The Interface between Design and Management

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Introduction

The escalating complexity of contemporary design projects has been the main reason behind the urgent demand for an innovative management approach to designing. The actual complexity of a design project results from the technical difficulty, the social difficulty, and the uniqueness of design.[1, 2] The technical difficulty is the logical consequence of the combination of different functions, forms, structures, procurement, and financial strategies in large-scale projects. The social difficulty is inevitable because of the involvement of a large number of stakeholders and participants with competing and incommensurable objectives. The uniqueness of design is reflected in the nature of the design problem, the design process employed in its solution, and the design practitioner. Most design problems are ill-defined, interconnecting many factors, and always in dynamic tension with the solutions. The design process is iterative, while the analysis often is done through synthesis. The design practitioners possess a unique competence for simultaneously reconstructing the problems and reframing the solutions. They work in knowledge-intensive organizations that cannot be managed only by laying down rules and procedures, which Mintzberg calls "operational adhocracy."[3]

This paper presents theoretical research, and intends to provoke academic discussions that bring a constructive impact to enhance design management study. Although the author was trained as an architect, this paper invites all readers to think about a new relationship between design and management which is believed to be relevant to all areas of design. The selected examples from architecture are intended to clarify the more general line of thinking.

State-of-the-Art of Design Management

There is a wide range of design management approaches. The main approach can be categorized as managing the product, managing the process, and managing the organization.[4]

Managing the product believes that the most important mission of design is to produce physical objects that meet the aesthetic and functional expectations in use, as well as the economical and technical requirements in production. Design management, in this case, is directed to ensure that a design product will meet all

1 Rizal Sebastian, "Multi-Architect Design Collaboration on Integrated Urban Complex Development in The Netherlands," *Journal of Design Research* 3:1 (2003).

2 Rizal Sebastian, "Reflective Design Management: A Socio-Psychological Approach to Multi-Architect Collaboration," *Proceedings of the 2nd International Conference of the Association of Architecture Schools of Australasia* (Melbourne: September 28–30, 2003).

3 H. Mintzberg, *Structure in Five: Designing Effective Organizations* (Englewood-Cliffs, NJ: Prentice Hall, 1983).

4 Rizal Sebastian, "Redefining the Framework of Architectural Design Management," *Journal of Constructon Research* (forthcoming).

value and performance criteria. Design management is responsible for defining the values to be met, translating them into a design brief, and guiding the designers in their understanding of the requirements.[5] In architecture, there are examples of how people try to manage design through the product. The architect supervisor and the municipality "manage" the design by composing architectural blocks in the city's master plan. Certain specialists "manage" the design by calculating and matching the exterior and interior space requirements according to the functions. Some other specialists "manage" the design by measuring the constructability and the efficiency of future utilization.

This approach is weak because it regards design as a static object whose value and performance can be completely defined beforehand. Design management only by composing the objects neglects the process through which the initial demand is assessed and the output is generated. If the preceding process is poor, then any effort to "polish" the product will never really resolve the problem. Management on value and performance probably would raise an interesting academic concept but, in real-world practice, it is almost impossible to continuously measure and formulate these parameters. The situations, the people, and the design products are repeatedly changing, and so are the value and the performance criteria.

Managing the process believes that management effort must be mainly focused on the design process. Design management should not interfere with the designer's prerogatives regarding the "quality" of design products, but rather take a supporting role by making the design process effective, efficient, and lean through the coordination of tasks and information.[6] It supposes that a well-managed process would deliver a high-quality product. Supporters of this approach have developed many methods and tools to make individual and collaborative design processes more effective.[7] They "manage" by analyzing, identifying, mapping, and arranging various design tasks in sequential or concurrent orders.[8] The design process is considered a complex system to be broken down into development phases, units of work, and product components.[9] During the process, the management also handles the large amount of design information that must be precisely controlled, stored, presented, and distributed.[10]

This approach also is weak because there is no guarantee that, if the process is well managed, the results will be excellent. Moreover, in practice, the design process is very dynamic, and not all work can be identified as an entity of task to be systematically linked. This mechanical approach is more suitable for engineering design and production processes in which efficiency has the highest priority. The studies for describing and modeling the design process are very useful for theoretical understanding. However, in architecture, most design projects are one-off. Every building project is unique, and thus less suitable for a generic methodology.

5 K. London, "Design Management Model for Performance-Based Briefing," *Proceedings of CIB W60 and W96 Joint Conference* (Hong Kong: May 6–8, 2002).

6 L. Koskela, G. Ballard, and V. P. Tanhuanpaa, "Towards Lean Design Management," *Proceedings of International Group for Lean Construction Conference* (Gold Coast, Ghana, 1997).

7 G. Friedl, M. Henk, G. J. Trum, and P. G. S. Rutten, "Modeling the Design Process: A Process Choreography," *Proceedings of the Joint CIB W096 and Design Research Society Conference* (Reading, UK: September 14–15, 2001).

8 S. A. Austin, A. N. Baldwin, B. Li, and P. Waskett, "Analytical Design Planning Technique: A Dependency Matrix Tool to Schedule Building Design Process," *Construction Management and Economics* 18 (2000).

9 C. Gray and W. Hughes, *Building Design Management* (Oxford: Butterworth-Heinemann, 2001).

10 A. Koutamanis, "Management of Digital Design Information: A Bottom-Up Approach," *Proceedings of the Joint CIB W096 and Design Research Society Conference* (Reading, UK: September 14–15, 2001).

Managing the organization currently is understood as the management of a design office and the coordination of inter-organizational decision-making. A design office can be seen as a "production line," where the demand from the market (client order) is acquired, the requirements are analyzed, the job is assigned to qualified personnel, and the design ideas, drawings, prototypes, and models are developed.[11] In a design office, usually there are two types of managers: the chief designer and the office manager. The chief designer is responsible for the reputation of the office, and he/she is in charge of the projects. The office manager—who usually is known as the one exercising design management—runs the organization, directs the "design production line," leads the office and project administration, and supervises the contractual relationships with other parties. In the case of inter-organizational decision-making, management relies on optimization techniques to make a decision out of conflicting goals from different organizations.[12] This approach has been extended into the design decision support system, which is based on mathematical programming, system thinking, and artificial intelligence.

The weakness of this approach is its limited relevance as corporate management or business administration for design firms. It is not directly involved in the activities of designing. It also relies too much on rational judgment. In actual practice, mathematical optimization for decision-making cannot always cope with uncertainty, multidimensional complexity, and flexible compromises. This is the reason why successful managers are those who are not only highly intelligent, but who also are able to effectively use professional skills, experience, and intuition for communication and negotiation with the other parties.

Generally, there are three barriers for the success of design management research and practice. The first barrier is the fact that design management concept—especially in architecture—is new, and the current research effort is greatly fragmented. Each study focuses on a specific issue of design and elaborates on a specific approach to manage it. Since the real design practice cannot be broken down into small areas to be managed separately, an integrated and coherent design management framework is needed.

The second barrier is that, although the existing approaches sound strong as theoretical concepts, they actually lack a solid scientific foundation. Those concepts also are very difficult to translate and be used by practitioners to handle the day-to-day situations encountered in a real project. In architecture, an innovative study for new scientific development often faces the opposing argument that design management is no more than a variant of project or construction management in the design phase.

The third barrier, which is the most important of all, is the fact that no existing approach can penetrate the core of designing, which is how designers work through creative processes to generate

11 G. Tunstall, *Managing the Building Design Process* (Oxford: Butterworth-Heinemann, 2000).

12 P. P. van Loon, *Inter-Organizational Design* (Ph.D. thesis: Delft University of Technology, 1998).

design solutions. It is remarkable that almost all popular concepts about design management have been established by people who do not personally design anything (e.g., managers, engineers, and scientists). Perhaps because of this, the approach often confronts the essence of designing and makes many designers reluctant to accept design management.

What's Next?

The only way to progress with design management—both as science and as a practical application—is by breaking through those barriers. For this purpose, we will go into an in-depth theoretical investigation to find the interface between designing and managing. This is a crucial step towards the establishment of a new, coherent framework.

On the highest abstraction level, the third barrier must be broken by extracting the essence of design and management, and seeking the shared nature, or in other words, the philosophical common ground on which we can build a new body-of-knowledge. If design and management have a shared nature, it can be assumed that they also have the same root in science. The second barrier must be broken by bringing design management into a certain field of fundamental science with relevant schools of thinking and theories.

Breaking through the third and the second barriers will direct us to discover the interface between design and management, which is the aim of this paper. This interface will join design and management in, first, a common term of reference and, second, a joint scientific paradigm. This will open the gate for developing a new coherent framework to resolve the fragmentation, which means breaking through the first barrier.

Proposition on Term of Reference

Until now, people in the building industry often perceive that design and management stand on two poles apart. Allinson begins his book by illustrating this common misunderstanding.[13] Many designers assume that management is dominated by strictly formulated techniques, methods, and instruments of thinking; and thus hardly compatible with the open, free, and holistic ways through which design handles the uncountable amount of variables. Its roots are in forms of technical rationality, in systems theory, and analytical technique. Its paradigm is the sophisticated mechanical control device, and its twin gods are economy and effectiveness. Conversely, many managers assume that design has an irreducible core concerned with issues outside the boundaries of instrumentality. Its agenda is cultural and aesthetic. Its values are poorly understood, its methods difficult to explain, and thus design is considered a "wild card" in the project management pack.

13 K. Allinson, *Getting There by Design: An Architect's Guide to Design and Project Management* (Oxford: Architectural Press, 1997).

Allinson challenges this misperception. He works from an architect's viewpoint to reveal that there is much common ground between design and management. His argument is quite successful in persuading architects to see that management is interesting and relevant for design. Unfortunately, even if all designers had become more familiar with management subjects, a substantial problem remains. The existing project management techniques have been proven to be inadequate for managing the complexities of contemporary design. Therefore, initiating an awareness among the designers of the importance of management subsequently must be followed by a theoretical research to bring management closer to design, to introduce a joint paradigm to be widely accepted by designers and managers, and to build a new design management framework on that common ground.

The first step into the theoretical research is the reexploration of the essence of design and management by looking comprehensively and deeply at both domains through new perspectives. If there were a universal and complete definition of design and management, our endeavor would have been much easier but, unfortunately, such a definition does not exist. Lawson states that an attempt to define design might lead either to a narrow and restricted view from a particular design discipline, or to a too general and abstract definition which is not very useful in helping us to understand design.[14] He writes that we probably will never really find a single satisfactory definition, but the searching itself is more important than the finding. Similarly, Drucker explains that management has no existence in itself, but is an organ dependent to the institution.[15] The question "What is management?" comes second after we can define management in and through its tasks. For that reason, this paper does not intend to present new definitions, but rather to obtain a reliable term of reference, which is valid for design as well as for management according to the current purpose and context. The underlying purpose is to prove that design can be naturally managed and, respectively, management can be well suited in design. The context is design practice in complex, collaborative projects.

The basic philosophical description of design as stated by Simon and Jones can be accepted by all designers since this applies to what they do.[16, 17, 18] This paper borrows their statements to examine whether management can fit into the same description. The hypothesis sounds as:

> Management resembles design because it, too, is the process by which we devise courses of action aimed at changing existing situations into preferred ones; or in other words, the process by which we initiate change in man-made things.

If this hypothesis is true, then it will become the meeting point between the two domains. Within this hypothesis are three main

14 B. Lawson, *How Designers Think: The Design Process Demystified* (Oxford: Butterworth-Architecture, 1990).

15 P. F. Drucker, *Management* (Oxford: Butterworth-Heinemann, 1974).

16 Herbert A. Simon, *The Sciences of the Artificial* (Cambridge: MIT Press, 1969).

17 J. C. Jones, *Design Methods: Seeds of Human Future* (New York: John Wiley, 1970).

18 Lawson, *How Designers Think*.

properties through which the essence of design and management can be examined: the actor, the action, and the setting.

By the setting, it is presumed that both design and management are situation-attached. In architecture, for instance, it can be seen that design—in contrary to pure art which is centered at the artist—holds the main responsibility for a real contribution to the environment. At the outset, architecture seems to deal with the physical environment only, but actually this will affect the social environment when it fulfils the human needs for space and aesthetics. Management, too, cannot restrict itself from the environment. Management's environment is the society, the organization, and the business enterprise. At the outset, management seems to deal with the social environment only, but actually this will affect the physical environment as it organizes people to decide on accommodation, mobility, facility, and equipment.

Both design and management are associated with the human environment, and are united in the mission to improve the quality of life by "satisfying" physical and social needs through the environment. Thus, the environment is not only the context, but also the object. As the object, it is not the existing environment that is the final destination of design and management, but rather the built one—the man-made one. The goal is not to understand the existing environment for the knowledge collection, but rather to find a way to change it into a more desirable one. In architectural design, the intervention is intended to develop better space (comfortable, healthy, safe, etc.) while, in management, it is to develop better people (motivated, self-esteemed, productive, etc.).

The environment, or the situation, that design and management deal with is definitely not an isolated one—like that of a laboratory or an art studio—which can be fully controlled. Either it is physical or social, the situation is severely influenced by external forces, making it full of unpredictability. Not only is the existing situation uncertain, but so is the targeted one, since it is very dependent on people's continuously changing preferences. This is one of the shared natures of design and management: working *with*—and *within* —uncertain situations.

By the action, design and management can stand on the same line if they are interpreted as verbs rather than as nouns. This means that the focus should not be on the drawings, models, rules, procedures, schemes, plans, or anything which is observed only as an object. Instead, design and management primarily must be considered as activity or practice. Drucker explains that, even though the components of management can be analyzed and organized systematically, the ultimate value of management is in its practice that leads to achievements. The distinctive criterion and the organizing principle of management is not its power to command over people and the work of other people, but rather its responsibility for contribution as an active function.

Design and management as activities occur in a certain process which, at the first sight, seems to be a process of change: changing the existing situations into the preferred ones. However, the process does not simply mean a shift between two existences, but rather a transformation from the existing reality into a new one that does not yet exist. Or in other words, from the present state to the future state that must be created and shaped. Therefore, design and management are more than just "the changing," but also "the making." In order to do this, design and management activities need specific knowledge to recognize the present situation, the expectation, and the transformation. They are knowledge-intensive activities that occur in a set of creation processes.

The process is not a ready-made system to run, but first it must be initiated and devised. Referring to Simon's vision, Boland explains this by saying that management begins with the activity that alerts us to the need for intervention in order to change the current state of affairs. It includes sensing and predicting the conditions that require action.[19] Following the initiation, there are goals, courses, and alternatives to be selected and followed. It now becomes clear that both design and management—in contrast to some kind of art—are not spontaneous and expressive, but purposive actions.[20] Thus, it can be said that design and management are creative activities with accountable goals and knowledge about ways to achieve these goals through a deliberately initiated process.

By the actor, design and management resemble each other since their fundamental principles can only be practiced by human beings. Management cannot be taken apart from the manager. Although what a manager has to be able to do can be learned, the vision, the dedication, the experience, the personal integrity, and the character of managers determine their success. People manage, rather than "forces" or "facts." Every achievement or failure of management is that of the manager. Design, too, is very much attached to the designer. A design firm is appreciated because of the qualification and the reputation of the designer. Design embraces the combination of four personal competences: implementational, improvisional, creative, and intellectual. Design takes a highly complex and sophisticated skill, which is very difficult to entirely replace with "machines." Even if it were possible to develop a "machine" with any of those competences, only human beings can sense and proportionally balance the competences for endless, incomparable cases.

In relation to the actor, it has to be realized that the target and the resource of design and management also are human beings. Design and management originally depart from the people's needs. In architecture, design is needed to provide shelter for mankind, which depends on three basic aspects: the fitness, the form, and the structure.[21] Management is needed to hold the society of organizations together and to make them work. In practice, design and

19 D. Boland, "Design in the Punctuation of Management Action," *Managing as Designing Workshop* (Cleveland: June 14–15, 2002).

20 Allinson, *Getting There by Design.*

21 Virtruvius, translated by D. Rowland and T. N. Howe, *Ten Books on Architecture* (Cambridge: Cambridge University Press, 1999).

management work with people in order to develop something for them, or to develop them. Moreover, design and management involve interpersonal relationships. Professional designers earn their living by designing for others, and often work in teams, hammering out rather than easily conceiving their ideas. In the same way, managers have to integrate "downwards" with their subordinates, as well as "sideways" with people in other areas and functions who have to put their work to use.

It can be said that design and management are centered at the human being as the performer (the leading role), the resource (the main contributor), and the ultimate goal (the final destination). Buchanan's description of design also can apply to management, and it can summarize the discussion so far. He describes that design is the human power of conceiving, planning, and making products that serve human beings in the accomplishment of their individual and collective purposes. "Power" is the efficient cause or agency of action that concerns creativity. "Conceiving, planning, and making" are activities executed with adequate knowledge and careful consideration. "Product" represents the changed environment, which can either be physical or social.[22]

Thus, the hypothesis at the beginning of this section can be confirmed as legitimate. Based on it, a proposition on a joint term of reference is constructed. It acknowledges design and management as: "Knowledge-intensive human activity, which works with and within uncertain situations, to deliberately initiate and devise a creative process for shaping a more desirable reality."

The new term of reference underpins the common ground between design and management. It is the bottom line of the interface between the two domains. It provides a way to connect a wide array of people's interpretations about the essence of design and management that forms the core of a coherent design management framework.

Proposition on Scientific Paradigm

The second part of the interface between design and management is a joint scientific paradigm. Kuhn describes a paradigm as a collection of beliefs shared by scientists, a set of agreements about how problems are to be understood.[23] A paradigm is essential because it guides the research efforts of scientific communities, and it is the criterion that most clearly identifies a field as a science. Kuhn envisions a science as having, at any one time, a paradigm or "worldview" of its environment. This scientific paradigm describes everything that the science holds—all of its laws, beliefs, procedures, methods, and everything upon which it bases its life. By his description, a paradigm is the set of inherited preconceptions, the "glass darkly" through which even the most scrupulous inquirer habitually views the world. When someone shatters the glass—as Einstein did with

22 Richard Buchanan, "Design Research and the New Learning," *Design Issues* 17:4 (Autumn, 2001).

23 T. S. Kuhn, *The Structure of Scientific Revolutions* (Chicago: Chicago University Press, 1962).

his theory of relativity, for instance—everyone is forced to ask questions differently, and to view the challenges of science and philosophy in a new way. This is known as a paradigm shift.

Finding a scientific paradigm for design and management involves facing an opposition that says that neither design nor management is rock-hard science. One the one hand, design and management often are questioned in terms of their legitimacy in being sufficiently fundamental as fields of science. Many concepts are based on personal success stories of the gurus, who invent the ideas, travel around, and gather a group of followers. Theoretical models are not empirically validated, while terminologies often appear weak against the critics of rules and formal logics. On the other hand, the attempt to define design and management as autonomous art or science can lead it to isolation.

Through the assessment by De Jong and Van Der Voordt, we can see that design cannot fully comply with the general criteria for scientific activity such as reliability, validity, and evaluative potential.[24] To comply with reliability, design must demonstrate consistent behaviors under circumstances that are determined beforehand. Regarding this characteristic, the reliability of design is restricted due to the fact that there is a range of possibilities to use a design product, and there is much freedom to choose between them. To comply with validity and evaluative potential, the design must be able to be generalized in different situations or contexts. In fact, design thinking is less focused on causality for generalization reasons, but more on conditionality since designers are hired particularly for solving problems in a unique way. For this reason, the classic empirical science, which strives towards design that can be generalized, may be frustrated. This has become even more complicated since design features elements which are incomparable with each other, such as usefulness, beauty, and sturdiness. The way design unifies these elements within a specific context is difficult to evaluate before a product is made and used. In architecture, even if a building as a design product proves its value this way, this does not ensure that the same way of designing will generate to the same results somewhere else.

Drucker says that believing that management can ever fully be a science could be harmful. Management is a practice rather than a science, although it contains elements of both. There are aspects and requirements that can be analyzed, organized systematically, and learned by anyone with normal intelligence. This stresses that management is not just a matter of experience, hunch, intuition, or native ability. And yet, achievement, rather than knowledge, is both the aim and the proof. Moreover, management as well as design—unlike "hard" science—are not value-free.

Having learned these opinions, it probably is questionable whether a scientific paradigm for design and management ever will be found. However, in the "scientific assessment" above, people

24 T. M. De Jong and D. J. M. Van Der Voordt, eds., *Ways to Study and Research* (Delft: DUP Science, 2002).

usually use the characteristics of natural or engineering sciences as starting points. The word "applied sciences" conceals but does not change the fact. It simply means that, in the professional schools, those topics are selected from mathematics and natural sciences for emphasis that are thought to be most nearly relevant to professional practice.[25]

It may appear that design and management do not completely belong to these natural or empirical sciences, but this does not mean that they are non-science. There is another kind of science, which Herbert Simon called "the sciences of the artificial." The term of reference generated in the last section also reflects the association between design and management with this kind of science. "Artificial" is used here in a very specific sense: to denote systems that have a given form and behavior only because they adapt (or are adapted), in reference to goals or purposes, to their environment. Simon characterizes an artificial system as an interface between two aspects (for example, a person and a building). These aspects lie in the province of natural science (a biological man/woman and a physical space/material), but the interface that links them is the realm of artificial science (the way an architect designs a building; the way an inhabitant lives in the building). Simon indicates how the sciences of the artificial are relevant to architecture, management, and to all fields that create designs to perform tasks or to fulfill goals and functions.

Simon describes how both man-made artifacts and man himself, in terms of this behavior, are artificial. He continues by saying that the complexity in human behavior is largely a reflection of the complexity of the environment in which he finds himself. The analysis in this paper fleshes out these abstract connections by emphasizing that design and management are activities by—and through—which human beings intervene in the environment. Within this understanding, the aspect of human behavior manifests itself in the social process within—and between—the individuals involved in designing or managing.

The nature of design as a social process has been explored by Bucciarelli.[26] He examines the consequences of the fact that design is both an instrumental process and an activity that always takes place in a social context. He compares design with language, as a human construction embedded in and co-terminus with a range of social activities. Design is a process which engages individuals, each with different ways of seeing the subject, but yet individuals who in collaboration, one with another, must work together to create, imagine, conjecture, propose, deduce, analyze, test, and develop a new product in accord with certain requirements and goals.

Management, too, is very much dominated by social process. Management is a social function, embedded in a tradition of values, customs, and beliefs, and in governmental and political systems.

25 Simon, *The Sciences of the Artificial*.

26 L. L. Bucciarelli, *Engineering Philosophy* (Delft: Delft University Press, 2003).

Management is culture-conditioned and, in turn, management and managers shape culture and society. Even though the management function, the work of management, its tasks, and its dimensions are universal and do not vary from country to country, the way the work is done is strongly influenced by national traits, national traditions, and national history, and sometimes determined by them. Thus, although management is an organized body of knowledge and, as such, applicable everywhere, it also is "culture."[27]

The evidence that design and management are intensely social processes enclosed in the sciences of the artificial has guided the search for a joint scientific paradigm towards social science. The next query is to determine which theories of social science can be used as the basis for developing a coherent design management framework.

Bucciarelli claims that design comprises two main aspects in balance. The first one involves the analysis of situation and the creation of design artifacts. The second one involves the purposes and roles in social circumstances. This is crucial because what **complicates** the situation and makes designing a challenge of the highest order is the fact that each participant sees the object of design differently. Bucciarelli says that design and many of the descriptions in the process of design are expressions in the various languages of "object worlds." This is aligned with what Buchanan calls "interaction design" that focuses on how human beings relate to other human beings through the mediating influence of products. Here, products are not only physical objects, but also experiences, activities, or services.[28]

Management, too, must balance two kinds of abilities in undertaking its main tasks. One involves the analytical and synthesizing ability, including human perception and insight; and the other involves integrity and the ability to interact with other people. The first ability is more dominant in tasks related to measuring, while the second one in tasks related to communicating, motivating, and developing people. Both abilities are equally important when management must set objectives and organize.

It is now clear that design and management as social sciences are nested in inseparable aspects of being *cognitive* and *interactive* at the same time. With respect to the cognitive aspect, design and management can refer to theories of cognitive psychology, especially those related to innovative and creative thinking. These theories explain how comprehension and creation go together in a knowledge activity by a human being, which is known as cognition. They include perception, learning, problem framing, idea generation, and decision making in an iterative circle of thinking and action using explicit and tacit knowledge.[29] With respect to the interactive aspect, design and management can refer to organizational theories about group dynamics.[30] These theories cover issues such as the synergic

27 Drucker, *Management*.

28 Buchanan, "Design Research and the New Learning."

29 M. Polanyi, *Personal Knowledge: Towards a Post-Critical Philosophy* (London: Routledge-Kegan, 1958).

30 H. D. Hohn, *Playing, Leadership, and Team Development in Innovative Teams* (Ph.D. thesis: Delft University of Technology, 1999).

interaction between individuals and between organizations, the behavior and conducive atmosphere of working groups, organizational culture, value, leadership, and governance, and organizing for performance.

Having searched for a joint scientific paradigm, this paper suggests that any attempt to develop design management on a firm scientific foundation should focus on managing the creative cognition through the dynamics of a design team.

Conclusion

This paper discusses a theoretical research to respond to the need for an innovative management of design. The existing management approach has failed to deliver satisfactory results, since it relies on weak scientific references and uses the top-down approach to apply project management instruments in design. The evidence shows that many of these instruments are in conflict with the essence of designing. To build a new, coherent design management framework, a common ground must first be established. The common ground is an interface between design and management that enables a new constructive perception to integrate these two domains. The interface consists of a joint term of reference and a joint scientific paradigm. Its early impact is achieved by guiding the managers to learn from particular design competences that are useful for handling complex tasks, and getting the designers to realize the significant role of management in improving design work.

In an attempt to recognize the essence of design and management, this paper draws upon some aspects of the work of Vitruvius, Drucker, Simon, Jones, Kuhn, Bucciarelli, Lawson, and Buchanan. As summarized by Dorst, there are two main paradigms of design: the one that sees design as a rational problem-solving process related to engineering sciences; and the other that describes design as an activity involving reflective practice related to the social sciences.[31] This paper assesses which paradigm is the most appropriate for the purpose of managing design.

The new phenomenon in real-world practice shows that social complexities in design have been escalating on top of the technical ones. While new technological inventions can solve almost any technical difficulty, a new demand has arisen for the socio-psychological approach to manage socially complex design collaboration. The same phenomenon also appears in the academic world, since there is an early tendency to shift from the technical-rationality to the social-psychology. In science philosophy, we can notice the "evolution" from systematic thinking to social-reflective paradigm. There is a revival of the human factor, with its unique cognitive facilities, as the focal point in design and management. Buchanan illustrates this as a fundamental shift in the intellectual arts that we employ to explore design in practice and research. The early theories of design found

31 C. H. Dorst, *Describing Design: A Comparison of Paradigms* (Ph.D. thesis: Delft University of Technology, 1997).

expression in the grammars and logics of design thinking, but new design finds expression in rhetoric and the dialectic.[32]

This paper promotes new perspectives from the cognitive sciences—which were once a matter of philosophical speculation—to become central to the science of design management. Design management through a socio-psychological approach has great potential, since it raises the sensitivity of designers to complex societal realities during and after the design process. It also contributes to creating better design through creative and reflective collaboration, progressive learning-in-action, and high-performance teamwork.

Recommendation for a New Framework

The logical follow-up for this interface will be research to develop a coherent framework for design management. Coherent means that the new framework must be consistent, understandable, and cohesive. In this sense, the framework must steadily integrate various aspects without contradiction, have clarity and intelligibility to be widely accepted on different levels, and be eligible as a plan for action. The framework must allow design and management to maintain their own "identities" but, at the same time, transform and improve both domains in practice through the shared nature, mutual dependency, and positive integration between them. The implementation of the framework is expected to equip professional designers and managers with a new way of thinking that will encourage them to employ innovative approaches to improve design and management practice.

Using the interface introduced in this paper as the underpinning, the framework will operate on the cognitive and interactive characters of design management.[33] There are indications that the reflective workshop could become a relevant instrument in which innovative thinking and group dynamics are optimized through design collaboration. The workshop also will provide opportunities for individual and group reflections.[34, 35] While maintaining that design management is central to managing the human creative competences in collective designing, other management elements must not be neglected. At the outset, design management must be able to link to the integral management and coordination of the project.

Since the framework is aimed at practical implementation, its concept needs to be verified by practicing designers, managers, and stakeholder representatives. Respectively, the framework should be validated through a number of actual case studies in empirical research. In order to incorporate the new paradigm of design management, which is oriented to the social sciences, a specific methodology for empirical research must be prepared. The road towards the realization of the new design management breakthrough in practice is long, yet this paper wishes to contribute by laying down the conceptual platform for further studies.

32 Buchanan, "Design Research and the New Learning."

33 R. Sebastian, H. de Jonge, M. Prins, and J. Vercouteren, "Managing-by-Designing: Management for Conceptual Design Phase of Multi-Architect Projects" in F. A. Duijn and L. H. M .J. Lousberg, eds., *Handbook of Building Project Management* (The Hague: Ten Hagen Stam [in Dutch], 2003).

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