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Loosely Coupled Systems: A Reconceptualization

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Diverse applications of the concept of loose coupling are embodied in five recurring voices that focus separately on causation, typology, effects, compensations, and outcomes. Each has a tendency to drift away from a dialectical interpretation of loose coupling toward a unidimensional interpretation of loose coupling, thereby weakening the explanatory value of the concept. The authors first use the five voices to review the loose coupling literature and then to suggest more precise and more productive uses of the concept.

The concept of organizations as loosely coupled systems is widely used and diversely understood. The concept has a rare combination of face validity, metaphorical salience, and cutting-edge mysticism, all of which encourage researchers to adopt the concept but do not help them to examine its underlying structure, themes, and implications. Like a linguistic Trojan horse, the loose coupling concept has preceded loose coupling theory into the various strongholds of organizational studies.

Because the concept has been underspecified, its use has generated controversy. Researchers who oppose the concept on the basis of its imprecision have watched as more and more researchers adopt it. Researchers who advocate the concept on the basis of its face validity have watched it become unrecognizable. Researchers who are in the middle have often used the concept hesitantly, convinced that it fits the phenomena they study, but uncertain about its meaning. These problems become even more apparent when loose coupling is compared with four other organizational perspectives that were

published about the same time as Weick's (1976) article on educational organizations as loosely coupled systems: transaction cost economics (Williamson, 1975), institutional theory (Meyer & Rowan, 1977), population ecology theory (Hannan & Freeman, 1977), and resource dependence theory (Pfeffer & Salancik, 1978). Each of these four perspectives has a more distinctive paradigm, a more compact theory, and more empirical support than is true of loose coupling.

Researchers who invoke the concept of loose coupling generally cite one of three definitions. Glassman (1973) wrote that loose coupling is present when systems have either few variables in common or the variables they have in common are weak (p. 73). Weick (1976) defined loose coupling as a situation in which elements are responsive, but retain evidence of separateness and identity (p. 3). Later, he wrote that loose coupling is evident when elements affect each other "suddenly (rather than continuously), occasionally (rather than constantly), negligibly (rather than significantly), indirectly (rather than directly), and eventually (rather than imme-

diately)" (Weick, 1982a, p. 380). Few researchers have questioned the meaning behind these statements.

On the surface, these underspecifications and the contradictions they have created may seem like social science run amok. However, as Levine (1985) argued, underspecified formulations often serve as a vehicle through which investigators can work on difficult conceptual problems. This seems to have been true of writing about loose coupling, and such an argument would explain why the notion is widely used, despite its apparent ambiguity.

This article has two objectives. The first is to organize the diverse literature on loose coupling. While reviewing this literature, we were disappointed to find that the concept has been applied to simpler organizational puzzles than originally intended. Thus, the second goal is to redirect research on loose coupling toward more difficult, yet potentially more useful, interpretations.

In studying approximately 300 works that invoke the concept of loose coupling, five relatively distinct voices were noted: causation, typology, effects, compensations, and organizational outcomes. To attain the first goal of organizing the loose coupling literature, most of the article is devoted to discussions of these five voices and their recurring arguments. Once the voices are established, they are linked in a preliminary theory of the loosely coupled system. To attain the second goal of redirecting loose coupling research, the article begins with a discussion of the underlying loose coupling puzzle. Throughout the essay we explain how each of the five voices drifts away from the puzzle, and we conclude with suggestions on how researchers can focus more directly on explaining the puzzle.

The Underlying Puzzle

The basic problem being addressed when people struggle to grasp the nature of loose cou-

pling was first identified by Thompson (1967). He argued that although organizational forms are designed to deal with inherent contradictions, the language of organizational scholars does not allow them to capture this reality. Organizations appear to be both determinate, closed systems searching for certainty and indeterminate, open systems expecting uncertainty. Faced with these "incompatible concepts," and with "the fact that our culture does not contain concepts for simultaneously thinking about rationality and indeterminateness" (Thompson, 1967, p. 10), people simplify their analyses either by ignoring uncertainty to see rationality or by ignoring rational action to see spontaneous processes.

Thompson's contribution was to see that one way to preserve both rationality and indeterminacy in the same system is to separate their locations. He treated the technical core as a closed, rational system that eliminated uncertainty; the institutional level as an open system that "faced up to uncertainty" and permitted "the intrusion of variables penetrating from the outside"; and the managerial level as a system that "mediated" between the two extremes (p. 12).

Loose coupling has proven to be a durable concept precisely because it allows organizational analysts to explain the simultaneous existence of rationality and indeterminacy without specializing these two logics in distinct locations. Loose coupling suggests that any location in an organization (top, middle, or bottom) contains interdependent elements that vary in the number and strength of their interdependencies. The fact that these elements are linked and preserve some degree of determinacy is captured by the word *coupled* in the phrase *loosely coupled*. The fact that these elements are also subject to spontaneous changes and preserve some degree of independence and indeterminacy is captured by the modifying word *loosely*. The resulting image is a system that is simultaneously open and closed, indeterminate and ra-

tional, spontaneous and deliberate. If a person selectively attends to the determinacy that exists among some elements, he or she will describe the interdependence as a tightly coupled system. That characterization is partly inaccurate because not all elements and linkages are affected and parts of the system remain loose and open. If a person selectively attends to the openness, independence, and indeterminate links among some elements, he or she will describe what amounts to a decoupled system. That characterization, too, is incomplete and inaccurate because parts of the system remain coupled and closed.

Thus, the concept of loose coupling allows theorists to posit that any system, in any organizational location, can act on both a technical level, which is closed to outside forces (coupling produces stability), and an institutional level, which is open to outside forces (looseness produces flexibility).

The image that *should* emerge from this discussion is the following. If there is neither responsiveness nor distinctiveness, the system is not really a system, and it can be defined as a *noncoupled system*. If there is responsiveness without distinctiveness, the system is tightly coupled. If there is distinctiveness without responsiveness, the system is decoupled. If there is both distinctiveness and responsiveness, the system is loosely coupled. This general image is described here as the dialectical interpretation of loose coupling.

The image that more commonly *does* emerge from uses of the loose coupling concept is much simpler. Loose coupling is typically portrayed as the endpoint of a scale that extends from tightly coupled to loosely coupled. Tightly coupled systems are portrayed as having responsive components that do not act independently, whereas loosely coupled systems are portrayed as having independent components that do not act responsively. This image is described here as the unidimensional interpretation of loose coupling.

Researchers who invoke the concept of loose

coupling have not yet made a distinction between the unidimensional and dialectical interpretation of the concept. Consequently, the loose coupling literature contains confusing mixtures of the two interpretations. For example, Rubin (1979) drew on dialectical interpretations to portray universities as loosely coupled systems. From this portrayal, she derived the unidimensional proposition that it should be easy for universities, because they are loosely coupled systems, to eliminate unwanted departments. Yet, when studying five state universities, she found that departments were difficult to eliminate because of ties among faculty members. She concluded by dismissing the notion that universities are loosely coupled systems and argued that researchers should pay attention to patterns of loose and tight coupling. Within one article, then, the concept of loose coupling was described in terms of dialectical theory, a unidimensional proposition, dialectical findings, unidimensional dismissal, and dialectical suggestions for further research.

One reason that the distinction between the unidimensional and dialectical interpretation has not been made is that no reviews of the loose coupling literature have been published. Instead, what have been written are documents that approximate reviews, including several unpublished qualifying examinations and dissertations (Beekun, 1988b; Cude, 1989; Taylor, 1983), a few retrospective assessments of the concept (Firestone, 1985; Weick, 1986, 1989), occasional translations of the concept across disciplinary boundaries (Dane, 1985; Gummer, 1982), a typology of loose coupling presented at a conference (Clark, Astuto, & Kuh, 1983), and the summary of a seminar on loosely coupled systems (Gibson, 1977). Because few of these works are widely available, organizational researchers have had to construct idiosyncratic interpretations of the concept, its general propositions, and its operationalizations. A straightforward review of the loose coupling literature may be the easiest way to free theorists to consider

puzzles such as the one highlighted in this section.

The Voice of Causation

The voice of causation is the first voice used in this article to review the loose coupling literature. Researchers who use the causation-seeking voice neither advocate nor condemn loose coupling as a management tool. In a relatively dispassionate way, they look for process and variance theories that help to explain why some systems are loosely coupled and others are not. This causation-seeking voice is structured around three recurring explanations for what causes loose coupling: causal indeterminacy, fragmentation of the external environment, and fragmentation of the internal environment.

Causal Indeterminacy

Several researchers have suggested that causal indeterminacy causes loose coupling. Causal indeterminacy refers to unclear means-ends connections, which are explored in writings on bounded rationality, selective perception, uncertainty, ambiguity, and intangibility of production materials. For example, Orton and Weick (1988, p. 14) argued that because people have bounded rationality (e.g., limited information-processing capabilities, memories that obscure details, and short attention spans) they notice different parts of their surroundings, will tune out different parts at different times, and will process different parts at different speeds. As a result of the idiosyncratic worlds formed under these conditions, people will find it difficult to coordinate their actions and will share few variables or weak variables, all of which leads to loose coupling.

Glassman (1973) portrayed loose coupling as a problem of selective perception: "If the observer is not looking at or understanding the operation of variables involved in coupling then his conceptual system will show a looser coupling than exists in the real world" (p. 85). According to Glassman, the perception of loose

coupling is most likely when observation time is limited, the number of observable variables is decreased, and the instruments for measuring variables are weakened.

Researchers also have observed how uncertainty can create causal indeterminacy, which can then create loose coupling (Weick, 1976, p. 4). For example, Faulkner and Anderson (1987) studied the effects of uncertainty on governance structures by analyzing the credits of 2,430 films released between 1965 and 1980. Unclear links between means ("capitalization, choice of creative elements, and marketing strategies"; p. 885) and ends ("economic and critical outcomes"; p. 884) were created by variance in the content and composition of artistic work, variance in the rates of investment flows, and variance in stochastic demand; this lack of clarity was heightened by diverse, uncertain, and imperfectly perceived markets. Under these uncertain conditions, loosely coupled project-based teams were created.

In a similar vein, March (1987) argued that ambiguity causes loose coupling, and he identified four ambiguities that are inherent in decision environments: (a) the preferences of decision makers are unstable and unpredictable over time; (b) problems, solutions, and actions are unrelated to each other; (c) self-interested reason is subordinated to occasionally obsolescent traditions; and (d) information is used primarily to create meaning out of previous decisions. March suggested that these ambiguities create loose coupling between information activities and decision activities.

Additionally, Clark (1983) wrote that the loosely coupled structure of universities is an inevitable consequence of their primary production material: knowledge.

[A]n academic system works with materials that are increasingly specialized and numerous, knowledge-intensive and knowledge-extensive, with a momentum of autonomy. This characterization applies most strongly to advanced systems, but even the most retarded systems will be based on a half-dozen or more distinct bundles of knowledge that have their own internal

logics and an inherent bent toward autonomy.
(p. 16)

Fragmented External Environment

Fragmentation of a system's external environment, a second recurring cause of loose coupling, typically takes one of two forms: dispersed stimuli or incompatible expectations. Fragmentation that takes the form of dispersed stimuli explains such diverse concepts as geographic dispersion, specialized market niches, and varied demands on the system. For example, Chase and Tansik (1983) wrote that customer contact increases the need for decoupling the activities within the organization. Manning (1979) demonstrated that the constant stream of diverse emergency calls to police organizations diminished the effects of hierarchical coordination by creating internal differentiation among operators, dispatchers, and officers. Manning argued that geographical dispersion and multiple possible stimuli require information structures that can simultaneously filter and respond to an environment of callers.

Fragmentation that takes the form of incompatible expectations has been illustrated by Meyer and Rowan (1977), who argued that schools must somehow reconcile incompatibilities between institutional pressures and technical pressures. They noted that organizations respond to this contradiction by buffering, building gaps between, loosely coupling, or decoupling formal structures from actual work activities in order to maintain "ceremonial conformity" (p. 341). In addition, support for Meyer and Rowan's decoupling thesis has been found in studies of hospitals (Covaleski & Dirsmith, 1983), courts (Hagan, Hewitt, & Alwin, 1979), and prisons (Thomas, 1984).

Fragmented Internal Environment

A third recurring source of loose coupling is the fragmentation of the internal environment, which can take a variety of forms. For example, Pfeffer (1978) suggested that organizations "are loosely coupled, in part, because few partici-

pants are constantly involved or care about every dimension of the organization's operations" (p. 37). Additionally, Boynton and Zmud (1987) observed that professionals who work with information systems face increased loose coupling between subunits when personal computers are dispersed throughout organizations. Sunesson (1985) suggested that "street-level bureaucracies" (p. 243) lead to loose coupling between goals and actions, whereas Raghunathan and Beekun (1989) proposed that the ownership coupling patterns of multinational corporations are a function of the maturity and cultural diversity of subsidiaries. Finally, Thomas (1983) described the Chicago Eight trial as a competition for control of proceedings and meanings that created loose couplings between judicial practices and the ideological premises of due process.

In summary, this voice often preserves a dialectical interpretation, as is evident in work on project-based teams over time (Faulkner & Anderson, 1987), interactions between judicial practices and due process principles (Thomas, 1983), and police organizations' joint tasks of filtering and responding to emergency calls (Manning, 1979). However, this voice also drifts from a dialectical interpretation when investigators portray loose coupling as *decoupling* (e.g., Chase & Tansik, 1983; Meyer & Rowan, 1977). When loose coupling is portrayed as decoupling, the diminished emphasis on connectedness, responsiveness, and interdependence dissolves the dialectic.

The Voice of Typology

The voice of typology is the second voice used in this article to review the loose coupling literature. Similar to researchers who use the voice of causation, researchers who use the voice of typology are not directly concerned with the value of loose coupling as a management tool. The voice of typology emphasizes descriptive clarity as a precursor to causal clarity. Such researchers see loose coupling as an analytical

language, rather than as a set of causal propositions. Consequently, this voice is structured around different types of loose coupling, rather than its causes or effects.

Working in the voice of typology, we identify the eight most frequently recurring types of loose coupling: loose coupling among individuals, among subunits, among organizations, between hierarchical levels, between organizations and environments, among ideas, between activities, and between intentions and actions.

Studies of loose coupling in which the individual is the unit of analysis are illustrated by Beekun's (1988a) network analysis of a multiplayer organization game, Hedberg's (1984) use of loose coupling as a design criterion in a steelworks, Schall's (1983) description of an investment division, Keidel's (1984) description of baseball teams, and Hagan, Hewitt, and Alwin's (1979) study of relationships within the judicial system.

Researchers also have considered a wide range of structural elements that are above the individual level and below the organizational level; in this article, these elements are categorized as *subunits*. Because the concept of loose coupling was first empirically grounded in educational organizations, one of the most frequently studied subunits has been the school classroom (Deal & Celotti, 1980; Murphy & Hallinger, 1984; Weick, 1976). Researchers have also considered the loose coupling between functional departments. For example, they have studied groups of telephone operators, dispatchers, and officers in a police organization (Manning, 1979); information systems departments and the rest of the organization (Boynton & Zmud, 1987); nursing subunits and physicians and paramedical subunits of hospitals (Leatt & Schneck, 1984); and business units (Gupta, 1984; Horwitch & Thietart, 1987).

Many studies have been conducted on the third type of loose coupling, loose coupling between organizations. For example, Provan (1983) differentiated five types of organizations of

organizations: coalitions, participatory federations, independent federations, mandated federations, and intraorganizational systems (p. 83). Although Provan rank-ordered these interorganizational organizations from loosely coupled (coalition) to tightly coupled (intraorganizational system), loose coupling has been documented within each of these organizational types. Bygrave (1988) studied the coupling in co-investment coalitions of venture capitalists. Covaleski, Dirsmith, and Jablonsky (1985) described a loosely coupled network of state geriatric service agencies. Luke, Begun, and Pointer (1989) described independent "quasi firms" in the hospital industry. Kaplan (1982) described an intervention into a loosely coupled federation of state agencies that shared a mandated common funding source. Finally, Raghunathan and Beekun (1989) discussed the varying looseness of ownership patterns of multinational corporations.

The fourth type of loose coupling, loose coupling that occurs between hierarchical levels, also has received attention. Firestone (1985) and his colleagues documented loose coupling between hierarchical levels in schools through a "school assessment survey," which measured coupling on five vertical dimensions: vertical communications, centralization on instruction matters, centralization on resource matters, support by the principal, and goal consensus (p. 12). In keeping with this theme, Gamoran and Dreeben (1986) also studied the influence of principals on classroom activity. Similarly, Ouchi (1978) studied the transmission of behavioral control and output control between hierarchical levels in department stores.

In a different approach to loose coupling between hierarchical levels, Covaleski and Dirsmith (1983) studied how the structural separations implied by Meyer and Rowan's (1977) version of institutional theory could be translated into the freedom of nurses from the intrusion of cost controls. Covaleski and Dirsmith suggested that effective nurse administrators alternately

adopt "budget masks" (for communications with hospital administrators) and professional "clan masks" (for communications with nurses), and they inferred that loose coupling between hierarchical levels occurs when people are willing and able to speak different languages to different levels.

A fifth type of loose coupling, loose coupling between organizations and environments, also has been described (e.g., Beekun & Ginn, 1988; Weick, 1979, p. 178). Other examples include Manning (1982), who described semiotic loose coupling between a police communication system and an environment of people making emergency phone calls. He reported that dramatic phone calls are "conventionalized" (p. 234) and frozen (p. 235) into rigidly defined crime codes by police operators, and he defined the telephone operators' task as one of processing, decoding, classifying, encoding, and transforming the calls into the code, language, or perspective of the organization. Therefore, by changing the information as it crosses the boundaries into the organization, police communication systems (a) maintain the integrity, consistency, and autonomy of their organizations and (b) loosen the couplings between the organization and its environment.

Frequently, researchers are concerned with the actions, events, or sequences within organizations, rather than specific entities or levels (Weick, 1979, p. 236). Such studies are categorized in this article as demonstrations of loose coupling between activities, and one example of this type of analysis is the study of loose coupling between problems and choices. Cohen, March, and Olsen's (1972) article focused on the loose coupling between problems and choice:

A major feature of the garbage can process is the uncoupling of problems and choices. Although decision making is thought of as a process for solving problems, that is often not what happens. Problems are worked upon in the context of some choice, but choices are made only when the shifting combinations of problems, so-

lutions, and decision makers happen to make action possible. (p. 16)

This puzzle, in various permutations, including loose coupling between information gathering and decision making, has been revisited many times by March and his colleagues (Cohen & March, 1974; Feldman & March, 1982; March, 1987; March & Olsen, 1976; March & Simon, 1958, p. 176).

Several theorists have explored loose coupling between ideas contained in accounts, goals, and ideologies. For example, Gaertner and Ramnarayan (1983) discussed four types of accounts that can be loosely coupled: auditing (performing within a framework for an external audience), implementation (performing within a framework for an internal audience), integration (setting the framework for an internal audience), and legitimation (setting the framework for an external audience). Bussigel, Barzansky, and Grenholm (1986) found that not only were goals in some medical schools incompatible, inconsistent, and indirectly related, but the relationships between these goals also were vaguely articulated. In addition, Meyerson and Martin (1987) suggested that ideologies can be loosely coupled (p. 634).

The final type of loose coupling, that is, loose coupling between intentions and actions, is described through the following examples. An unpublished manuscript by Salancik (1975) on loose coupling between intentions and actions serves as an anchor for several ideas, including loose coupling between planning and implementation (Withane, 1984), official structures and negotiated orders (Thomas, 1983, 1984), and structural facades and technical cores (Meyer & Rowan, 1977). Similarly, Hagan, Hewitt, and Alwin (1979), who studied loose coupling between the structural facades and technical cores of judicial systems, argued that societal demands for individualized justice were grafted onto the American judicial system in the early 20th century in the form of probation officers' presentenc-

ing recommendations (p. 597). These authors further demonstrated that the judicial system has kept parole officers decoupled from a more efficiency-oriented judge-prosecutor subsystem that rewards guilty pleas.

In summary, this voice can also preserve the dialectical interpretation of loose coupling. The dialectical interpretation is most evident when the typology captures descriptions of ongoing actions, for example, nurse administrators adopting masks (Covaleski & Dirsmith, 1983), police operators conventionalizing emergency phone calls (Manning, 1982), and judicial systems decoupling parole officers' recommendations from sentencing decisions (Hagan, Hewitt, & Alwin, 1979). However, this voice drifts from the dialectical interpretation when the typology captures descriptions of static entities, for example, when sports teams, schools, or geriatric services networks are labeled as loosely coupled systems (Keidel, 1984; Murphy & Hallinger, 1984; Covaleski, Dirsmith, & Jablonsky, 1985).

The Voice of Direct Effects

Researchers who use the voice of direct effects are the strongest advocates of loose coupling as a management strategy. The voice's theme is, "loose coupling has specific effects and the effects are desirable." The three most frequently recurring direct effects are modularity, requisite variety, and discretion.

For example, Page-Jones (1980) encouraged software designers to attain "modularity" (p. 102) through loose coupling:

The first way of measuring design quality we'll explore is *coupling*, the degree of interdependence between two modules. Our objective is to minimize coupling; that is, to make modules as independent as possible. . . . *Low coupling* between modules signifies a well-designed system. (pp. 101, 103)

Page-Jones suggested that modularity is attained by the elimination of unnecessary relationships, by reducing the number of necessary

relationships, and by using loose couplings instead of tight couplings. To differentiate loose couplings from tight couplings, he proposed a continuum of couplings between software modules, ranging from "loose, or good" to "tight, or bad" (p. 103). As the tightness of couplings increases, the modularity (p. 102) of the system decreases. Page-Jones referred to high coupling as "pathological coupling" because it "brings us back to the mess of nonmodular coding" (p. 114). Other studies by Perrow (1984) and Cude and Browning (1989) have identified similarities between machine modularity and modularity in human systems.

The second direct effect of loose coupling, requisite variety, also has been analyzed by organizational scholars. Weick (1976) proposed that loosely coupled systems could more accurately register their environments through requisite variety. (A system has requisite variety to the extent that its elements serve as a medium that can register inputs with accuracy.) Additionally, registering improves when elements become more numerous and the constraints among them weaken (Heider, 1959; Orton, 1988).

The final direct effect of loose coupling, discretion, can be broken into two forms: behavioral discretion and cognitive discretion. *Behavioral discretion* is the capacity for autonomous action. March (1987) suggested that ambiguity creates loose coupling between information activities and decision activities and that this loose coupling creates autonomy for information gatherers. Vaughan (1982), writing for a law review audience, suggested a more specific type of behavioral discretion—freedom to make external alliances for illegal purposes. She cited loosely coupled systems as an organizational form which obscures subunit activities from the monitoring of top management. According to her, as top management's ability to monitor subunit activities decreases, the subunits are more likely to "engage in a fraudulent transaction with another organization" because "no countervailing intraorganizational authority can prevent or

control the unlawful behavior" (Vaughan, 1982, pp. 1394–1395).

In contrast to behavioral discretion, *cognitive discretion* is the freedom to perceive or construct an idiosyncratic meaning. For example, Manning (1982) described the process through which police organizations create semiotic worlds, which are distinct from the communities these organizations are intended to serve. This process is facilitated by an expectation that Weick, Gilfillan, and Keith (1973) described as the *presumption of logic*. These authors proposed that when people are about to confront an indeterminate set of events, they often presume that the events will have made sense and then act as if the events are sensible and determinate, which often makes the set of events determinate in the process. The process unfolds like a generic self-fulfilling prophecy. Having presumed that the events follow a logic of some sort, these people act with confidence and implant a logic that confirms their prescription.

In summary, the voice of direct effects preserves the dialectical interpretation of loose coupling when it frames loose coupling as a counterrational concept. The voice of direct effects has always been dependent on a prevailing, rational, Weberian emphasis on structures that increase determinacy. One important example is found in the abstract to Weick's (1976) loose coupling article, which begins, "In contrast to the prevailing image . . ." (p. 3). Additionally, when researchers such as Manning (1982) describe how connectedness (police responsiveness to phone calls) can be explained as disconnectedness (idiosyncratic semiotic worlds), they are grounding the voice of direct effects in a larger context that expects connectedness. As theorists' concepts of loose coupling have matured, the counterrational tone has softened, but so too has the dialectical tone. When researchers remove the concept of loose coupling from the rational background that it attacks, the voice of direct effect drifts toward a unidimensional interpretation (e.g., Page-Jones, 1980; Vaughan,

1982), highlighting modularity, requisite variety, and discretion, while ignoring interaction, requisite integration, and control.

The Voice of Compensations

Theorists who use the voice of compensations try to restore a dialectic to the concept of loose coupling. The voice's theme is "loose coupling is an unsatisfactory condition that should be reversed." The voice of compensations is most visible in the educational administration literature, where researchers have had to redefine the role of educational administrators based on recurrent findings that schools are loosely coupled systems (Firestone, 1985). Researchers working in the voice of compensations search for nonobvious sources of order that administrators can use to influence dispersed organizations. The three most frequently recurring managerial strategies are enhanced leadership, focused effort, and shared values.

Enhanced Leadership

Some theorists view the management of loosely coupled systems as a problem and call for "stronger" leadership. For example, Murphy and Hallinger (1984) argued that loose coupling research described "what is" and school effectiveness research described "what can be" (p. 10). They wrote that loose coupling research implies that organizational levels and components have limited influence on other organizational levels and components because of "the presence of multiple and often conflicting goals" and "the lack of a clear instructional technology" (p. 7). Murphy and Hallinger (1984) also stated that in contrast to loose coupling, "the teacher effectiveness literature portrays schools as possessing a clearly defined technology or means to reach goals" (p. 8). The solution, according to these authors, is strong leadership that unifies goals and clarifies technology (pp. 9–10).

Other researchers have suggested that loose coupling calls for subtle leadership. For exam-

ple, Boynton and Zmud (1987) counseled information systems professionals who, because of the dispersal of computer technology, will find themselves in more loosely coupled systems, to try "to simultaneously provide centralized direction and coordination while recognizing the value of increased discretion" (p. 62). Similarly, Weick (1982b) counseled educational administrators to be more attentive to the "glue" that holds loosely coupled systems together: "since channels are unpredictable, administrators must get out of the office and spend lots of time one on one—both to remind people of central visions and to assist them in applying these visions to their own activities" (p. 676). Therefore, this one-on-one or subtle leadership implies sensitivity to diverse system components (Kaplan, 1982) and the ability to control systems through conversation (Gronn, 1983, p. 20).

Focused Attention

A second form of compensation is to focus attention on specific relations in the system. For example, Peters (1978) wrote that "small step strategies" within "vast, loosely linked systems" may produce more effective, efficient, interesting, varied, and thoughtful organizational changes (p. 49). In addition, researchers have described several ways in which individuals can compensate for loose coupling by carefully selecting targets, controlling resources, and acting forcefully.

Glatthorn (1981) emphasized the careful selection of targets when he described a process through which a successful curriculum change could be attained in a loosely coupled system: map what is currently taught, reduce the curriculum to structured and basic information, and provide flexibility for teachers to adapt the curriculum (p. 112). Generalizing from this strategy, managers can change the behavior of subordinates in loosely coupled systems if they build on subordinates' ongoing behavior, focus only on controllable and essential behaviors, and pro-

vide the freedom for subordinates to adapt the behavior to local needs.

The use of resource control as a compensation for loose coupling has been illustrated by Gamoran and Dreeben (1986) in their study of school administrators. They found, in a year-long study of 13 classes in 7 schools, that the allocation of time to reading activities, the provision of particular curricular materials, and the grouping of students each had a significant effect on children's reading ability. Gamoran and Dreeben interpreted their findings as evidence of administrator influence on classroom activity.

Specific targets, such as curriculum materials and resource flows, do not have to be "correctly" selected to serve as compensations for loose coupling. Forceful action itself can often create orderly contingencies among events that then remove some indeterminacy. Self-fulfilling prophecies are an example of this process, but the more general formulation is that people can enact regularities into their environment (Smircich & Stubbart, 1985; Weick, 1979). People who disagree about causation can reestablish some determinacy either by voting for a subset of factual premises, which they will treat as binding, or by manipulating the environment (Hedberg, Nystrom, & Starbuck, 1976) so that it contains explicit cause-effect ties on which they can agree.

Shared Values

Use of shared values is a third means to compensate for loose coupling. This form of compensation is especially crucial because it often constitutes the sole remaining basis that holds together a loosely coupled system. If organizations are determinate means-ends structures for attaining preferred outcomes, and if loose coupling is produced by uncertainties about these means-ends structures (Thompson, 1967, p. 134), then agreement about preferences is the only source of order that is left. Reaffirmation of shared values in the face of loose coupling has

been emphasized by such authors as Deal (1985), Ouchi (1978, 1980), and Meyer and Rowan (1977).

For example, Deal (1985) wrote that administrators should use tight cultural couplings to counteract loose couplings between policies and actions. He suggested that administrators should build stronger cultures through the analysis of history, the identification of heroes and heroines, the enhancement of ceremonies and rituals, and the cultivation of stories and storytellers. Similarly, Ouchi (1978) argued that control loss between hierarchical levels leads to modularity and discretion (p. 283), which is compensated for by a clan orientation (Ouchi, 1980, 1981).

Meyer and Rowan (1977) suggested that the cohesive force that keeps decoupled organizations from becoming anarchies is "the logic of confidence and good faith" (p. 358). This logic emphasizes ceremonial management, considerations of face, the twin assumptions that people are performing their tasks correctly and that "things are as they seem," all of which allow decoupled structures to continue operation.

In summary, this voice preserves a dialectical interpretation when it builds on the premise that looseness on some dimensions should be complemented by coupling on other dimensions. Gamoran and Dreeben (1986) accepted the concept of diminished direct control by principals, which fuels a search for alternative sources of control. Researchers who use this voice drift away from the dialectical interpretation when they reject looseness as a legitimate organizational form. When researchers try to replace looseness with coupling, they assume the dialectic away (e.g., Lutz, 1982; Murphy & Hallinger, 1984).

The Voice of Organizational Outcomes

Researchers who use the voice of organizational outcomes try to predict and measure the

effects that loose coupling has on the performance of organizations. Because of the causal distance between loose coupling and organizational outcomes, the voice of organizational outcomes requires the consideration of more independent variables than does the voice of direct effects. The outcome voice, consequently, is less forceful than the voice of direct effects in advocating loose coupling as a managerial strategy, and it focuses on five organizational outcomes: persistence, buffering, adaptability, satisfaction, and effectiveness.

Persistence

Persistence, a general term referring to stability, resistance to change, and continued operation, is discussed frequently as an organizational outcome of loose coupling. For example, Glassman (1973) presented 13 examples, from varying levels of system complexity, of loose couplings that create persistence. Persistence is also evident in the reduced responsiveness of an organization. Wilson and Corbett (1983) found empirical support, emphasized by Firestone (1985), for the idea that tightly coupled systems are more conducive to systemwide change than loosely coupled systems. In addition, Meyerson and Martin (1987) noted that managers were unable to plan, predict, control, or change a loosely coupled system. Finally, Hagan, Hewitt, and Alwin (1979) demonstrated that parole officers evoke little response from judges; Kaplan (1982) suggested that interventionists can only evoke short-term responses from federations; and Deal and Celotti (1980) noted that communities are not always able to evoke responses from loosely coupled schools.

Buffering

Buffering is a second outcome of loose coupling (Thompson, 1967). Weick (1976) suggested that loosely coupled systems seal off and prevent the spread of problems, an ability that Schoonhoven (1986) saw as desirable in space

stations. One proposed benefit of modularity in software design is that it reduces the occurrence of ripple effects, for example, a bug in one module appearing as a symptom in another module (Page-Jones, 1980, p. 102).

Three studies have demonstrated that buffering in loosely coupled systems is partial, rather than complete. Although Perrow (1984) idealized loose coupling as a solution to the dangers of tight coupling, evidence in his analysis of the Three Mile Island accident indicated that loose coupling was part of the cause of the Three Mile Island accident: Three warnings that conceivably could have prevented the accident were not communicated to the plant engineers (Perrow, 1981). In a similar vein, Rubin (1979) found that five state universities could not easily terminate departments, which she interpreted as evidence that the universities were characterized by patterns of tight and loose couplings, rather than simply loose couplings. Finally, Cameron, Kim, and Whetten (1987) found that although administrators in loosely coupled systems could buffer their subordinates from turbulence, they could not buffer them from decline (p. 236).

Adaptability

Whereas persistence and buffering imply adaptation to change through neutralizing the impact of the change, another outcome of loose coupling, adaptability, implies assimilation and accommodation of the change (Weick, 1979, p. 120). In the literature on loose coupling, three types of adaptability have been suggested: experimentation, collective judgment, and dissent.

To cope directly with conditions such as apparent causal indeterminacy, people often "act to expose the conditions for acting; causal relationships in the environment or in the interface between learner and environment are gradually untangled" (Hedberg, 1981, p. 4). Actions that untangle causality are what is meant by experimentation. Hedberg (1984) argued that the design of a steelworks should respond to

workers' desires for more local information, exploration (p. 53), learning, self-design, experimentation, reflection (p. 57), "a right to curiosity" (p. 58), local learning, and local solutions (p. 64). Confirming Hedberg's link between loose coupling and experimentation, Manning (1979) argued that loosely coupled police officers were better able to find solutions to complex problems than tightly coupled police officers, and Perrow (1984) argued that if complex technologies were more loosely coupled, operators would be able to find solutions through exploratory problem solving.

Collective judgment, another form of adaptability, was described by Thompson and Tuden (1959). They argued that when loose coupling takes the form of disagreement on means-ends relationships (causal indeterminacy), the system coheres if there is still agreement on preferences (shared values). Thompson and Tuden referred to this combination as the *judgment* decision-making strategy. The structural form which corresponds to a judgment decision strategy is represented by a self-governing voluntary group, a form often called a *collegium* (Thompson, 1967, p. 200). The collegium promotes wise choice because people who have equal influence, equal information, and a decision scheme of majority rule are able to apply multiple perspectives to situations and combine their perspectives to create a collective judgment. Because of the relative advantages of the loosely coupled form in creating collective judgment, it is not surprising that collegium forms such as the judiciary (e.g., Hagan, Hewitt, & Alwin, 1979), universities (e.g., Rubin, 1979), and voluntary associations (e.g., Golembiewski, 1979) are heavily represented in loose coupling literature.

A third type of adaptability, the preservation of dissent, is preserved and generated in loosely coupled systems through cultural insurance (Weick, 1976) and unified diversity (Eisenberg, 1984). Nemeth (1986) argued that minority influence helps systems adapt to complex problems because it intensifies cognitive effort by the majority. Nemeth and Staw (in press) demonstrated

through a review of literature on minority influence that the strain for uniformity threatens dissent and restricts adaptability, creativity, and survival. Eisenberg (1984) wrote that ambiguity facilitates "unified diversity" because people retain multiple understandings while believing their understanding is singular and shared. The result is an increased likelihood of adaptability.

Satisfaction

Loose coupling also appears to have implications for job satisfaction because it affects efficacy, conflict, security, and social contacts. First, some investigators have argued that loose coupling fosters self-determination and a sense of efficacy (Weick, 1976). In part, this may be because the setting of objectives is easier on a localized level (Chase & Tansik, 1983). Second, researchers have noted that loosely coupled systems often reduce conflict between system elements because in these situations such elements are not required to agree, interact with, or adapt to each other, creating fewer occasions for conflict (Deal & Celotti, 1980; Meyer & Rowan, 1977). Third, researchers have suggested that loosely coupled systems create a haven of psychological safety in which deviance and experimentation are protected (Meyerson & Martin, 1987, p. 636). Finally, Jones (1984) proposed that loosely coupled, horizontally differentiated, or self-contained subunits create a perception of smaller group size, which he hypothesized would increase task visibility, monitoring, and social exchange among employees. Although self-determination, reduced conflict, psychological safety, and deepened social interaction are generally considered as contributors to higher satisfaction, loose coupling can also generate loneliness (Deal & Celotti, 1980), which detracts from satisfaction.

Effectiveness

If an organization is persistent, buffered, and adaptable, and has satisfied employees, is it effective? Some researchers emphasize organizational outcomes of loose coupling that suggest

ineffectiveness (e.g., Lutz, 1982; Murphy & Hallinger, 1984), whereas others emphasize outcomes that suggest effectiveness (e.g., Covalleski & Dirsmith, 1983). The debate over the effectiveness of loose coupling is pervasive, woven throughout many discussions of loose coupling. For example, a few investigators have addressed effectiveness directly by considering productivity, market share, return on investment (ROI), efficiency, and "excellence" as organizational outcomes.

On a group level, Birnbaum (1981) found that research groups composed of members who agreed on the overall goals of the research project, but had diverse academic training and affiliations, were more productive on some dimensions than groups composed of members with less diverse academic training and affiliations.

On a business-unit level, Horwitch and Thietart (1987) conducted a PIMS data analysis that tested the effects of three types of coupling on ROI (a measure of short-term effectiveness) and market share (a measure of long-term effectiveness). These authors found (a) that loose coupling (e.g., no shared market) is often compensated for (e.g., by shared facilities) to create effectiveness and (b) that different contexts require different coupling patterns. Beekun and Ginn (1988) reported similar findings in hospitals' extra-organizational linkages: Different strategic types (analyzer, defender, reactor, prospector) imply their own optimal coupling gestalts for attaining efficiency and effectiveness. Therefore, effectiveness, from a strategy perspective, is attained by conforming to the coupling patterns dictated by a combination of environment and strategy (Raghunathan & Beekun, 1989).

On a general organizational level, Peters and Waterman (1982) argued that simultaneous loose-tight coupling helped create "excellence." More specifically, they argued that employee autonomy, experimentation, and innovation can be facilitated through a strongly held set of shared values.

In summary, researchers who use this voice preserve the dialectical interpretation of loose

coupling when they begin with a unidimensional interpretation of loose coupling and end by concluding that researchers should use a dialectical interpretation. For example, according to Rubin (1979), universities have a limited ability to eliminate departments, and researchers should continue to study patterns of loose and tight coupling. Cameron, Kim, and Whetten (1987, p. 236) found that loose coupling can protect organizations from some effects of decline, but not from others. Theorists who use this voice weaken the dialectical interpretation when they begin and end with a unidimensional interpretation of loose coupling (e.g., Kaplan, 1982).

A Preliminary Model of Loose Coupling Theory

The five voices reviewed in the previous section can be combined to form a simple, sequential model. In Figure 1, we present a preliminary model of loose coupling theory, built on the presentation conventions of causal modeling (Jöreskog & Sörbom, 1986).

The switch from five voices to five latent-variable-like constructs changes the discussion in several ways. First, the intricate interactions among the voices/variables are represented as simple sequentiality. Second, each variable now appears to have the same weight, although different voices are stronger in different contexts. Third, the single model implies a much higher degree of consensus than actually exists among loose coupling researchers; researchers who use different voices would portray the model differently. Despite all these simplifications, the model compactly summarizes past thinking on loose coupling. Additionally, although not formally presented as propositions, each arrow in the model is a proposed causal relationship.

Conclusions

In general, the review of the loose coupling literature presented here supports Thompson's (1967) assertion that organization theorists find it

difficult to think simultaneously about rationality and indeterminacy. For each of the five voices, loose coupling is often reduced to a unidimensional variable, a simplification that should be resisted. The following section explains how researchers can avoid that simplification.

Within organization theory, there are many unidimensional variables but few dialectical concepts. Dialectical concepts are rare because they are difficult to build. Loose coupling, for example, is the product of many years of effort by organization theorists to combine the contradictory concepts of connection and autonomy. Burns and Stalker (1961) assigned connectedness to the mechanistic organization and autonomy of components to the organic organization. Thompson (1967) moved these two forces inside one system by combining the concepts of open systems (connected to environmental forces) and closed systems (independent of environmental forces). Lawrence and Lorsch (1967) provided another organizational resolution to the connected/autonomous paradox by arguing that differentiation could be compensated for by the creation of integrating mechanisms such as liaisons or cross-functional committees. The dialectical interpretation of loose coupling builds on and extends these arguments by juxtaposing both forces, simultaneously, within the same system (Das, 1984).

If loose coupling is maintained as a dialectical concept, it can illuminate the answers to several organizational puzzles that have eluded organization theorists.

The first puzzle involves the definition of *organization*. Most definitions of organization consist of at least two components: (a) a source of order which consolidates, unifies, or coalesces diverse elements or fragments and (b) elements or fragments, which are consolidated, unified, or coalesced by a source of order. When researchers define organizations as monolithic corporate actors, they overemphasize order and underemphasize elements; when researchers define organizations as mere aggregates of individuals, they overemphasize elements and underem-

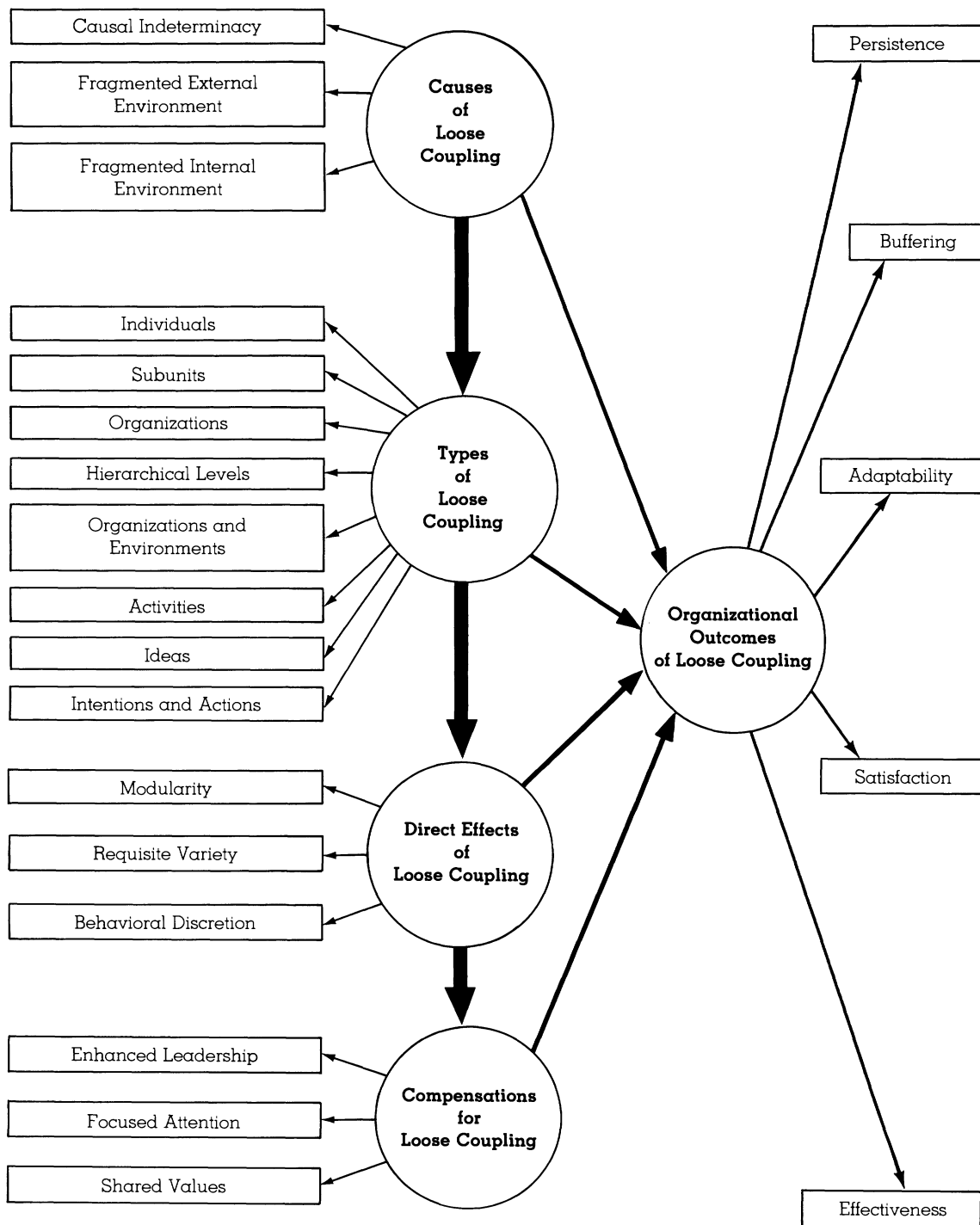


Figure 1. Loose coupling theory.

phasize order. If researchers begin with richer definitions of organization, they will arrive at more accurate findings and conclusions. If the loose coupling concept can be maintained in its dialectical form, and if it can help researchers begin studies with more subtle and intricate definitions of organizations, it can raise the quality of organizational research.

A second potential contribution of loose coupling is its use in the measurement and interpretation of interpretive systems (Daft & Weick, 1984). A loosely coupled system is a good vehicle for registering objectives outside itself, but is itself an elusive object to understand. Thus, in a loosely coupled system, what is most likely to be socially constructed is the system itself, not the world it faces. This raises an interesting issue because it suggests that analysts know and understand least well the vehicles that are most effective at sensing. The property that makes them good sensors is the very same property that has made them indistinct objects. A corollary to these ideas is that organization theory currently may be skewed toward the study of organizations that are least able to interpret their environments. The concept of loose coupling, when maintained in its dialectical form, should be a useful tool in identifying, measuring, and understanding interpretive systems.

A third puzzle that the loose coupling concept may help theorists to understand is the fluidity, complexity, and social construction of organizational structure. Loose coupling may be able to do for the study of organizational structure what bounded rationality did for the study of decision making (Simon, 1976). By recognizing and explaining how decisions are made by humans with limited interest, time, and energy, Simon required studies of decision making to move into more subtle, more detailed, and more enigmatic directions. The concept of loose coupling, with its recognition of numerous structural dimensions, its emphasis on simultaneous coupling and decoupling, and its portrayal of structures as malleable through managerial intervention,

similarly forces researchers to move more deeply into the human workings which underlie organizational structure. In the same way that bounded rationality has led researchers to study the processes of decision making, rather than merely the outcomes, loose coupling may lead researchers to study structure as something that organizations do, rather than merely as something they have.

For researchers to begin to solve puzzles such as these, it is essential that the concept of loose coupling remain dialectical, rather than unidimensional. The following suggestions are means by which the simplification of unidimensionality can be avoided.

Research methodologies that encourage researchers to parse dialectical concepts into unidimensional variables should be avoided. The frequently pursued direct effect, X causes Y, is still the social science ideal. The numerous, more complicated forms of this relationship have been considered as disappointing approximations to the ideal. Within this netherworld of approximations to direct effects, there are several ways to represent dialectical concepts. One of the simplest is the translation of bipolar variables to two-variable matrices (Bobko, 1985). Another technique is to regress a concept onto contradictory independent variables, which was used in Figure 1 to combine decoupling (types of loose coupling) and coupling (compensations for loose coupling). A third technique is the use of deviation-regulating loops, in which variables shift values as the cycle progresses (Maruyama, 1963; Orton & Weick, 1988). To preserve the dialectical interpretation of loose coupling, researchers must continue to transform methodology to serve theory, rather than transforming theory to serve methodology.

The concept of loose coupling is simplified when researchers use it for flat, static descriptions, rather than detailed, dynamic descriptions. Weick (1979, p. 44) argued that nouns focus attention on reified objects, whereas verbs focus attention on dynamic processes. Re-

searchers who see systems as static objects to be labeled ("this is a loosely coupled system") are less likely to capture loose coupling than are researchers who see systems as an arena for complex, ongoing processes ("loose coupling in this system occurs when . . ."). The dialectical interpretation of loose coupling can be strengthened when researchers look closely at the processes within systems. For example, ethnographies, case studies, and systematic observations (Manning, 1979, 1982; Rubin, 1979; Thomas, 1984) are methodologies that seem to encourage this careful analysis, whereas questionnaires and casual observations (Firestone, 1985; Lutz, 1982) are methodologies that seem to discourage it. The relevant criterion is familiarity: Will researchers describe the processes within the system or will they simply categorize systems? To preserve the dialectical interpretation, greater familiarity with a few systems is currently more valuable than lesser familiarity with many.

The third way to drift away from the unidimensional interpretation is to ignore the presence of connectedness within organizations. From a Weberian bureaucratic perspective, the recurring surprise is that organizations routinely exhibit looseness (Corwin, 1981). From a decoupling perspective, the recurring surprise is that organizations routinely exhibit coupling. When researchers enter organizations expecting to find little that is coupled (e.g., Orton, 1989), they are surprised to find that organizational members spend most of their time thinking about structural connections, rather than structural disconnections. Theorists who err on the side of overemphasizing the presence of disconnectedness in organizations need little exposure to organizations before they begin to speak about patterns of couplings and decouplings, instead of just decouplings (Meyer, 1980; Rubin, 1979).

Researchers also drift away from the dialectical interpretation by making imprecise general statements, as in the following argument: (a) "loosely coupled systems are supposed to be more effective than tightly coupled systems," (b)

"General Motors is more loosely coupled than Ford," (c) "Ford has been more profitable in recent years," therefore, (d) "tightly coupled systems may be more effective than loosely coupled systems." To state that an organization is a loosely coupled system is the beginning of a discussion, not the end. What elements are loosely coupled? What domains are they coupled on? What domains are they decoupled on? What are the characteristics of the couplings and decouplings? Researchers who invoke the concept of loose coupling can avoid simplifying it by specifying their assumptions more precisely.

The last way in which researchers drift away from the dialectical interpretation of loose coupling is to describe it as managerial failure. The easiest way to remedy this situation is to observe a set of organizations that are routinely labeled as loosely coupled systems: schools, universities, hospitals, police organizations, and judicial systems. These forms are not failed bureaucracies, but distinct organizational forms. As Grandori (1987) noted, "A system in which everybody can do everything and in which the links between various parts do not necessarily have to follow given interdependence relationships but are virtually interchangeable and separable is a concept that organization theory had previously treated primarily in terms of peer groups. Indeterminists coined the phrase *loosely coupled systems* to define complex organizations that have this feature" (pp. 93–94). Some organizations fit Grandori's description better than others. The reason it is important to focus on these organizations is that such organization members are more likely to have thought deeply about interactions between couplings and decouplings, their interactions are more salient, and observers are more likely to categorize the interactions as characteristics of loosely coupled systems.

To assert that a system is loosely coupled is to predicate specific properties and a specific history to the system, rather than an absence of properties.

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