Organizational Design and Control Choices

Christian Hofmann
LMU Munich
Munich School of Management
Geschwister Scholl Platz 1, 80539 Munich, Germany
hofmann@bwl.lmu.de

Laurence van Lent
Tilburg University
Department of Accountancy
PO Box 90153, 5000 LE Tilburg, the Netherlands
vanlent@tilburguniversity.edu

Accepted for publication in:
Oxford Research Reviews: Business and Management
Oxford University Press

This version: March 2015

Organizational Design and Control Choices

Abstract

Building on new insights from organizational economics, management accounting researchers have highlighted how incentive contracts and performance measure choices complement structural arrangements in firms. We discuss how "slow moving" elements in organizational design, such as the allocation of decision rights to local managers and interdependencies between different parts of the production function, affect the working of incentives and performance measures. We pay attention to the empirical challenges that researchers face in this area and argue that mixed method approaches in which economic models are combined with empirical evidence can help to build a body of evidence that is robust and admits cross-study accumulation of knowledge. Finally, we illustrate how recent economic models that incorporate other-regarding preferences can help to bridge the gap between economics-based research in management accounting and more traditional approaches that rely on the behavioral sciences.

Organizational Design and Control Choices

1. Introduction

We discuss how accounting researchers have used the economic theory of organizational design to address salient managerial problems such as the assignment of decision rights and the use of incentives and performance measures. The literature in this field has developed in an iterative fashion, and we survey both theoretical and empirical studies. Empirical insights that contradict earlier theoretical predictions spur new developments in theory, while theory has in turn generated ideas for empirical testing. This evolution of the field may have brought about one of its particularly attractive features; namely, the significant number of mixed-method studies that combine both formal theory and empirical tests.

In contrast with other areas of accounting research, economics-based work occupies something of a niche in management accounting. Most studies appear to be inspired by behavioral approaches and by theories grounded in organizational sociology. In particular, contingency theory has been traditionally used to provide the theoretical underpinning for empirical examinations of how management accounting systems respond to variations in environment and the resultant "uncertainty". For researchers more steeped in this tradition, we wish to offer a comprehensive and self-contained discussion of the main ideas and findings in the economics-based management accounting literature. For those who, like us, work in this area, we intend to provide a frank assessment of what has been learned in the past twenty years. We believe that a careful exposition of the limitations of existing work (some of it, our own) enhances this assessment. Further, we can extend it by providing our views on promising directions for future work and by identifying dead ends.

Using economics in addition to other theories to understand organizational design offers substantial benefits. To some extent, these benefits include the usual advantages of having a framework that is transparent and rigorous regarding the logic of its arguments. If assumptions have to be made, how

they affect predictions will be clear. Economics emphasizes the optimizing choice behavior of individuals who tradeoff costs and benefits in deciding the best course of action. In addition, economic analysis rests on the concept of equilibrium. A key insight is that an individual's best plan of action depends on the anticipated actions of other parties—and thus, strategic behavior is put "front and center" in the analysis. Partly because beliefs about what other individuals will do play such an important role in determining equilibrium behavior, an economist's view on causality is nuanced. Rather than viewing the world in terms of unidirectional causality, which dominates contingency thinking, economists tend to see it as consisting of forces that have reciprocal (feedback) relations. Consider the following example: economic theory suggests that "better" performance measures increase the scope for pay-for-performance (e.g., cash bonuses). When incentives are steeper, a firm can attract more high-ability employees because they believe that pay-for-performance will yield higher payoffs than fixed wages. But with a high-quality workforce, the firm may in turn require less monitoring and thus the good performance measures that served as the starting point of this illustration.

Economics prizes intuitive, testable predictions and allows knowledge to be accumulated across studies as empirical tests are ultimately derived from the same set of assumptions about human behavior. None of this is to deny that other disciplines have much to offer to the (empirical) investigation of organizations (Zimmerman 2001, Hopwood 2002). However, those who attempt to consolidate empirical findings in management accounting and assemble generalizable knowledge from prior work often lament the difficulty in unifying hugely disparate studies (Ittner and Larcker 2001, Luft and Shields 2003). As we will show, the economics-based literature has yielded a significant (and cohesive) set of results on how firms use accounting information internally.[1]

We organize our discussion by first introducing the idea of *complementarities* between organizational design choices in Section 2. Complementarities precisely describe what management consultants like to call "synergies"—the idea that "1 + 1 = 3". While the introduction of the

[1] Merchant, Van der Stede, and Zheng (2003) provide a more extensive discussion of overlap and differences between the more "mainstream" approaches in management accounting.

complementarities concept has galvanized the economic literature on organizational design, it has also laid bare the problems associated with doing empirical work in this area. Thus, we describe in some detail the key insights of considering complementarities in explaining organizational design choices. We then highlight how the presence of complementarities complicates the empirical work in accounting research, and where possible, we provide guidance on study design. This discussion lays the groundwork for our assessment of the accounting literature that empirically investigates the existence of complementarities between key control choices.

One important insight from prior literature is that organizational design choices vary systematically in response to two key "primitives", namely the presence of knowledge differences between senior managers and employees as well as the existence of spillovers between organizational units within a firm. Knowledge differences (see Section 3) arise when employees have private information that is difficult to communicate to others (higher or lower in the hierarchy). Spillovers (see Section 4) can arise from how the firm has organized production or may alternatively be due to two units of the same firm sharing factor or product markets. Our discussion parallels the development in the economics-based literature in which knowledge differences were the initial focus, with subsequent consideration of spillovers. This sequence follows naturally from principal-agent models that were originally preoccupied by information frictions between the principal and a single agent. A natural next step is to consider how contractual arrangements change when the principal faces two or more agents, which in turn might be mutually dependent.

In Section 5, we look ahead to potential future developments and opportunities for research. One particularly promising research track uses results from the field of "behavioral economics" to explain control choices. The economics literature asks what happens to standard model predictions when *other-regarding* preferences augment the utility function of agents. Other-regarding preferences add additional layers of expectations regarding the behavior of other agents, thereby giving rise to diverse types of implicit incentives (Milgrom and Roberts 1992). When these social preferences are salient, managerial decisions regarding the use of pay-for-performance, decentralization, and the application of "soft

controls" might differ greatly from those made when agents are primarily self-interested and motivated by money. By considering social preferences (and the economics literature on implicit contracts), we attempt to bridge the gap between studies that follow the economics paradigm and more traditional studies in management accounting that follow an approach inspired by contingency theory. Indeed, while the economics-based literature emphasizes incentive and performance measurement systems, contingency-based control frameworks (Simons 1995, Merchant and Van der Stede 2007) suggest a more elaborate interpretation of control choices (which focuses attention on "beliefs" and personnel and cultural controls).

Our choice of papers discussed here is somewhat driven by taste. We focus primarily on recent work in the economic analysis of control choices and include only those studies that are particularly relevant to researchers working in accounting; that is, our primary interest centers on the use of performance measures and incentive systems in firms. In addition, our choice also testifies to our beliefs that mixed-method studies can be particularly helpful to advance this field of study to the next level. We highlight how prior research has benefited from a mixed-method approach and what areas can still profit from a combination of formal theory and rigorous empirical work.

2. Complementarities and Organizational Design

In this section, we argue that the economic notion of complementarities helps to simplify the complexity of organizational design problems. We then discuss the implications of complementarities in organizational design for empirical research and review the available evidence. [2]

2.1 Concepts

Organizational design problems can readily become mind-boggling puzzles. Indeed, immense demands are placed on "the designer" to select strategies, recruit and motivate people, organize employees in effective structures, develop routines, and encourage a culture that supports the firm's objectives. Nevertheless, economic theory suggests that a limited number of "coherent patterns" (Roberts 2004) exist among the choice variables confronting the designer. Certain constellations of choices go

[2] This section uses material previously published as Nikolaev and van Lent (2005) and van Lent (2007).

together ("fit") and are more likely to yield beneficial outcomes. Indeed, a predictable relation often exists between a firm's environment and the choice variables of organizational design.[3] When this relation is well understood, the design problem becomes much more tractable. Certain organizational features can only effectively be adopted if a cluster of other features are present, which greatly reduces the number of distinct choices that need to be made. The Milgrom and Roberts (1995) example of two very different designs used in manufacturing illustrates this idea. On the one hand, some firms use traditional mass production, which relies on the logic of the transfer line, interchangeable parts, and economies of scale. Specialized skill jobs fit with high inventories, vertical integration, mass marketing, narrow product lines, and a host of other policy variables. On the other hand, firms can adopt "modern manufacturing", featuring, among other things, highly skilled, cross-trained workers, horizontal communication, demand management, make to order, reliance on outside suppliers, and short production runs. The underlying logic is flexibility, speed, economies of scope, and core competencies.

While mass production is often seen as an inferior solution, *both* mass production and modern manufacturing can in fact furnish the *optimal* response to the business environment of the firm. Importantly, the key idea is that the specific organizational design features of one cannot be interchanged with those of the other. Thus, once the designer understands where traditional mass production outperforms modern manufacturing within the business environment, he also knows what specific (cluster of) choices to make.

These insights are derived from a line of inquiry in the economic analysis of organizations that departs from simplifying assumptions that require a model's problem to have "well-behaved" features, such as smoothly concave objective functions and convex choice sets, to conduct comparative statics. As Roberts (2004) points out, no reason exists to believe that these traditional conditions hold when analyzing organizational design problems. For example, increasing returns to scale, learning effects, and indivisibilities are all incompatible with concave objective functions. New methods of comparative statics allow economists to deal with large numbers of choice variables without assuming concave objective

[3] A comparable point is made in the contingency literature (e.g., Grabner and Moers 2013).

functions. Instead, the key assumption is that the choice variables interact. In the context of organizational design, choices or attributes, such as a firm's strategy and structure, are assumed to be linked to one another and to respond together to an environmental change. Because some organization design choices work best in concert with other choices, "coherent clusters" emerge.

Complementarity is then best understood as the idea that doing more of one choice increases the marginal payoffs of doing more of the other choice. Or in more formal terms, paraphrasing Brynjolfson and Milgrom (2012), for a profit-maximizing firm that is considering changing one or both of two practices, let $\Delta_1$and Δ_2 be the increase in profits from changing one or the other, and let Δ_B be the increase resulting from doing both. Any Δ can be positive or negative and can depend on the other choices that the firm makes. The two changes are (weakly) complementary if $\Delta_B \geq \Delta_1 + \Delta_2$, regardless of the firm's other choices.

The economics-based accounting literature has mostly highlighted the possible complementarities between three elements of organizational design: (1) the allocation of decision rights, (2) the incentive system, and (3) the performance measurement system (Brickley, Smith and Zimmerman 2001).[4] While this approach clearly compromises some of the richness suggested in the theoretical organizational design literature, it allows researchers to focus on the aspects of organizational design that are salient to accounting scholars.

2.2 Implications of complementarity for empirical testing

To the extent that complementarities underlie organizational design choices, it is unreasonable to consider the relation between two choices within a coherent cluster in isolation, holding all other choices constant. In other words, the *ceteris paribus* condition underlying the interpretation of Ordinary Least Squares regressions is likely violated (Heckman 2000, Van Lent 2007). Similarly, one cannot conclude causality if covariance occurs within clusters of choices since clusters are likely to respond to a third,

[4] In a multi-agent setting, Feltham, Hofmann, and Indjejikian (2015) show that accounting practices that aggregate the performance contributions of different economic agents can complement organizational forms characterized by decentralization of contracting authority, whereas accounting practices that capture the performance contributions separately tend to favor more centralized organizational forms.

exogenous factor). Ideally, therefore, empirical researchers should explore the interactions among all the choice variables composing a coherent cluster and document how different clusters of choices influence outcomes. However, given the econometric problems with implementing such a research design, it is unreasonable to expect that this can easily be done.

Partial relief may come from the growing evidence that some elements of organizational design are "slow moving", such as the assignment of decision rights within firms (Abernethy and Lillis 2001, Nagar 2002, Abernethy, Bouwens and van Lent 2004), whereas others can be easily adapted to environmental and strategic changes. This evidence in the economics-based literature aligns with earlier ideas propagated in the contingency literature, which has always seen "structural arrangements" as antecedents (i.e., preceding choices) of management accounting and control systems (Chenhall and Morris 1986, Chapman 1997). Firms use the more malleable elements of formal design (e.g., performance measurement and the information system) to respond to changes in markets or technology (Roberts 2004, Bouwens and van Lent 2007).[5] Thus, while the elements of an organization's design will interact, the impact of the malleable elements on the quasi-fixed elements will likely be of second-order importance. In a related development, Van den Steen (2013) characterizes *strategy* as "the smallest set of (core) choices to optimally guide the other choices" (p. 3). Once a strategy has been defined, further decisions on specific aspects of organization design fall into place. Endogeneity concerns can be allayed when using the more slow-moving elements of an organization's design or strategy (in Van den Steen's sense) as explanatory variables in regressions.

To reinforce these ideas, consider Figure 1. The graph plots a firm's degree of decentralization on the horizontal axis and all other control choices on the vertical axis. Dashed lines represent iso-profit lines in an initial State s_1, and Point A characterizes the optimal degree of decentralization and control choices in this state, where the optimal structure is a relatively centralized firm. Changes in the environment affect the iso-profit lines. With substantial changes of the environment, labeled State s_2, dot-dashed lines

[5] The difficulties of organizational design research are well-illustrated when one considers the evidence in Campbell, Datar and Sandino (2009) that a firm's decision to expand into certain markets is itself an outcome of organizational design choices.

represent the associated levels of identical firm profit, and Point B characterizes the new optimal degree of decentralization and control choices; the optimal structure is now more decentralized. In a frictionless world, in which firms can change the level of decentralization smoothly and without costs, firms will adjust to environmental changes by making corresponding changes in the assignment of decision rights. Control choices will be adjusted to reflect the complementarities with decentralization. And so, for marginal changes of the environment (from State s_1 to State s_2), the firm might move from Point A to Point B in a relatively smooth manner along the solid curve connecting the two points. Along the way from A to B, performance differences may be present. Indeed, these differences prompt firms to move closer toward the new equilibrium.

INSERT FIG. 1 ABOUT HERE

In contrast, when switching costs are consequential and firms cannot easily change the level of decentralization, variation of control choices vertically to Point A might result from the firm's attempt to compensate for the mismatch between the demands of the changing environment and the present level of decentralization. The degree of decentralization then remains fixed as long as the cost of the mismatch is less than the switching cost. Only when the mismatch becomes very costly (and control choices can no longer be adjusted to compensate for the adverse consequences of the mismatch) will the firm change its organizational structure. For example, if the cost of mismatch is consequential in State s_2, the firm "leaps" from point A to B and radically reorganizes from a centralized to a decentralized structure.

Estimation in the presence of complementarities. Overall, the econometric solutions available to address estimation problems in the presence of complementary organizational design choices are rather limited (Van Lent 2007). While textbook solutions such as instrumental variable techniques, simultaneous equation modelling, and the use of panel data could in principle be summoned to explicitly account for different variations of the endogeneity problem, limitations in available data, theoretical indeterminacy, and lack of plausibly exogenous variation in the variables of interest prevent their successful application in practice.

The most common approach in accounting is to estimate simultaneous equation models (SEMs) in which the researcher specifies one equation for each choice variable of interest. This approach relies on first separating the choice variables the researcher cares about and those that are considered predetermined for the purpose of the analysis. Note that this practice stretches the credibility of the method considerably inasmuch as the analysis is motivated by the economic theory of organizational design. Usually, the researcher then allows the choice variables of interest to feedback to each other; that is, they appear as explanatory variables in the equation of the remaining choice variables. The consistent estimation of such a system of equations assumes the presence of valid "instrumental variables". These instruments should produce variation in the (endogenous) explanatory variables in each equation but only affect the dependent variable through the impact that the endogenous explanatory variable has on it. In addition, *unique* instruments need to be found for every endogenous variable. The challenges associated with finding valid and sufficiently strong instruments have not often been overcome in the prior (accounting) literature (Larcker and Rusticus 2010). The evidence based on this approach, which we will briefly summarize, should thus be interpreted with considerable care.

Perhaps even more fundamental, however, is a problem outlined by Wooldridge (2002) that concerns the appropriate use of SEMs. The problem centers on SEMs only being suitable when each equation in the model has economic meaning in isolation from the other equations in the system ("the autonomy requirement"). This condition fails when "the endogenous variables in the system are all choice variables of the *same* economic unit" (Wooldridge 2002). Of course, in the empirical literature dealing with organizational design, the designer (say, senior management) is conceptualized as making all of the decisions with regard to performance measures, decentralization, and incentives, and the autonomy requirement would not appear to be met. As Wooldridge notes, determining how one endogenous variable trades off against another can still be useful, but no conclusions about causality can be drawn. Indeed, in such analysis, the choice of which endogenous variables to treat as the dependent variables "is largely arbitrary" (Wooldridge 2002, 211).

Testing for complementarities. Existing work has used two methods to test for complementarities in the organizational design attributes under investigation. The first examines whether the *performance outcomes* of firms that adopt organizational design elements thought to be complementary are larger when the elements are adopted together or separately ("productivity equations") (Athey and Stern 1998, Cassiman and Veugelers 2006, Brynjolfsson and Milgrom 2012). In practical terms, the test is carried out by specifying a regression with some metric of performance as the dependent variable and the hypothesized complementary choices as explanatory variables appearing both as simple and interaction effects. With two choices, complementarity is said to exist if the coefficient on the interaction term constructed from these two choices is positive and significant (in a simple *t*-test). Thus, a researcher could specify the following regression:

$$ROA_{it} = \alpha_0 + \alpha_1 Delegation_{it} + \alpha_2 Incentive\ Intensity_{it} + \alpha_3 Delegation_{it} \times Incentive\ Intensity_{it} + \varepsilon_{it}, \quad (1)$$

where *ROA* is accounting-based return-on-assets, *Delegation* is the extent to which decision rights are allocated to lower levels in the hierarchy, and *Incentive Intensity* denotes the degree of pay-for-performance sensitivity. A *t*-test of the hypothesis that $\alpha_3 = 0$ is interpreted as evidence of (the lack of) complementarity.

The second approach exploits the idea that complementarities predict that organizational design practices are more likely to be adopted jointly rather than separately ("demand equations"). A significant positive correlation between two choices thus provides evidence of their complementary nature (Arora and Gambardella 1990, Arora 1996). To ensure that omitted factors (such as fundamental firm characteristics) are not driving this correlation, the researcher conditions on a set of observable characteristics. Specifically, each (endogenous) organizational design variable is regressed against a set of exogenous determinants. The pairwise correlations between the residuals of these (reduced-form) regressions then provide evidence of complementarity. In reduced form, endogenous variables are expressed as a function of exogenous variables only; that is, the regressions do not model the interrelations between the endogenous choices. While this approach certainly has intuitive appeal and is

easy to implement, it also relies on a strong assumption that the set of conditioning variables is reasonably complete. Without a well-specified reduced form regression, the correlation between the residual terms might not signal complementarity but rather the presence of a third factor that is correlated with the two organizational design choices under consideration.

The (productivity equation) test based on the performance differences between adopting practices together or separately has low power when little reason exists to expect that inefficient combinations of practices survive on competitive markets. Similarly, when managers have a perfect understanding of the complementarities in their firm and have full discretion to act on this knowledge, the researcher will *only* observe instances of practices either being adopted together or not adopted at all. Without the ability to observe the performance of firms that adopt one organizational design feature separately, the method breaks down (Brynjolfsson and Milgrom 2012). When the researcher, however, is fortunate enough to find instances in which the "assignment of the treatment" (i.e., the adoption of an organizational design choice) is determined randomly, the productivity equation test will be more powerful than the alternative based on demand equations. Thus, in a "costless redesign" world where there are no switching costs, performance differences would not be expected between designs because firms will self-select into the architecture that fits their circumstances best and hence little scope exists for a productivity equation test. However, as Brynjolfsson and Milgrom (2012) maintain, most real-world cases will not be characterized by random assignment of organizational practices or by perfectly correlated design choices (which presume that managers have full knowledge of complementarities and can choose the corresponding organization design perfectly). And therefore, in practice, both tests might be useful.[6,7]

2.3 Empirical evidence on complementarities

Few (accounting) studies have attempted to document complementarities between the key elements of organizational design. Simplifying assumptions are often made, usually implicitly, which

[6] For example, when design choices are not perfectly correlated, researchers will find it easier to apply demand equation tests and identify conditions under which specific organizational design practices are adopted jointly.

[7] A parallel literature in contingency work asks how to examine empirically the key prediction that fit yields performance improvements (Burkert, Davila, Mehta and Oyon 2014).

amount to viewing some organizational design features as predetermined (or slow-moving). For example, Bushman et al. (1995) assume a sequence of organizational design choices—although they recognize the possibility that these choices could change simultaneously—and investigate how performance measures and incentives are used in response to varying degrees of (pre-determined) interdependencies between organizational units.

Accounting researchers are mostly interested in the performance measures used in incentive contracts to reduce the conflict of interest between the firm and its employees. In many cases, assuming that "structural arrangements" (i.e., the delegation of decision rights) are quasi-fixed is reasonable. Indeed, studies that allow authority to vary simultaneously with the design of incentives and/or the choice of performance measures tend to show that the relation flows from authority to incentives and/or performance measures, but not the other way around (Nagar 2002, Abernethy et al. 2004). While these findings are consistent with Roberts' (2004) theoretical notion of malleable versus slow-moving organizational attributes, the available evidence does not support any strong conclusions. First, researchers tend to isolate only one particular design parameter of performance measures (e.g., the use of financial measures) or incentive contracts (e.g., the pay-performance sensitivity), while ignoring other pertinent contract design differences (such as targets).[8] Second, empirically, the evidence is based on SEMs with instrumental variables that might not be valid. These models do not allow a causal interpretation about the direction of the relation but rather document how one endogenous variable trades off against another.

Perhaps the most comprehensive attempt to test whether the three key elements of organizational design are complements is undertaken by Widener et al. (2008). These authors document in a sample of 53 B2C Internet companies that decentralization choices affect both the design of the incentive system as well as (marginally) the use of (revenue-based) performance measures. While incentive systems and

[8] The theoretical construct of "incentives" is often narrowly operationalized. Proxies often focus on cash-bonuses or on equity incentives. Much less attention is devoted to the incentives deriving from promotions despite evidence that the monetary effects of promotions on lifetime pay are large. Refer to Campbell (2008) for a study in which promotion incentives take center stage.

performance measures also are interrelated (i.e., affect each other in a bidirectional sense), neither influences decentralization. The study is a courageous first stab at providing empirical evidence on major predictions derived from organizational design theory. Nevertheless, in addition to the reservations voiced earlier about the possibility of identifying causal effects using simultaneous models (without valid instruments), the study's small sample size likely limits what can be inferred given the demands of the research design.

Indjejikian and Matejka (2011) question whether organizational design choices are complementary. They argue that a manager's authority and the use of financial performance measures produced by the firm's internal accounting system are substitutes rather than complements. Managers who have more authority can compromise the requisite "hardness" of the performance measure, rendering them less useful for contracting. Indjejikian and Matejka's evidence suggests that choices regarding local manager authority and financial performance measures are not taken together.

To conclude our discussion of complementarities, we note that empirical work in the presence of complementarities is challenging as is testing for their existence. In the final analysis, we believe that while continuing to work in this area is important, researchers should also be courageous and address important questions of organizational design regardless of whether they can fully account for complementarity in their empirical work. It is safe to assume that complementarities are present. It is also safe to assume that causal inference will be difficult due to the empirical complexities associated with complementarities. But innovative work using interesting datasets that reveal robust correlations between organizational design variables is important and should not be casually dismissed (Van Lent 2007).

An econometric solution to the endogeneity problems caused by complementarities might very well be illusionary. To show causal effects, researchers need randomization. Applying an econometric method does not magically create the requisite randomization. Instead, randomization has to be found in real life, either through controlled experiments or by chance. Once researchers find instances of (quasi) randomization, they should then apply the correct econometric methods to exploit them. Simultaneous equation models, for example, might give the correct answer if there is quasi random variation. More

commonly (in the practice of accounting research), however, credible quasi random variation is typically not present.

3. Specific knowledge and organizational design choices

The accounting literature has examined how the organizational design of firms varies in the presence of (1) knowledge differences between senior management and employees and (2) spillovers between organizational units within a firm. Accounting studies tend to zoom in on *control choices*, defined here as the design of performance measurement and incentive systems. Often, but not always, these studies consider these control choices together with decisions about the delegation of authority. Frequently, the assumption is that information asymmetries and spillovers are exogenously determined. For example, firms may decide to create a divisionalized structure, which is thought to precede decisions about decentralization and incentives. Divisions are established to minimize the connections among them as well as the coordination necessary across divisionary boundaries (Milgrom and Roberts 1992). Nevertheless, the connections remaining after the divisions are in place are thought to affect the optimal control choices of interest to accountants.

We discuss in this section the relation between (specific) knowledge and control choices, before turning in the next section to the role of spillovers. Note that separating the roles of specific knowledge and spillovers, while consistent with accounting literature, is somewhat artificial. In fact, creating a divisionalized structure influences the information asymmetry between divisional units and headquarters as well as the spillovers between divisional units. Indeed, Rantakari (2013) argues that volatile environments not only tend to produce more informational frictions within a firm, but also decrease the interdependencies between its operating units. The idea is that volatility makes local responsiveness more valuable, which in turn is achieved by reducing the extent of (operational) integration. Thus, knowledge differences (caused by the business environment) influence control choices directly, but plausibly also indirectly through their effect on within-firm spillovers.

3.1 Concepts

Many empirical studies in accounting rely on a conceptual model of organizational design developed by Jensen and Meckling (1992). In this model, the authors characterize information frictions in terms of a knowledge problem. The basic idea is that knowledge is valuable in decision making and to get the best decisions possible, knowledge essential for a particular decision should be in the hands of the decision maker. This *collocation* of knowledge and decision rights can be accomplished either by moving the relevant information to the responsible individual or by having the person with the pertinent knowledge make the decision. Jensen and Meckling distinguish between knowledge that can be transferred among people at low cost (*general knowledge*) and knowledge that is transferrable only with great difficulty (*specific knowledge*). The "cost" involved can be manifold; knowledge might lose significance if transfer to others means delay, it might require tacit understanding of geographic circumstances and local institutions, or it might be meaningless when aggregated. Knowledge might also be costly to obtain because it requires scientific, legal, or medical training.

When the relevant knowledge for a certain decision is *specific*, then moving the decision rights is thought to be the optimal response. However, for *general* knowledge, collocation is achieved by transferring the knowledge to the individuals that have the decision rights. Assigning decision rights to individuals who do not bear the full economic consequences of their decisions creates a control problem. Individuals tend to use decision rights to make themselves better off. As the distance between the decision-right holder and the CEO's office increases, presumably so does the divergence in the objective functions of the lower level employee and senior management. Ultimately, organizations face a trade-off between the costs arising from making decisions on poor information (when not fully utilizing the employee's specialized knowledge) and the costs due to inconsistent objectives (when delegating decision rights to a self-interested individual with superior private knowledge). At the optimal location of decision rights, these two costs are in balance. Organizations can address the control loss due to inconsistent

objectives by developing performance measurement and evaluation systems and reward and punishment systems.[9]

It is worth noting that specific knowledge and information asymmetry are not synonymous (even though they are sometimes casually used as substitutes). Information asymmetry can potentially be solved by communication between the party with private knowledge and the uninformed party. According to the *Revelation Principle*, any possible equilibrium outcome can be replicated by a truth-telling equilibrium outcome (Myerson 1979).[10] Since specific knowledge implies that communication is (too) costly, the Revelation Principle may not apply, and there is scope for decentralization.[11]

While Jensen and Meckling's conceptual model motivates many empirical studies, a concurrent, more formal literature has emerged that examines the effect of information frictions on control choices (in conjunction with the delegation of decision rights). Important early contributions include Melumad, Mookherjee, and Reichelstein (1992) and Baiman, Larcker, and Rajan (1995).

Information frictions often arise because organizations exist in volatile environments. Unexpected changes in the environment expand the quantity of information and increase the probability that it becomes stale before it is acted upon (Christie, Joye and Watts 2003). Thus, environmental volatility tends to escalate knowledge transfer costs. Standard incentive theory suggests that more volatile and risky environments go hand in hand with *muted* incentives and *lower* compensation risk imposed on the employee (Indjejikian 1999). These information frictions increase the measurement error in performance measures (Holmstrom 1979, Holmstrom and Milgrom 1991), and the optimal response is to reduce incentive intensity. This prediction contrasts sharply with the prior discussion of the Jensen and Meckling

[9] Athey and Roberts (2001) suggest that assigning decision rights to someone other than the best-informed party might be optimal. This outcome is achieved when available performance measures are used both to provide incentives to employees to exert effort and to motivate them to select the correct investment project. In Athey and Roberts's model, effort provision incentives are best served with a precise measure of the employee's input, whereas optimal investment selection is promoted by using a measure that captures the value created for the firm.

[10] In particular, the Revelation Principle states that any outcome in which decision rights are decentralized to agents can be replicated by a centralized organization in which all agents communicate their private information to a central planner such as senior management (Mookherjee 2012).

[11] Besides assuming unblocked or costless communication, the Revelation Principle also assumes unrestricted contracts and full commitment by the principal about how the communicated information will be used. In settings where contracts are restricted or the principal cannot commit to the use of information, there is thus scope for beneficial decentralization.

(1992) framework in which (compensation) risk and the delegation of decision rights to employees with specific knowledge are complementary and thus positively correlated.

Prendergast's (2002) analysis directly addresses this (tenuous) trade-off between risk and incentives. He argues that uncertainty affects the responsibilities and discretion offered to employees, which in turn affect incentives. In uncertain environments, senior management has limited insights about which activities employees should perform. To ensure that employees choose the correct activity, their incentives are based on a measure of the senior management's payoff. Without uncertainty, management can simply restrict the allowed activities and monitor whether employees take the restricted actions. Prendergast's model highlights that incentives can be based on different types of performance measures. Input measures are more closely related to the employee's actions, and output measures are associated with senior management's payoff. Prendergast assumes that the available measure of output is reliable (and independent of the uncertainty of the environment). Indeed, the predictions of his model are reversed when the output measure is distorted (Prendergast 2002).

A related approach is taken by Raith (2008), who considers senior management's choice between input measures (i.e., verifiable information about the agent's effort) and a noisy measure of output. He refers to the extent of noise in measuring output as environmental uncertainty. Thus, rather than assuming that a good quality output measure exists, Raith (2008) allows the quality to vary with the riskiness of the environment. The main result from this study indicates that when an employee has specific knowledge about how his actions contribute to senior management's objectives, incentives must be based on output measures correlated with those objectives, rather than on input measures correlated with the employee's actions.

Hwang et al. (2009) extend Raith's model by introducing team production (i.e., a second employee) and allowing employees to have private information on the productivity of both their individual task and the team task. The authors consider three performance measures (based on input, individual output, and team output) and examine how these measures are used in response to changes in the employee's specific knowledge and in the value of sharing knowledge among team members. The

findings parallel those in Raith (2008), and even with perfect input measures available, both types of (noisy) output measures are used more when specific knowledge increases to induce employees to use their knowledge (in the interest of senior management). Their model also predicts that when the value of knowledge sharing increases, the use of input measures decreases and greater reliance is placed on both output-based measures. Individual output measures are used more to ensure that employees have sufficiently strong incentives to attend to the individual task and not just the team task.

In sum, the picture that emerges from theory is as follows. Environmental uncertainty and other information frictions can cause knowledge to reside with the (local) agent and be too costly to transfer to other decision makers in the hierarchy. If so, decision rights are allocated to these agents, performance measures become more output based, and rewards are contingent on delivered performance.

3.2 Empirical evidence on relation between specific knowledge and organizational design choices

In our discussion of the empirical evidence, we will draw mostly on the accounting literature. While presented separately, note that important theoretical advances have been made based on the empirical observation that the prediction from standard incentive theory regarding the negative relation between risk and incentives does not hold generally. Thus, rather than empirical studies testing theory, the literature has developed in an iterative fashion.

Considerable support exists for the prediction that information frictions are positively associated with allocating decision rights to local agents. Several studies document a robust positive correlation, although empirical proxies for both decentralization and information frictions are sometimes crude because authors have to rely on publicly available data to infer details about the inner workings of firms in their samples (Foss and Laursen 2005). For example, Christie et al. (2003) combine survey data on the dependent variable (whether the second hierarchical level of the firm is a cost or a profit center) with publicly available data (at the firm-level) on the number of lines of business a firm owns and its growth opportunities, uncertainty, and size as measures of information frictions. Generally, a positive association exists between these information friction proxies and the choice for (a more decentralized) profit center. Abernethy et al. (2004) and Nagar (2002) both rely on survey data (representing a broad cross-section of

firms and the banking industry, respectively) and consider the delegation decision in conjunction with the choice of performance measures and of incentive intensity, respectively. Accounting for the simultaneous relations between design choices, these studies consistently find a significant positive correlation between the extent of information frictions and decentralization. Baiman et al. (1995), using proprietary data from two human resource consultancies, document that the allocation of decision rights to business unit managers increases with their relative expertise compared to their principal's. Robinson and Stocken (2013) report that firms reallocate decision rights in response to a changing environment. When decision right allocation and environment are mismatched, these authors also find that performance is negatively impacted.

While Moers (2006) does not find strong evidence for a relation between information frictions and decentralization, his findings suggest that delegation increases when the contracting properties of available performance measures are better. Although Moers interprets this finding as evidence that decentralization and incentive choices are made simultaneously to deal with information frictions, Abernethy et al. (2004) and Widener et al. (2008) report results that are more consistent with the decentralization choice being made first and performance measures then being adopted to address the ensuing incentive problems. Indeed, when Abernethy et al. (2004) regress the use of performance measures onto both decentralization and a proxy for information frictions, only decentralization obtains a significant coefficient. Ortega (2009) documents that decentralization increases when jobs in the firm become more complex, which he attributes to the effect of specific knowledge. His study also shows that output-based pay-for-performance is positively associated with job complexity (and thus with information frictions).

Turning to design choices other than decentralization, Bouwens and van Lent (2007) show that the use of broad performance measures (such as accounting returns) increases when business unit managers face more information frictions. Similarly, Hwang et al. (2009) report empirical evidence consistent with their prediction that information frictions are positively associated with the use of output-based performance measures as well as the use of group-based incentives. They also find, again in line

with their prediction, that both output- and group-based measures are used more when the value of sharing knowledge increases. Some evidence also exists that nonfinancial performance measures are used more in response to information frictions (Ittner, Larcker and Rajan 1997). As nonfinancial measures tend to be more related to employee actions than to output, it is not clear how this finding maps into the available theoretical predictions (Raith 2008).

None of these studies explicitly test for complementarity between decentralization and incentive choices, as suggested in Prendergast (2002), and thus no definitive evidence is currently available regarding the underlying mechanisms connecting information frictions, decentralization, and incentives.

4. Spillovers and organizational design choices

Spillovers within a firm arise because different units specialize in different subsets of the firm's activities. In that sense, spillovers result from the firm's decisions on the optimal division of labor—that is, how the firm's production function is "cut up" in pieces and how tasks between organizational units are allocated (Lawrence and Lorch 1967, Milgrom and Roberts 1992, Acemoglu, Aghion, Lelarge, Van Reenen and Zilibotti 2007, Kretschmer and Puranam 2008). Not only may the production technology and the exchange of goods, services, and information between units cause spillovers, but units can also be interdependent because they draw on the same factor, labor, or product markets (Burton and Obel 1984, Holmstrom and Milgrom 1990). Thus, spillovers can be present due to units within the firm sharing production facilities or because they compete to hire scarce talent. Firms set up their divisions and other units to be as independent as possible and to minimize the costs of coordinating between them (Milgrom and Roberts 1992). Nevertheless, as the units are part of the same firm, they still need to cooperate. Spillovers might be well understood by parties involved in internal interactions, and the decisions made in one unit do not have to pose significant constraints on the action choices of managers in other units. However, when these conditions are not in place, firms benefit when units cooperate and coordinate to manage the consequences of spillovers.

Cooperation and coordination have long been recognized to be different concepts (e.g., Puranam and Raveendran 2012). Coordination involves aligning actions within the firm, while cooperation is about

motivating employees to work together (Kretschmer and Puranam 2008). Phrased another way, coordination is exogenously determined by the production function of the firm, while the degree of cooperation is amenable to the working of control choices. In the accounting literature, the difference between coordination and cooperation has not yet received much attention, and studies that further explore its implications for control choices are needed. A first step in this direction could be to recognize that coordination centers on using accounting information in its decision-*facilitating* role, whereas cooperation is about accounting information's decision-*influencing* role (Demski and Feltham 1976). Regardless, the core design problem facing management is conceptualized as developing performance measurement systems and incentives to encourage the divisions to work well together (Roberts 2004).[12]

4.1 Concepts

Firms have many structural ways in which they can reduce coordination problems and motivate employees to work together. Accountants are keen to point out that spillovers caused by the internal deliveries of products and services can be addressed by using cost allocation and transfer pricing (Zimmerman 2003). A perfect transfer pricing system would ensure that the performance measure used to evaluate an employee fully reflects any spillovers arising from interdependencies within the firm. In practice, perfect transfer pricing systems are unlikely to exist; a market price for the internally delivered product or service might not exist, or it might inadequately capture the opportunity costs of the delivery (Baldenius and Reichelstein 2006). Further, firms have to cope with exogenous restrictions, such as tax laws, and the need to keep the accounting system practicable. In addition, spillovers are not just caused by internal deliveries, but could also arise from information processing frictions between units (Puranam, Raveendran and Knudsen 2012). These frictions emerge because coordinating activities under uncertainty is costly (Galbraith 1973). Higher demands are placed on the communication of information as well as on

[12] Once more, we would like to emphasize that the sharp distinction we draw here between spillovers and information frictions might not be tenable, either theoretically or empirically (Rantakari 2013). Indeed, as Ortega (2009) points out, an employee's specific knowledge might be about how to best cooperate with other units (see also, Hwang et al. 2009).

the gathering, interpretation, and synthesis of data. Such frictions are exceedingly difficult to capture in transfer prices.

Coordination (but not necessarily cooperation) problems can be solved by centralizing decision making (Christie et al. 2003). Rather than having the managers of two units independently align their actions, a third (higher-level) manager coordinates the work. Sometimes, the coordination needed involves structurally integrating the two units into a new single (bigger) unit. In other circumstances, a more ad hoc arrangement can be used in which the integrating manager acts as a "liaison officer" between the two units. A liaison officer might have the decision rights to arbitrate between unit managers to resolve conflicts (Mintzberg 1983). However, the presence of information frictions (in particular, specific knowledge) often prevents the adoption of more centralized structures. In this situation, control choices that involve placing incentive weight on particular performance measures that encourage cooperation might be a valuable alternative.

Bushman et al. (1995) draw attention to "above-level" performance measures, which in essence provide a summary statistic of the performance of not just the manager who is the subject of assessment, but also that of other managers in the firm. For example, firm-wide earnings is an "above-level" measure for individual divisional managers. Similarly, when multiple divisions are organized in a group, group-level earnings are an above-level measure for the division manager. Bushman et al. argue that spillovers manifest themselves in the "informativeness" of the performance measures available for contracting. Above-level performance measures are more sensitive to capturing the effects of a manager on others and will receive more incentive weight when spillovers become more important.

Baiman and Baldenius (2009) draw attention to the idea that not only above-level performance measures might be beneficial in coordinating activities (and encouraging cooperation), but nonfinancial performance measures can achieve the same objective. In their model, nonfinancial measures facilitate information sharing between privately informed agents. Bouwens et al. (2015) provide an analytical model that illustrates how three types of performance measures (above-level, own-level, and below-level, such as R&D expenses for a divisional manager) are optimally used in the presence of spillovers. These

authors follow findings from the empirical literature, discussed more fully later, that document differential consequences for incoming and outgoing effects; that is, the spillovers that affect the focal manager and those that are due to the actions of the focal manager but affect others in the firm. Interestingly, Bouwens et al. (2015) report that the two types of interdependencies interact and can reinforce each other. In part due to this interaction, the resulting predictions for the optimal allocation of incentive weights between these three alternative types of performance measures is not trivial. Nevertheless, the theory confirms the intuition that both above-level measures and below-level measures can be used to respond to spillovers.

A related literature in economics focuses less on the specifics of the performance measure, and instead considers the use of group or team incentives when cooperation between multiple agents working on a joint task is important (e.g., Holmstrom 1982). This literature is mostly concerned with (avoiding) the problem of free riding, although Itoh (1991) considers whether team or individual performance-based pay is optimal in a setting where agents have to choose between working on their own task or helping others. It turns out that when the two tasks are "strategic complements" (i.e., receiving help from someone else induces the agent to work harder on his own task), team pay is optimal.

4.2 Empirical evidence on the relation between organizational design choices and spillovers

The management literature on how organizational design creates and deals with spillovers is substantial and dates back to early writers such as Lawrence and Lorsch (1967) and Thompson (1967). The basic insight from this body of work is confirmed by Christie et al. (2003) who find that increased spillovers are negatively associated with decentralization (measured as the choice between profit centers and cost centers). Abernethy et al. (2004) also report a negative association between *outgoing* (but not incoming) externalities and decentralization.

The empirical evidence on the association between the use of different types of performance measures and spillovers is somewhat mixed. For example, in their early work, Bushman et al. (1995) document a positive association between interdependencies and the use of "above-level" performance measures in the compensation contract of business unit managers. However, when interdependencies are

signed (in outgoing and incoming spillovers from the local manager's perspective), subsequent studies report mixed results for their effect on the use of above-level performance measures (Keating 1997, Abernethy et al. 2004). Bouwens and van Lent (2007) document that spillovers are not just associated with above-level measures but also explain variation in the use of both nonfinancial measures and disaggregated (below-level) cost and revenue measures.

Bouwens et al. (2015) offer a potential explanation for these somewhat divergent results. They highlight the need to consider the full spectrum of available performance measures (i.e., above-, own-, and below-level measures) simultaneously, and they also stress the need to account for a possible interaction effect between incoming and outgoing spillovers. Their empirical evidence shows that outgoing spillovers are mostly responsible for the increased use of above-level measures, while incoming spillovers explain the use of below-level measures. Their analysis also shows that the use of above-level as well as below-level measures is limited to cases of severe spillovers between units. When either outgoing or incoming spillovers are low (regardless of the extent of the other type of spillover), incentive contracts almost exclusively rely on own-level measures.

One major issue that stymies progress is the quality of empirical proxies for spillovers. Extant work often relies on survey questions that ask about the impact managers have on other units in the firm (Keating 1997) or the degree of internal deliveries of goods and services within the company (Bouwens et al. 2015). Others rely on relatively crude firm-level measures of the degree of (related) diversification in the firm to gauge the interdependencies between organizational units (Christie et al. 2003). Clearly, there is a need to develop measures that more precisely map into the "primitives" of organizational design; that is, those choices about production technology and the division of labor between different functional parts of the firm. Such measures should capture interdependencies that are present regardless of the action choices of individual (local) managers (and are therefore more credibly characterized as slow-moving). Once developed, they can be used to address problems of *coordination*. Concurrently, better empirical measures should also be developed for managerial actions that affect the *cooperation* between units given the primitives of the organizational design.

5. Social preferences and control choices

Empirical studies on the design of performance measurement and incentive systems often show low to moderate coefficients of determination, suggesting that firm-level determinants can explain only some of the observed variations. To create a more complete picture, recent studies have focused on personal traits of managers as potential determinants of performance measurement and incentive systems. Such traits can be innate or may depend on the socialization or education of a manager, thus affecting managerial preferences or capabilities.

Relatedly, research in behavioral economics has provided substantial evidence that individuals are not purely motivated by material self-interest, but rather exhibit pro-social or other-regarding preferences. A case in point is the ultimatum game, in which participants in experiments tend to offer "fair" splits of a given amount of money (Güth, Schmittberger and Schwarze 1982), despite the subgame perfect Nash equilibrium in which the money is divided to enable the participant who splits the money to keep (almost) all of it (i.e., the participant maximizes the difference between splits). To incorporate the evidence that other-regarding preferences matter, recent economic literature has expanded the domain of an economic agent's utility function to include issues such as inequity aversion (Fehr and Schmidt 1999), identity and social norms (Akerlof and Kranton 2000), and guilt aversion and integrity (Charness and Dufwenberg 2006, Battigalli and Dufwenberg 2007). In economic models, such prosocial preferences can be reflected either via the disutility an agent incurs when deviating from some "appropriate" behavior or by assuming that the agent acts within a self-imposed constraint (Etzioni 1988, Sen 1997).

Importantly, prosocial preferences seem to be generally consistent with rationality (Brennan 1994), offering a wide scope of possibilities to study managerial decision-making and the interplay with organizational design, specifically performance measurement and incentives. Carefully extended economic models can be built by using a richer description of managerial preferences, thereby addressing issues such as diligence or work ethic (Carlin and Gervais 2009), self-confidence and intrinsic motivation (Benabou and Tirole 2003), peer pressure and social norms (Fischer and Huddart 2008), and even corporate culture (Crémer 1993). While these notions of managerial behavior are often deemed important

in the field of management, they are hard to explain using more traditional economic models in which an agent's decisions are purely driven by material self-interest. Thus, including other-regarding preferences may bridge the gap between studies that follow the economics paradigm with more traditional studies embedded in a contingency-based control framework (Simons 1995).

We discuss in this section the relation between prosocial preferences and control choices. Their mutual influence is especially obvious in the context of organizational design choices, because decisions about issues such as task allocation, span of control, or hierarchical reporting also pertain to the relation between multiple individuals.

5.1 Concepts

A fundamental theme of economics is that "incentives matter" and that individuals respond to them by adjusting effort and improving performance. Clearly, intrinsic motivation provides a straightforward alternative to monetary incentives via contingent compensation; preferences for honesty and equality or the desire to adhere to social norms and to identify with an organization suggest a broad set of alternative incentives. A properly designed control system requires that these incentives be well balanced with the more traditional elements of control systems such as contingent compensation and performance measurement. For example, it is well established that extrinsic motivation interacts with intrinsic motivation in a nontrivial way, and providing incentives via contingent compensation can reduce an individual's pleasure in performing an activity. Extrinsic motivation crowding out intrinsic motivation points to a hidden cost of incentives (Benabou and Tirole 2003, Sliwka 2007). Such hidden costs suggest that in settings where intrinsic motivation is highly important, providing weak or muted incentives can be optimal.[13]

More specifically, the effort an agent (i.e., manager) provides for a specific task varies with the agent's confidence about successfully finishing the task. In settings of incomplete, private information about ability, an agent can use choices by the principal (e.g., superior) to update his or her beliefs about

[13] Note, however, that in their field experiment, Ashraf et al. (2013) find no evidence that financial rewards crowd out intrinsic motivation.

the likelihood of successfully finishing a task. In particular, drawing from his or her own experience, the principal may be more cognizant about the attractiveness of a particular task, in terms of the likelihood of successfully finishing it, but also whether it is pleasant to perform (Benabou and Tirole 2003). Then, the choice of incentives signals the principal's private information to the agent. Benabou and Tirole (2003) show that contingent compensation can crowd out intrinsic motivation when the agent is less informed compared to the principal (e.g., given large differences in the seniority of the manager and his superior) and when the principal is more willing to offer contingent compensation for an unattractive task.

Prosocial preferences in the form of managerial preferences for honesty can also affect managerial reporting behavior (Evans, Hannan, Krishnan and Moser 2001) and thereby budgeting policies (Mittendorf 2006). Firm owners optimally trade off managerial preferences for perquisites and for being honest. Mittendorf (2006) shows that firm owners can take advantage of a manager's desire to report honestly, and by appropriately designing the manager's compensation, reduce the information rents required to induce truthful reporting. Interestingly, this result holds even when firm owners are uncertain about the manager's preference for honesty. In Mittendorf's model, extensive misreporting behavior by a few managers is consistent with a large number of honest managers in the population of managers, suggesting a more nuanced interpretation of recent corporate reporting scandals.

Prosocial preferences can also manifest in an individual's desire to adhere to social norms established by peers in the same organization or profession. Social norms can be enforced by peer pressure and by feelings of guilt. Fischer and Huddart (2008) study a principal/multi-agent setting where each agent incurs a cost when his or her effort deviates from a social norm that reflects the average effort of peers, suggesting an intricate relation between optimal control choices and managerial behavior. Effort choices by peer agents spill over to the focal agent via the social norm, reinforcing the focal agent's motivation to provide effort. These authors show that the spillover enlarges the benefits of monetary incentives for productive tasks, whereas the benefits of monetary incentives are reduced for unproductive tasks such as window dressing. Further, by appropriately assigning individuals and tasks to organizational units, the principal can influence an agent's peers and foster unit-specific norms, with the objective to

reinforce monetary incentives for productive tasks and to diminish the motivation to engage in unproductive tasks.

The prospect of promotions can provide incentives via a manager's concern for his or her career, which interact with incentives following contingent compensation. In the context of promotions, the consequences of inequity aversion seem to be especially pronounced, since promotions by their very nature generate diverging income streams. Evidence suggests that the social context (e.g., the social distance among colleagues) affects the intensity of inequity aversion (Loewenstein, Thompson and Bazerman 1989). Thus, with vertical promotion, a manager compares his or her outcome with that of a close colleague, suggesting high inequity cost; in turn, with lateral promotion, a manager compares his or her outcome with that of an unknown manager from another organizational unit or even from outside the firm, suggesting low inequity cost. Grund and Sliwka (2005) argue that the optimal promotion strategy trades off the inequity cost related to vertical and lateral promotions and the loss in human capital that results when an agent is laterally promoted to a group that requires different skills.

Whereas the prior studies assume that "inappropriate" behavior introduces a disutility for the agent, thereby affecting the agent's choice problem, one may argue that morality cannot be balanced against monetary rewards (Etzioni 1988). In other words, the agent's cost of deviating from appropriate behavior can be excessive, thus deterring any inappropriate behavior. Carlin and Gervais (2009) study the incentive contracts offered to ethical agents and the associated organizational structure. Ethical agents are subject to a self-imposed constraint that prevents them from shirking, thereby relaxing the agent's incentive compatibility constraint in the principal's program. The authors predict high-powered incentives in cases where, for example, labor input is an important factor to production such as in Research & Development. Moreover, high-powered incentives are optimal in cases in which the firm's production technology relies on cooperative behavior. In contrast, low-powered incentives are optimal in more bureaucratic firms where the agents' efforts are substitutes rather than complements.

Prosocial preferences can also follow from the manager adopting the identity of the organization (Akerlof and Kranton 2000). Individuals who identify with an organization feel a duty to behave

according to its standards; organizations, in turn, can take advantage of the duty perceived by its members. In particular, firm owners can issue standards to influence the behavior of managers that strongly identify with the firm. Heinle, Hofmann, and Kunz (2012) study the interrelation between identity preferences, incentives, and performance evaluation. In particular, they identify conditions underlying a positive relation between the strength of identity preferences, high-powered incentives, and the number of performance measures. More specifically, firm owners optimally use more precise performance measures such as accounting earnings to evaluate managers who identify strongly with the firm, whereas managers who identify weakly with the firm are evaluated using more congruent performance measures such as stock prices.

Collectively, the preceding arguments illustrate the diversity and richness of studies that allow for other-regarding preferences. In particular, the studies suggest that other-regarding preferences can significantly affect the allocation of tasks to individuals, the strength of (monetary) incentives necessary to motivate desired behavior, and the set of performance measures. Given the (potentially) simultaneous effects on the elements of organizational design, a proper and comprehensive theory is required to understand the trade-offs involved in organizational design.

5.2 Empirical evidence on relation between social preferences and control choices

Only a few studies in the accounting domain have empirically tested for the relation between social preferences and managerial behavior, and the firm's associated choice of the control system. More generally, these studies address whether individual traits outside firm-specific characteristics influence the design of a firm's control system. The difference between individual traits and firm-specific characteristics blurs when, based on sociological reasoning, individual perceptions of organizational conventions or norms are aggregated to organizational constructs such as work climate (Schneider 1975) or ethical work climate (Victor and Cullen 1988). In turn, an organization's (ethical) work climate can be more or less attractive to individuals, which likely induces an endogenous matching between individuals and organizations. Empirically separating individual from firm-specific effects thus becomes a hard task.

Dikolli, Mayew, and Steffen (2012) consider the relation between a manager's integrity and the manager's financial reporting choices. In their study, they define integrity as relating to "honoring one's word" (Erhard and Jensen 2013). The authors assess CEO integrity using a linguistic measure based on a given CEO's excessive use of causation words. They find a positive relation between their linguistic-based integrity measure and several measures of accrual quality, suggesting that a manager's integrity is of importance in financial reporting.

A few studies have empirically addressed the relation between social preferences and the design of performance measurement systems. Campbell (2012) documents that firms can pre-empt control problems by selecting employees to the job who have preferences that align with those of the firm. Abernethy, Bouwens, Hofmann, and van Lent (2014) study the relations between an organization's work climate, managerial behavior, and the use of aggregate performance measures. An organization's work climate reflects "how things are done" within an organization and how managers interact with each other. These authors find that organizational units characterized by a work climate that focuses strongly *on-self* exhibit greater accounting manipulations and a lower supply of working hours relative to organizational units characterized by a work climate that focuses less *on-self*. Moreover, to limit the detrimental effects of accounting manipulations, the former organizational units also place a greater weight on aggregate performance measures.

6. Concluding remarks

In this review, we have sought to impress four fundamental ideas on the reader. First, the existence of complementarities between elements of the organizational design reduces the decision problem faced by the "designer". Second, complementarities generally complicate empirically tests, and approaches such as productivity equations or demand equations both suffer from conceptual deficiencies. Empirical evidence on complementarities is weak at best, which also reflects the limited proxies typically available for empirical tests. Third, the accounting literature has extensively investigated the variation of organizational design in the presence of specific knowledge and spillovers between organizational units. Fourth, recent developments in behavioral economics suggest a potentially strong influence of other-

regarding preferences on individual behavior and, thereby, performance measurement systems and incentives.

While forecasting the advancement of academic research is generally a hard task, often deemed to fail miserably, our remarks suggest at least three areas where scholars of organizational design may make important contributions. First, future empirical tests may take advantage of some elements of organizational design being rather slow moving in order to explore the alleged reasons in favor of complementarities between elements of organizational design. Second, progress in characterizing dependent and independent variables seems warranted, in part to better connect the variables with the underlying theoretical constructs. Third, addressing questions related to other-regarding preferences may be a fruitful endeavor, which could involve characterizing the firm-specific or managerial conditions under which specific other-regarding preferences are either strong or weak. This approach calls for establishing measures that gather an individual's personality traits and relating these measures to the strength of specific other-regarding preferences.

We conclude this article by reiterating the usefulness of mixed-method studies that combine formal theory with empirical work. We have highlighted some of the pitfalls associated with these studies, which include the problems of "translating" theoretical concepts into empirical proxies and the difficulties in demonstrating how a given paper's tests are related to the equilibrium predictions of a particular model. Despite these pitfalls, integrating formal economic theory in management accounting has a huge potential upside. Management accounting has been much more successful than other areas in accounting (notably capital markets–based research) in using nonarchival methods and evidence from the field. Only very recently have some financial accounting researchers called for conducting research with "significant interaction with the actual practitioners involved" (Soltes 2014) and published work that relies to a significant degree on data that might have earlier been called "anecdotal" (Graham, Harvey and Rajgopal 2005, Dichev, Graham, Harvey and Rajgopal 2013). Notwithstanding their advantage from using nonarchival data sources, management accounting researchers have been much less successful in building a coherent body of theory based on integrating vastly disparate evidence. Our plea for using

mixed methods in management accounting research is therefore not to be construed as asking for more diversity in research methods (and neither is it to be interpreted as an appeal to reduce this diversity). Rather, we believe that authors will have a better chance to produce "a substantive body of knowledge" (Zimmerman 2001) when using formal economic theory to guide their empirical work. As economic models have expanded to allow the systematic analysis of behavioral issues, our plea does not move the literature away from incorporating valuable insight from organization psychology and sociology, but rather allows these insights to be incorporated in a durable stock of knowledge that encourages future generations of researchers to expand on what we know about organizational design.

Acknowledgements

We appreciate the helpful feedback from an anonymous reviewer as well as from Margaret Abernethy, Salvador Carmona, and Chung-Yu Hung.

References

Abernethy, M. A., J. Bouwens, C. Hofmann and L. Van Lent (2014). Social norms, agents' choices and incentive contract design. University of Melbourne and Tilburg University.

Abernethy, M. A., J. Bouwens and L. van Lent (2004). "Determinants of control system design in divisionalized firms." The Accounting Review **79**(3): 545-570.

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

Acemoglu, D., P. Aghion, C. Lelarge, J. Van Reenen and F. Zilibotti (2007). "Technology, Information, and the Decentralization of the Firm." The Quarterly Journal of Economics **122**(4): 1759-1799.

Akerlof, G. A. and R. E. Kranton (2000). "Economics and Identity." The Quarterly Journal of Economics **115**(3): 715-753.

Arora, A. (1996). "Testing for complementarities in reduced-form regressions: A note." Economics Letters **50**(1): 51-55.

Arora, A. and A. Gambardella (1990). "Complementarity and external linkages: the strategies of the large firms in biotechnology." The Journal of Industrial Economics: 361-379.

Ashraf, N., O. Bandeira and K. Jack (2013). No margin, no mission? A field experiment on incentives for public service delivery. STICERD - Economic Organisation and Public Policy Discussion Papers Series.

Athey, S. and J. Roberts (2001). "Organizational design: Decision rights and incentive contracts." American Economic Review **91**(2): 200-205.

Athey, S. and S. Stern (1998). An Empirical Framework for Testing Theories About Complementarity in Organizational Design. NBER Working-paper 6600.

Baiman, S. and T. Baldenius (2009). "Non-financial performance measures as coordination devices." The Accounting Review **84**(2): 299-330.

Baiman, S., D. F. Larcker and M. V. Rajan (1995). "Organizational Design for Business Units." Journal of Accounting Research **33**(2): 205-229.

Baldenius, T. and S. Reichelstein (2006). "External and internal pricing in multidivisional firms." Journal of Accounting Research **44**(1): 1-28.

Battigalli, P. and M. Dufwenberg (2007). "Guilt in games." The American economic review: 170-176.

Benabou, R. and J. Tirole (2003). "Intrinsic and extrinsic motivation." Review of Economic Studies **70**(3): 489-520.

Bouwens, J., C. Hofmann and L. Van Lent (2015). "Performance Measures and Intra-Firm Spillovers: Theory and Evidence." Available at SSRN 2263136.

Bouwens, J. and L. van Lent (2007). "Assessing the performance of business unit managers." Journal of Accounting Research **45**(4): 667-697.

Brennan, M. J. (1994). "Incentives, rationality, and society." Journal of Applied Corporate Finance **7**(2): 31-39.

Brickley, J., C. Smith and J. Zimmerman (2001). Managerial economics and organizational architecture. Homewood, Irwin.

Brynjolfsson, E. and P. Milgrom (2012). "Complementarity in organizations." The Handbook of Organizational Economics: 11.

Burkert, M., A. Davila, K. Mehta and D. Oyon (2014). "Relating alternative forms of contingency fit to the appropriate methods to test them." Management Accounting Research **25**(1): 6-29.

Burton, R. M. and B. Obel (1984). Designing Efficient Organizations: Modelling and Experimentation, Nort Holland.

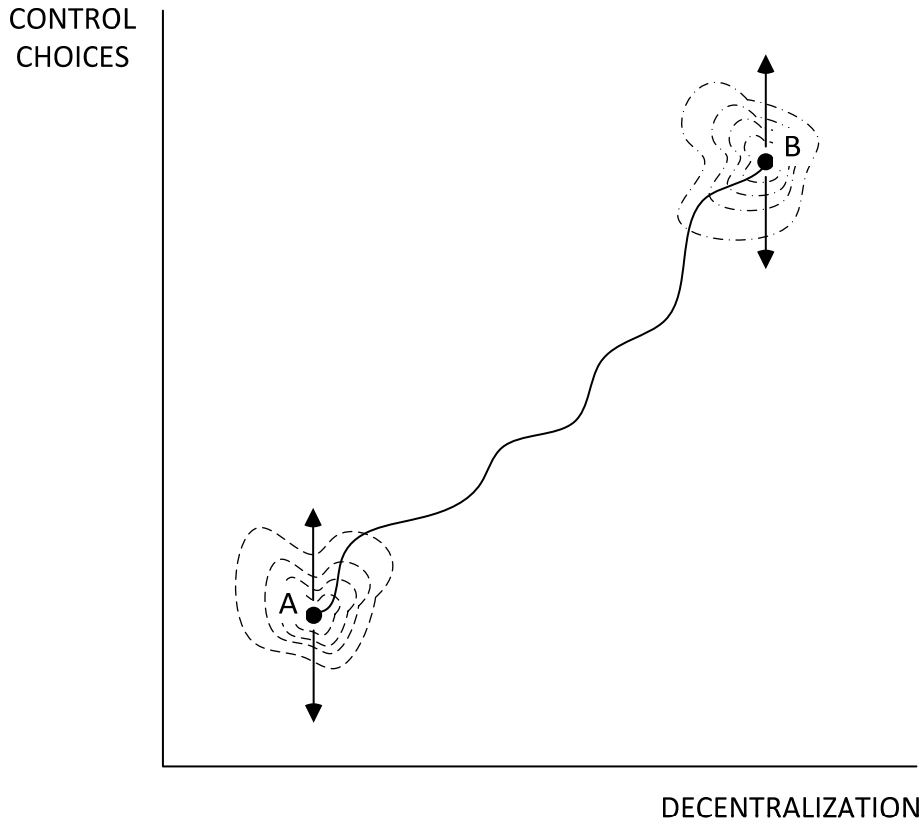
Bushman, R. M., R. J. Indjejikian and A. Smith (1995). "Aggregate performance measures in business unit manager compensation: The role of intrafirm interdependencies." Journal of Accounting Research **33**(Supplement): 101-127.

Campbell, D. (2008). "Nonfinancial Performance Measures and Promotion-Based Incentives." Journal of Accounting Research **46**(2): 297-332.
Campbell, D. (2012). "Employee selection as a control system." Journal of Accounting Research **50**(4): 931-966.
Campbell, D., S. M. Datar and T. Sandino (2009). "Organizational Design and Control across Multiple Markets: The Case of Franchising in the Convenience Store Industry." The Accounting Review **84**(6): 1749-1779.
Carlin, B. and S. Gervais (2009). "Work Ethic, Employment Contracts, and Firm Value." The Journal of Finance **64**(2): 785-821.
Cassiman, B. and R. Veugelers (2006). "In search of complementarity in innovation strategy: internal R&D and external knowledge acquisition." Management science **52**(1): 68-82.
Chapman, C. S. (1997). "Reflections on a contingent view of accounting." Accounting, Organizations and Society **22**(2): 189-205.
Charness, G. and M. Dufwenberg (2006). "Promises and partnership." Econometrica **74**(6): 1579-1601.
Chenhall, R. and D. Morris (1986). "The impact of structure, environment and within-firm dependencies on the perceived usefulness of management accounting systems." The Accounting Review **61**: 16-35.
Christie, A. A., M. Joye and R. Watts (2003). "Decentralization of the firm: theory and evidence." Journal of Corporate Finance **9**(1): 3-36.
Crémer, J. (1993). "Corporate culture and shared knowledge." Industrial and Corporate Change **2**(3): 351-386.
Demski, J. S. and G. A. Feltham (1976). Cost determination: a conceptual approach, Iowa State University Press.
Dichev, I., J. Graham, C. R. Harvey and S. Rajgopal (2013). "Earnings quality: Evidence from the field." Journal of Accounting and Economics **56**(2-3): 1-33.
Dikolli, S. S., W. J. Mayew and T. D. Steffen (2012). Honoring one's word: CEO integrity and accruals quality. Available at SSRN: http://ssrn.com/abstract=2131476.
Erhard, W. and M. Jensen (2013). "Putting integrity into finance: A purely positive approach." Harvard Business School NOM Unit Working Paper(12-074): 12-01.
Etzioni, A. (1988). The moral dimension: Toward a new economics, Free Press (New York and London).
Evans, J. H., R. L. Hannan, R. Krishnan and D. V. Moser (2001). "Honesty in managerial reporting." Accounting Review **76**(4): 537-559.
Fehr, E. and K. M. Schmidt (1999). "A theory of fairness, competition, and cooperation." The quarterly journal of economics **114**(3): 817-868.
Feltham, G. A., C. Hofmann and R. J. Indjejikian (2015). "Performance aggregation and decentralized contracting." The Accounting Review **in press**.
Fischer, P. and S. Huddart (2008). "American Economic Association." The American Economic Review **98**(4): 1459-1475.
Foss, N. J. and K. Laursen (2005). "Performance pay, delegation and multitasking under uncertainty and innovativeness: An empirical investigation." Journal of Economic Behavior & Organization **58**(2): 246-276.
Galbraith, J. (1973). Designing complex organizations. New York, Random House.
Grabner, I. and F. Moers (2013). "Management control as a system or a package? Conceptual and empirical issues." Accounting Organizations and Society **38**(6-7): 407-419.
Graham, J. R., C. R. Harvey and S. Rajgopal (2005). "The economic implications of corporate financial reporting." Journal of Accounting & Economics **40**(1-3): 3-73.
Grund, C. and D. Sliwka (2005). "Envy and compassion in tournaments." Journal of Economics & Management Strategy **14**(1): 187-207.
Güth, W., R. Schmittberger and B. Schwarze (1982). "An experimental analysis of ultimatum bargaining." Journal of economic behavior & organization **3**(4): 367-388.
Heckman, J. J. (2000). "Causal parameters and policy analysis in econometrics: a twentieth century retrospective." Quarterly Journal of Economics **115**(1): 45-98.

Heinle, M. S., C. Hofmann and A. H. Kunz (2012). "Identity, Incentives, and the Value of Information." The Accounting Review **87**(4): 1309-1334.
Holmstrom, B. (1979). "Moral hazard and observability." Bell Journal of Economics **10**: 74-91.
Holmstrom, B. (1982). "Moral hazard in teams." The Bell Journal of Economics: 324-340.
Holmstrom, B. and P. Milgrom (1990). "Regulating trade among agents." Journal of Institutional and Theoretical Economics **146**: 85-105.
Holmstrom, B. and P. Milgrom (1991). "Multitask Principal Agent Analyses - Incentive Contracts, Asset Ownership, and Job Design." Journal of Law Economics & Organization **7**: 24-52.
Hopwood, A. (2002). "If only there were simple solutions, but there aren't: some reflections on Zimmerman's critique of empirical management accounting research." European Accounting Review **11**(4): 777-786.
Hwang, Y. C., D. H. Erkens and J. H. Evans (2009). "Knowledge Sharing and Incentive Design in Production Environments: Theory and Evidence." Accounting Review **84**(4): 1145-1170.
Indjejikian, R. J. (1999). "Performance Evaluation and Compensation Research: An Agency Perspective." Accounting Horizons **13**(2): 147-157.
Indjejikian, R. J. and M. Matějka (2011). "Accounting decentralization and performance evaluation of business unit managers." The Accounting Review **87**(1): 261-290.
Itoh, H. (1991). "Incentives to help in multi-agent situations." Econometrica: Journal of the Econometric Society: 611-636.
Ittner, C. D. and D. F. Larcker (2001). "Assessing empirical research in managerial accounting: a value-based management perspective." Journal of Accounting & Economics **32**(1-3): 349-410.
Ittner, C. D., D. F. Larcker and M. V. Rajan (1997). "The choice of performance measures in annual bonus contracts." Accounting Review **72**(2): 231-255.
Jensen, M. C. and W. E. Meckling (1992). Specific and general knowledge and organizational structure. Contract Economics. L. Werin and H. Wijkander. Cambridge, Blackwell**:** 251-274.
Keating, A. S. (1997). "Determinants of divisional performance evaluation practices." Journal of Accounting and Economics **24**: 243-274.
Kretschmer, T. and P. Puranam (2008). "Integration Through Incentives Within Differentiated Organizations." ORGANIZATION SCIENCE **19**(6): 860-875.
Larcker, D. F. and T. O. Rusticus (2010). "On the use of instrumental variables in accounting research." Journal of Accounting and Economics **49**(3): 186-205.
Lawrence, P. and J. Lorch (1967). Organizations and environment. Homewood, Irwin.
Loewenstein, G. F., L. Thompson and M. H. Bazerman (1989). "Social utility and decision making in interpersonal contexts." Journal of Personality and Social psychology **57**(3): 426.
Luft, J. and M. Shields (2003). "Mapping management accounting research: graphics and guidelines for theory-consistent empirical research." Accounting, Organizations and Society **28**(2-3): 169-250.
Melumad, N., D. Mookherjee and S. Reichelstein (1992). "A Theory of Responsibility Centers." Journal of Accounting & Economics **15**(4): 445-484.
Merchant, K. A. and W. Van der Stede (2007). Management control systems: Performance measurement, evaluation and incentives. Harlow, Financial Times Press.
Merchant, K. A., W. A. Van der Stede and L. Zheng (2003). "Disciplinary constraints on the advancement of knowledge: the case of organizational incentive systems." Accounting, Organizations and Society **28**(2–3): 251-286.
Milgrom, P. and J. Roberts (1992). Economics, organization and management. Englewood Cliffs, NJ, Prentice Hall.
Milgrom, P. and J. Roberts (1995). "Complementarities and fit: strategy, structure, and organizational change in manufacturing." Journal of Accounting and Economics **19**: 179-208.
Mintzberg, H. (1983). Structure in fives: Designing effective organizations. Englewood Cliffs, NJ, Prentice Hall International.
Mittendorf, B. (2006). "Capital budgeting when managers value both honesty and perquisites." Journal of Management Accounting Research **18**(1): 77-95.

Moers, F. (2006). "Performance measure properties and delegation." The Accounting Review **81**(4): 897-924.
Mookherjee, D. (2012). Incentives in hierarchies. The handbook of organizational economics. R. Gibbons and J. Roberts. Princeton, Princeton University Press**:** 764-798.
Myerson, R. (1979). "Incentive compatibility and the bargaining problem." Econometrica **47**(1): 61-73.
Nagar, V. (2002). "Delegation and incentive compensation." The Accounting Review **77**(2): 379-395.
Nikolaev, V. and L. van Lent (2005). "The endogeneity bias in the relation between cost-of-debt capital and corporate disclosure policy." European Accounting Review **14**(4): 677-724.
Ortega, J. (2009). "Employee Discretion and Performance Pay." The Accounting Review **84**(2): 589-612.
Prendergast, C. (2002). "The tenuous trade-off between risk and incentives." Journal of Political Economy **110**(5): 1071-1102.
Puranam, P. and M. Raveendran (2012). "Interdependence & Organization Design." HANDBOOK OF ECONOMIC ORGANIZATION, A. Grandori, ed., Edward Elgar.
Puranam, P., M. Raveendran and T. Knudsen (2012). "Organization Design: The Epistemic Interdependence Perspective." Academy of Management Review **37**(3): 419-440.
Raith, M. (2008). "Specific knowledge and performance measurement." RAND Journal of Economics **39**(4): 1059-1079.
Rantakari, H. (2013). "Organizational Design and Environmental Volatility." Journal of Law, Economics, and Organization **29**(3): 569-607.
Roberts, J. (2004). The modern firm: Organizational design for performance and growth. Oxford, Oxford University Press.
Robinson, L. A. and P. C. Stocken (2013). "Location of Decision Rights Within Multinational Firms." Journal of Accounting Research **51**(5): 1261-1297.
Schneider, B. (1975). "ORGANIZATIONAL CLIMATES: AN ESSAY." Personnel Psychology **28**(4): 447-479.
Sen, A. (1997). "Maximization and the Act of Choice." Econometrica: Journal of the Econometric Society: 745-779.
Simons, R. (1995). Levers of control: how managers use innovative control systems to drive strategic renewal. Boston, Harvard Business School Press.
Sliwka, D. (2007). "Trust as a signal of a social norm and the hidden costs of incentive schemes." American Economic Review **97**(3): 999-1012.
Soltes, E. (2014). "Incorporating Field Data into Archival Research." Journal of Accounting Research **52**(2): 521-540.
Thompson, J. D. (1967). Organizations in action. New York, McGraw-Hill.
Van den Steen, E. (2013). "Strategy and the strategist: how it matters who develops the strategy." Working Paper, Harvard Business School **14-057**.
Van Lent, L. (2007). "Endogeneity in management accounting research: A comment." European Accounting Review **16**(1).
Victor, B. and J. B. Cullen (1988). "The Organizational Bases of Ethical Work Climates." Administrative Science Quarterly **33**(1): 101-125.
Widener, S. K., M. B. Shackell and E. A. Demers (2008). "The Juxtaposition of Social Surveillance Controls with Traditional Organizational Design Components." Contemporary Accounting Research **25**(2): 605-638.
Wooldridge, J. M. (2002). Econometric analysis of cross section and panel data. Cambridge, MA, MIT Press.
Zimmerman, J. L. (2001). "Conjectures regarding empirical managerial accounting research." Journal of Accounting and Economics **32**: 411-427.
Zimmerman, J. L. (2003). Accounting for decision making and control. Homewood, Irwin.

Figure 1: The relation between decentralization and control choices



The figure represents the relation between a firm's degree of decentralization (horizontal axis) and other control choices (vertical axis). In State s_1, dashed lines represent iso-profit lines and a relatively centralized firm is optimal (Point A); in State s_2, dot-dashed lines represent iso-profit lines and a relatively decentralized firm is optimal (Point B). For a marginal change in the environment from s_1 to s_2, given a costless variation of decentralization, the firm moves from Point A to Point B following the solid curve. Given consequential switching costs, in State s_1, the firm adjusts to changes of the environment by adjusting the control choices, keeping the degree of decentralization fixed. The degree of decentralization is held constant as long as "cost of mismatch < switching cost". When the cost of mismatch is consequential (say, in State s_2), the firm "leaps" from Point A to Point B and implements a more decentralized structure.