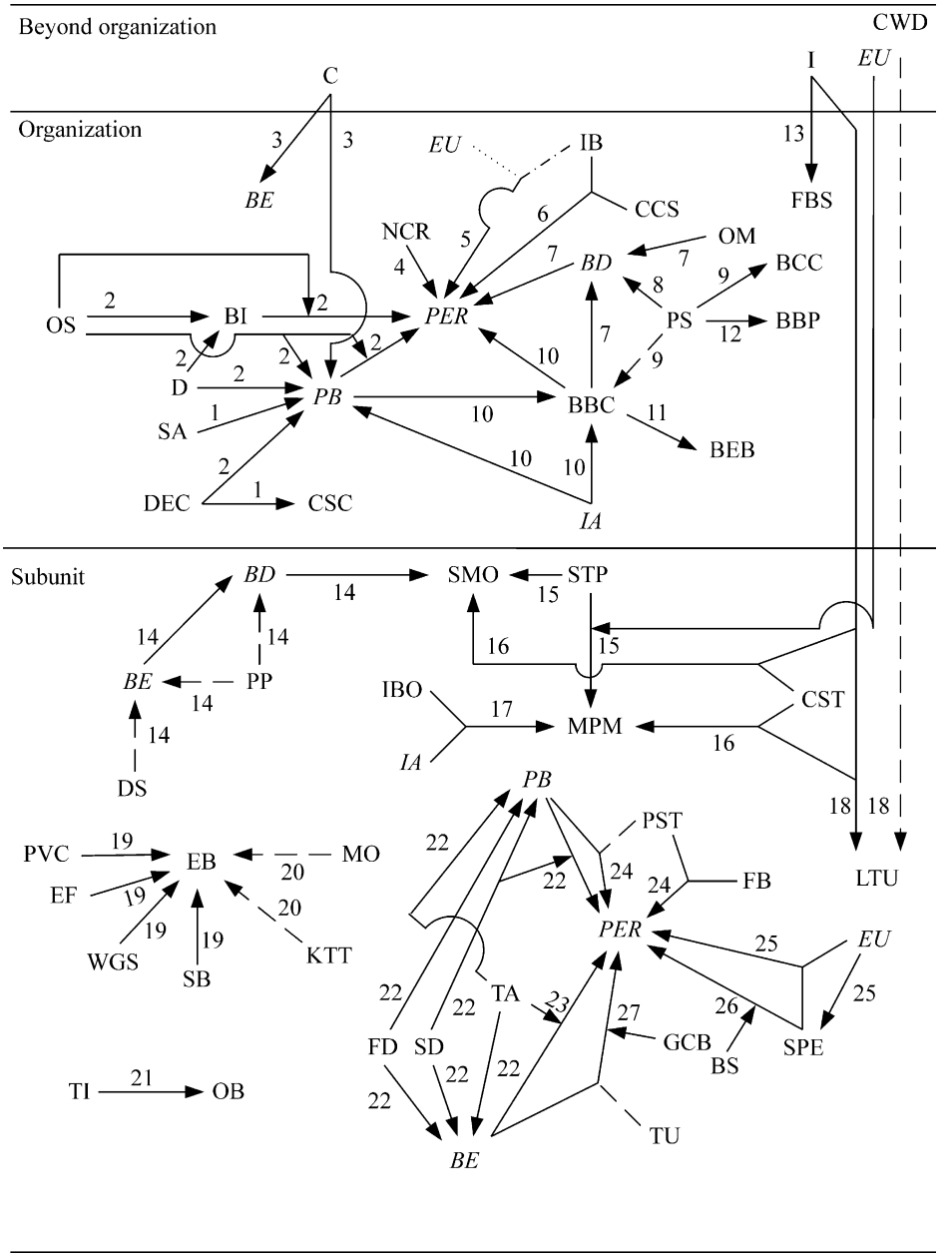
BDF Budget-difficulty fairness
BE Budget emphasis by a superior in evaluating a subordinate
BEC Budget emphasis by superior's superior in evaluating a subordinate (contagion)
BGC Budget goal clarity
BPF Budget-process fairness
CBG Commitment to the budget goal
CPD Collectivistic/power-distance national culture (beyond organization level variable)
CV Controllability of budget variances used for determining rewards
EBA Expectation that budget will be achieved
FBF Frequency of budget feedback
FBP Felt budget pressure by superior
FP Fixed pay
IJ Interest in job
ILC Subordinate's internal locus of control
JRI Job relevant information
M Motivation
MBE Management-by-exception
MD Manipulation of data
OC Organizational commitment
PB Participative budgeting
PBC Use of participative budgeting to coordinate task interdependence
PBE Explanation given for why participation did not lead to budget subordinate proposed
PBM Use of participative budgeting to increase subordinates' motivation
PBP Use of participative budgeting for planning and goal setting
PDC Power-distance culture
PEA Performance evaluation criteria agreement
PER Performance
PPE Participative performance evaluation
PRO Poor relations with superiors and peers
PV Variance in performance
RA Role ambiguity
S Stress
SAT Satisfaction
SCL Superior's considerate leadership style
SIF Subordinate influence on budget
SIL Superior's internal locus of control
SIV Subordinate involvement during budgeting
SLS Superior's initiating structure leadership style
SS Superior-subordinate authoritarianism consistency **[subunit-level variable]**
SSR Superior-subordinate good relationship
TI Task interdependence
TS Trust in superior
TU Task uncertainty

Prior research

1. DeCoster and Fertakis (1968)

2. Hopwood (1974), Rahman and McCosh (1976)
3. Hopwood (1972)
4. Otley (1978)
5. Kenis (1979)
6. Cook (1967)
7. Brownell (1981, 1982a), Frucot and Shearon (1991)
8. Brownell (1983a)
9. Lindquist (1995)
10. Harrison (1993)
11. Cherrington and Cherrington (1973)
12. Chenhall (1986)
13. Chenhall and Brownell (1988)
14. Milani (1975), Kenis (1979)
15. Brownell and Hirst (1986); PB × BE: Harrison (1992)
16. Hopwood (1972), Kenis (1979)
17. Ross (1994)
18. Hirst and Yetton (1999)
19. Magner, Welker, and Campbell (1995)
20. Brownell and McInnes (1986)
21. Licata, Stawser, and Welker (1986)
22. Ansari (1976)
23. Tiller (1983)
24. Brownell and Dunk (1991), Lau, Low, and Eggleton (1995); PB × BE: Brownell (1982b), Dunk (1989); PB × TU: Brownell (1985), Mia (1989); BE × TU: Abernethy and Brownell (1997)
25. Rockness (1977); BD × F: Hirst and Lowy (1990)
26. Brownell (1983b)
27. Dunk (1990)
28. Milani (1975)
29. Mia (1988)
30. Libby (2001)
31. Libby (1999)
32. O'Connor (1995)
33. Kren (1992)
34. Searfoss (1976), Kenis (1979), Kren (1990)
35. Shields, Deng, and Kato (2000)
36. Nouri and Parker (1998), Shields, Deng, and Kato (2000)
37. Searfoss (1976), Kren (1990)
38. Kenis (1979), Nouri and Parker (1998)
39. Kren (1990)
40. Nouri and Parker (1998)
41. Kenis (1979), Shields, Deng, and Kato (2000)
42. Shields and Shields (1998)

Appendix B. Causes and effects of budgeting at the organization and subunit levels



Variable identification

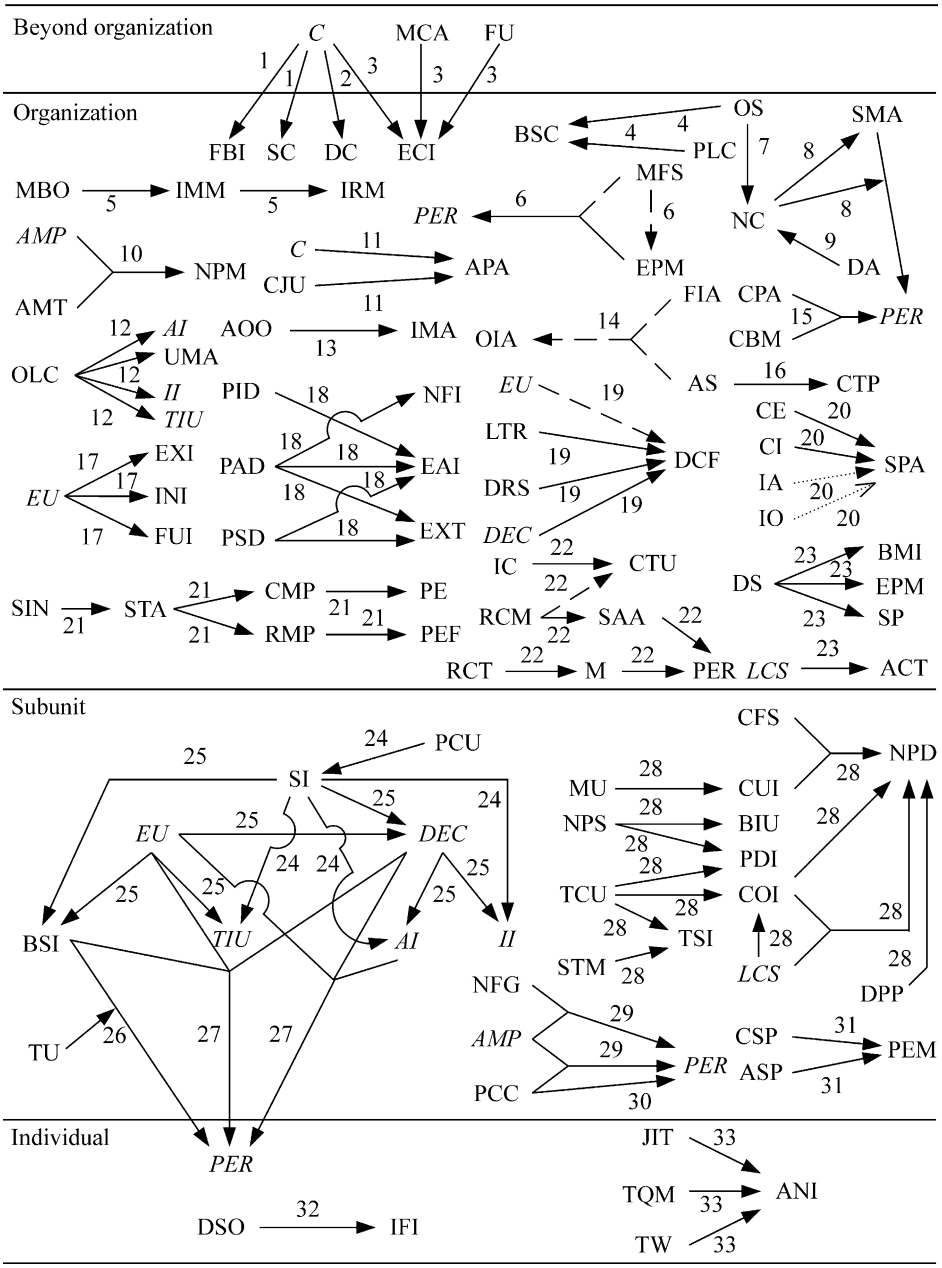
BBC Budget-based compensation
BBP Budget-based planning
BCC Budget-based cost control

BD	Budget difficulty
BE	Budget emphasis by a superior in evaluating a subordinate
BEB	Budget estimate bias
BI	Budget importance
BS	Build strategy
C	Competition
CCS	Change in competitive strategy
CSC	Control system complexity
CST	Control system tightness
CWD	Confucian work dynamism
D	Diversification
DEC	Decentralization
DS	Differentiation strategy
EB	Importance of expenditure budget for management control
EF	External funding
EU	Environmental uncertainty
FB	Flexible budget
FBS	Formality of budget system
FD	Functional differentiation
GCB	Goal congruent behavioral orientation
I	Individualism
IA	Information asymmetry within organization
IB	Interactive use of budgets
IBO	Importance of dealing with budget overruns
KTT	Knowledge of task transformation process
LTU	Long-term incentive use
MO	Measurability of output
MPM	Manipulate performance measure
NCR	Number of potential causes of budget variances recorded in the accounting system
OB	Use of operating budgets for management control
OM	Outcome monitoring
OS	Organizational size
PB	Participative budgeting
PER	Performance
PP	Past performance
PS	Prospector strategy
PST	Product standardization
PVC	Planning vs. control decision
SA	Structure of activities
SB	Size of budget
SD	Size of department
SMO	Short-term managerial orientation
SPE	Subjective vs. formula approach to performance evaluation
STP	Short-term profit pressure
TA	Technology automation
TI	Task interdependence
TU	Task uncertainty
WGS	Work-group size

Prior research

1. Bruns and Waterhouse (1975)
2. Merchant (1981)
3. Anderson and Lanen (1999)
4. Emsley (2000)
5. Chapman (1998)
6. Abernethy and Brownell (1999)
7. Simons (1988)
8. Simons (1987, 1988)
9. Simons (1987)
10. Shields and Young (1993)
11. Walker and Johnson (1999)
12. Collins, Holzmann, and Mendoza (1997)
13. Birnberg and Snodgrass (1988)
14. Van der Stede (2000)
15. Merchant (1990)
16. Chow, Kato, and Merchant (1996)
17. Merchant (1985)
18. Merchant, Chow and Wu (1995)
19. Rockness and Shields (1988)
20. Rockness and Shields (1984)
21. Macintosh and Daft (1987)
22. Merchant (1984)
23. Dunk (1992)
24. Brownell and Merchant (1990)
25. Govindarajan (1984)
26. Govindarajan and Gupta (1985)
27. Abernethy and Stoelwinder (1991)

Appendix C. Information for planning and control



Variable identification

ACT Activity-based accounting and management
AI Usefulness of aggregated information

AMP	Advanced manufacturing practices
AMT	Advanced manufacturing technologies
ANI	Availability of nonfinancial information to workers
AOO	Acquisition by another organization
APA	Adoption by Chinese organization of joint-venture partner's management accounting
AS	Asset specificity
ASP	Achievement of sales or profit target, controlling for the level of sales or profit
BIU	Use of budget information in management control system
BMI	Benchmark information
BSC	Balanced scorecard use
BSI	Usefulness of broad scope information
C	Competition
CBM	Capital budgeting monitoring system
CE	Capital expenditures
CFS	Customer-focused strategy
CI	Capital intensity
CJU	Chinese organizations' joint-venture partner is a US organization vs. non-US organization
COI	Use of cost information in the management control system
CMP	Clinical-management performance measures
CPA	Capital asset abandonment/sale
CSP	Controllable portion of sales and profits
CTP	Cost-based transfer pricing
CTU	Conflict and tension among balanced-scorecard users
CUI	Use of customer information in the management control system
DA	Diverse activities within organization
DC	Use of disaggregated cost information
DCF	Effectiveness of discounted cash flow model for capital budgeting decisions
DEC	Decentralization
DPP	Detailed project planning
DRS	Discounted cash flow-based reward system
DS	Differentiation strategy
DSO	Type of decision is more strategic and less operational
EAI	Usefulness of ex ante relative to ex post information
ECI	Use of elaborate cost information
EPM	Efficiency-based performance measure
EU	Environmental uncertainty
EXI	Usefulness of external, historical information
EXT	Usefulness of external relative to internal information
FBI	Use of flexible-budget information
FIA	Frequency of internal audit
FU	Funding uncertainty
FUI	Usefulness of future, internal information
IA	Information asymmetry within organization
IC	Ineffective communication about balanced-scorecard measures
IFI	Importance of financial information for decision making
II	Usefulness of integrated information
IMA	Increased importance of management accounting practices
IMM	Improved matching of management accounting with contextual variables

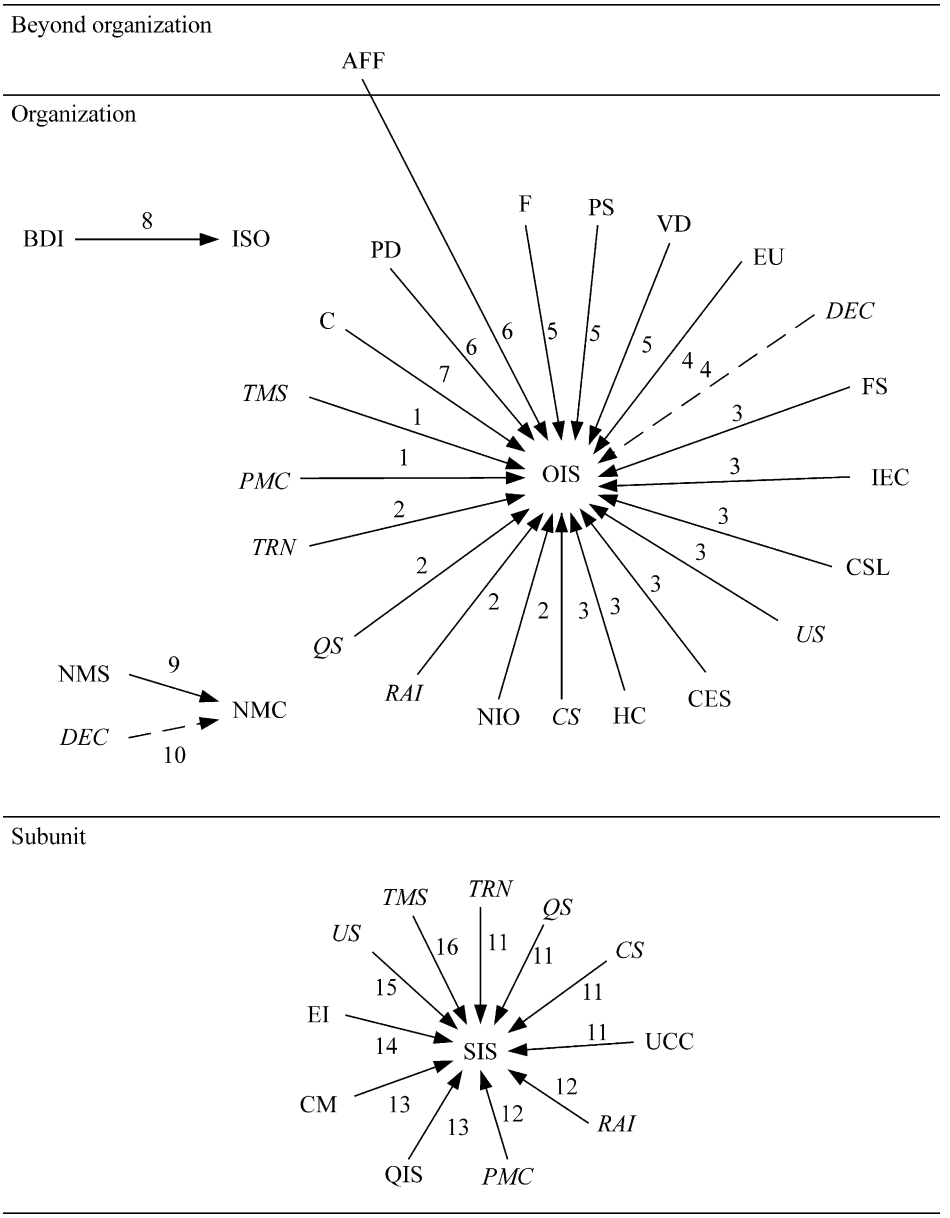
INI	Usefulness of internal, nonfinancial information
IO	Inside ownership
IRM	Increased reliance on management accounting system
JIT	Just in time
LCS	Low-cost/price strategy
LTR	Long-term reward
M	Motivation
MBO	Management buyout
MCA	Mandated government cost-accounting system
MFS	Manufacturing flexibility strategy
MU	Market uncertainty
NC	Need for internal coordination
NFG	Existence of quantified nonfinancial goals
NFI	Usefulness of nonfinancial relative to financial information
NPD	New product development performance
NPM	Importance of nonfinancial performance measures
NPS	New product development project scope
OIA	Outsourcing of internal audit
OLC	Organizational life cycle (growth and revival stages vs. other stages)
OS	Organizational size
PAD	Alternative development phase of strategic capital budgeting decisions
PCU	Product customization
PCC	Performance contingent compensation
PDI	Use of product design information in the management control system
PEM	Positive performance evaluation of the manager
PE	Performance effectiveness
PEF	Performance efficiency
PER	Performance
PID	Identification phase of strategic capital budgeting decisions
PLC	Products are in early (vs. late) stages of life cycle
PSD	Project selection phase of strategic capital budgeting decisions
RCM	Reliable, comprehensive, causally-linked set of measures in balanced scorecard
RCT	Rewards based on controllable, challenging balanced-scorecard targets
RMP	Resource-management performance measures
SAA	Strategic alignment of action of balanced-scorecard users
SC	Use of standard cost information
SI	Subunit interdependencies
SIN	Service innovation
SMA	Sophisticated management accounting
SP	Strategic planning techniques
SPA	Sophistication of post-auditing of capital budgeting investments
STA	Structural autonomy
STM	Time-to-market strategy
TCU	Technological uncertainty
TIU	Usefulness of timely information
TQM	Total quality management
TSI	Use of time schedule information in the management control system
TU	Task uncertainty

TW Teamwork
UMA Use of management accounting information

Prior research

1. Khandwalla (1972)
2. Anderson and Lanen (1999)
3. Geiger and Ittner (1996)
4. Hoque and James (2000)
5. Jones (1992)
6. Abernethy and Lillis (1995)
7. Flesher and Flesher (1979)
8. Flesher and Flesher (1979), Johnson (1981, 1983)
9. Johnson (1981, 1983)
10. Perera, Harrison, and Poole (1997)
11. Firth (1996)
12. Moores and Yuen (2001)
13. Jones (1985)
14. Widener and Selto (1999)
15. Smith (1993)
16. Colbert and Spicer (1995)
17. Gordon and Narayanan (1984)
18. Larcker (1981)
19. Haka (1987)
20. Gordon and Smith (1992)
21. Abernethy and Lillis (2001)
22. Malina and Selto (2001)
23. Chenhall and Langfield-Smith (1998)
24. Bouwens and Abernethy (2000)
25. Chenhall and Morris (1986)
26. Mia and Chenhall (1994), Chong (1996)
27. Gul and Chia (1994)
28. Davila (2000)
29. Sim and Killough (1998)
30. Young, Shields, and Wolf (1988)
31. Ghosh and Lusch (2000)
32. Covaleski, Dirsmith, and White (1987)
33. Banker, Potter, and Schroeder (1993)

Appendix D. Implementing management accounting change



Variable identification

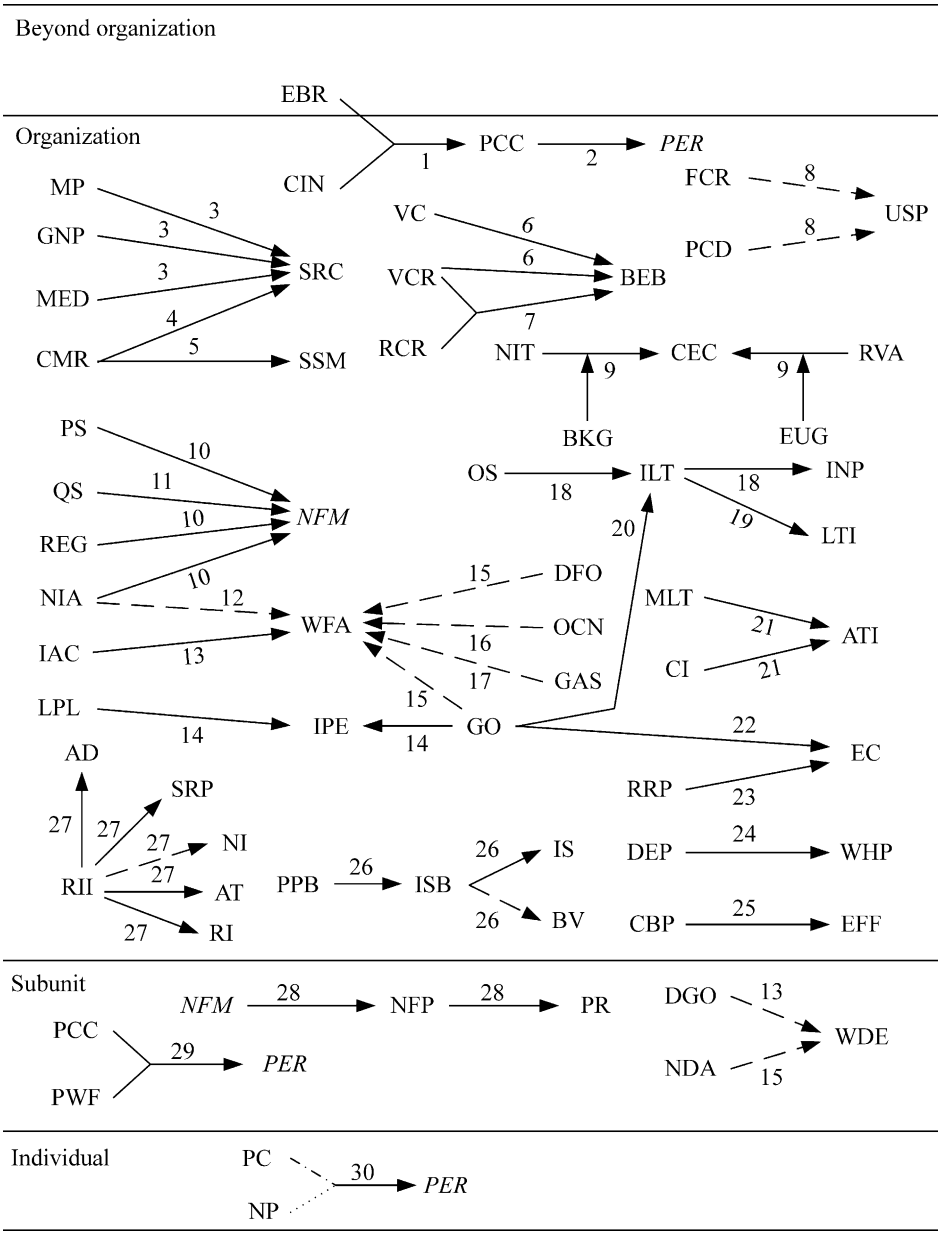
AFF ABC as fad and fashion
BDI Board of directors' interlock: director of focal organization is the director of an ISO-accredited organization
C Competition
CES Compatibility with existing cost system

CM	Complexity of manufacturing
CS	Champion/sponsor
CSL	Consultants
DEC	Decentralization
EI	Employee involvement
EU	Environmental uncertainty
F	Formalization
FS	Functional specialization
HC	Horizontal communication
IEC	Improvement over the existing cost system
ISO	Focal organization becomes ISO accredited
NIO	Non-accounting ownership/involvement
NMC	Number of changes in management accounting systems
NMS	Number of management accounting systems
OIS	Organizational implementation/adoption or success/satisfaction with ABC and/or activity-based management
PD	Product diversity
PMC	Linkage to performance evaluation and compensation
PS	Prospector strategy
QIS	Quality of non-cost information systems
QS	Quality strategy
RAI	Resource adequacy for implementation
SIS	Subunit implementation/adoption or success/satisfaction with ABC and/or activity-based management
TRN	Training in ABC
TMS	Top management support
UCC	Use of the control system for continuous improvement
US	Union support
VD	Vertical differentiation

Prior research

1. Anderson (1995), Shields (1995)
2. Shields (1995)
3. Anderson (1995)
4. Anderson (1995), Gosselin (1997)
5. Gosselin (1997)
6. Malmi (1999)
7. Anderson (1995), Malmi (1999)
8. Chua and Petty (1999)
9. Libby and Waterhouse (1996)
10. Williams and Seaman (2001)
11. Foster and Swenson (1997)
12. Foster and Swenson (1997), McGowan and Klammer (1997), Anderson and Young (1999)
13. Krumwiede (1998), Anderson and Young (1999)
14. McGowan and Klammer (1997)
15. Anderson and Young (1999)
16. Foster and Swenson (1997), McGowan and Klammer (1997), Krumwiede (1998), Anderson and Young (1999)

Appendix E. Performance measures and incentives



Variable identification

AD Asset disposition
AT Asset turnover
ATI After-tax income (vs. pretax) as the basis of executive compensation
BEB Budget estimate bias
BKG Banking versus other industries

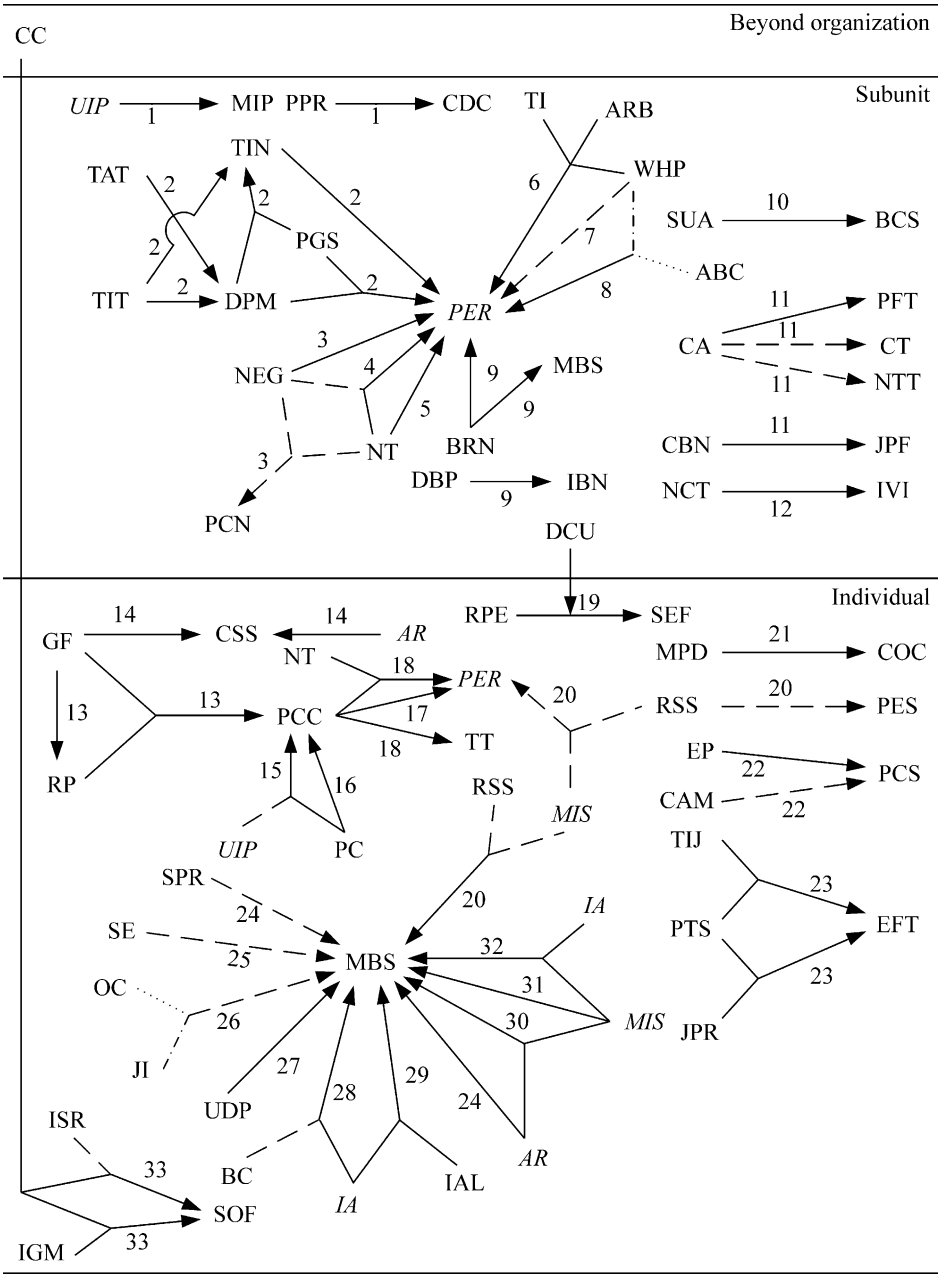
BV	Bonus volatility
CBP	Competition and cost-based pricing for government services
CEC	Change in executive compensation
CI	Capital intensity
CIN	Current inefficiency of the organization
CMR	Change in cost-sensitivity of revenues due to regulatory change
DEP	Dependence of other business units' performance on focal unit
DFO	Dependence of focal business units' performance on other units
DGO	Divisional growth opportunities
EBR	Adoption of efficiency-based regulation
EC	Executive compensation
EFF	Efficiency performance
EUG	Electric utility industry after 1980 and grocery industry versus other industries
FCR	Frequency of cost reporting to physicians
GAS	Growth in assets and sales
GNP	Government or nonprofit hospital (motivation to shift costs to provide more charity care)
GO	Growth opportunities
IAC	Informativeness of accounting earnings for organizational value
ILT	Incentive based on long-term measures
INP	Innovation performance
IPE	Weight on individual performance evaluation (vs. financial measures like earnings) in incentive compensation
IS	Income smoothing
ISB	Internal (past performance) vs. external (peer performance) standard for bonus
LPL	Length of product life cycle
LTI	Long-term investment
MED	Percent of Medicaid patients (revenue shortfall, motivation to shift costs)
MLT	Degree to which the organization is multinational
MP	Market power (ability to shift costs)
NDA	Noise in the divisional accounting measures
NFM	Weight on nonfinancial, relative to financial, performance measures in incentive compensation
NFP	Nonfinancial performance
NI	New investment
NIA	Noise in organizational accounting measures
NIT	Change in net interest income/total assets
NP	Number of time periods since the incentive system was implemented
OCN	Ownership concentration
OS	Organizational size
PC	Performance capability
PCD	Provision of comparison data (i.e. other physicians' costs)
PCC	Performance contingent compensation
PER	Performance
PPB	Prior performance is a better estimate of current performance than is peer performance
PR	Profit
PS	Prospector strategy
PWF	Percentage of workforce permanent (vs. temporary)
QS	Quality strategy
RCR	Regulation constraining revenues

REG	Regulation potentially responsive to nonfinancial measures
RI	Residual income
RII	Residual-income based (vs. earnings-based) incentive
RRP	Relative ROA performance compared to industry
RVA	Change in revenue/assets
SRC	Shifting of reported costs to products with more cost-sensitive revenues
SRP	Share repurchases
SSM	Shift to providing services with more cost-sensitive revenues
USP	Unnecessary services ordered by physicians
VC	Volume change providing incentive to bias
VCR	Variable cost ratio relative to allowable ratio
WDE	Weight on division earnings in compensation
WFA	Weight on organizational accounting numbers in compensation
WHP	Weight on higher-level (e.g. group) performance in lower-level (e.g. individual) compensation

Prior research

1. Lanen and Larcker (1992)
2. Enis (1993)
3. Eldenburg and Soderstrom (1996)
4. Eldenburg and Kallapur (1997), Cavalluzzo, Ittner, and Larcker (1998)
5. Eldenburg and Kallapur (1997)
6. Blanchard, Chow, and Noreen (1986)
7. Eldenburg and Soderstrom (1996)
8. Eldenburg (1994)
9. Ely (1991)
10. Ittner, Larcker, and Rajan (1997)
11. Ittner and Larcker (1995), Ittner, Larcker, and Rajan (1997)
12. Lambert and Larcker (1987), Sloan (1993)
13. Sloan (1993)
14. Bushman, Indjejikian, and Smith (1996)
15. Keating (1997)
16. Ke, Petroni, and Safieddine (1999)
17. Lambert and Larcker (1987)
18. Holthausen, Larcker, and Sloan (1995)
19. Larcker (1983), Cooper and Selto (1991)
20. Bizjak, Brickley, and Coles (1993)
21. Newman (1989)
22. Gaver and Gaver (1993)
23. Antle and Smith (1986)
24. Bushman, Indjejikian, and Smith (1995), Keating (1997)
25. Cavalluzzo, Ittner, and Larcker (1998)
26. Murphy (2001)
27. Wallace (1997)
28. Banker, Potter, and Srinivasan (2000)
29. Banker, Lee, and Potter (1996)
30. Banker, Lee, Potter, and Srinivasan (2001)

Appendix F. Contracting and control: microprocesses



Variable identification

ABC ABC (vs. volume-based allocation) cost information
AR Aversion to risk
ARB Arbitration available

BC	Budgetary constraints on investment proposals
BCS	Bargaining costs of accounting-based contracts
BRN	Budget as the result of successful negotiation (vs. imposed without negotiation or after an impasse)
CA	Complementary sourcing and compensation arrangements
CAM	Control system allows agent to misrepresent (independent of payoff effects)
CBN	Competitive (vs. cooperative) behavior in negotiation
CC	Chinese culture
CDC	Change of contract design by superior to imitate more successful contracts
COC	Choice of optimal contract
CSS	Choice of safe standard (low mean, low risk payoff)
CT	Conflict in transfer price negotiations
DCU	Degree of common uncertainty among comparison groups
DBP	Difference between budget proposals of superior & subordinate in the initial negotiation
DPM	Diversity of team performance measures
EFT	Effort
EP	Expected payoff to principal
GF	Gain (vs. loss) framing of outcomes
IA	Information asymmetry within organization
IAL	Information asymmetry between labor market and manager
IBN	Impasse in budget negotiation
IGM	In-group (vs. out-group) membership
ISR	Information sharing reveals negative information about sharer
IVI	Income uncertainty of investments chosen by managers
JI	Job involvement
JPF	Joint profit from negotiated transfer price
JPR	Joint (vs. individual) piece rate
MBS	Misrepresentation by subordinate
MIP	Magnitude of incentive pay
MIS	Misrepresentation-inducing incentive system
MPD	Magnitude of payoff difference between optimal and alternative contracts
NCT	Number of competitors in tournament incentive
NEG	Negotiated (vs. centrally established) transfer prices
NT	Number of trials
NTT	Negotiation time for transfer price
OC	Organizational commitment
PC	Performance capability
PCC	Performance contingent compensation
PCS	Principal's choice of control system
PCN	Perceived conflict
PER	Performance
PES	Performance in excess of the standard
PFT	Perceived fairness of the transfer price
PGS	Participation in goal setting
PPR	Poor profit performance
PTS	Performance of team members more separable
RP	Remembered performance
RPE	Relative performance evaluation

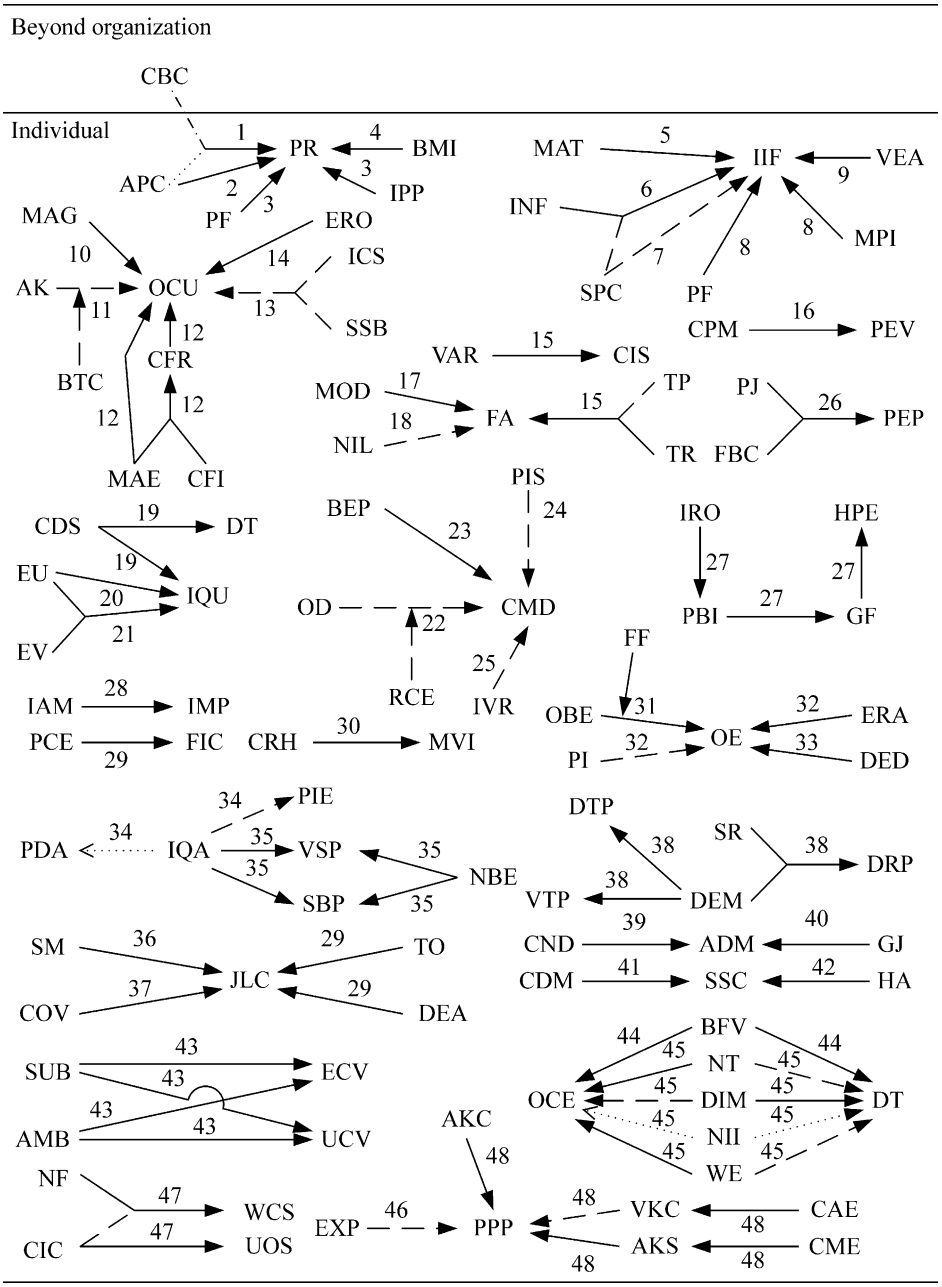
RSS	Ratchet system for standard setting
SE	Self-esteem
SEF	Subordinate effort
SOF	Sharing of information
SPR	Social pressure not to misrepresent expected budget performance
SUA	Second-order uncertainty in accounting information
TAT	Time spent in intra-departmental teams
TI	Task interdependence
TIJ	Tournament (vs. individual or joint piece-rate)
TIN	Team (vs. individual) incentives
TIT	Time spent in inter-departmental teams
TT	Time spent on task
UDP	Unequal division of payoffs between superior and subordinate
UIP	Uncertainty of incentive pay
WHP	Weight on higher-level (e.g. group) performance in lower-level (e.g. individual) compensation

Prior research

1. Shields and Waller (1988)
2. Scott and Tiessen (1999)
3. Ghosh (1994)
4. DeJong, Forsythe, Kim, and Uecker (1989)
5. Chow, Shields, and Chan (1991)
6. Greenberg, Greenberg, and Mahenthiran (1994); TI×WHP: Chow, Shields, and Chan (1991)
7. Chalos and Haka (1990)
8. Drake, Haka, and Ravenscroft (1999)
9. Fisher, Frederickson and Peffer (2000)
10. Haka, Luft and Ballou (2000)
11. Ghosh (2000)
12. Sayre, Rankin, and Fargher (1998)
13. Luft (1994)
14. Kim (1992)
15. Waller and Chow (1985)
16. Chow (1983), Shields and Waller (1988)
17. Bailey, Brown, and Cocco (1998)
18. Sprinkle (2000)
19. Frederickson (1992)
20. Chow, Cooper, and Haddad (1991)
21. Kirby (1992)
22. Evans, Heiman-Hoffman, and Rau (1994)
23. Rankin and Sayre (2000)
24. Young (1985)
25. Belkaoui (1985–1986)
26. Nouri (1994)
27. Evans, Hannan, Krishnan, and Moser (2001)
28. Kachelmeier, Smith, and Yancey (1994)
29. Harrell and Harrison (1994)

30. Waller (1988)
31. Baiman and Lewis (1989), Waller and Bishop (1990), Chow, Hirst, and Shields (1994)
32. Chow, Cooper, and Waller (1988)
33. Chow, Deng, and Ho (2000)

Appendix G. Individual judgments and decisions



Variable identification

ADM Accurate use of the decision maker's policy by the information evaluator
AMB Ambiguity of outcomes (combination of positive and negative)
AK Accounting knowledge
AKC Activity-based cost knowledge content
AKS Activity knowledge structure
APC Accurate product costs
BEP Bet elicitation procedure with incentives (vs. direct question about probabilities)
BMI Benchmark information
BFV Budget forecast and variance are required, in addition to a production decision
BTC Business (vs. personal) task context
CAE Cost-accounting practice experience
CBC Cournot (vs. Bertrand) competition
CIC Chosen (vs. imposed) cost system
CDM Conservative (vs. Bayesian) decision-maker
CDS Complex decision style
CFI Cash flow (vs. earnings) format of information
CFR Cash flow (vs. earnings) analysis of investment
CIS Confidence interval size
CMD Cost-minimizing variance investigation decision
CME Cost-management practice experience
CPM Common (vs. division-specific) performance measures
CND Consistency of the decision-maker
COV Covariation of cause and effect
CRH Compensation system rewards higher threshold for variance investigation
DEA Disconfirming evidence for alternative causes
DED Evaluator disagrees ex ante with the evaluatee's decision
DEM Difference between equal-profit transfer price and market price
DIM Number of different dimensions of information
DRP Difference between the predicted reservation price and the market price
DT Decision time
DTP Difference between predicted transfer price and market price
ECV External (vs. internal) causes attributed in explaining variances
ERA Evaluatee is responsible for anticipating outcome
ERO Explicit reporting of opportunity costs (vs. inference from demand and profit)
EU Environmental uncertainty
EV Economic value of information
EXP Expensing (vs. capitalization) of intangibles
FA Forecast accuracy
FBC Feedback is consistent with stated policy
FIC Frequency with which evidence type is chosen
FF Frequency of feedback
GF Gain (vs. loss) framing of outcomes
GJ Group (vs. individual) judgment **[Subunit level]**
HA High anchor for sample-size choice
HPE Higher performance evaluation for investigating than for not investigating the variance
IAM Intolerance of ambiguity

ICS	Intuitive cognitive style
IIF	Decision-maker ignores irrelevant reported cost allocations
IMP	Rated importance of information
INF	Information about relevance of cost data
IPP	Information about production processes
IQA	Information quantity available
IQU	Information quantity used
IRO	Investigation reveals out-of-control process
IVR	Increasing (vs. decreasing) variation in outcomes
JLC	Judged likelihood of cause of variance
MAE	Management accounting experience
MAG	Magnitude (vs. existence only) of the opportunity costs reported
MAT	Materiality
MOD	Model-based judgment replaces subjective judgment
MPI	Market price information
MVI	Magnitude of variance required to trigger an investigation
NBE	Number of business units evaluated
NF	Negative feedback about the usefulness of cost system
NII	Number of information items
NIL	Noise in reports due to lag
NT	Number of trials
OBE	Evaluator has experience with outcome-based evaluation
OCE	Optimizing choice of expenditure
OCU	Opportunity costs are used in making a decision
OD	Overlap of distributions of in-control and out-of-control
OE	Effect of outcome on performance evaluation
PBI	Perceived benefit of an investigation
PCE	Positive confirming evidence (vs. negative confirming or disconfirming)
PDA	Performance-cause diagnosis accuracy
PEP	Performance evaluation is consistent with policy
PEV	Weight on measure in performance evaluation
PI	Evaluator has prior involvement with evaluatee's decision
PIE	Percentage of available items examined
PIS	Prior experience with inappropriate standard
PF	Profit feedback
PJ	Policy for judgment is explicitly provided
PPP	Profit-prediction performance
PR	Profit
RCE	Relative cost of Type II vs. Type I errors
SSB	Sponsorship bias
SBP	Information search by performance measures (vs. by responsibility centers)
SM	Size match between cause and effect
SPC	Specific experience in which different costs were relevant than in the present task
SR	Seller's (vs. buyer's) role
SSC	Sample size chosen
SUB	Subordinate (vs. superior) role
TO	Temporal order of evidence is cause before effect
TP	Time pressure

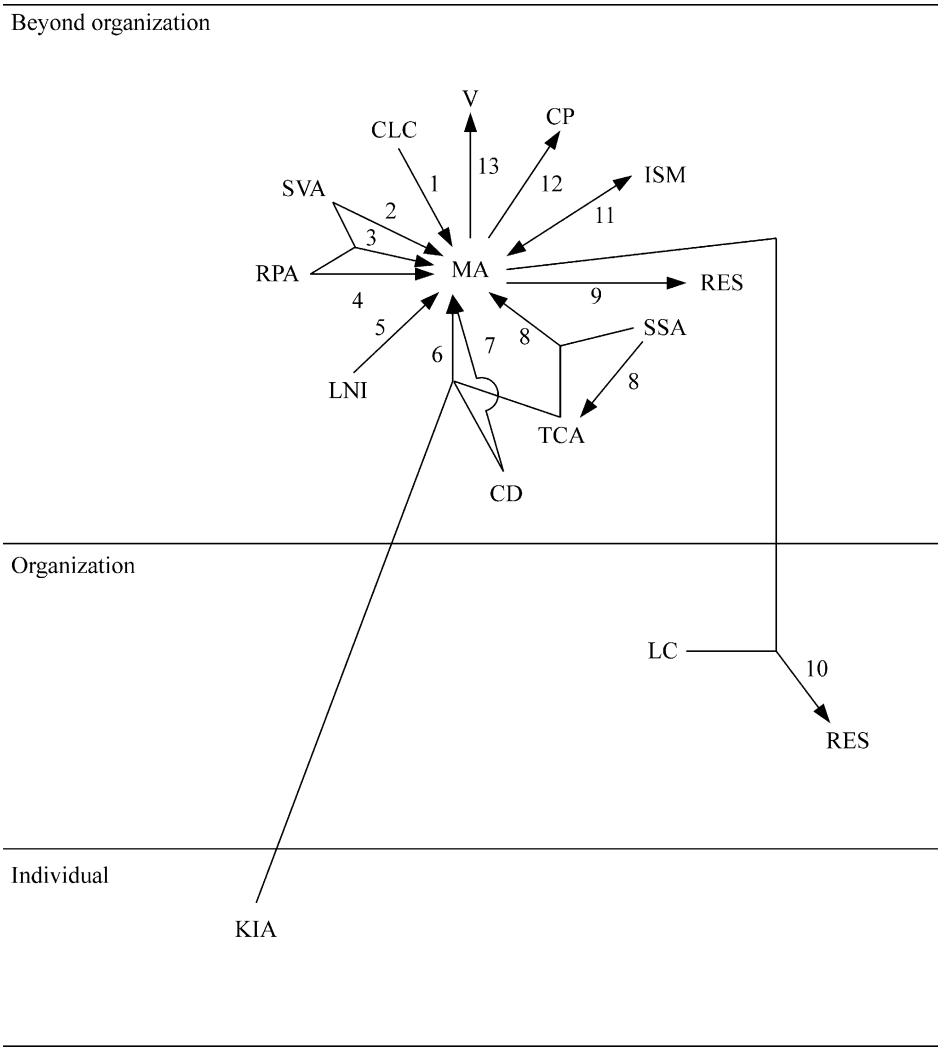
TR Trended (vs. randomly alternating) data provided as the basis for prediction
UCV Unstable (vs. stable) causes attributed in explaining variances
UOS Usefulness rating of own vs. alternative cost system
VAR Variability in data used for prediction
VEA Variety of experience with alternative accounting methods
VKC Volume-based cost knowledge content
VSP Variance in individual search patterns
VTP Variance in transfer price predictions
WCS Willingness to change cost system
WE Work experience

Prior research

1. Callahan and Gabriel (1998)
2. Gupta and King (1997)
3. Gupta and King (1997), Briers et al. (1999)
4. Briers et al. (1999)
5. Haka, Friedman, and Jones (1986)
6. Dyckman, Hoskin, and Swieringa (1982)
7. Ashton (1976a), Moon (1990)
8. Waller, Shapiro and Sevcik (1999)
9. Barnes and Webb (1986)
10. Friedman and Neumann (1980)
11. Vera-Muñoz (1998)
12. Vera-Muñoz, Kinney and Bonner (2001)
13. Chenhall and Morris (1991)
14. Hoskin (1983)
15. Eggleton (1982)
16. Lipe and Salterio (2000)
17. Ashton (1984)
18. Mock (1969)
19. Driver and Mock (1975)
20. San Miguel (1976)
21. Dilla (1989)
22. Brown (1981)
23. Eger and Dickhaut (1982)
24. Chang and Birnberg (1977)
25. Brown (1983)
26. Harrell (1977)
27. Lipe (1993)
28. Dermer (1973)
29. Brown (1985)
30. Magee and Dickhaut (1978)
31. Frederickson, Peffer, and Pratt (1999)
32. Brown and Solomon (1987)
33. Brown and Solomon (1993)
34. Shields (1983)

35. Shields (1980)
36. Brown (1987)
37. Brown (1985, 1987)
38. Luft and Libby (1997)
39. Ashton (1981)
40. Uecker (1982)
41. Uecker (1978)
42. Uecker (1980)
43. Shields, Birnberg, and Frieze (1981)
44. Mock (1973)
45. Iselin (1988)
46. Luft and Shields (2001)
47. Jermias (2001)
48. Dearman and Shields (2001)

Appendix H. Management accounting in its historical and social context



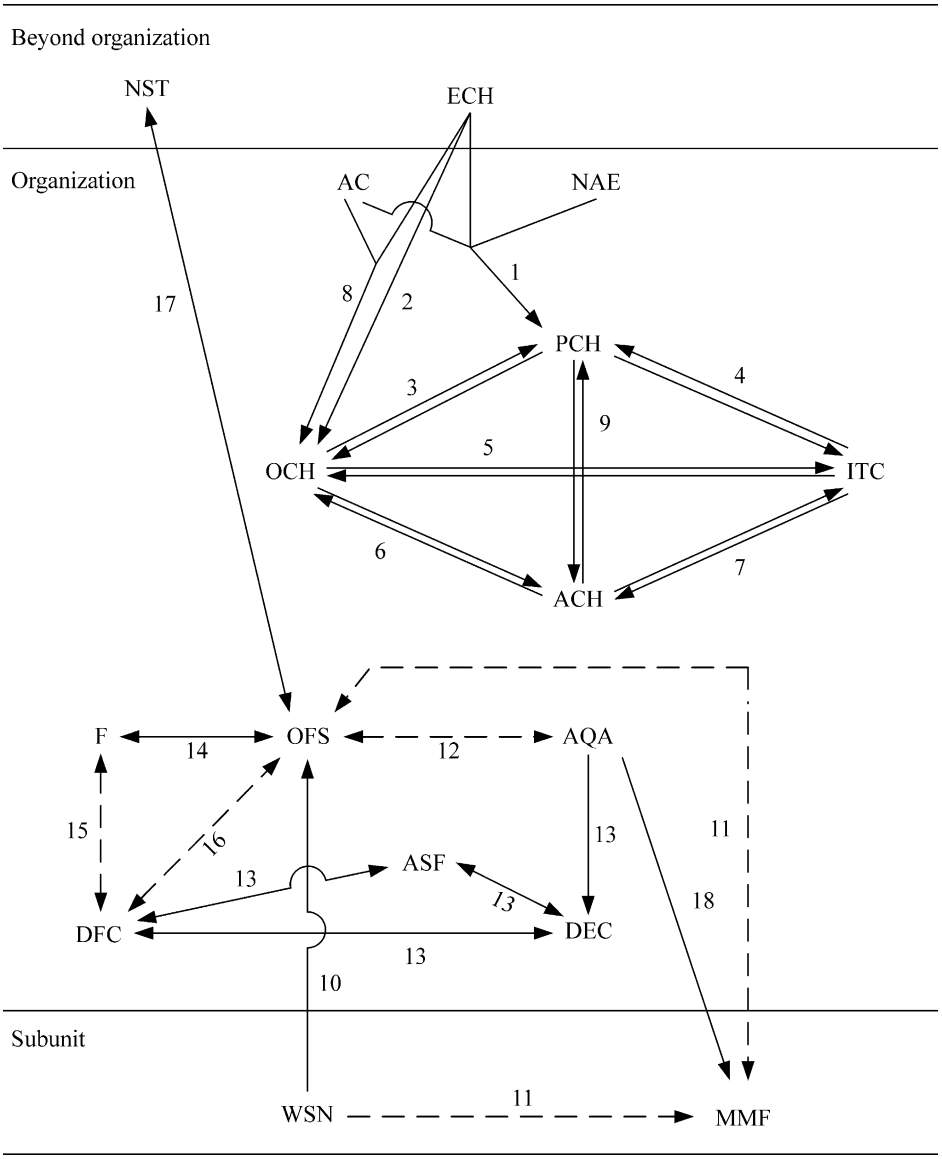
Variable identification

CD	Calculative discourse
CLC	Control of labor by capital
CP	Concealment of political (power, resource allocation) issues
ISM	Individual subjectivity is responsive to management accounting
KIA	Key individuals' actions supporting management accounting
LC	Local circumstances affecting resistance to management accounting
LNI	Limitations of nonaccounting information (e.g. memory failure, need for public verifiable knowledge)
MA	Management accounting and control system development and use
RES	Resistance to management accounting control systems and their effects
RPA	Resource pressure and resource allocation problems
SSA	State support for accounting (e.g. wartime economic controls, legal privileges for accountants)
SVA	Symbolic value of management accounting
TCA	Technical (management accounting) capability is available
V	Visibility of what is accounted for

Prior research

1. Knights and Collinson (1987), Bougen (1989), Bougen, Ogden, and Outran (1990), Hopper and Armstrong (1991)
2. Ansari and Euske (1987), Czarniawska-Joerges, and Jacobsson (1989)
3. Boland and Pondy (1983), Covaleski and Dirsmith (1988), Nahapiet (1988)
4. Coombs (1987), Czarniawska-Joerges (1988)
5. Preston (1986)
6. Bhimani (1993), Bougen (1989), Oakes and Miranti (1996); KIA × TCA: Euske and Riccaboni (1999)
7. Miller and O'Leary (1987), Hoskin and Macve (1988), Walsh and Stewart (1993)
8. Loft (1986), Armstrong (1987), Carmona, Ezzamel, and Gutierrez (1997)
9. Coombs (1987), Bougen (1989), Hopper and Armstrong (1991), Bhimani (1993), Carmona, Ezzamel, and Gutierrez (1997)
10. Bougen, Ogden and Outram (1990), Oakes and Covaleski (1994)
11. Miller and O'Leary (1987), Hoskin and Macve (1988), Bhimani (1994)
12. Covaleski and Dirsmith (1986, 1988), Nahapiet (1988), Colignon and Covaleski (1988), Frances and Garnsey (1996), Preston, Chua, and Neu (1997), Chwastiak (2001)
13. Miller and O'Leary (1987), Hoskin and Macve (1988), Nahapiet (1988), Preston (1992), Walsh and Stewart (1993), Chwstiak (2001)

Appendix I. Organizational change processes and the relation of financial and operational realities



Variable identification

AC	Accounting through which environmental change is analyzed
ACH	Accounting change (e.g. costing systems)
AQA	Availability and quality of accounting information
ASF	Acquisition strategy based on financial performance
DEC	Decentralization
DFC	Dominance of financial reality
ECH	Environmental change (market pressure, reduced government funding)

F	Formalization
ITC	Information technology change
MMF	Mental model/expertise puts operational issues in financial terms (versus nonintegrated financial and operational expertise)
NAE	Non-accounting expertise
NST	National style favoring technical specialization (Germany) vs. lay and commercial views (UK)
OCH	Organizational change (responsibility structure, accounting control, etc.)
OFS	Operational and financial separation in the organizational structure
PCH	Production change
WSN	Work socialization and experience does not integrate financial and nonfinancial information

Prior research

1. AC × ECH × NAE: Miller and O'Leary (1994); AC × ECH: Hopwood (1987), Carmona, Ezzamel, and Gutierrez (1997)
2. Czarniawska-Joerges (1988), Den Hertog and Wielinga (1992), Abernethy and Chua (1996)
3. Hopwood (1987)[22] Preston (1992), Miller and O'Leary (1994, 1997), Mouritsen (1999)
4. Hopwood (1987), Miller and O'Leary (1994)
5. Hopwood (1987), Den Hertog and Wielinga (1992), Miller and O'Leary (1994)
6. Hopwood (1987), Covaleski and Dirsmith (1988), Nahapiet (1988), Preston (1992), Preston, Cooper, and Coombs (1992), Miller and O'Leary (1994, 1997), Chua (1995), Ogden (1995), Abernethy and Chua (1996), Euske and Riccaboni (1999), Mouritsen (1999), Briers and Chua (2001)
7. Hopwood (1987), Miller and O'Leary (1994), Briers and Chua (2001)
8. Nahapiet (1988), Covaleski and Dirsmith (1988), Dent (1991), Preston (1992), Preston, Cooper, and Coombs (1992), Hänninen (1995), Ogden (1995), Briers and Chua (2001)
9. Preston (1992), Walsh and Stewart (1993), Miller and O'Leary (1994), Carmona, Ezzamel, and Gutierrez (1997), Miller and O'Leary (1997), Mouritsen (1999), Briers and Chua (2001)
10. Covaleski and Dirsmith (1983), Berry et al. (1985), Ahrens (1997), Llewellyn (1998)
11. Berry et al. (1985), Ahrens (1997), Llewellyn (1998)
12. Berry et al. (1985), Dent (1991)
13. Roberts (1990)
14. Covaleski and Dirsmith (1983) (FRM → OFS only), Ahrens (1997)
15. Ahrens (1997)
16. Dent (1991), Ahrens (1996, 1997)
17. Ahrens (1996)
18. Berry et al. (1985), Ahrens (1997)

[22] In Hopwood (1987) the following links are described as being unidirectional: PCH→OCH, PCH→ITC, OCH→ACH, ITC→ACH.

Appendix J. Map notation

The causal-model forms in the maps are denoted as follows.

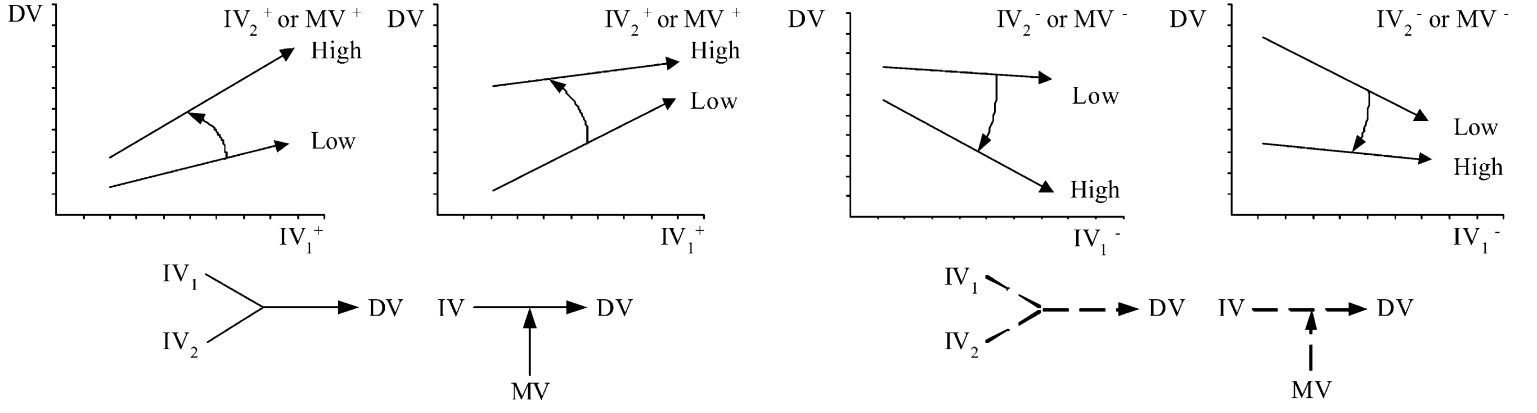
1. Unidirectional linear additive relations between an independent variable (IV) and a dependent variable (DV) can have a positive or negative sign:

2. Intervening-variable models have an intervening variable (IPV) between the independent and dependent variables. Signs of the relations can be positive or negative.

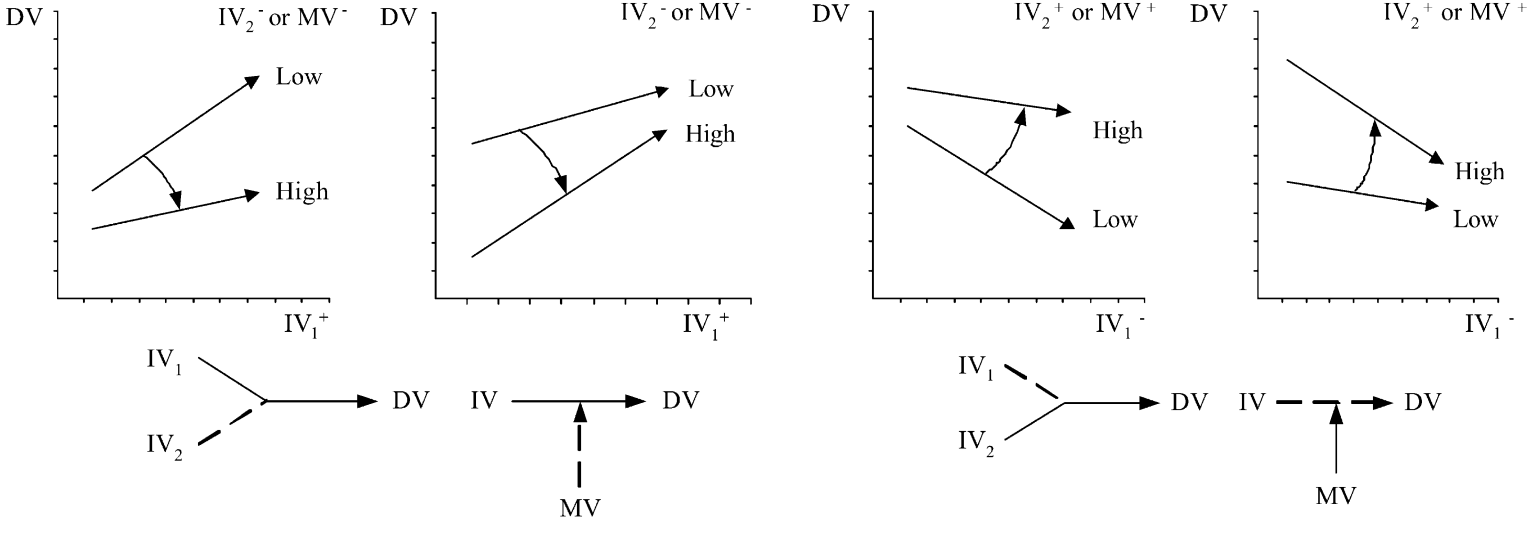
3. Interactions, whether involving independent variables or independent and moderator variables (MV), vary depending on their forms and signs. For example, two-variable interactions may be ordinal (monotonic) or disordinal (non-monotonic). MV interactions have a "T" shape and IV interactions have a "Y" shape. (See Section 5.2 for discussion of MV's and interacting IV's.) In principle, curvilinear and bidirectional relations may interact, but there are few instances of curvilinear interactions in the maps; therefore all components of the interactions are shown in the illustrations below as linear and unidirectional.

A. Ordinal interactions: The magnitude but not the sign of the IV_1-DV relation is affected by the level of IV_2 or MV (the magnitude may be as low as zero) and the IV_2-DV relation is affected by the level of IV_1. The eight forms of two-way ordinal interactions vary by whether the signs of the two IV's or IV and MV are common or mixed. For both common and mixed sign interactions, IV_2 or MV can either accentuate or attenuate the effect of IV_1 on Y, as shown in the interaction plots below. For parsimony, a single representation is provided for each pair of interaction plots. For example, either of the first two plots can be represented by the first "Y" arrow if it is an independent-variable interaction or by the first "T" arrow if it is a moderator-variable interaction. See the studies in question for more exact representations.

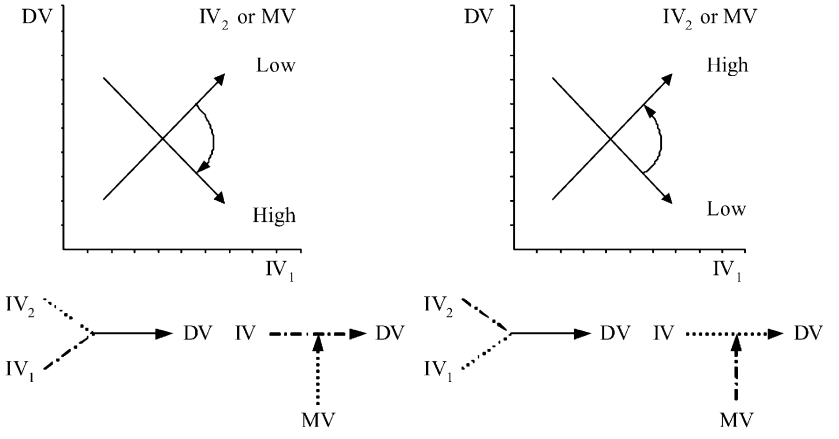
COMMON-SIGN INTERACTIONS:



MIXED-SIGN INTERACTIONS:



B. Disordinal interactions: The sign of the IV_1-DV relation depends on the level of IV_2 or MV and the sign of the IV_2-DV relation depends on the level of IV_1 or MV.



On the maps, the disordinal interactions are drawn such that IV_1 is the lower (left) independent variable and IV_2 is the upper (right) independent variable.

C. There are only a few three-way interactions on the maps. These interactions can have a larger variety of forms than two-way interactions, and the maps do not attempt to represent their exact forms. If all arrows in a three-way interaction are solid lines, then all IV's have non-negative effects on the DV. If a three-way interaction has both solid- and broken-line arrows, then the IV's have mixed-sign effects on the DV. See the studies in question for more exact representations.

4. Unidirectional nonlinear relations are quadratic:

U relation (convex): IV ⋯⋯⋯⋯⋯⋯> DV Inverted-U relation (concave): IV⋯⋯⋯⋯⋯⋯> DV

5. Bidirectional relations can have positive and/or negative signs. In reciprocal nonrecursive models, the bidirectional causation is simultaneous. In cyclical recursive models, a detectable time interval separates the effect of X_1 on X_2 from the effect of X_2 on X_1.

Reciprocal nonrecursive: $X_1 \longleftrightarrow X_2$ Cyclical recursive: $X_1 \rightleftharpoons X_2$

6. Where "high" and "low" levels of a variable are not clear from the variable name, the low level is in parentheses in the variable identification list.

Appendix K. Variables that appear on more than one map

Name	*Description*	*Appendix*
BBC	Budget-based compensation	A,B
BD	Budget difficulty	A,B
BE	Budget emphasis by a superior in evaluating a subordinate	A,B
BEB	Budget estimate bias	B,E
BMI	Benchmark information	C,G
C	Competition	B,C,D
CI	Capital intensity	C,E
DEC	Decentralization	B,C,D,I
DS	Differentiation strategy	B,C
EU	Environmental uncertainty	B,C,D,G
F	Formalization	D,I
GF	Gain (vs. loss) framing of outcomes	F,G
IA	Information asymmetry within organization	B,C,F
M	Motivation	A,C
NT	Number of trials	F,G
OC	Organizational commitment	A,F
OS	Organizational size	B,C,E
PB	Participative budgeting	A,B
PC	Performance capability	E,F
PCC	Performance contingent compensation	C,E,F
PER	Performance	A,B,C,E,F
PR	Profit	E,G
PS	Prospector strategy	B,D,E
QS	Quality strategy	D,E
TI	Task interdependence	A,B,F
TU	Task uncertainty	A,B,C
WHP	Weight on higher-level (e.g. group) performance in lower-level (e.g. individual) compensation	E,F

Appendix L. Variables with partially shared meanings: examples

Nonfinancial information variables. Eight variables in the maps represent the use of nonfinancial information as compared to financial information.

Usefulness of internal, nonfinancial information (Map C, link 17).
Usefulness of nonfinancial relative to financial information (Map C, link 18).
Usefulness of broad scope information. [The studies shown in Map C, links 25–27 define narrow-scope information as including only financial, internally-focused, and historical measures, while broad scope information includes nonfinancial, externally focused, and future-oriented measures as well (Chenhall and Morris 1986)].
Importance of nonfinancial performance measures (Map C, link 10).
Availability of nonfinancial information to workers (Map C, link 33).
Existence of quantified nonfinancial goals (Map C, link 29).
Weight on nonfinancial performance measures in incentive compensation (Map E, links 10–11, 28).

Diversity of team performance measures (Map F, link 2). Achieving high scores on the diversity measure used in this study requires a mix of financial and nonfinancial performance.

Uncertainty variables. Uncertainty variables include the following:

Environmental uncertainty (Map B, links 5, 25; Map C, links 17, 19, 25; Map D, link 4; Map G, links 20–21).
Task uncertainty (Map B, link 27).
Funding uncertainty (Map C, link 3).
Uncertainty of incentive pay (Map F, links 1, 15).
Income uncertainty of investments chosen by managers (Map F, link 12).

In addition, information accuracy and informativeness variables such as accurate product costs (Map G, links 1, 2), noise in organizational accounting information (Map E, links 10, 12) or informativeness of accounting earnings for organizational value (Map E, link 13) capture specific uncertainties. For example, the less accurate reported product costs are, the greater the uncertainty about actual resource use by a particular product and the greater the uncertainty about profits resulting from decisions based on reported product costs.

Interdependence variables include the following:

Task interdependence (Map A, link 42; Map B, link 21; Map F, link 6).
Subunit interdependencies (Map C, links 24–25).
Weight on higher-level performance (e.g. firm, team) in lower-level (e.g. division, individual) compensation (Map F, links 6–8).
Tournament versus individual piece rate versus joint piece rate compensation (Map F, link 23).
Dependence of other business units' performance on actions of the focal unit (Map E, link 24).
Dependence of the focal unit's performance on actions of other units (Map E, link 15).

Information asymmetry variables include information asymmetry measured or manipulated relatively directly (Map B, links 10, 17; Map C, link 20; Map F, links 28–29, 32) and variables that have been interpreted as proxies for information asymmetry such as size of an organization or subunit (Map B, links 2, 22; Map C, links 4, 7), decentralization or diversification (Map B, links 1–2; Map C, links 19, 25), and absence of inside ownership or ownership concentration (Map C, link 20; Map E, link 16).

Performance variables appear in most maps (A, B, C, E, F, G) but at multiple levels (individual, subunit, organization) and with various degrees of inclusiveness—for example, subunit performance in new product development (Map C, link 28) versus overall subunit performance (Map C, links 29–30, and Maps B, E, and F).

References

Abbott, A. (1992). From causes to events: notes on narrative positivism. *Sociological Methods and Research*, *20*, 428–455.

Abbott, A. (1997). Of time and space: the contemporary relevance of the Chicago school. *Social Forces*, *75*, 1149–1182.

Abbott, A. (1998). The causal devolution. *Sociological Methods and Research*, *27*, 148–181.

Abbott, A. (2001). *Chaos of disciplines*. Chicago: University of Chicago Press.

Abernethy, M., & Brownell, P. (1997). Management control systems in research and development organizations: the role of accounting, behavior and personnel controls. *Accounting, Organizations and Society*, *22*, 233–248.

Abernethy, M., & Brownell, P. (1999). The role of budgets in organizations facing strategic change: an exploratory study. *Accounting, Organizations and Society*, *24*, 189–204.

Abernethy, M., & Chua, W. (1996). A field study of control system "redesign": the impact of institutional processes on strategic choice. *Contemporary Accounting Research*, *13*, 569–606.

Abernethy, M., & Lillis, A. (1995). The impact of manufacturing flexibility on management control system design. *Accounting, Organizations and Society*, *20*, 241–258.

Abernethy, M., & Lillis, A. (2001). Interdependencies in organizational design: a test in hospitals. *Journal of Management Accounting Research*, 13, 107–129.

Abernethy, M., & Stoelwinder, J. (1991). Budget use, task uncertainty, system goal orientation and subunit performance: a test of the "fit" hypothesis in not-for-profit hospitals. *Accounting, Organizations and Society*, *16*, 105–120.

Ahrens, T. (1996). Styles of accountability. *Accounting, Organizations and Society*, *21*, 138–174.

Ahrens, T. (1997). Talking accounting: an ethnography of management knowledge in British and German brewers. *Accounting, Organizations and Society*, *22*, 617–637.

Alchian, A. (1950). Uncertainty, evolution, and economic theory. *Journal of Political Economy*, *58*, 211–221.

Anderson, S. (1995). A framework for assessing cost management system changes: the case of activity based costing implementation at General Motors, 1986–1993. *Journal of Management Accounting Research*, *7*, 1–51.

Anderson, S., & Lanen, W. (1999). Economic transition, strategy and the evolution of management accounting practices: the case of India. *Accounting, Organizations and Society*, *24*, 525–560.

Anderson, S. W., & Young, S. M. (1999). The impact of contextual and process factors on the evaluation of activity-based costing systems. *Accounting, Organizations and Society*, *24*, 525–560.

Ansari, S. L. (1976). Behavioral factors in variance control: report on a laboratory experiment. *Journal of Accounting Research*, *14*, 189–211.

Ansari, S., & Euske, K. J. (1987). Rational, rationalizing, and reifying uses of accounting data in organizations. *Accounting, Organizations and Society*, *12*, 549–570.

Antle, R., & Smith, A. (1986). An empirical investigation of the relative performance evaluation of corporate executives. *Journal of Accounting Research*, *24*, 1–39.

Armstrong, P. (1987). The rise of accounting controls in British capitalist enterprises. *Accounting, Organizations and Society*, *12*, 415–436.

Asher, H. B. (1983). *Causal modeling*. Newbury Park: Sage.

Ashton, R. H. (1976). Cognitive changes induced by accounting changes: experimental evidence on the functional fixation hypothesis. *Journal of Accounting Research, Supplement*, *14*, 1–24.

Ashton, R. H. (1976). Deviation-amplifying feedback and unintentional consequences of management accounting systems. *Accounting, Organizations and Society*, *1*, 289–300.

Ashton, R. H. (1981). A descriptive study of information evaluation. *Journal of Accounting Research*, *19*, 42–61.

Ashton, A. H. (1984). A field test of implementations of laboratory studies of decision making. *The Accounting Review*, *59*, 361–375.

Bailey, C., Brown, L., & Cocco, A. (1998). The effects of monetary income on worker learning and performance in an assembly task. *Journal of Management Accounting Research*, *10*, 119–131.

Baiman, S., & Lewis, B. L. (1989). An experiment testing the behavioral equivalence of strategically equivalent employment contracts. *Journal of Accounting Research*, *27*, 1–20.

Banker, R. D., Lee, S. Y., & Potter, G. (1996). A field study of the impact of a performance-based incentive plan. *Journal of Accounting and Economics*, *21*, 195–226.

Banker, R. D., Lee, S. Y., Potter, G., & Srinivasan, D. (2001). An empirical analysis of continuing improvement following the implementation of a performance-based compensation plan. *Journal of Accounting and Economics*, *30*, 315–350.

Banker, R. D., Potter, G., & Schroeder, R. G. (1993). Reporting manufacturing performance measures to workers: an empirical study. *Journal of Management Accounting Research*, *5*, 33–55.

Banker, R. D., Potter, G., & Srinivasan, D. (2000). An empirical investigation of an incentive plan that includes nonfinancial performance measures. *The Accounting Review*, *75*, 65–92.

Barnes, P., & Webb, J. (1986). Management information changes and functional fixation: some experimental evidence from the public sector. *Accounting, Organizations and Society*, *11*, 1–18.

Baxter, J., & Chua, W.F. (in press). Alternative management accounting research. *Accounting, Organizations and Society*. PII: S0361-3682(02)00022-3.

Belkaoui, A. (1985/6). Slack budgeting, information distortion and self-esteem. *Contemporary Accounting Research*, 12, 111–123.

Berg, J., Dickhaut, J., & McCabe, K. (1995). The individual versus the aggregate. In R. H. Ashton, & A. H. Ashton (Eds.), *Judgment and Decision-Making Research in Accounting and Auditing*. Cambridge: Cambridge University Press.

Berger, P. L., & Luckmann, T. (1967). *The social construction of reality*. New York: Doubleday.

Berry, A., Capps, T., Cooper, D., Ferguson, P., Hopper, T., & Lowe, E. (1985). Management control in an area of the NCB: rationales of accounting practices in a public enterprise. *Accounting, Organizations and Society*, *10*, 3–28.

Berry, W. D. (1984). *Nonrecursive causal models*. Newbury Park: Sage.

Bhimani, A. (1993). Indeterminacy and the specificity of accounting change: Renault 1898–1938. *Accounting, Organizations and Society*, *18*, 1–40.

Bhimani, A. (1994). Accounting and the emergence of 'economic man'. *Accounting, Organizations and Society*, *19*, 637–674.

Birnberg, J., & Snodgrass, C. (1988). Culture and control: a field study. *Accounting, Organizations and Society*, *13*, 447–464.

Bizjak, J., Brickley, J., & Coles, J. (1993). Stock-based incentive compensation and investment behavior. *Journal of Accounting and Economics*, *16*, 349–372.

Blalock, H. M. (1964). *Causal Inferences in Nonexperimental Research*. New York: W.W. Norton.

Blanchard, G. A., Chow, C. W., & Noreen, S. (1986). Information asymmetry, incentive schemes and information biasing: the case of hospital budgeting under rate regulation. *The Accounting Review*, *61*, 1–15.

Blumer, H. (1956). Sociological analysis and the "variable". *American Sociological Review*, *21*, 683–690.

Boland, R. J., & Pondy, L. R. (1983). Accounting in organizations: a union of natural and rational perspectives. *Accounting, Organizations and Society*, *8*, 223–234.

Bougen, P. (1989). The emergence, roles and consequences of an accounting–industrial relations interaction. *Accounting, Organizations and Society*, *14*, 203–234.

Bougen, P., Ogden, S., & Outram, Q. (1990). The appearance and disappearance of accounting: wage determination in the UK coal industry. *Accounting, Organizations and Society*, *15*, 149–170.

Bouwens, J., & Abernethy, M. (2000). The consequences of customization on management accounting system design. *Accounting, Organizations and Society*, *25*, 221–242.

Braverman, H. (1974). *Labor and monopoly capital*. New York: Monthly Review Press.

Briers, M. L., Chow, C. W., Hwang, N.-C.R., & Luckett, P. F. (1999). The effects of alternative types of feedback on product-related decision performance: a research note. *Journal of Management Accounting Research*, *11*, 75–92.

Briers, M., & Chua, W. F. (2001). The role of actor-networks and boundary objects in management accounting change: a field study of an implementation of activity-based costing. *Accounting, Organizations and Society*, *26*, 237–269.

Brown, C. (1981). Human information processing for decisions to investigate cost variances. *Journal of Accounting Research*, *19*, 62–85.

Brown, C. (1983). Effects of dynamic task environment on the learning of standard cost variance significance. *Journal of Accounting Research*, *21*, 413–431.

Brown, C. (1985). Causal reasoning in performance assessment: effects of cause and effect temporal order and covariation. *Accounting, Organizations and Society*, *10*, 255–266.

Brown, C. (1987). Diagnostic inference in performance evaluation: effects of cause and effect covariation and similarity. *Contemporary Accounting Research*, *4*, 111–126.

Brown, C. E., & Solomon, I. (1987). Effects of outcome information on evaluations of managerial decisions. *The Accounting Review*, *62*, 564–577.

Brown, C. E., & Solomon, I. (1993). An experimental investigation of explanations for outcome effects on appraisals of capital budgeting decisions. *Contemporary Accounting Research*, *10*, 83–111.

Brownell, P. (1981). Participation in budgeting, locus of control and organizational effectiveness. *The Accounting Review*, *56*, 844–860.

Brownell, P. (1982a). A field study examination of budgetary participation and locus of control. *The Accounting Review*, *57*, 766–777.

Brownell, P. (1982b). The role of accounting data in performance evaluation, budgetary participation and organizational effectiveness. *Journal of Accounting Research*, *20*, 12–27.

Brownell, P. (1983a). Leadership style, budgetary participation and managerial behavior. *Accounting, Organizations and Society*, *8*, 307–322.

Brownell, P. (1983b). The motivational impact of management-by-exception in a budgetary context. *Journal of Accounting Research*, *21*, 456–472.

Brownell, P. (1985). Budgetary systems and the control of functionally differentiated organizational activities. *Journal of Accounting Research*, *23*, 502–512.

Brownell, P., & Dunk, A. (1991). Task uncertainty and its interaction with budgetary participation and budget emphasis: some methodological issues and empirical investigation. *Accounting, Organizations and Society*, *16*, 693–703.

Brownell, P., & Hirst, M. (1986). Reliance on accounting information, budgetary participation, and task uncertainty: tests of a three-way interaction. *Journal of Accounting Research*, *24*, 241–249.

Brownell, P., & McInnes, M. (1986). Budgetary participation, motivation, and managerial performance. *The Accounting Review*, *61*, 587–600.

Brownell, P., & Merchant, K. (1990). The budgetary and performance influences of product standardization and manufacturing process automation. *Journal of Accounting Research*, *28*, 388–397.

Bruns, W. J., & Waterhouse, J. (1975). Budgetary control and organization structure. *Journal of Accounting Research*, *13*, 177–203.

Bryk, A. S., & Raudenbush, S. W. (1992). *Hierarchical linear models: applications and data analysis methods*. Newbury Park: Sage.

Burns, T., & Stalker, G. M. (1961). *The management of innovation*. London: Tavistock.

Bushman, R. M., Indjejikian, R. J., & Smith, A. (1995). Aggregate performance measures in business unit manager compensation: the role of intrafirm interdependencies. *Journal of Accounting Research, Supplement*, *33*, 101–134.

Bushman, R. M., Indjejikian, R. J., & Smith, A. (1996). CEO compensation: the role of individual performance evaluation. *Journal of Accounting and Economics*, *21*, 161–193.

Callahan, C. M., & Gabriel, E. A. (1998). The differential impact of accurate product cost information in imperfectly competitive markets: a theoretical and empirical investigation. *Contemporary Accounting Research*, *15*, 419–455.

Carmona, S., Ezzamel, M., & Gutierrez, F. (1997). Control and cost accounting practices in the Spanish Royal Tobacco Factory. *Accounting, Organizations and Society*, *22*, 411–446.

Carroll, G. R., & Hannan, M. T. (2000). *The demography of corporations and industries*. Princeton: Princeton University Press.

Cavalluzzo, K., Ittner, C., & Larcker, D. (1998). Competition, efficiency, and cost allocation ingovernment agencies: evidence on the federal reserve system. *Journal of Accounting Research*, *136*, 1–32.

Chalos, P., & Haka, S. (1990). Transfer pricing under bilateral bargaining. *The Accounting Review*, *65*, 624–641.

Chang, D. L., & Birnberg, J. G. (1977). Functional fixity in accounting research: perspective and new data. *Journal of Accounting Research*, *15*, 300–312.

Chapman, C. S. (1998). Accountants in organizational networks. *Accounting, Organizations and Society*, *23*, 737–766.

Chenhall, R. (1986). Authoritarianism and participative budgeting: a dyadic analysis. *The Accounting Review*, *61*, 263–272.

Chenhall, R. (in press). Management control systems design within its organizational context: findings from contingency-based research and directions for the future. *Accounting, Organizations and Society*. PII: S0361-3682(02)00027-7.

Chenhall, R., & Brownell, P. (1988). The effect of participative budgeting on job satisfaction and performance: role ambiguity as an intervening variable. *Accounting, Organizations and Society*, *13*, 225–234.

Chenhall, R. H., & Langfield-Smith, K. (1998). The relation between strategic priorities, management techniques and management accounting: an empirical investigation using a systems approach. *Accounting, Organizations and Society*, *23*, 243–264.

Chenhall, R. H., & Morris, D. (1986). The impact of structure, environment, and interdependence on the perceived usefulness of management accounting systems. *The Accounting Review*, *61*, 16–35.

Chenhall, R., & Morris, D. (1991). The effect of cognitive style: sponsorship bias on the treatment of opportunity costs in resource allocation decisions. *Accounting, Organizations and Society*, *16*, 27–46.

Cherrington, D., & Cherrington, J. (1973). Appropriate reinforcement contingencies in the budgeting process. *Journal of Accounting Research, Supplement*, *11*, 225–253.

Chong, V. K. (1996). Management accounting systems, task uncertainty and managerial performance: a research note. *Accounting, Organizations and Society*, *21*, 415–422.

Chow, C. (1983). The effects of job standard tightness and compensation scheme on performance: an exploration of linkages. *The Accounting Review*, *58*, 667–685.

Chow, C., Cooper, J., & Waller, W. (1988). Participative budgeting: effects of a truth-inducing pay scheme and information asymmetry on slack and performance. *The Accounting Review*, *63*, 111–122.

Chow, C. W., Deng, J., & Ho, J. (2000). The openness of knowledge sharing within organizations: a comparative study of the United States and the People's Republic of China. *Journal of Management Accounting Research*, *12*, 65–95.

Chow, C., Hirst, M., & Shields, M. (1994). Motivating truthful subordinate reporting: an experimental investigation in a two-subordinate context. *Contemporary Accounting Research*, *10*, 699–720.

Chow, C., Kato, Y., & Merchant, K. (1996). The use of organizational controls and their effects on data manipulation and management myopia: a Japan vs. US comparison. *Accounting, Organizations and Society*, *21*, 175–192.

Chow, C., Shields, M., & Chan, Y. (1991). The effects of management controls and national culture on manufacturing performance: an experimental investigation. *Accounting, Organizations and Society*, *16*, 209–226.

Chua, W. F. (1995). Experts, networks and inscriptions in the fabrication of accounting images: a story of the representation of three public hospitals. *Accounting, Organizations and Society*, *20*, 111–145.

Chua, W. F., & Petty, R. (1999). Mimicry, director interlocks, and the interorganizational diffusion of a quality strategy: a note. *Journal of Management Accounting Research*, *11*, 93–104.

Chwastiak, M. (2001). Taming the untamable: planning, programming and budgeting and the normalization of war. *Accounting, Organizations and Society*, *26*, 501–519.

Colbert, G., & Spicer, B. (1995). A multi-case investigation of a theory of the transfer pricing process. *Accounting, Organizations and Society*, *20*, 423–456.

Colignon, R., & Covaleski, M. (1988). An examination of managerial accounting practices as a process of mutual adjustment. *Accounting, Organizations and Society*, *13*, 559–579.

Collins, F., Holzmann, O., & Mendoza, R. (1997). Strategy, budgeting, and crisis in Latin America. *Accounting, Organizations and Society*, *22*, 669–690.

Collins, R. (1981). On the microfoundations of macrosociology. *American Journal of Sociology*, *86*, 984–1014.

Cook, D. (1967). The effect of frequency of feedback on attitudes and performance. *Journal of Accounting Research Supplement*, *5*, 213–224.

Coombs, R. W. (1987). Accounting for the control of doctors: management information systems in hospitals. *Accounting, Organizations and Society*, *12*, 389–404.

Cooper, J. C., & Selto, F. H. (1991). An experimental examination of the effects of SFAS No. 2 on research and development investment decisions. *Accounting, Organizations and Society*, *16*, 227–242.

Cooper, R., Kaplan, R. S., Maisel, L. S., Morrissey, E., & Oehm, R. (1992). *Implementing activity-based cost management: moving from analysis to action*. Montvale, NJ: Institute of Management Accountants.

Covaleski, M., & Dirsmith, M. (1983). Budgeting as a means for control and loose coupling. *Accounting, Organizations and Society*, *8*, 323–340.

Covaleski, M., & Dirsmith, M. (1986). The budgetary process of power and politics. *Accounting, Organizations and Society*, *11*, 193–214.

Covaleski, M., & Dirsmith, M. (1988). The use of budgetary symbols in the political arena: an historically informed field study. *Accounting, Organizations and Society*, *13*, 1–24.

Covaleski, M., Dirsmith, M., & Samuel, S. (1996). Managerial accounting research: the contributions of organizational and sociological theories. *Journal of Management Accounting Research*, *8*, 1–35.

Covaleski, M., Dirsmith, M., & White, C. (1987). Economic consequences: the relationship between financial reporting and strategic planning, management and operating control decisions. *Contemporary Accounting Research*, *3*, 408–429.

Czarniawska-Joerges, B. (1988). Dynamics of organizational control: the case of Berol Kemi AB. *Accounting, Organizations and Society*, *13*, 415–430.

Czarniawska-Joerges, B., & Jacobsson, B. (1989). Budget in a

cold climate. *Accounting, Organizations and Society*, *14*, 29–39.

Davila, T. (2000). An empirical study on the drivers of management control systems' design in new product development. *Accounting, Organization and Society*, *25*, 283–410.

Davis, J. A. (1985). *The logic of causal order*. Newbury Park: Sage.

Dearman, D., & Shields, M. (2001). Cost knowledge and cost-based judgment performance. *Journal of Management Accounting Research*, *13*, 1–18.

DeCoster, D., & Fertakis, J. (1968). Budget-induced pressure and its relationship to supervisory behavior. *Journal of Accounting Research*, *6*, 237–246.

DeJong, D., Forsythe, R., Kim, J., & Uecker, W. (1989). A laboratory investigation of alternative pricing mechanisms. *Accounting, Organizations and Society*, *14*, 41–64.

Demski, J. S., & Feltham, G. A. (1976). *Cost determination: a conceptual approach*. Ames, IA: Iowa State University Press.

Den Hertog, F., & Wielinga, C. (1992). Control systems in dissonance: The computer as an ink blot. *Accounting, Organizations and Society*, *17*, 103–127.

Dent, J. (1991). Accounting and organizational cultures: A field study of the emergence of a new organizational reality. *Accounting, Organizations and Society*, *16*, 705–732.

Dermer, J. (1973). Cognitive characteristics and the perceived importance of information. *The Accounting Review*, *73*, 519–551.

Diehl, E., & Sterman, J. D. (1995). Effects of feedback complexity on dynamic decision making. *Organizational Behavior and Human Decision Processes*, *62*, 198–215.

Dilla, W. N. (1989). Information evaluation in a competitive environment: context and task effects. *The Accounting Review*, *64*, 404–432.

Donaldson, L. (2001). *The contingency theory of organizations*. Thousand Oaks, CA: Sage Publications.

Douglas, M. (1986). *How institutions think*. Syracuse, NY: Syracuse University Press.

Drake, A., Haka, S., & Ravenscroft, S. (1999). Incentive effects on innovation, interaction, and productivity in a group environment. *The Accounting Review*, *74*, 323–345.

Driver, M., & Mock, T. (1975). Human information processing, decision style theory, and accounting information. *The Accounting Review*, *50*, 490–508.

Dunk, A. (1989). Budget emphasis, budgetary participation and managerial performance: a note. *Accounting, Organizations and Society*, *14*, 321–324.

Dunk, A. (1990). Budgetary participation, agreement on evaluation criteria and managerial performance: a research note. *Accounting, Organizations and Society*, *14*, 171–178.

Dunk, A. (1992). Reliance on budgetary control, manufacturing process automation and production subunit performance: a research note. *Accounting, Organizations and Society*, *15*, 195–203.

Dyckman, T., Hoskin, R., & Swieringa, R. J. (1982). An accounting change and information processing changes. *Accounting, Organizations and Society*, *7*, 1–11.

Eger, C., & Dickhaut, J. (1982). An examination of the conservative information processing bias in an accounting framework. *Journal of Accounting Research*, *20*, 711–723.

Eggleton, I. C. (1982). Intuitive time-series extrapolation. *Journal of Accounting Research*, *20*, 68–102.

Eldenburg, L. (1994). The use of information in total cost management. *The Accounting Review*, *69*, 96–121.

Eldenburg, L., & Kallapur, S. (1997). Changes in hospital service mix cost allocations in response to changes in Medicare reimbursement schemes. *Journal of Accounting and Economics*, *23*, 31–52.

Eldenburg, L., & Soderstrom, N. (1996). Accounting system management by hospitals operating in a changing regulatory environment. *The Accounting Review*, *71*, 23–42.

Elster, J. (1983). *Explaining technical change: a case study in the philosophy of science*. Cambridge: Cambridge University Press.

Ely, K. (1991). Interindustry differences in the relation between compensation and firm performance. *Journal of Accounting Research*, *29*, 37–58.

Emsley, D. (2000). Variance analysis and performance: two empirical studies. *Accounting Organization and Society*, *25*, 1–12.

Enis, C. (1993). Earnings based compensation plans, performance, and capital expenditure policy in the motor carrier industry. *The Accounting Review*, *68*, 928–941.

Euske, K., & Riccaboni, A. (1999). Stability to profitability: managing interdependencies to meet a new environment. *Accounting, Organizations and Society*, *24*, 463–482.

Evans, J. H., Heiman-Hoffman, V. B., & Rau, S. (1994). The accountability demand for information. *Journal of Management Accounting Research*, *6*, 24–42.

Evans, J. H., Hannan, R. L., Krishnan, R., & Moser, D. V. (2001). Honesty in managerial reporting. *The Accounting Review*, *76*, 537–559.

Ferreira, L., & Merchant, K. (1992). Field research in management accounting and control: a review and evaluation. *Accounting, Auditing and Accountability Journal*, *5*, 3–34.

Firth, M. (1996). The diffusion of managerial accounting procedures in the People's Republic China and the influence of foreign partnered joint ventures. *Accounting, Organizations and Society*, *21*, 629–654.

Fisher, J. (1995). Contingency-based research on management control systems: categorization by level of complexity. *Journal of Accounting Literature*, *14*, 24–53.

Fisher, J., Frederickson, J., & Peffer, S. (2000). Budgeting: an experimental investigation of the effects of negotiation. *The Accounting Review*, *75*, 93–114.

Flesher, T. K., & Flesher, D. L. (1979). Managerial accounting in an early 19th century German-American religious commune. *Accounting, Organizations and Society*, *4*, 297–304.

Foster, G., & Swenson, D. (1997). Measuring the success of activity-based cost management and its determinants. *Journal of Management Accounting Research*, *9*, 109–141.

Foucault, M. (1972). *The archaeology of knowledge*. New York: Pantheon.

Foucault, M. (1979). *Discipline and punish: the birth of the prison*. New York: Vintage.

Frances, J., & Garnsey, E. (1996). Supermarkets and suppliers in the United Kingdom: system integration, information and control. *Accounting, Organizations and Society*, *21*, 591–610.

Frederickson, J. (1992). Relative performance information: the effects of common uncertainty and contract type on agent effort. *The Accounting Review*, *67*, 647–669.

Frederickson, J. R., Peffer, S. A., & Pratt, J. (1999). Performance evaluation judgments: effects of prior experience under different performance evaluation schemes and feedback frequencies. *Journal of Accounting Research*, *37*, 151–165.

Friedman, L. A., & Neumann, B. R. (1980). The effects of opportunity costs on project investment decisions: a replication and extension. *Journal of Accounting Research*, *18*, 407–419.

Frucot, V., & Shearon, W. (1991). Budgetary participation, locus of control, and Mexican managerial performance and job satisfaction. *The Accounting Review*, *66*, 80–99.

Fudenberg, D., & Levine, D. K. (1998). *The theory of learning in games*. Cambridge, Mass: The MIT Press.

Galbraith, J. R. (1973). *Designing complex organizations*. Reading, MA: Addison-Wesley.

Gaver, J., & Gaver, K. (1993). Additional evidence on the association between the investment opportunity set and corporate financing, dividend and compensation policies. *Journal of Accounting and Economics*, *16*, 125–160.

Geertz, C. (1973). *The interpretation of cultures; selected essays*. New York: Basic Books.

Geiger, D. R., & Ittner, C. D. (1996). The influence of funding source and legislative requirements on government cost accounting practices. *Accounting, Organizations and Society*, *21*, 549–568.

Ghosh, D. (2000). Complementary arrangements of organizational factors and outcomes of negotiated transfer price. *Accounting, Organizations and Society*, *25*, 661–682.

Ghosh, D. (1994). Intra-firm pricing: experimental evaluation of alternative mechanisms. *Journal of Management Accounting Research*, *6*, 78–92.

Ghosh, D., & Lusch, R. F. (2000). Outcome effect, controllability and performance evaluation of managers: some field evidence from multi-outlet businesses. *Accounting, Organizations and Society*, *25*, 411–426.

Giddens, A. (1976). *New rules of sociological method: a positive critique of interpretative sociologies*. New York: Basic Books.

Gordon, L., & Narayanan, V. (1984). Management accounting systems, perceived environmental uncertainty and organization structure: an empirical investigation. *Accounting, Organizations and Society*, *9*, 33–48.

Gordon, L., & Smith, K. J. (1992). Postauditing capital expenditures and firm performance: the role of asymmetric information. *Accounting, Organizations and Society*, *17*, 741–758.

Gosselin, M. (1997). The effect of strategy and organizational structure on the adoption and implementation of activity-based costing. *Accounting, Organizations and Society*, *22*, 105–122.

Govindarajan, V. (1984). Appropriateness of accounting data in performance evaluation: an empirical examination of environmental uncertainty as an intervening variable. *Accounting, Organizations and Society*, *9*, 125–136.

Govindarajan, V., & Gupta, A. K. (1985). Linking control systems to business unit strategy: impact on performance. *Accounting, Organizations and Society*, *10*, 51–66.

Gray, B. (1990). The enactment of management control systems: a critique of Simons. *Accounting, Organizations and Society*, *15*, 145–148.

Greenberg, P., Greenberg, R., & Mahenthiran, S. (1994). The impact of control policies on the process and outcomes of negotiated transfer pricing. *Journal of Management Accounting Research*, *6*, 93–127.

Gul, F. A., & Chia, Y. M. (1994). The effects of management accounting systems, perceivedenvironmental uncertainty and decentralization on managerial performance: a test of three-way interaction. *Accounting, Organizations and Society*, *19*, 413–426.

Gupta, M., & King, R. (1997). An experimental investigation of the effect of cost information and feedback on product cost decisions. *Contemporary Accounting Research*, *14*, 99–127.

Haka, S. F. (1987). Capital budgeting techniques and firm specific contingencies: a correlational analysis. *Accounting, Organizations and Society*, *12*, 31–48.

Haka, S., Friedman, L., & Jones, V. (1986). Functional fixation and interference theory: a theoretical and empirical investigation. *The Accounting Review*, *61*, 455–474.

Haka, S., Luft, J., & Ballou, B. (2000). Second-order uncertainty in accounting information and bilateral bargaining costs. *Journal of Management Accounting Research*, *12*, 115–139.

Hannan, J. (1991). *Aggregation and disaggregation in the social sciences*. Lexington, MA: D. C. Heath & Co.

Hänninen, S. (1995). Accountability lost? An environmental struggle over the economic feasibility of incineration. *Accounting, Organizations and Society*, *20*, 175–192.

Harrell, A. (1977). The decision-making behavior of Air Force officers and the management control process. *The Accounting Review*, *52*, 833–841.

Harrell, A., & Harrison, P. (1994). An incentive to shirk, privately-held information, and manager project evaluation decisions. *Accounting, Organizations and Society*, *19*, 569–577.

Harrison, G. (1992). The cross-cultural generalizability of the relation between participation, budget emphasis and job related attitudes. *Accounting, Organizations and Society*, *17*, 1_15.

Harrison, G. (1993). Reliance on accounting performance measures in superior evaluation style—the influence of national culture and personality. *Accounting, Organizations and Society*, *18*, 319–339.

Hartmann, F., & Moers, F. (1999). Testing contingency hypotheses in budgetary research: an evaluation of the use of moderated regression analysis. *Accounting, Organizations and Society*, *24*, 291–316.

Hedström, P., & Swedberg, R. (1998). *Social mechanisms: an analytical approach to social theory*. Cambridge: Cambridge University Press.

Hirst, M., & Lowy, S. (1990). The linear additive and interactive effects of budgetary goal difficulty and feedback on performance. *Accounting, Organizations and Society*, *15*, 425–436.

Hirst, M. K., & Yetton, P. W. (1999). The effects of budget goals and task interdependence on the level of and variance in performance: a research note. *Accounting, Organizations and Society*, *24*, 205–216.

Holmström, B. (1979). Moral hazard and observability. *The Bell Journal of Economics*, *10*, 74–91.

Holthausen, R. W., Larcker, D. F., & Sloan, R. G. (1995). Business-unit innovation and the structure of executive compensation. *Journal of Accounting and Economics*, *19*, 279–314.

Hopper, T., & Armstrong, P. (1991). Cost accounting, controlling labor and the rise of conglomerates. *Accounting, Organizations and Society*, *16*, 405–438.

Hopwood, A. (1972). An empirical study of the role of accounting data in performance evaluation. *Journal of Accounting Research, Supplement*, *10*, 156–182.

Hopwood, A. (1974). Leadership climate and the use of accounting data in performance evaluation. *The Accounting Review*, *49*, 485–495.

Hopwood, A. (1976). *Accounting and human behavior*. Englewood Cliffs: Prentice-Hall.

Hopwood, A. (1987). The archaeology of accounting systems. *Accounting, Organizations and Society*, *12*, 207–234.

Hoque, Z., & James, W. (2000). Linking balanced scorecard measures to size and market factors: impacts on organizational performance. *Journal of Management Accounting Research*, *12*, 1–13.

Hoskin, K., & Macve, R. (1988). The genesis of accountability: the West Point connections. *Accounting, Organizations and Society*, *13*, 37–74.

Hoskin, R. E. (1983). Opportunity cost and behavior. *Journal of Accounting Research*, *21*, 78–95.

Iselin, E. R. (1988). The effect of information load and information diversity on decision quality in a structured decision task. *Accounting, Organizations and Society*, *13*, 147–164.

Ittner, C., & Larcker, D. (1995). Total quality management and the choice of information and reward systems. *Journal of Accounting Research*, *33*, 1–34.

Ittner, C., & Larcker, D. (1998). Innovations in performance measurement: trends and research implications. *Journal of Management Accounting Research*, *10*, 205–238.

Ittner, C., & Larcker, D. (2001). Assessing empirical research in management accounting: a value-based management perspective. *Journal of Accounting and Economics*, *32*, 349–410.

Ittner, C. D., Larcker, D. F., & Rajan, M. V. (1997). The choice of performance measures in annual bonus contracts. *The Accounting Review*, *72*, 231–256.

James, L. R., Mulaik, S. A., & Brett, J. M. (1982). *Causal analysis: assumptions, models, and data*. Beverly Hills: Sage.

Jermias, J. (2001). Cognitive dissonance and resistance to change: the influence of commitment confirmation and feedback on judgment usefulness of accounting systems. *Accounting, Organizations and Society*, *26*, 141–160.

Johnson, H. T. (1981). Toward a new understanding of 19th century cost accounting. *The Accounting Review*, *56*, 510–518.

Johnson, H. T. (1983). The search for gain in markets and firms: a review of the historical emergence of management accounting systems. *Accounting, Organizations and Society*, *8*, 139–146.

Jones, C. S. (1985). An empirical study of the role of management accounting systems following takeovers or mergers. *Accounting, Organizations and Society*, *10*, 177–200.

Jones, C. S. (1992). The attitudes of owner-managers towards accounting control systems following management buyout. *Accounting, Organizations and Society*, *17*, 151–168.

Kachelmeier, S. J., Smith, J. R., & Yancey, W. P. (1994). Budgets as a credible threat: an experimental study of cheap talk and forward induction. *Journal of Management Accounting Research*, *94*, 144–174.

Ke, B., Petroni, K., & Safieddine, A. (1999). Ownership concentration and sensitivity of executive pay to accounting performance measures: evidence from publicly and privately held insurance companies. *Journal of Accounting and Economics*, *28*, 185–209.

Keating, A. S. (1997). Determinants of divisional performance evaluation practices. *Journal of Accounting and Economics*, *24*, 243–274.

Kenis, I. (1979). Effects of budgetary goal characteristics on managerial attitudes and performance. *The Accounting Review*, *54*, 707–721.

Kennedy, P. (1998). *A guide to econometrics*. Cambridge, MA: MIT Press.

Kerlinger, F. N. (1986). *Foundation of behavioral research*. New York: Holt, Rinehart and Winston.

Khandwalla, P. (1972). The effect of different types of competition on the use of management controls. *Journal of Accounting Research*, *10*, 275–285.

Kim, D. (1992). Risk preferences in participative budgeting. *The Accounting Review*, *67*, 303–319.

Kirby, A. J. (1992). Incentive compensation schemes: experimental calibration of the rationality hypothesis. *Contemporary Accounting Research*, *8*, 374–400.

Klein, K. J., Dansereau, F., & Hall, R. J. (1994). Levels issues in theory development, data collection and analysis. *Academy of Management Review*, *19*, 195–229.

Klein, K. J., Tosi, H., & Cannella, A. (1999). Multilevel theory building: benefits, barriers, and new developments. *Academy of Management Journal*, *24*, 243–248.

Knights, D., & Collinson, D. (1987). Disciplining the shopfloor: a comparison of the disciplinary effects of managerial psychology and financial accounting. *Accounting, Organizations and Society*, *12*, 457–478.

Kozlowski, S. W. J., & Klein, K. J. (2000). A levels approach to theory and research in organizations. In K. J. Klein, & S. W. J. Kozlowski (Eds.), *Multilevel theory, research and methods in organizations*. San Francisco: Jossey-Bass.

Kreft, I., & De Leeuw, J. (1998). *Introducing multilevel modeling*. London: Sage.

Kren, L. (1990). Performance in a budget-based control system:

an extended expectancy theory model approach. *Journal of Management Accounting Research*, *2*, 100–112.

Kren, L. (1992). Budgetary participation and managerial performance: the impact of information and environmental volatility. *The Accounting Review*, *67*, 511–526.

Krumwiede, K. R. (1998). The implementation stages of activity based costing and the impact of contextual and organizational factors. *Journal of Management Accounting Research*, *10*, 239–278.

Lambert, R. A., & Larcker, D. F. (1987). An analysis of the use of accounting and market measures of performance in executive compensation contracts. *Journal of Accounting Research*, *25*, 85–125.

Lanen, W. N., & Larcker, D. F. (1992). Executive compensation contract adoption in the electric utility industry. *Journal of Accounting Research*, *30*, 70–93.

Larcker, D. F. (1981). The perceived importance of selected information characteristics for strategic capital budgeting decisions. *The Accounting Review*, *61*, 519–538.

Larcker, D. F. (1983). The association between performance plan adoption and corporate capital investment. *Journal of Accounting and Economics*, *5*, 3–30.

Latour, B. (1987). *Science in action: how to follow scientists and engineers through society*. Cambridge: Harvard University Press.

Lau, C., Low, L., & Eggleton, I. (1995). The impact of reliance on accounting performance measures on job-related tension and managerial performance: additional evidence. *Accounting, Organizations and Society*, *20*, 359–381.

Lawrence, P., & Lorsch, J. (1967). *Organization and environment: managing differentiation and integration*. Boston: Division of Research, Graduate School of Business Administration, Harvard University.

Lewin, K. (1948). *Resolving social conflicts*. New York: Harper.

Libby, T. (1999). The influence of voice and explanation on performance in a participative budgeting setting. *Accounting, Organizations and Society*, *24*, 125–138.

Libby, T. (2001). Referent cognitions and budgeting fairness: a research note. *Journal of Management Accounting Research*, *13*, 91–105.

Libby, T., & Waterhouse, J. (1996). Predicting change in management accounting systems. *Journal of Management Accounting Research*, *8*, 137–150.

Licata, M. P., Strawser, R. H., & Welker, R. B. (1986). A note on participation in budgeting and locus of control. *The Accounting Review*, *61*, 112–117.

Likert, R. (1961). *New patterns of management*. New York: McGraw-Hill.

Lindquist, T. (1995). Fairness as an antecedent to participative budgeting: examining the effects of distributive justice and referent cognitions on satisfaction and performance. *Journal of Management Accounting Research*, *7*, 122–147.

Lipe, M. G. (1993). Analyzing the variance investigation decision: the effects of outcomes, mental accounting, and framing. *The Accounting Review*, *68*, 748–764.

Lipe, M. G., & Salterio, S. E. (2000). The balanced scorecard: judgmental effects of common and unique performance measures. *The Accounting Review*, *75*, 283–298.

Llewellyn, S. (1998). Boundary work: costing and caring in the Social Services. *Accounting, Organizations and Society*, *23*, 23–28.

Loft, A. (1986). Towards a critical understanding of accounting: the case of cost accounting in the UK. *Accounting, Organizations and Society*, *11*, 137–169.

Luft, J. (1994). Bonus and penalty initiatives: contract choice by employees. *Journal of Accounting and Economics*, *18*, 181–206.

Luft, J. (1997). Fairness, ethics, and the effect of management accounting on transaction costs. *Journal of Management Accounting Research*, *9*, 199–216.

Luft, J., & Libby, R. (1997). Profit comparisons, market prices, and managers' judgments about negotiated transfer pricing. *The Accounting Review*, *72*, 217–229.

Luft, J., & Shields, M. D. (2001). Why does fixation persist? experimental evidence on the judgment performance effects of expensing intangibles. *The Accounting Review*, *76*, 561–587.

Macintosh, N., & Daft, R. (1987). Management control systems and departmental interdependencies: an empirical study. *Accounting, Organizations and Society*, *12*, 49–64.

MacKenzie, S. B. (2001). Opportunities for improving consumer research through latent variable structural equation modeling. *Journal of Consumer Research*, *28*, 159–166.

Magee, D., & Dickhaut, J. (1978). Effects of compensation plans on heuristics in cost variance investigation. *Journal of Accounting Research*, *16*, 294–314.

Magner, N., Welker, R., & Campbell, T. (1995). The interactive effect of budgetary participation and budget favorability on attitudes toward budgetary decision makers: a research note. *Accounting, Organizations and Society*, *20*, 611–618.

Malina, M., & Selto, F. (2001). Communicating and controlling strategy: an empirical study of the effectiveness of the balanced scorecard. *Journal of Management Accounting Research*, *13*, 47–90.

Malmi, T. (1999). Activity-based costing diffusion across organizations: an exploratory empirical analysis of Finnish firms. *Accounting, Organizations and Society*, *24*, 649–672.

Marschak, J., & Radner, R. (1972). *Economic theory of teams*. New Haven, CT: Yale University Press.

Mayo, E. (1933). *The human problems of an industrial civilization*. New York: Macmillan.

McGowan, A., & Klammer, T. (1997). Satisfaction with activity-based cost management implementation. *Journal of Management Accounting Research*, *9*, 217–237.

McGregor, D. (1960). *The human side of the enterprise*. New York: McGraw-Hill.

Merchant, K. (1981). The design of the corporate budgeting system: influences on managerial behavior and performance. *The Accounting Review*, *56*, 813–829.

Merchant, K. (1984). Influences on departmental budgeting: an empirical examination of a contingency model. *Accounting, Organizations and Society*, *9*, 291–310.

Merchant, K. (1985). Budgeting and the propensity to create budgetary slack. *Accounting, Organizations and Society*, *10*, 201–210.

Merchant, K. (1990). The effects of financial controls on data

manipulation and management myopia. *Accounting, Organizations and Society*, *15*, 297–313.

Merchant, K., Chow, C., & Wu, A. (1995). Measurement, evaluation and reward of profit center managers: a cross-cultural field study. *Accounting, Organizations and Society*, *20*, 619–638.

Merchant, K., Van der Stede, W., & Zheng, L. (in press). Disciplinary constraints on the advancement of knowledge: the case of organizational incentive systems. *Accounting, Organizations and Society*. PII: S0361-3682(02)00051-4.

Meyer, J. W., & Rowan, B. (1977). Institutional organizations: formal structures as myth and ceremony. *American Journal of Sociology*, *80*, 340–363.

Mia, L. (1988). Managerial attitude, motivation and the effectiveness of budget participation. *Accounting, Organizations and Society*, *13*, 465–476.

Mia, L. (1989). The impact of participation in budgeting and job difficulty on managerial performance and work motivation: a research note. *Accounting, Organizations and Society*, *14*, 347–358.

Mia, L., & Chenhall, R. H. (1994). The usefulness of management accounting systems, functional differentiation and managerial effectiveness. *Accounting, Organizations and Society*, *19*, 1–14.

Milgrom, P., & Roberts, J. (1992). *Economics, organization, and management*. Englewood Cliffs, NJ: Prentice-Hall.

Milani, K. (1975). Budget-setting, performance and attitudes. *The Accounting Review*, *50*, 274–284.

Miller, P., & O'Leary, T. (1987). Accounting and the construction of the governable person. *Accounting, Organizations and Society*, *12*, 235–265.

Miller, P., & O'Leary, T. (1994). Accounting, 'economic citizenship,' and the spatial reordering of manufacture. *Accounting, Organizations and Society*, *19*, 15–43.

Miller, P., & O'Leary, T. (1997). Capital budgeting practices and complimentary relations in the transition to modern manufacture: a field-based analysis. *Journal of Accounting Research*, *35*, 257–271.

Mock, T. (1969). Comparative value of information structures. *Journal of Accounting Research, Supplement*, *7*, 124–159.

Mock, T. (1973). The value of budget information. *The Accounting Review*, *48*, 520–534.

Moon, P. (1990). Some experimental evidence on functional fixation: a note. *Accounting, Organizations and Society*, *15*, 193–198.

Moores, K., & Yuen, S. (2001). Management accounting systems and organizational configuration: a life-cycle perspective. *Accounting, Organizations and Society*, *26*, 351–389.

Mouritsen, J. (1999). The flexible firm: strategies for a subcontractor's management control. *Accounting, Organizations and Society*, *24*, 31–55.

Murphy, K. (2001). Performance standards in incentive contracts. *Journal of Accounting and Economics*, *30*, 245–278.

Muth, J. (1961). Rational expectations and the theory of price movements. *Econometrica*, *29*, 315–335.

Nahapiet, J. (1988). The rhetoric and reality of accounting change: a study of resource allocation. *Accounting, Organizations and Society*, *13*, 333–358.

Newell, A., & Simon, H. (1972). *Human problem solving*. Englewood Cliffs, NJ: Prentice-Hall.

Newman, H. A. (1989). Selection of short-term accounting-based bonus plans. *The Accounting Review*, *64*, 758–772.

Nouri, H. (1994). Using organization commitment and job investment to predict budgetary slack: a research note. *Accounting, Organizations and Society*, *19*, 289–295.

Nouri, H., & Parker, R. (1998). The relationship between budget participation and job performance: the roles of budget adequacy and organizational commitment. *Accounting, Organizations and Society*, *23*, 467–483.

Oakes, L., & Covaleski, M. (1994). A historical examination of the use of accounting-based incentive plans in the structuring of labor-management relations. *Accounting, Organizations and Society*, *19*, 579–597.

Oakes, L., & Miranti, P. (1996). Louis D. Brandeis and standard cost accounting: a study of the construction of historical agency. *Accounting, Organizations and Society*, *21*, 569–586.

O'Connor, N. (1995). The influence of organizational culture on the usefulness of budget participation by Singaporean-Chinese managers. *Accounting, Organizations and Society*, *20*, 383–403.

Ogden, S. G. (1995). Transforming frameworks of accountability: the case of water privatization. *Accounting, Organizations and Society*, *20*, 193–218.

Otley, D. (1978). Budget use and managerial performance. *Journal of Accounting Research*, *16*, 122–149.

Perera, S., Harrison, G., & Poole, M. (1997). Customer-focused manufacturing strategy and the use of operations-based non-financial performance measures: a research note. *Accounting, Organizations and Society*, *22*, 557–572.

Pfeffer, J. (1981). *Power in organizations*. Marshfield, MA: Pitman.

Preston, A. (1986). Interactions and arrangements in the process of informing. *Accounting, Organizations and Society*, *11*, 521–540.

Preston, A. (1992). The birth of clinical accounting: a study of the emergence and transformations of discourses on costs and practices of accounting in US hospitals. *Accounting, Organizations and Society*, *17*, 63–100.

Preston, A., Chua, W., & Neu, D. (1997). The diagnosis-related group-prospective payment system and the problem of the government of rationing health care to the elderly. *Accounting, Organizations and Society*, *22*, 147–164.

Preston, A., Cooper, D., & Coombs, R. (1992). Fabricating budgets: a study of the production of management budgeting in the National Health Service. *Accounting, Organizations and Society*, *17*, 561–593.

Rahman, M., & McCosh, A. M. (1976). The influence of organisational and personal factors on the use of accounting information: an empirical study. *Accounting, Organizations and Society*, *1*, 339–356.

Rankin, F. W., & Sayre, T. L. (2000). The effects of performance separability and contract type on agent effort. *Accounting, Organizations and Society*, *25*, 683–696.

Richardson, G. P. (1991). *Feedback thought in social science and*

systems theory. Philadelphia: University of Pennsylvania Press.

Roberts, J. (1990). Strategy and accounting in a UK conglomerate. *Accounting, Organizations and Society*, *15*, 107–120.

Rockness, H. (1977). Expectancy theory in a budgetary setting: an experimental examination. *The Accounting Review*, *52*, 893–903.

Rockness, H., & Shields, M. (1984). Organizational control systems in research and development. *Accounting, Organizations and Society*, *9*, 165–178.

Rockness, H., & Shields, M. (1988). An empirical analysis of the expenditure budget in research and development. *Contemporary Accounting Research*, *4*, 568–581.

Ross, A. (1994). Trust as a moderator of the effect of performance evaluation style on job-related tension: a research note. *Accounting, Organizations and Society*, *19*, 629–635.

Rosser, J. B. (1996). Chaos theory and rationality in economics. In L. D. Kiel, & Ee. Elliott (Eds.), *Chaos theory in the social sciences* (pp. 199–213). Ann Arbor: University of Michigan Press.

Rousseau, D. M. (1985). Issues of level in organizational research: multi-level and cross-level perspectives. *Research in Organizational Behavior*, *7*, 1–38.

San Miguel, J. G. (1976). Human information processing and its relevance to accounting: a laboratory study. *Accounting, Organizations and Society*, *1*, 357–373.

Sayre, T. L., Rankin, F. W., & Fargher, N. (1998). The effects of promotion incentives on delegated investment decisions: a note. *Journal of Management Accounting Research*, *10*, 313–324.

Scott, T., & Tiessen, P. (1999). Performance measurement and managerial teams. *Accounting, Organizations and Society*, *24*, 263–285.

Searfoss, G. (1976). Some behavioral aspects of budgeting for control: an empirical study. *Accounting, Organizations and Society*, *1*, 375–388.

Sharma, S., Durand, R., & Gur-Arie, O. (1981). Identification and analysis of moderator variables. *Journal of Marketing Research*, *18*, 291–300.

Shields, J., & Shields, M. (1998). Antecedents of participative budgeting. *Accounting, Organizations and Society*, *23*, 49–76.

Shields, M. (1980). Some effects of information load on search patterns used to analyze performance reports. *Accounting, Organizations and Society*, *5*, 429–442.

Shields, M. (1983). Effects of information supply and demand on judgment accuracy: evidence from corporate managers. *The Accounting Review*, *58*, 284–303.

Shields, M. (1995). An empirical analysis of firms' implementation experiences with activity-based costing. *Journal of Management Accounting Research*, *7*, 148–166.

Shields, M. (1997). Research in management accounting by North Americans in the 1990s. *Journal of Management Accounting Research*, *9*, 3–61.

Shields, M., Birnberg, J., & Frieze, I. H. (1981). Attributions, cognitive processes and control systems. *Accounting, Organizations and Society*, *6*, 69–93.

Shields, M., Deng, F. J., & Kato, Y. (2000). The design and effects of control systems: tests of direct- and indirect-effects models. *Accounting, Organizations and Society*, *25*, 185–202.

Shields, M., & Waller, W. (1988). A behavioral study of accounting variables in performance incentive contracts. *Accounting, Organizations and Society*, *13*, 581–594.

Shields, M., & Young, S. M. (1993). Antecedents and consequences of participative budgeting: evidence on the effects of asymmetrical information. *Journal of Management Accounting Research*, *5*, 265–280.

Sim, K. L., & Killough, L. (1998). The performance effects of complementarities between manufacturing practices and management accounting systems. *Journal of Management Accounting Research*, *10*, 325–346.

Simon, J. L. (1969). *Basic research methods in social science*. New York: Random House.

Simon, H. (1973). The organization of complex systems. In H. H. Pattee (Ed.), *Hierarchy theory: the challenge of complex systems*. New York: George Braziller.

Simons, R. (1987). Accounting control systems and business strategy: an empirical analysis. *Accounting, Organizations and Society*, *12*, 357–374.

Simons, R. (1988). Analysis of the organizational characteristics related to tight budget goals. *Contemporary Accounting Research*, *4*, 267–283.

Sloan, R. G. (1993). Accounting earnings and top executive compensation. *Journal of Accounting and Economics*, *9*, 287–310.

Smith, K. (1993). Investment monitoring systems, abandonment of capital assets, and firm performance. *Journal of Management Accounting Research*, *5*, 281–299.

Sprinkle, G. B. (2000). The effect of incentive contracts on learning and performance. *The Accounting Review*, *75*, 299–326.

Sterman, J. D. (1989a). Misperceptions of feedback in dynamic decision making. *Organizational Behavior and Human Decision Processes*, *43*, 301–335.

Sterman, J. D. (1989b). Modeling managerial behavior: misperceptions of feedback in a dynamic decision-making experiment. *Management Science*, *35*, 321–339.

Sterman, J. D., Repenning, N. P., & Kofman, F. (1997). Unanticipated side effects of successful quality programs: exploring a paradox of organizational improvement. *Management Science*, *43*, 503–521.

Stewart, I. (1989). *Does God play dice? the mathematics of chaos*. Oxford: Blackwell.

Thompson, J. D. (1967). *Organizations in action*. New York: McGraw-Hill.

Tiller, M. (1983). The dissonance model of participative budgeting: an empirical exploration. *Journal of Accounting Research*, *21*, 581–595.

Tversky, A., & Kahneman, D. (1974). Judgment under uncertainty: heuristics and biases. *Science*, *185*, 1124–1131.

Uecker, W. C. (1978). A behavioral study of information system choice. *Journal of Accounting Research*, *16*, 169–189.

Uecker, W. C. (1980). The effects of knowledge of the user's decision model in simplified information evaluation. *Journal of Accounting Research*, *18*, 91–213.

Uecker, W. C. (1982). The quality of group performance in simplified information evaluation. *Journal of Accounting Research*, *20*, 388–402.

Van der Stede, W. A. (2000). The relationship between two consequences of budgetary controls: budgetary slack creation and managerial short-term orientation. *Accounting, Organizations and Society*, *25*, 609–622.

Van de Ven, A., & Drazin, R. (1985). The concept of fit in contingency theory. In B. Staw, & L. Cummings (Eds.), *Research in organizational behavior (Vol. 7)*. Greenwich, CT: JAI.

Vera-Muñoz, S. C. (1998). The effects of accounting knowledge and context on the omission of opportunity costs in resource allocation decisions. *The Accounting Review*, *73*, 47–72.

Vera-Muñoz, S. C., Kinney, W. R., & Bonner, S. E. (2001). The effects of domain experience and task presentation format on accountants' information relevance assurance. *The Accounting Review*, *76*, 405–429.

Vroom, V. (1964). *Work and motivation*. New York: Wiley.

Walker, K. B., & Johnson, E. N. (1999). The effects of a budget-based incentive compensation scheme on the budgeting behavior of managers and subordinates. *Journal of Management Accounting Research*, *11*, 1–28.

Wallace, J. S. (1997). Adopting residual income-based compensation plans: do you get what you pay for? *Journal of Accounting and Economics*, *24*, 275–300.

Waller, W. (1988). Slack in participative budgeting: the joint effect of a truth-inducing pay scheme and risk preferences. *Accounting, Organizations and Society*, *13*, 87–98.

Waller, W. (1995). Decision-making research in managerial accounting: return to behavioral-economics foundations. In R. Ashton, & A. Ashton (Eds.), *Judgment and decision-making research in accounting and auditing*. Cambridge: Cambridge University Press.

Waller, W., & Bishop, R. (1990). An experimental study of incentive pay schemes, communication and intrafirm resource allocation. *The Accounting Review*, *65*, 812–836.

Waller, W., & Chow, C. (1985). The self-selection and effort effects of standard-based employment contracts: a framework and some empirical evidence. *The Accounting Review*, *60*, 458–476.

Waller, W. S., Shapiro, B., & Sevcik, G. (1999). Do cost-based pricing biases persist in laboratory markets? *Accounting, Organizations and Society*, *24*, 717–739.

Walsh, E., & Stewart, R. (1993). Accounting and the construction of institutions: the case of a factory. *Accounting, Organizations and Society*, *18*, 783–800.

Weick, K. (1969). *Social psychology of organizing*. Reading, MA: Addison-Wesley.

Widener, S. K., & Selto, F. (1999). Management control systems and boundaries of the firm: why do firms outsource internal auditing activities. *Journal of Management Accounting Research*, *11*, 45–74.

Williams, J., & Seaman, A. (2001). Predicting change in management accounting systems: national culture and industry effects. *Accounting, Organizations and Society*, *26*, 443–460.

Young, S. M. (1985). Participative budgeting: the effects of risk aversion and asymmetric information on budgetary slack. *Journal of Accounting Research*, *23*, 829–842.

Young, S. M., & Lewis, B. (1995). Experimental incentive-contracting research in management accounting. In R. Ashton, & A. Ashton (Eds.), *Judgment and decision-making research in accounting and auditing*. Cambridge: Cambridge University Press.

Young, S. M., Shields, M. D., & Wolf, G. (1988). Manufacturing controls and performance: an experiment. *Accounting, Organizations and Society*, *13*, 607–620.