Chapter 14
Design Science in the Management Disciplines

Management is that for which there is no algorithm. Where there is an algorithm, it's administration.

– Roger Needham.

Design science and natural science are complementary research paradigms in the management disciplines. Fundamentally the task of management is to develop, articulate, and achieve organizational goals and purposes. Design science research addresses that task by creating novel and effective artifacts that are demonstrated to improve managers' capability to change "existing situations into preferred ones" (Simon (1996), p. 130). Natural science research addresses it by developing theories that provide deep, principled explanations of phenomena, justified by rigorous empirical evidence that managers can use to guide their actions. Designed artifacts have no special dispensation from the laws of nature; however, business organizations and the environments in which they operate are social constructions (Searle, J. R. (1995)). They are themselves *artifacts* designed to achieve human goals, purposes, and intentions, influenced by and operating within the context of emergent and intentional human behavior. Furthermore, natural science explanations of how or why an artifact works or does not work may lag years behind the application of the artifact. If academic research is to make significant contributions to management practice it must utilize the results from each paradigm to guide the other. There is evidence that this integration is beginning to take place in several management disciplines including information systems and organizational science. This paper summarizes and assesses this emerging work.

14.1 Introduction

Design is fundamental to the management disciplines (Simon 1996, Romme 2003, Boland et al. 2008). Managers are engaged in the design and implementation of

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business systems aimed at improving organizational performance. A manager's professional responsibility is to transform existing situations into preferred ones, to shape social organizations and economic processes and to create value (Boland et al. 2008).

Yet with the possible exception of management science, academic research in the management disciplines is primarily based on the natural science paradigm. "Organizational phenomena are approached as empirical objects with descriptive properties" (Romme 2003, p. 558), which emerge through natural processes and are governed by the laws of nature. The goal of scientific research is to discover these laws by studying extant organizations, positing theories that explain or predict extant phenomena, and empirically testing those theories. However, organizational phenomena are both emergent and designed. Emergent phenomena occur as designed artifacts are appropriated and engaged in the performance of organizational tasks (Garud et al. 2006). The success of an organization depends on both the design of the organization – its structure, strategies, leadership, incentives, etc. – and the execution of that design by people who exhibit, among other characteristics, free will in moral, ethical, and economic judgments.

Echoing Daft and Lewin (1990), Romme (2003) contends that "the study of organizations needs a design mode ... of engaging in research" as a mechanism to address the "persistent relevancy gap" in organizational studies research (pp. 558–559). Iivari (2007) and Hevner (2007) present a similar view of research in the information systems discipline. Addressing the issue of research relevance Benbasat and Zmud (1999, p. 191) conclude that "our focus should be on how to best design IT artifacts and IS systems to increase their compatibility, usefulness, and ease of use or on how to best manage and support IT or IT-enabled business initiatives." Boland et al. (2008, p. 12) contend that "giving serious attention to Simon's call for recognizing the importance of designing to management is long overdue."

However, natural science and design science are not dichotomous. They are two sides of the same coin. Pragmatist philosophers, for example, argue that truth (justified theory) and utility (artifacts that are effective) are inseparable and that scientific research should be evaluated in light of its practical implications (see, e.g., Aboulafia 1991). Thus science and design represent a "virtuous cycle" in management research (Hevner 2007) with the results of scientific inquiry being "reformulated into (preliminary) design propositions" and the results of design inquiry being "reformulated into hypotheses" that can be tested scientifically (Romme 2003, p. 568).

Natural science and design science, in fact, represent two perspectives on the acquisition and codification of knowledge (March and Smith 1995). Natural science studies "how things are." Design science studies "how things ought to be" (Simon 1996). Design science is artifact-oriented. Its products are assessed against intentional criteria of value or utility (Dunbar and Starbuck 2006). Rather than producing general theoretical knowledge, design science produces and applies knowledge of tasks or situations in order to create effective artifacts. Design problems can be framed in different ways and may have conflicting goals and evaluation

criteria. Continual problem finding, framing, and re-evaluation are core activities of design (Rittel and Webber 1973). Research results are perishable (March and Smith 1995). Consequently design as a research paradigm focuses on problem solving and learning by doing (Markus et al. 2002, Järvinen 2007, Daft and Lewin 1990, Argyris et al. 1974, 1985).

Natural science research consists of two activities, discovery and justification (Kaplan 1964). Discovery is the process of generating or proposing scientific claims (e.g., theories). Justification includes activities by which such claims are tested for validity. The discovery process is not well understood. It is fundamentally a creative process of observation and positing explanations. Justification, on the other hand, has been heavily prescribed for by philosophers of science (March and Smith 1995). It makes extensive use of the hypothetico-deductive method in which observational hypotheses deduced from theories are evaluated against norms of truth or explanatory power. Claims must be consistent with observed facts, the ability to predict future observations being a mark of explanatory success (Bechtel 1988). Progress is achieved as new theories provide deeper, more encompassing, and more accurate explanations. Most scientific methodologies used by management researchers are prescriptions for collecting and assessing data in this way (Jenkins 1985, Romme 2003, Iivari 2007).

Parallel to the discovery–justification pair from natural science research, design science research also consists of two activities, build and evaluate (March and Smith 1995). Build is the process of constructing an artifact for a specific purpose and evaluate is the process of determining how well the artifact performs. Analogous to the discovery process in natural science, the build process in design science is a creative process of generating and representing the space of alternative solutions and devising mechanisms for moving from worse to better ones. However, in contrast to the justification process in natural science, the evaluation process in design science is task and situation specific. Significant difficulties result from the fact that the evaluation of an artifact is related to its intended use within a prescribed environment. Thus the evaluation criteria are relative to a particular purpose and environment and to the intended use of an artifact. General problem-solving methods, for example, are applicable to many different problems with performance varying considerably over the domain of application. Thus, not only must an artifact be evaluated but also the evaluation criteria themselves must be determined for the artifact in a particular environment.

Managers are understandably concerned about questions such as “Why do some investments in business systems and organizational structures not result in an improvement in firm performance?” and “What investments will do so?” The first is a theory-based, causal-related question. The second is a design-based, problem-solving question. Each represents a critical class of research questions in the management disciplines. Answering the first question requires an understanding of phenomena that occur at the intersection of markets, industries, organizations, people, and business technologies – the locus of the management disciplines. Researchers addressing it must develop and justify theories that provide deep principled explanations of these phenomena. Such theories must explain what happened,

why it happened, and possibly predict what will happen within a given context. This is the focus of much of the research published in the management literature.

While such theories may be strictly explanatory in nature, their relevancy and value are determined by the degree to which they enable managers to design business systems that improve organizational performance (Romme 2003, Dunbar and Starbuck 2006, Alter 2003, Benbasat and Zmud 1999). This is the focus of the second question. Answering it is fundamentally a design task that requires shaping artifacts and events to create an envisioned, more desired future (Boland and Collopy 2004). Researchers addressing it must build and evaluate novel and innovative artifacts that extend the boundaries of management knowledge, addressing important problems heretofore not thought to be amenable to structural approaches (Denning 1997, Sinha and Van de Ven 2005, Vaast and Levina 2006). This is the focus of design science research in the management disciplines.

14.2 Design Concepts

Design is both verb and noun: activity and result, process and product. Design implies purpose and intent (Simon 1996). People design artifacts for specific purposes (Fuller 1992). Those purposes include both aesthetics and accomplishment: form and function, art and tool, beauty and utility. A design (noun) is a conceptualization – an idea, a plan, whose purpose is demonstrated through its implementation and use. A design is evaluated by the degree to which its implementation fulfills that purpose. The evaluation may be primarily subjective as in art and fashion or it may be objective as in structural engineering and mechanical systems or it may be a combination of both as in architecture and management.

Design is considered to be a "wicked problem" when there are (1) conflicting, changing, and ambiguous desired ends; (2) a very large, if not infinite number of design alternatives, at least some of which are unknown; and (3) the consequences of design decisions are difficult or impossible to assess (Rittel and Webber 1973). In such situations creativity, innovation, and imagination are required in all stages of the design process: (1) the conceptualization and visualization of desired goals, (2) the determination of a reasonable set of design alternatives, (3) the development of design evaluation criteria, (4) the assessment of the consequences of design decisions, and (4) the selection of a satisfactory alternative (Simon 1996). Business organizations are designed artifacts whose general purpose is to accomplish the goals of its constituencies. Those goals include maximization of shareholder value, social responsibility, and development of human capital, among many others.

Of course not all organizational design problems are "wicked." To the extent that management can articulate and control the goals and the decision alternatives and predict outcomes of their actions, organizational design problems become more "tame." Such problems are satisfactorily addressed by normal application of best practice – analogous to the practice of "normal science" (Kuhn 1970). It is the wicked organizational problems that are in need of design science research – problems for which managers must balance the goals of various constituencies

when developing and implementing organizational designs. Studying such problems requires the type of paradigm shift offered by design science.

Furthermore, design in an organizational context differs from design in the context of physical artifacts. Unlike physical artifacts that obey immutable laws of nature organizations are social constructions (Searle 1995, 2006) that depend upon human behavior and collective intentionality for their success or failure. It is not that business organizations are immune from the laws of nature; but insofar as the components from which organizations are constructed and the environments in which they operate are themselves ideas (Searle 1995), their performance is dependent upon the acceptance and execution of those ideas. The designed artifacts of business organizations are conceptual objects such as incentives, reporting relationships, training, organizational memory, routines and procedures, agreements/contracts, and information systems (Walsh and Ungson 1991, Nelson and Winter 1982, March and Simon 1958, Feldman and Pentland 2003, Benbasat and Zmud 1999). These enable managers to organize, direct, control, and monitor the utilization of the organization's resources (people, machines, products, money, knowledge, etc.).

Organizations are conceptual artifacts – policies, rules, roles, responsibilities, authority, work systems designed to enable and empower people to accomplish tasks and achieve goals. Organization design involves the creation of roles, processes, and formal reporting relationships in an organization. Organizations are designed for specific purposes. These may be explicitly although imperfectly captured in an organization's mission statement or they may be implicitly captured in the culture of the organization. Economists argue that the purpose of a firm is to maximize its long-term value. Of course different stakeholders may ascribe different, multidimensional, and even conflicting criteria to assessing the "value" of the firm.

Information systems and organizational routines (Feldman and Pentland 2003) are among the key components of organizational design as they are extensions of human cognitive capabilities. They are the tools of knowledge work enabling new organizational forms and providing management and decision-making support. For example, incentive structures related to job performance such as achieving sales, product quality, or customer satisfaction goals require information gathering and analysis capabilities. Management of outsourcing and inter-organizational partnerships requires secure information sharing. Identification of problems and opportunities requires the gathering and analysis of "business intelligence" (Simon 1977). More and more frequently business decisions are made based on computer-based analysis and recommendations. Similarly, organizational routines are intended to provide guidance to human action within prescribed organizational contexts. Yet even such artifacts are appropriated and adapted by humans in ways and for purposes that the designers may not have envisioned (Feldman and Pentland 2003).

Thus design must be informed by appropriate theories that explain or predict human behavior; however, these may be insufficient to enable the development and adaptation of effective organizational artifacts. Romme (2003, p. 158) contends that scientific theories may explain "emergent organizational phenomena" related to extant organizational forms and artifacts but they "cannot account for qualitative

novelty (Bunge 1979, Ziman 2000)" achieved by human intention, creativity, and innovation in the design and appropriation of such artifacts. That is, science, the process of understanding "what is," may be insufficient for design, the process of understanding "what can be."

Simon (1996) argues that management is a profession and that design differentiates the sciences from the professions. Design as a research paradigm focuses on the construction and evaluation of novel artifacts that enable the solution of important problems for which extant theory and design knowledge are inadequate. It is not "a-theoretical" but "extra-theoretical." It utilizes extant theory and design knowledge but is fundamentally a creative activity in which knowledge is acquired through the building and use of novel problem-solving artifacts, i.e., constructs, models, methods, and instantiations (March and Smith 1995, Hevner et al. 2004). That knowledge must be tested through the evaluation of the produced artifact. Rigorous testing results in a demonstration that the design can be utilized to solve real problems. Designs have no special dispensation from the laws of nature. Hence theoretical research should be utilized to explain why the design works and to specify contingencies upon it. Justification of such theories results in principles that can then become part of the "best practice." However, because organizations and the environments in which they operate are social constructions, such "design theories" are perishable. That is, they are subject to change as the social reality changes. There may, in fact, be no immutable "laws of organizational design" to be discovered and codified.

The importance of design as a mode of research in the management disciplines has been recognized in the academic literature. *Organizational Science* (Dunbar and Starbuck 2006), *Organization Studies* (Jelinek et al. 2008), and *MIS Quarterly* (March and Storey 2008), premier academic journals in their respective disciplines, have recently produced special issues dealing with design science research. All three journals recognize the importance of improving organizational performance, a fundamental goal of design science research and a consequence of theoretical results that guide design practice. In the next section we review the work in organizational studies.

14.3 Design Science Research in Organizational Studies

In the prior sections we have articulated the design science research perspective and have begun to detail its application to management. Organization design research has a prominent place in the history of organizational studies, dating back to the classic works of scholars such as Burns and Stalker (1960), Perrow (1967), Lawrence and Lorsch (1967), and Galbraith (1977). This research operates from the premise that design entails an explicit and intentional effort to improve an organization on specific criteria (Dunbar and Starbuck 2006). In other words, design envisions systems that do not yet exist – either completely new systems or new states of existing systems (Jelinek et al. 2008).

The foundational research on organization design focused primarily on impersonal structural characteristics such as span of control, levels of hierarchy, formalization of rules, and standard operating procedures (Madsen et al. 2006). This body of early organization design research coalesced into structural contingency theory which examined a set of organizational attributes "aligned," "fit," or "congruent" with the current state of a knowable world (Grandori and Furnari 2008). The research on fit entailed matching task environment states with organizational design characteristics and examining the corresponding effects on performance. This work evolved into configurational studies that introduced the idea of equifinality – that a variety of design characteristics might be effective under the same circumstances. Empirical results of studies conducted in the structural contingency tradition (both alignment and configuration studies) were largely equivocal, failing to establish causal links between design characteristics and organizational performance. As a result, further empirical research and design theory development were largely abandoned.

Although this tradition dominated early research studies, there were notable exceptions. Representative of these exceptions, Hedberg et al. (1976) argued for organization designing as an ongoing process performed intuitively by managers, designs themselves being processes that generate dynamic sequences of solutions, which, in turn, trigger new designs. However, this work was primarily case-based or simulation-based and lacked actionable conclusions. In general, design science failed to play a significant role in mainstream organization studies research and attempts to engender a design framework were more "cookbooky" (Simon 1996) and one-off than systematic studies. As a result, the impact of research on management practice was limited (Daft and Lewin 1990).

Recently, however, design science research in organizational studies has enjoyed renewed interest and substance (Boland and Collopy 2004, Dunbar and Starbuck 2006, Jelinek et al. 2008). To articulate the form the renewed interest has taken we first review the essence of the design science mindset applied to organization design. Next, we examine recent empirical work in organization design and highlight how design science concepts have been more fully incorporated into this recent work, most notably, by focusing on design as ongoing process rather than one-off solutions and design as guides for thinking, problem solving, and feeling rather than as solutions in and of themselves. Last, we use recent work on design aesthetics (Barry and Rerup 2006) and the subjective experience of design (e.g., Yoo et al. 2006) to articulate a potential research direction for future work.

A design science perspective on organization design has received recent attention in terms of what constitutes a design approach or mindset. First and foremost, the emerging work in this area emphasizes that successfully designing an organization is necessarily messy, dynamic, iterative, and responsive to ever-changing circumstances such that the design at any particular moment is a temporary arrangement to be revisited, revised, or removed as results become apparent, new needs arise, or better methods emerge (Jelinek et al. 2008). That is, organizational design is essentially a "wicked problem."

This approach is reflected in many of the design-led organizations (e.g., IDEO, Nissan Design, Wolff Olins, etc.) studied by Michlewski (2008). These are characterized by their ability and willingness to embrace discontinuity and open-endedness. Embracing discontinuity and open-endedness is reflected in the assumptions that organization designers make about their organizations and the people who populate them. For example, a design mindset views employees as agents capable of knowledgeable and skilled social action (Dougherty 2008). The implications for organizational design are that design artifacts (structures, policies, procedures, etc.) are seen as operational guides that facilitate action and even improvisation rather than as constraints narrowly channeling and directing thought and action (Dougherty 2008).

Similarly, in a study of the design and redesign of a Pediatric Intensive Care Unit, Madsen et al. (2006) found that the "organizational design" exists at least as much in designers' visions and attitudes as in organizations' formal structures. A design science perspective on organization design is not without structure; however, instead of the formalized and stable structures envisioned by structural contingency theory it entails perishable design principles. These may take the form of (i) simple rules that act to shape and guide employee action and sensemaking (Eisenhardt and Sull 2001), (ii) design propositions that are tailored to specific conditions, contexts, and objectives (e.g., "if condition C is present, to achieve A, do B") (Romme and Endenburg 2006), or (iii) a logic of prescription that states "to achieve outcome O in context C, use intervention type I that operates through generative mechanism M" (Denyer et al. 2008). Developing either general design rules or context-dependent prescriptions implies that there are no immutable "laws of nature" that govern the underlying phenomena – designs are open to revision and updating based on changing conditions (March and Smith 1995).

Some recent work has chosen to bridge the structural contingency theory and design science perspectives more completely by exploring the design science mindset as applied to changes in managerial structures and organizational forms. For example, in their study of redesigning organizational structure at NASA after the Columbia shuttle disaster, Carroll et al. (2006) found a design process that utilized software tools (OrgCon and SimVision) to model assessments of various organization designs (e.g., centralization/decentralization) as a means of supplementing intuitive and experiential-based organization design and for providing a technical grammar, i.e., constructs, for assessing alternatives and otherwise revising designs.

Westerman et al. (2006) similarly advocate a balanced position in their study of organizations developing new lines of business. Their findings lead them to conclude that firms should choose the adaptation mode that best fits their strategic context and capabilities, but should do so in a manner that allows for further exploration and design adaptation. Madsen et al. (2006) provide further evidence of the value of balancing adaptation within a structural contingency theory framework with a design science mindset by showing how a clear managerial vision provides sufficient stability to allow for extreme flexibility, distributed knowledge, and decentralized decision making as well as ongoing evolution of structural characteristics.

Jacobides and Billinger (2006) offer a model of how an organization can use its structure to more fully embrace design thinking. In their study of "Fashion, Inc." the authors examined how the organization "opened itself up" by making its boundaries more permeable (i.e., putting more of the organization into contact with the marketplace) which had the effect of enhancing learning, easing monitoring, and allowing for resources to be more readily redeployed to higher value activities. In sum, the results of this work suggest the importance of balancing an adaptation (i.e., a specific structural change) with processes and a mindset of adaptability (openness to learning and new data). Lastly, Vaast and Levina (2006) illustrate the dangers of ignoring design science in favor of a rigid application of structural contingency thinking. Specifically, they document how a new CIO at ServCo carried out a disastrous redesign of the IT organization by viewing design as static (i.e., failing to adapt once the design was implemented) and matching the redesign to a poor model of the organization's internal environment. Specifically, the CIO, through his redesign, virtually eliminated the historically important socially embedded relationships between IT staff and stakeholders and, even in light of new information that made these problems manifest, remained resistant to adapting the design.

Other recent work has examined organizational design as an ongoing process in which patterns of working create and change designs. In their study of Linux and Wikipedia, Garud et al. (2008), for example, found that design operated as both the medium and the outcome of action. In other words, the "incomplete designs" of these tools blur the line between designer and user and in doing so acts as a trigger for generative engagement. The incompleteness and the engagement it engenders transforms the design and creates new avenues for ongoing engagement which, in turn, attracts a new set of contributors who bring into the fold their own contextualized needs, purposes, and goals and leads to further change and refinement.

Barry and Rerup (2006) similarly argue that effective designs rely as much on processes as solutions and that the designs which remain underspecified and retain tension such that design is viewed as an orienting structure and an action-oriented process are most adaptive. But they carry this argument further by adding that aesthetic experience is the "glue" that can keep an organization together amidst such a world of flux (Barry and Rerup 2006). The architectural firm Gehry Partners further exemplifies the notion of design as process (Boland et al. 2008). Managers are seen as primarily "form givers" charged with fostering a "design gestalt" – a capability that combines ideas, resources, tools, and people into collectives that can create "remarkable artifacts" (Yoo et al. 2006). The design gestalt results from ongoing processes of intense collaboration using representational tools (block models, sketches, and software) to rapidly develop and refine prototypes followed by conscious questioning of the prototype design.

Garud et al. (2006) detail similar practices used by Infosys to create and sustain an organizationally distributed mindset of designing and design as process. Infosys possesses an "asking culture" that entails helping, challenging, and "pragmatic experimentation" (i.e., prototyping) and enables iterative cycles of "experiment, learn, refine, and scale-up" all of which comprise the essence of a "design attitude."

This culture and attitude give rise to formalized forums (PSPD and voice of youth) that provide a safe space for offering dissenting opinions which act to help temper rash design and implementation.

Organization design research that has most fully incorporated a design science perspective also presents some of the most interesting opportunities for future research. For example, Yoo et al.'s (2006) study of Gehry Partners suggests that design may start with creativity and emotion (namely, Gehry's representation of his emotional vision) that acts to mobilize action and engage debate among stakeholders, which refines and reconstitutes the design. This assertion merits further empirical exploration and theoretical development. Specifically, what roles do creativity and emotion play in initiating and sustaining the design process? Moreover, what is the affective experience of designing? Are individuals operating in a manner consistent with design science principles more likely to experience "flow" (Quinn 2005)? Is designing in the manner of operation at Gehry partners likely to generate greater flow, increase engagement, and reduce employee turnover?

In their research on Calder and the constructivists and Learning Lab Denmark (LLD) Barry and Rerup (2006) highlight an additional aspect of design that merits exploration – aesthetics. LLD uses its physical architecture to create an ambiance of warm social enclosures and well-lit, comforting centers that help offset the long Scandinavian winters. The authors contend that aesthetics are profoundly intertwined with design formation such that they guide the design process and govern design reception, use, and revision. This contention deserves further investigation with respect to conceptual artifacts such as organizational structures, policies, and procedures as opposed to physical artifacts such as office configurations. Developing and systematizing design principles based on aesthetic aspects of design and exploring their impact more directly could provide useful insights and likely generate novel prescriptions.

14.4 Conclusions

In his seminal book, *The Sciences of the Artificial*, Simon (1996) observes that "Everyone designs who devises courses of action aimed at changing existing situations into preferred ones" (p. 130). The development, implementation, and use of organizational systems are rooted in changing existing situations into preferred ones. Indeed, management itself can be viewed as a design discipline (Simon 1996, Boland and Collopy 2004). Managers within organizational contexts use incentives, reporting relationships, training, knowledge, agreements, and information technology, among other resources, to define work systems through which organizational goals are accomplished (Alter 2003, Galbraith 1977).

Simon (1996) posits a science of design rooted in (1) utility and statistical decision theory to define the "problem space" and (2) optimization and "satisficing" techniques to search it. The problem space represents "desired situations," "the present situation" and "differences between the desired and the present" (p. 141).

Search techniques represent "actions . . . that are likely to remove particular differences between desired and present states" (p. 142). Wicked organizational design problems – those requiring design science research studies, are characterized by significant uncertainty, particularly with respect to objectives and alternatives (Rittel and Webber 1973). Hence, the representation of such design problems and the generation and evaluation of design solutions are the major tasks in design science research.

Challenges for design science research in the management disciplines are to build and evaluate artifacts that enable managers and business professionals to (1) describe desired organizational capabilities and their relationship with present and desired organizational situations and (2) develop actions that enable them to implement organizational capabilities that move the organization toward desired situations. Hence design science research is problem-focused. Initial research in a new problem area typically focuses on constructing "sufficient, and not necessary, actions for attaining goals" (p. 144). These are frequently in the form of prototype artifacts that demonstrate the feasibility of addressing the problem (Markus et al. 2002, Walls et al. 1992, Romme 2003). Subsequent research aims at improving the effectiveness and efficiency of attaining goals or demonstrating the necessity of certain actions, thereby adding to our knowledge of goal attainment (Vaishnavi and Kuechler 2007). Simon (1996) describes the latter as improving the factorization of differences yielding parallel search paths and as improving the allocation of resources applied to such paths.

Design science research is increasingly recognized as an equal companion to behavioral science research in the management disciplines including organizational science (Romme 2003) and information technology (Hevner 2007, Iivari 2007). Contributions of design science research are in the combined novelty and utility of constructed artifacts. These must be demonstrated in the presentation of design science research. Demonstrating that existing business artifacts and theories are or are not adequate for a specified problem is an important step in this process as is comparing the utility of existing artifacts within specific organizational contexts.

Thus, a design science research contribution requires: (1) identification and clear description of a relevant organizational problem, (2) demonstration that no adequate solutions exist in the extant knowledge base, (3) development and presentation of a novel artifact (constructs, models, methods or instantiations) that addresses the problem, (4) rigorous evaluation of the artifact enabling the assessment of its utility, (5) articulation of the value added to the knowledge base and to practice, and (6) explanation of the implications for management practice (Hevner et al. 2004). Echoing Daft and Lewin (1990) and Romme (2003) we contend that this mode of research will indeed have a significant impact on management practice.

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