

# Making a Difference: Organization as Design

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## Abstract

Mainstream organizational research is based on science and the humanities. Science helps us to understand organized systems, from an outsider position, as empirical objects. The humanities contribute to understanding, and critically reflecting on, the human experience of actors inside organized practices. This paper argues that, in view of the persistent relevance gap between theory and practice, organization studies should be broadened to include design as one of its primary modes of engaging in research. Design is characterized by its emphasis on solution finding, guided by broader purposes and ideal target systems. Moreover, design develops, and draws on, design propositions that are tested in pragmatic experiments and grounded in organization science. This study first explores the main differences and synergies between science and design, and explores how and why the design discipline has largely moved away from academia to other sites in the economy. The argument then turns to the genealogy of design methodologies in organization and management studies. Subsequently, this paper explores the circular design methodology that serves to illustrate the nature of design research, that is, the pragmatic focus on actionable knowledge as well as the key role of ideal target systems in design processes. Finally, the author proposes a framework for communication and collaboration between the science and design modes, and argues that scholars in organization studies can guide human beings in the process of designing and developing their organizations toward more humane, participative, and productive futures. In this respect, the organization discipline *can* make a difference.

(Design; Pragmatism; Organization Science; Design Propositions; Design Rules; Epistemology)

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Design... is the principal mark that distinguishes the professions from the sciences. Schools of engineering, as well as schools of architecture, business, education, law, and medicine, are all centrally concerned with the process of design (Simon 1996, p. 111).

There exists a designerly way of thinking and communicating that is both different from the scientific and scholarly ways of thinking and communicating, and is as powerful as the scientific and scholarly methods of enquiry, when applied to its own kinds of problems (Archer 1984, p. 348).

## Introduction

Organizational research is currently based on the sciences and humanities, which are its main role models. Science helps to understand organized systems by uncovering the laws and forces that determine their characteristics, functioning, and outcomes. Science itself is based on a representational view of knowledge, in which organizational phenomena are approached as empirical objects with descriptive properties (Donaldson 1985, 1996; Mohr 1982). The descriptive and analytic nature of science helps to explain any existing or emerging organizational phenomena, but cannot account for qualitative novelty (Bunge 1979, Ziman 2000). In this respect, the notion of causality underpinning science is the study of variance among variables, the linkage of a known empirical phenomenon into a wider network of data and concepts; science tends to focus on testing propositions derived from general theories.

Organizational research that draws on the humanities as its main role model assumes knowledge to be constructivist and narrative in nature (e.g., Denzin 1983, Gergen 1992, Parker 1995, Zald 1993). This implies that all knowledge arises from what actors think and say about the world (Gergen 1992). The nature of thinking and reasoning in the humanities is critical and reflexive (Boland 1989). Thus, research focuses on trying to understand, interpret, and portray the human experience and discourse in organized practices. In this way, the goal of appreciating complexity is given precedence over the goal of achieving generality.

Building on Herbert Simon's (1996) writings, this paper argues for a design approach to organization studies. The idea of design involves inquiry into systems that do not yet exist—either complete new systems or new states of existing systems. The main question thus becomes, "Will it work?" rather than, "Is it valid or true?" Design is based on pragmatism as the underlying epistemological notion. Moreover, design research draws on "design causality" to produce knowledge that is both actionable and open to validation. An important characteristic of design is the use of ideal target systems when defining the initial situation.

The main argument in this paper is that the study of organization needs a design mode, as much as science and humanities modes, of engaging in research. In this respect, science and humanities use and study the creations of human design. The notion of design may therefore contribute to solving the fundamental weakness of organization and management theory—the so-called *relevance gap* between theory and practice. That is, organization and management theory tends to be not obvious or relevant to practitioners (e.g., Beyer

and Trice 1982, Hambrick 1994, Huff 2000, Miner 1997, Priem and Rosenstein 2000).

Table 1 provides a conceptual framework that defines the main differences and complementarities of science, humanities, and design as three ideal-typical modes of engaging in organizational research. This framework provides the setting for the remainder of this paper.

This paper will focus on the differences and synergies between organization science and design; reference to the humanities perspective will be made merely in the

**Table 1 Three Ideal-Typical Modes of Engaging in Organizational Research**

	Science	Humanities	Design
<i>Purpose:</i>	Understand organizational phenomena, on the basis of consensual objectivity, by uncovering general patterns and forces that explain these phenomena.	Portray, understand, and critically reflect on the human experience of actors inside organized practices.	Produce systems that do not yet exist—that is, change existing organizational systems and situations into desired ones.
<i>Role Model:</i>	Natural sciences (e.g., physics) and other disciplines that have adopted the science approach (e.g., economics).	Humanities (e.g., aesthetics, ethics, hermeneutics, history, cultural studies, literature, philosophy).	Design and engineering (e.g., architecture, aeronautical engineering, computer science).
<i>View of Knowledge:</i>	<i>Representational:</i> Our knowledge represents the world as it is; nature of thinking is descriptive and analytic. More specifically, science is characterized by (a) a search for general and valid knowledge and (b) "tinkering" in hypothesis formulation and testing.	<i>Constructivist and narrative:</i> All knowledge arises from what actors think and say about the world; nature of thinking is critical and reflexive.	<i>Pragmatic:</i> Knowledge in the service of action; nature of thinking is normative and synthetic. More specifically, design assumes each situation is unique and it draws on purposes and ideal solutions, systems thinking, and limited information. Moreover, it emphasizes participation, discourse as medium for intervention, and pragmatic experimentation.
<i>Nature of Objects:</i>	Organizational phenomena as <i>empirical objects</i> , with descriptive and well-defined properties, that can be effectively studied from an outsider position.	<i>Discourse</i> that actors and researchers engage in; appreciating the complexity of a particular discourse is given precedence over the goal of achieving general knowledge.	Organizational issues and systems as <i>artificial objects</i> with descriptive as well as imperative (ill-defined) properties, requiring nonroutine action by agents in insider positions. Imperative properties also draw on broader purposes and ideal target systems.
<i>Focus of Theory Development:</i>	Discovery of general causal relationships among variables (expressed in hypothetical statements): Is the hypothesis valid? Conclusions stay within the boundaries of the analysis.	Key question is whether a certain (category of) human experience(s) in an organizational setting is "good," "fair," etc.	Does an integrated set of design propositions work in a certain ill-defined (problem) situation? The design and development of new (states of existing) artifacts tends to move outside boundaries of initial definition of the situation.

context of its criticism on science. This is not to say that the humanities are only important for the science-humanities debate in organization studies. As is evident from Table 1, the humanities serve as one of three key modes of engaging in organizational research; each of these three modes is essential to the pluralistic nature of the field of organization studies. The future development of organizational research largely depends on building interfaces for communication and collaboration between these three modes.

This paper focuses on the science-design interface because the relevance gap between theory and practice is most likely to be bridged by discussing differences and complementarities between the mainstream science's and (practitioner's) design mode. Moreover, the debate between the science and (postmodern) humanities camps appears to have turned our attention away from the important issue of research objectives and our commitments as scholars. In this respect, the pragmatism of the design mode has also been described as the common ground—in an epistemological sense—on which science and humanities can meet (Argyris et al. 1985, Wicks and Freeman 1998).

The framework in Table 1 also suggests some differences in terminology. When discussing the science mode, I will refer to organizational systems as *empirical objects* with descriptive and well-defined properties, whereas *artificial objects* with both descriptive and imperative properties serve as objects of design research. That is, science and design may focus on the same kind of objects, but do so from different epistemological positions.

The argument is organized as follows. First, I explore organization science from the representational perspective as well as from more recently developed understandings of the practice of science. Subsequently, I discuss and develop the notion of design more extensively; in this section I also explore how and why the design disciplines have largely moved away from academia to other sites in the economy. The first and third columns in Table 1 anticipate and summarize the argument about science and design to this point in the paper.

The argument then turns to the genealogy of design methodologies in organization and management studies. Next, the circular design methodology serves to illustrate the latest generation of design approaches in organization studies. Finally, I explore the implications of organizational research at the interface of science and design, and propose a framework for developing research at this interface (see Table 2 for a preview).

## Organization Science as Ideal-Typical Mode of Research

### Purpose

Science develops knowledge about what already is, by discovering and analyzing existing objects (Simon 1996). It is based on several key values, particularly disinterestedness and consensual objectivity. Disinterestedness implies that scientists are constrained to protect the production of scientific knowledge from personal bias and other subjective influences (Merton 1973, Ziman 2000). Because researchers can never be completely cleansed of individual and other interests, science therefore strives to attain consensual objectivity, that is, a high degree of agreement between peers (Pfeffer 1993, Ziman 2000). This implies that organization science, in its ideal-typical form, strives for consensual objectivity in researching and understanding general patterns and forces that explain the organized world.

### Role Model and View of Knowledge

Mainstream organization "science" is based on the idea that the methodology of the natural sciences should and can be the methodology of organization science. This approach asserts that knowledge is representational in nature (Donaldson 1985, 1996), and assumes that our knowledge represents the world as it is. The key research question is thus whether or not general knowledge claims are valid. As a result, the nature of thinking in organization science tends to be descriptive and analytical.

### Nature of Objects

Knowledge claims in science refer to organizational phenomena as empirical objects with descriptive properties. Organization science assumes organizational order to be empirically manifested as a set of stable regularities that can be expressed in the form of hypothetical statements. These statements are usually conceived as revealing the nature of organizations, namely as a set of objective mechanisms underlying diverse organizational realities (Donaldson 1985, 1996). This approach (implicitly) assumes these objective mechanisms can be most effectively studied from an unbiased "outsider" position.

### Focus of Theory Development

Organization science tends to focus on the discovery of general causal relationships among variables. These causalities can be rather simple ("If  $x$  and  $y$ , then  $z$ "). Because variations in effects may be due to other causes than those expressed in a given proposition,

causal inferences are usually expressed in probabilistic equations or expressions (e.g., "X is negatively related to y"). This concept of causality helps to explain any observable organizational phenomena, but in itself cannot account for qualitative novelty (Bunge 1979, Ziman 2000). Conclusions and any recommendations therefore have to stay within the boundaries of the analysis.

The following research methods are frequently used in organization science: The controlled experiment, field study, mathematical simulation modeling, and case study. In controlled experiments, the research setting is safeguarded from the constraints and disturbances of the practice setting, and thus a limited number of conditions can be varied in order to discover how these variations affect dependent variables (e.g., Sarbaugh-Thompson and Feldman 1998). In the field study, also known as the natural experiment, the researcher gathers observations regarding a number of practice settings, measuring in each case the values of relevant (quantitative or qualitative) variables; subsequently the data are analyzed to test whether the values of certain variables are determined by the values of other variables (e.g., Eisenhardt and Schoonhoven 1996, Kraatz and Zajac 2001, Wageman 2001). Mathematical simulation modeling involves the study of complex cause-effect relationships over time; this requires the translation of narrative theory to a mathematical model, to enable the researcher to develop a deep understanding of complex interactions among many variables over time (e.g., Rudolph and Repping 2002). Finally, the single or comparative case study helps researchers to grasp holistic patterns of organizational phenomena in real settings (Numagami 1998).

### **Criticism of Science as Exclusive Mode of Research**

Drawing on the humanities, some writers explicitly criticize the representational nature of science-based inquiry (e.g., Gergen 1992, Tsoukas 1998). Others express severe doubts about whether the representational and constructivist view are really incompatible (Czarniawska 1998, Elsbach et al. 1999, Tsoukas 2000, Weiss 2000). This debate on the nature of knowledge has primarily addressed epistemological issues and has turned attention away from the issue of research objectives, that is, from our commitments as organization researchers (Wicks and Freeman 1998).

Moreover, studies of how research is actually done in the natural sciences have been undermining science as the (exclusive) role model for organizational research. Anthropological studies of how research in some of the natural sciences actually comes about suggest that

the actual operations of scientific inquiry are constructive rather than representational, and are embedded in a social process of negotiation rather than following the (individual) logic of hypothesis formulation and testing (Latour and Woolgar 1979, Knorr-Cetina 1981). Knorr-Cetina (1981) suggests the concept of "tinkering" to describe and understand what she observed in the natural sciences: Tinkerers are "aware of the material opportunities they encounter at a given place, and they exploit them to achieve their projects. At the same time, they recognize what is feasible, and adjust or develop their projects accordingly. While doing this, they are constantly engaged in producing and reproducing some kind of workable object which successfully meets the purpose they have temporarily settled on" (Knorr-Cetina 1981, p. 34; see also Knorr 1979).

More recently, work by Gibbons et al. (1994) has motivated a number of authors to advocate that organization and management studies should be repositioned from research that is discipline based, university centered, and focused on abstract knowledge toward so-called Mode 2 research (Huff 2000, Starkey and Madan 2001, Tranfield and Starkey 1998). Mode 2 research, which appears to be characteristic to a number of disciplines in the applied sciences and engineering, focuses on producing knowledge in the context of application and is transdisciplinary: Potential solutions arise from the integration of different skills in a framework of application and action, which normally goes beyond that of any single contributing discipline (Gibbons et al. 1994, Tranfield and Starkey 1998). Mode 2 research is heterogeneous in terms of the skills and experience people bring to it. In addition, accountability and sensitivity to the impact of the research is built in from the start (Ziman 2000). In this respect, Mode 2 research draws on the humanities to built reflexivity into the research process (Gibbons et al. 1994, Nowotny et al. 2001).

The proposal for Mode 2 research has been debated in a special issue of the *British Journal of Management* (e.g., Grey 2001, Hatchuel 2001, Hodgkinson et al. 2001, Huff and Huff 2001, Weick 2001). For example, Hatchuel (2001) suggests that Mode 2 research requires two essential conditions: (1) a clarification of the scientific object of management research and (2) the design of research-oriented partnerships of academics and practitioners. Weick (2001) argues that the "relevance" gap is as much a product of practitioners being wedded to gurus and fads as it is the result of academics being wedded to science. He suggests that this gap persists because practitioners forget that the world is idiosyncratic, egocentric, and unique to each person and organization.

These ideas suggest that organizational research is better captured and guided by more pluralistic and sensitive methodologies than by exclusive images of how science should be or is actually practiced. In this respect, no discipline or method of inquiry has a monopoly on wisdom in the social sciences, because there is no way to determine what constitutes “better” forms of meaning creation, in either the epistemological or moral sense (Fabian 2000, Heller 2001, Wicks and Freeman 1998, Ziman 2000). Moreover, knowledge acquisition with regard to broad and complex issues requires a close, isomorphic relationship between the variety of issues researched, and a requisite variety of research modes to engage with them (Heller 2001). Thus, I suggest the epistemological core of organization studies includes at least three different ideal-typical modes of research that cannot readily be reduced to a single privileged culture of inquiry (see Table 1).<sup>1</sup> In the following sections, we respond to the need for Mode 2 research by means of a separate ideal-typical “design” mode of engaging in research, rather than by compromising the ideal-typical notion of science.

## Design as Ideal-Typical Mode of Research

This section describes the nature of design research, in comparison with science, and also describes how and why the design disciplines have moved away from the academic community to other sites in the economy.

### Purpose

In *The Sciences of the Artificial* Herbert Simon (1996) argues that science develops knowledge about what already is, whereas design involves human beings using knowledge to create what should be, things that do not yet exist. Design, as the activity of changing existing situations into desired ones, therefore appears to be the core competence of all professional activities.

### Role Model

Historically and traditionally, says Simon (1996), the sciences research and teach about natural things, and the engineering disciplines deal with artificial things, including how to design for a specified purpose and how to create artifacts that have the desired properties. The social sciences have traditionally viewed the natural sciences as their main reference point. However, Simon argues that engineers are not the only professional designers, because “everyone designs who devises courses of action aimed at changing existing situations into preferred ones. The intellectual activity that produces material artifacts

is no different fundamentally from the one that prescribes remedies for a sick patient or the one that devises a new sales plan for a company or a social welfare policy for a state” (Simon 1996, p. 111).

Simon (1996) also describes how the natural sciences almost drove the sciences of the artificial from professional school curricula—particularly in engineering, business, and medicine—in the first 20 to 30 years after World War II. An important factor driving this process was that professional schools in business and other fields craved academic respectability, when design approaches were still largely “intuitive, informal and cookbooky” (Simon 1996, p. 112). In addition, the enormous growth of the higher education industry after World War II created large populations of scientists and engineers who dispersed through the economy and took over jobs formerly held by technicians and others without academic degrees (Gibbons et al. 1994). This meant that the number of sites where competent work in the areas of design and engineering was being performed increased enormously, which in turn undermined the exclusive position of universities as knowledge producers in these areas (Gibbons et al. 1994). Another force that contributed to design being (almost) removed from professional school curricula was the development of capital markets offering large, direct rewards to value-creating enterprises (Baldwin and Clark 2000). In other words, design in the technical as well as managerial and social domains moved from professional schools to a growing number of sites in the economy where it was viewed as more respectable and where it could expect larger direct economic rewards.

### View of Knowledge

Design is based on *pragmatism* as the underlying epistemological notion. That is, design research develops knowledge in the service of action; the nature of design thinking is thus normative and synthetic in nature—directed toward desired situations and systems and toward synthesis in the form of actual actions. The pragmatism of design research can be expressed in more detail by exploring the normative ideas and values characterizing good practice in professions such as architecture, organization development, and community development. These ideas and values are defined here; several ideas described by Nadler and Hibino (1990) have been adapted and extended on the basis of the work of others; three additional values and ideas—regarding participation, discourse, and experimentation—have been defined on the basis of other sources, including my own work. The first three values and ideas define the content dimension of design

inquiry: (1) each situation is unique; (2) focus on purposes and ideal solutions; and (3) apply systems thinking.

*Each Situation is Unique.* This assumption implies that no two situations are alike; each problem situation is unique and is embedded in a unique context of related problems, requiring a unique approach (Checkland and Scholes 1990, Nadler and Hibino 1990). The unique and embedded nature of each situation makes it ill defined, or wicked, which means that there is insufficient information available to enable the designer to arrive at solutions by transforming, optimizing, or superimposing the given information (Archer 1984).

*Focus on Purposes and Ideal Solutions.* Focusing on purposes helps "strip away" nonessential aspects of the problem situation. It opens the door to the creative emergence of larger purposes and expanded thinking. It also leads to an increase in considering possible solutions, and guides long-term development and evolution (Banathy 1996, Nadler and Hibino 1990, Tranfield et al. 2000). If an ideal target solution can be identified and agreed upon, this solution puts a time frame on the system to be developed, guides near-term solutions, and infuses them with larger purposes. "Even if the ideal long-term solution cannot be implemented immediately, certain elements are usable today" (Nadler and Hibino 1990, p. 140).

*Apply Systems Thinking.* Systems thinking helps designers to understand that every unique problem is embedded in a larger system of problems (Argyris et al. 1985, Checkland and Scholes 1990, Vennix 1996). It helps them to see "not only relationships of elements and their interdependencies, but, most importantly, provides the best assurance of including all necessary elements, that is, not overlooking some essentials" (Nadler and Hibino 1990, p. 168).

Four other ideas define the values and ideas regarding the process of design: (1) limited information; (2) participation and involvement in decision making and implementation; (3) discourse as medium for intervention; and (4) pragmatic experimentation.

*Limited Information.* The available information about the current situation (or system) is by definition limited; in the context of a design project, this awareness guards participants against excessive data gathering that may make them experts with regard to the existing artifacts, whereas they should become experts in designing new ones. Too much focus on the existing situation may prevent people from recognizing new ideas and seeing new ways to solve the problem (Nadler and Hibino 1990).

*Participation and Involvement in Decision Making and Implementation.* Those who carry out the solution should be involved in its development from the beginning. Involvement in making decisions about solutions and their implementation leads to acceptance and commitment (Vennix 1996). Moreover, getting everybody involved is the best strategy if one wants long-term dignity, meaning, and community (Endenburg 1998, Weisbord 1989). In some cases, the benefits of participation in creating solutions can be more important than the solution itself (Romme 1995, 2003).

*Discourse as Medium for Intervention.* For design professionals, language is not a medium for representing the world, but for intervening in it (Argyris et al. 1985). Thus, the design process should initiate and involve dialogue and discourse aimed at defining and assessing changes in organizational systems and practices (Checkland and Scholes 1990, Warfield and Cardenas 1994).

*Pragmatic Experimentation.* Finally, pragmatic experimentation is essential for designing and developing new artifacts, and for preserving the vitality of artifacts developed and implemented earlier (Argyris 1993, Banathy 1996). Pragmatic experimentation emphasizes the importance of experimenting with new ways of organizing and searching for alternative and more-liberating forms of discourse (Argyris et al. 1985, Romme 2003, Wicks and Freeman 1998). This approach is necessary to "challenge conventional wisdom and ask questions about 'what if?' but it is tempered by the pragmatist's own commitment to finding alternatives which are useful" (Wicks and Freeman 1998, p. 130).

Some of these ideas are familiar to other approaches. For example, the notion of discourse is shared with postmodernism (Gergen 1992), although the latter may not support the underlying notion of pragmatism (see Table 1). The importance of participation and involvement is also emphasized in the literature on participative management and empowerment (Romme 1995). The notion of experimentation is also central to laboratory experiments in the natural sciences and (some parts of the) social sciences; however, experiments by designers in organizational settings are best understood as action experiments (Argyris et al. 1985), rather than as controlled experiments in a laboratory setting.

In response to the need for more relevant and actionable knowledge, organization researchers tend to adopt action research methods to justify a range of research methods and outputs. Action research has been, and still is, not well accepted on the grounds that it is not normal science (Eden and Huxham 1996, Heron and Reason

1997, Tranfield and Starkey 1998). Action researchers have been greatly concerned with methods to improve the rigor and validity of their research, in order to gain academic credibility. Moreover, action researchers in this area have emphasized retrospective problem diagnosis more than finding and creating solutions (e.g., Eden and Huxham 1996). Design research incorporates several key ideas from action research, but is also fundamentally different in its future-oriented focus on solution finding.

### **Nature of Objects**

Design focuses on organizational issues and systems as *artificial objects* with descriptive as well as imperative properties, requiring nonroutine action by agents in insider positions. The imperative properties also draw on broader purposes and ideal target systems. The pragmatic focus on changing and/or creating artificial objects rather than analysis and diagnosis of existing objects makes design very different from science. The novelty of the desired (situation of the) system as well as the nonroutine nature of the actions to be taken imply that the object of design inquiry is rather ill defined.

### **Focus of Theory Development**

The key question in design projects is whether a particular design "works" in a certain setting. Such a design can be based on implicit ideas (cf. the way we plan most of our daily activities). However, in case of ill-defined organizational issues with a huge impact, a systematic and disciplined approach is required (Boland 1978). A systematic and disciplined approach involves the development and application of propositions, in the form of a coherent set of related design propositions. Design propositions are depicted, for example, as follows: "In situation *S*, to achieve consequence *C*, do *A*" (Argyris 1993, Argyris et al. 1985).

In case of an ill-defined current and desired situation, a design approach is required that cannot and should not stay within the boundaries of the initial definition of the situation. Archer (1984, p. 348) describes an ill-defined problem as "one in which the requirements, as given, do not contain sufficient information to enable the designer to arrive at a means of meeting those requirements simply by transforming, reducing, optimizing, or superimposing the given information alone." Ill-defined issues are, for example, lack of communication and collaboration between team members or different organizational units; nonparticipation as the typical response of employees to participation programs initiated by management; and the security of commercial airline flights with regard to new forms of terrorism. By contrast, well-defined problems are, for example, determining the

optimal inventory level for a particular business; selecting the best candidate from a pool of applicants on the basis of an explicit list of requirements; and computing a regression analysis of a certain dependent variable on a set of independent and control variables (Newell and Simon 1972).

When faced with ill-defined situations and challenges, designers employ a solution-focused approach. They begin generating solution concepts very early in the design process, because an ill-defined problem is never going to be completely understood without relating it to an ideal target solution that brings novel values and purposes into the design process (Banathy 1996, Cross 1984). According to Banathy (1996), focusing on the system in which the problem situation is embedded tends to lock designers into the current system, although design solutions lie outside of the existing system: "If solutions could be offered within the existing system, there would be no need to design. Thus designers have to transcend the existing system. Their task is to create a different system or devise a new one. That is why designers say they can truly define the problem only in light of the solution. The solution informs them as to what the real problem is" (Banathy 1996, p. 20).

### **Genealogy of Design Methodology in Organization Studies**

Since the mid-1970s design methodologies have been developing. The first edition of Simon's *The Sciences of the Artificial*, published in 1969 (Simon 1996), was particularly influential in the development of systematic and formalized design methodologies in architecture, engineering, urban planning, medicine, and computer science (e.g., Baldwin and Clark 2000, Cross 1984, Jackson and Keys 1984, Klir 1981, Long and Dowell 1989, Warfield 1990).

Compared with these disciplines, the notion of design is less established in the current state of the art of organization theory. This has not always been the case. In this respect, three generations of design methodologies for organization and management can be distinguished. The first generation developed in the late 1800s and early 1900s and culminated in the work of the engineer Frederick Taylor (1911), whose work was initially published and discussed only in engineering journals (Barley and Kunda 1992). Known as the "scientific management" movement, these design approaches arose from attempts by managers with engineering backgrounds to apply the principles of their discipline to the organization of production. The core of these approaches involved specific schemes and practices for improving

managerial control and coordination, particularly in the area of cost accounting systems, production control systems, and wage payment plans (Barley and Kunda 1992).

The second generation of design methodologies in organization and management focused on regulatory approaches such as sociotechnical systems, functionalist systems theory, and human relations (Checkland 1981, Drucker 1954, Emery and Trist 1972, Jaques 1962). Similar to the first generation of design approaches, the primary concern of the second generation was to seek universal dictums that managers could employ in the course of their work (Burrell and Morgan 1979). However, unlike their predecessors, the new design approaches described and codified general processes rather than specific tools and practices—for example, in the area of setting objectives, planning, and forecasting (Barley and Kunda 1992).

More recently, a third generation of design thinking is emerging. This category of design approaches is increasingly grounded in explicitly stated philosophical and theoretical positions, characterized by a co-evolutionary, value-laden, and ethics-based systems approach. Examples include design methodologies for organizing education (Banathy 1996, 1999; Romme 2003; Schön 1987), for group model building (Vennix 1996), and for teamwork in business organizations (Tranfield et al. 1998, 2000). In Europe, Endenburg (1998) has pioneered the development of a system's design methodology for organizations (see also, Romme 1999). The latter design methodology will be explored in more detail in the next section.

Argyris and co-authors have developed a well-known design methodology in the area of organizational learning and defensive behavior (e.g., Argyris et al. 1985, Argyris and Schön 1978). This methodology "begins with a conception of human beings as designers of action" (Argyris et al. 1985, p. 80) and involves a tool for intervention in so-called limited learning systems. A model of effective learning systems guides interventions in these limited learning systems. The model of effective learning systems guides the researcher as an interventionist—that is, he intends to produce action consistent with this model to interrupt the counterproductive features of the limited learning system (e.g., Argyris 1993, Argyris and Kaplan 1994, Argyris and Schön 1978, Argyris et al. 1985, Schwarz 1994).

Particularly as a result of the first generation of design methodologies, the concept of design is easily misinterpreted as being a technical, instrumental concept used by managers trying to bring their organizations under rational control. This older notion of design is no longer useful and relevant. In the second, and particularly in

the third generation of design thinking, managers are not viewed as all-powerful architects of organizations: Their influence on organizational processes is assumed to be limited, because they are not the only participants in the discursive and collaborative processes that shape organizational systems (Banathy 1996, Endenburg 1998).

## The Case of Designing Circular Organizations

This section describes the development and application of the circular design methodology. I have selected this example because it is grounded in explicit theoretical frameworks and has been tested in a large number of organizations.

The circular organizational design, pioneered by Gerard Endenburg, aims at the creation of learning ability by active participation at the organizational level as well as at the group and individual levels. Endenburg started to develop this design approach in the early 1970s, when he was CEO of an electrotechnical company in The Netherlands. In this company, he was confronted with problems such as the functioning of the works council that did not appear to provide any opportunities for effective consultation between management and employees, but instead, frequently generated conflicts. Inspired by the notion of circularity from systems theory as well as the idea of consensus decision making practiced in Quaker organizations, Endenburg started experimenting with a so-called circular design to solve the problem of employee participation and involvement (Endenburg 1998, Romme 1999). At this early stage, the notions of circularity and consensus served as rather broad and ill-defined ideal targets that helped to define the current situation regarding employee participation; that is, the prevailing authority and power structure as well as decision-making practice in the company were perceived as roadblocks to any attempt to increase participation.

In the first few years, experiments were set up in collaboration with other managers and employees within the company; later outsiders started participating in the further development of the circular design and its implementation process. This has led to a well-developed approach, which essentially implies that the organization's ability for effective learning and decision making at all levels is increased by adding a so-called circular structure to the existing (usually) hierarchical structure (Romme 1999).

This design approach involves a number of design rules, defining how decisions should be made, how different decision-making units are to be linked, and

so forth.<sup>2</sup> These rules are formulated in terms of, "to achieve *A* in situation *S*, do *D*." For example, one of the rules is as follows: To achieve effective implementation of and commitment to decisions about policy issues in a group of people authorized to do so, decisions are taken on the basis of consent (defined as "no argued objection"); that is, a decision is made if and only if all participants give consent (Endenburg 1998).

These rules are laid down in the company's statutes, as a set of permanent rules safeguarding the participation of all stakeholders and shareholders at the board level and managers and employees at other levels in the organization. The circular design method also includes tools in the area of setting objectives, organizing and managing work, performance assessment, and performance-based compensation at the individual, group, and organizational levels (Endenburg 1998). Case studies of several firms that have redesigned their organization on the basis of the circular model suggest that decision making and learning proceeds more easily and effectively with rather than without this redesign (Romme 1999, Van Vlissingen 1991).

Since the first experiments in Endenburg's own company in the early 1970s, the circular model now appears to have progressed beyond the experimental stage. It is currently being used in about 30 organizations throughout the world including Brazil, Canada, The Netherlands, and the United States (Romme 1999, Romme and Reijmer 1997, Van Vlissingen 1991). Dutch firms, required by law to install one or more work councils, are exempted from this requirement if they have implemented the circular model (Romme 1999). Thus, the circular design as an ideal-target solution has been tested in an increasing number of organizational practices. Elsewhere, the details of the circular design approach have been described and grounded in systems theory (Endenburg 1998, Romme 1995) and organization theory (Romme 1997, 1999).

The way in which the circular model serves as an ideal-target system in the design process can be illustrated as follows. Very early in the design process in an organization, typically with help of external consultants, the organization uses the circular design rules to define the nature of problems and challenges it is facing (Romme and Reijmer 1997). For example, in a first session with the executive team of a large catering services firm, the imperatives for and direction of organizational change were explored. The executives initially defined these imperatives in terms of low commitment to and involvement of their employees and middle management in service quality programs,

which had been set up to improve the firm's competitive position. The consultant then introduced the circular system as an ideal-target solution, and invited the executives to frame and understand the problems they were facing in terms of this ideal-typical system. The executives subsequently reframed the existing situation in their organization in terms of a lack of sustained opportunities for participation, as well as their own mistrust in delegating authority to local managers. In this respect, their initial problem definition was perceived to be not "wrong," but incomplete and superficial. The executive team subsequently started a long-term effort to develop a tailor-made solution, drawing on the design rules that constitute circular organizing as an ideal-target system, to decentralize decision making to the people closest to the customer and at the lowest level possible in view of the decision issue (Romme and Reijmer 1997). These and other cases suggest that the circular model as an ideal-target system serves to define and understand the existing organizational situation from a more systemic point of view, and broaden and deepen the managerial focus on symptoms and events (Endenburg 1998, Romme 1999, Romme and Reijmer 1997, Van Vlissingen 1991).

The development and application of the circular design illustrates some of the key elements and characteristics of the design mode of engaging organizational research. The circular methodology acknowledges the ill-defined and embedded nature of organizational problems, and uses broader purposes, ideal-target solutions, and systems thinking (combined in an ideal-target system), to guide long-term organizational development. In the early stages of developing the methodology, the ideal-target system was itself ill defined—in terms of broad concepts such as circularity. By means of a variety of pragmatic experiments in which these concepts were specified, applied, and tested, a detailed and codified methodology gradually arose.

Moreover, this methodology appears to focus on finding solutions, rather than on extensive analysis of the current situation. It also emphasizes and enables participation by people involved. In this paper, I will not deal with the (scientific) question of whether or not circular designs perform better than others. At this point it is sufficient to observe that circular designs appear to "work," that is, produce satisfactory outcomes for a population of professionals other than the pioneers (e.g., Romme 2003, Romme and Reijmer 1997, Van Vlissingen 1991).

The focus on solutions, envisioned with help of broader purposes and ideal-target systems, characterizes the circular methodology. Mainstream science in the area

of organization studies would suggest a focus on analyzing and understanding the existing situation, which in itself would not lead to any changes in the direction of a novel situation or system.

### **Developing the Design-Science Interface**

This section explores the implications of positioning organizational research at the interface of science and design, and describes a framework for developing this interface (see Table 2).

#### **Two Concepts of Causality**

The concept of causality underpinning science is the study of *variance* among variables across time or space, that is, the linkage of a known empirical phenomenon into a wider network of data and concepts. Thus science tends to focus on testing propositions derived from general theories (Markus and Robey 1988, Mohr 1982, Ziman 2000).

Design draws on what Argyris (1993, p. 266) calls *design causality* to produce knowledge that is both actionable and open to validation. The notion of design causality appears to be less transparent and straightforward than the concept of causality underpinning science—involving the study of variance among variables (see Table 2). This is because of two characteristics of design causality. First, design causality explains how patterns of variance among variables arise in the first place, and in addition, why changes within the pattern are not likely to lead to any fundamental changes (Argyris 1993). For example, both the hierarchical command structure and the circular structure (see previous section) model a certain category of structures in which organizational processes and patterns are embedded. Each structure defines a relatively invariant pattern of values, action strategies, group dynamics, and outcomes.

Second, when awareness of a certain ideal-target system (e.g., the circular design) has been created, design causality implies ways to change the causal patterns. That is, ideal-target systems can inspire, motivate, and enable agents to develop new organizational processes and systems. Both Argyris (1993) and Endenburg (1998) emphasize, however, that the causality of the old and the new structure will co-exist, long after a new program or structure has been introduced.

These two characteristics of design causality tend to complicate the development and testing of design propositions as hypotheses in science. A full integration of the design and science modes is thus not feasible; this reinforces the argument made earlier in this paper that

integration is not desirable because no mode of research has a monopoly on wisdom.

#### **Toward an Interface Between Design and Science**

If design and science need to co-exist as important modes of engaging in organizational research, any attempt to reduce the relevance gap between mainstream theories and the world of practice (see Introduction) starts with developing an interface between design and science. A key element of the interface proposed here involves the notion of design propositions.

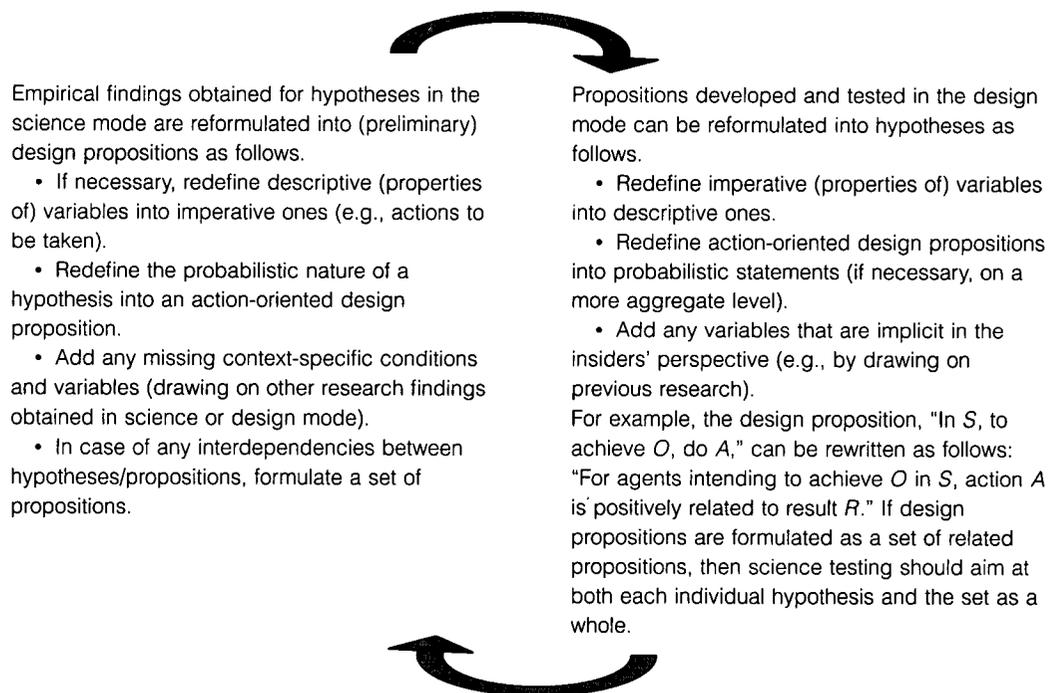
Design propositions, as the core of design knowledge, are similar to knowledge claims in science-based research, irrespective of differences in epistemology and notions of causality. These design propositions can provide a shared focus for dialogue and collaboration between design and science. In this respect, Van Aken (2004) argues that a design science for management research should focus on the development of tested and grounded rules. Drawing on Bunge (1967), he argues that effective partnerships between science and design in the technical domain lead to tested technological rules grounded in scientific knowledge—for example, the design rules for airplane wings being tested in engineering practice as well as grounded in the laws and empirical findings of aerodynamics and mechanics (Van Aken 2004). Van Aken (2001) recommends a similar approach to testing and grounding design rules in management research. He argues that testing should involve both alpha and beta testing, notions adopted from software development. Alpha testing involves the initial development of a design proposition, and is done by the researchers themselves through a series of cases. Subsequently, beta testing is a kind of replication research done by third parties to get more objective evidence as well as to counteract any blind spots or flaws in the design propositions not acknowledged by the researchers (Van Aken 2001).

This suggests that research at the design-science interface should focus on design propositions developed through testing in practical contexts as well as grounding in the empirical findings of organization science. This type of research would enable collaboration between the design and science mode, while it would also respect some of the methodological differences between the two modes. Table 2 outlines how design propositions are redefined into hypotheses that can be empirically tested in the science mode, and vice versa—how hypotheses grounded in empirical evidence are translated in preliminary design propositions.

At the interface between science and design, some research methods appear to be more effective than

**Table 2 Framework for Creating Synergy and Collaboration Between Design and Science**

	Design Mode	Science Mode
Causality Concept	Design causality: Study of how relatively invariant patterns arise, and of ways to change these patterns, to produce knowledge that is actionable as well as open to validation.	Variance causality: Study of cause-effect relationships by analyzing variance among variables over time and/or space, to produce knowledge that is general and consensually objective in nature.
Interface Between Design and Science	Design propositions refer to variables as well as relatively invariant patterns (with descriptive as well as imperative properties), for example: "In <i>S</i> , to achieve <i>O</i> , do <i>A</i> ."  Several design propositions tend to be part of a coherent set.	Propositions/hypotheses, referring to variables with descriptive properties, are typically formulated as follows. "If <i>x</i> , then <i>y</i> " or " <i>x</i> is neg/pos related to <i>y</i> ."  Each hypothesis is tested on the basis of data regarding the relevant (including control) variables measured.



**Research Methods at the Interface:**

- (1) Alpha and beta testing of design propositions by means of action experiments and comparative case studies (both based on experimental replication logic)
- (2) Simulation modeling of the current and ideal target system, particularly by means of integrated simulation methods (e.g., system dynamics modeling)
- (3) In case of (1) and (2), but also when other methods are applied, a combined insider-outsider approach facilitates development of design propositions grounded in organization science and tested in professional practice.

others. The nature of alpha and beta testing of design propositions by means of action experiments is highly similar to the replication logic recommended for comparative case studies (Eisenhardt 1989, Numagami 1998, Yin 1984). Thus, the collaboration between researchers

in insider roles (e.g., internal consultants) who adopt the method of action experiments and academic researchers in outsider roles employing a comparative case method is less likely to suffer from differences in, for example, notions of causality between design and science.

Another research method that may be effectively employed at the design-science interface is simulation modeling. In particular, simulation methods involving both conceptual models (mathematical simulation and learning laboratories) appear to be very promising—such a method is, for example, system dynamics modeling (Akkermans 2001, Maani and Cavana 2000, Oliva and Serman 2001). In this respect, simulation modeling allows people to build and test models describing the current and desired (states of the) system, which helps them to move outside the mental boundaries of the current situation.

In general, the collaboration between insiders and outsiders with regard to the organizational systems under study appears to increase the effectiveness of research projects at the design-science interface. Bartunek and Louis (1996) have developed guidelines for building insider-outsider configurations in organizational research.

With a few exceptions, design inquiry is left to practitioners such as organization development professionals and management consultants, with the result that the body of design knowledge is rather fragmented and dispersed over many different sites. Because the design mode of engaging with organizational phenomena has moved away from the academic community to other sites in the economy and society, a persistent gap between organization theory and practice exists. Design research must therefore be redirected toward more rigorous research to produce *design propositions* that can be grounded in empirical research as well as tested, learned, and applied by “reflective practitioners” (Schön 1987) in organization and management. The form of such propositions and rules—as the core of design knowledge—is very similar to knowledge claims in science. This similarity is an important condition for dialogue and collaboration between design and science, to the extent that these propositions can provide a shared focal point. A more rigorous approach to design inquiry will facilitate collaboration and dialogue with organization science.

In this respect, recent studies of design as an empirical object have adopted co-evolutionary perspectives on organizational systems (e.g., Galunic and Eisenhardt 2001, Lewin and Volberda 1999, Victor et al. 2000, Wageman 2001) that are congruent with the ideas put forward here. For example, Wageman (2001) examines the relative effects of design choices and hands-on coaching on the effectiveness of self-managing teams. Wageman’s findings show that only design activity affects team task performance, and in addition, that well-designed teams are helped more than poorly designed

teams by hands-on coaching (Wageman 2001). Although Wageman’s propositions are descriptive and explanatory in nature, they can be rewritten into a set of (preliminary) design propositions concerning the design and coaching of teams—as objects with descriptive as well as imperative properties.

In general, the synergy between science and design can be summarized as follows. First, the body of knowledge and research methods of organization science can serve to ground preliminary design propositions in empirical findings, suggest ill-defined areas to which the design mode can effectively contribute, and build a cumulative body of knowledge about organization theory and practice. In turn, the design mode serves to translate empirical findings into design propositions for further pragmatic development and testing; it can suggest research areas (e.g., with emerging design propositions that need empirical grounding in organization science) to which science can effectively contribute; and, finally, design research can reduce the relevance gap between science and the world of practice.

## Concluding Remarks

After enjoying a certain degree of paradigmatic consistency and unity in the first half of the 20th century, organizational research has become increasingly pluralistic in nature (Pfeffer 1993, Weiss 2000). In the years since Burrell and Morgan’s (1979) presentation of multiple approaches, the attention of the community of organization scholars has been turning away from the important issue of research objectives and our commitments as researchers.

In this respect, science and the humanities help to understand existing organizational systems, rather than to actually create new organizational artifacts. This suggests that organization studies must be reconfigured as an academic enterprise that is explicitly based on science, humanities, and design. With a few exceptions in the academic community, design inquiry into organization and organizing is currently largely left to practitioners such as organization development professionals and management consultants. As a result, the body of design knowledge appears to be fragmented and dispersed, in any case more so than science- and humanities-based knowledge of organization. Design research should therefore be redirected toward more rigorous research, to produce outcomes that are characterized by high external validity but that are also teachable, learnable, and actionable by practitioners. Collaboration and exchange between science and design can only be effective if a common framework is available that facilitates interaction and communication between the two.

The argument in this paper involved a modest attempt to define the main conditions, differences, and synergies of three modes of engaging in organizational research (see Table 1). Subsequently, the nature and contribution of the design mode was explored and illustrated in more detail. Finally, a framework for exploiting the potential synergies between organization science and design was proposed (see Table 2).

This paper has focused on the interface between design and science, which points to the fact that the design-humanities interface is a promising area for future work. For example, the role of values in design—such as in the area of participation—was discussed, but needs to be studied more extensively: Do these key values actually affect the design process, and if so, how? Is it possible to define measurable standards with regard to the implementation of these values? Another example is the aesthetic dimension of design. Challenging the familiar images of scientific management, Guillén (1997) shows that this early design approach had and still has a strong aesthetic influence on architecture and the building industry. This suggests that organization researchers operating in the area of design should acknowledge and study the often implicit aesthetic aspects and implications of their work. In general, design requires deliberate ethical and aesthetic choices, particularly with respect to the broader purposes and ideal-target systems that help to understand the existing situation and to motivate the design process. Critical and postmodern theorizing may therefore serve to study the role of these ethical and aesthetic elements of design, for example, to explore to what extent new organizational artifacts are liberating in nature and to what extent they are affected by ideological manipulation and control (cf. Parker 1995, Vince 2001).

Complexity theory, the study of macroscopic patterns in collections of interacting elements, has been redirecting the literature toward notions of emergence, co-evolution, and complex adaptive systems (e.g., Lewin and Volberda 1999, McKelvey 1997). Evidently, design projects are embedded in a network of interacting processes, agents, and systems. However, there is hardly any research that approaches the notion of design from the perspective of complexity theory.<sup>3</sup> The application of complexity theory to the co-evolution of design processes and objects is therefore a promising area for future work.

The need to broaden organization studies toward design has major implications for the doctoral, master, and undergraduate programs through which organization scholars and professionals *in spe* are trained and socialized. Currently, the only option available for newcomers

in the field of organization studies is to choose between becoming a loyal member of either “mainstream” science or the humanities subculture. The science approach to a large extent continues to prevail in organization studies, in part because most Ph.D. training programs tend to focus on it. In addition, the liberal arts tradition at the undergraduate level in the United States and elsewhere is entirely based on science and humanities subjects. As a result, design tends to be perceived and positioned as an applied discipline, with a minor role (if any) in education compared with the “big three” disciplines: natural sciences, social sciences, and the humanities (Bloom 1987, Ziman 2000). If organization scholars would like their discipline to play a constructive role in society, the training and socialization of students and junior scholars is the first place to start.

In this respect, the human race has been profoundly changing the parameters of the evolutionary process, particularly as a result of the collaboration between the natural sciences and the design and engineering disciplines. Our capacity for learning, producing knowledge, and designing and organizing complex systems has an extraordinary, although often unintended, impact on societal evolution. The key question for scholars in our field therefore is: For what purposes are we going to use our scholarly capacity for learning and creating? Drawing on design research, this capacity can be used to guide human beings in the process of shaping and developing their organizations toward more humane, participative, and productive futures. This is a complex and challenging task that requires intensive collaboration between organization science and design. Here we *can* make a difference.

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### Endnotes

<sup>1</sup>Moreover, Nowotny et al. (2001) argue that too much focus on its epistemological core is likely to constrain the potential of science and “could be taken to imply that ultimate and absolute truth is still attainable” (Nowotny 2001, p. 200). I also deliberately avoid the position of “paradigm incommensurability” (cf. Czarniawska 1998, Donaldson 1998). In this respect, the thesis of “paradigm incommensurability” appears to stem from a misreading of Thomas Kuhn’s (1962) famous *The Structure of Scientific Revolutions* (e.g., Hacking 1986, Wilber 1998).

<sup>2</sup>In this paper, the term "design proposition" refers to a preliminary design "rule," whereas "design rule" refers to design propositions that have been successfully tested in practice (i.e., by way of pragmatic experimentation) as well as those that are grounded in empirical evidence.

<sup>3</sup>An exception is the conditioned emergence framework developed by MacIntosh and MacLean (1999). This framework implies organizational transformation can be viewed as an emergent process that can be accessed and influenced through three interacting gateways—order generating "design" rules, far-from-equilibrium, and positive feedback.

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