

“Models of Man” in Design Thinking: The “Bounded Rationality” Episode

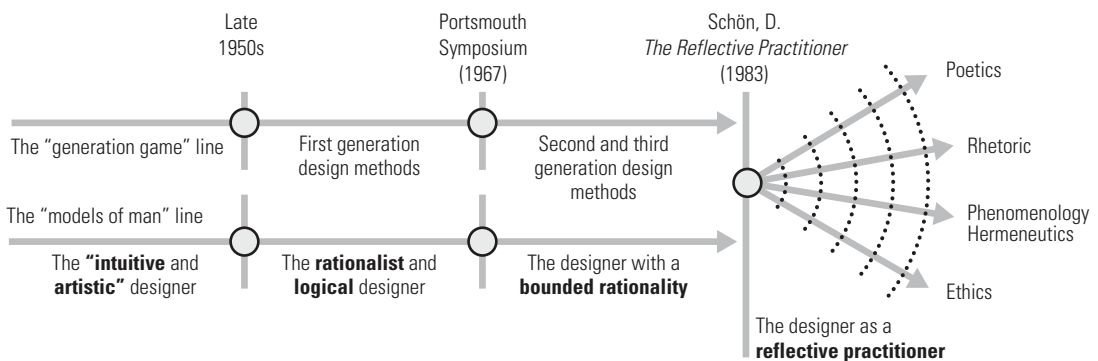
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The “Generation Game” in Design Thinking

Design thinking—“the study of the cognitive processes that are manifested in design action”¹—has been mostly described, from the late 1950s to the early 1980s, in terms of what is largely accepted today as the “generation game” (i.e., first-, second-, and third-generation design methods).² Proponents of the first generation; based on a strong reaction against the intuitive, artistic, and “beaux-arts” vision of the design process, which was largely diffused since the nineteenth century in design professional education; have supported, between the late 1950s and 1967,³ a very logical, systematic, and rationalist⁴ view of design activities (see figure 1). However, difficulties and a huge resistance met by this rationalist and logical trend led some major proponents of the design methods movement to fundamentally change their theoretical perspective from 1967 to the early 1980s. Horst Rittel proposed the idea of second- generation design methods⁵ oriented towards more participatory and argumentative design and planning processes. In a similar participatory perspective, Christopher Alexander also experimented with a new approach to design based on the idea of the “pattern language.”⁶ But according to Nigel Cross, “...it has to be admitted that, like the first-generation methods, these second-generation methods have also met with only moderate success.”⁷ Therefore, simultaneous to this period, a third-generation view emerged whose proponents⁸ were devoted to studying and acquiring an increased understanding of designers’ cognitive behaviors as they simply occurred in the traditional ways of their practice.

Figure 1
Some landmarks in the evolution of design thinking.



Finally, in an attempt to go beyond this “generational” evolution of design thinking, Nigel Cross, in his 1981 paper, introduced arguments to encourage a paradigmatic shift with the intention of helping design thinking inquiries move towards what he called a “post-industrial” design paradigm. However, what is known today as the “reflective turn” suddenly emerged. It was introduced at the same time by Donald Schön (1983), who proposed a more comprehensive vision. This would help scholars, particularly in design thinking, to position their research on a more global perspective; an epistemology of the “reflective practice.”⁹ Therefore, since the early 1980s, research in design thinking tried to embrace a wide range of issues (poetical, rhetorical, phenomenological, hermeneutical, and ethical)¹⁰ in order to obtain greater insights and an improved understanding of the design phenomenon.

The Idea of “Models of Man”

The teaching of design theories, especially at the graduate level, increasingly imposes the need for professors to explain some of the underlying philosophical roots and assumptions of the theoretical discourses to their students. Therefore, it is recommended that, as an academic discipline, design and its philosophy (i.e., the knowledge that leads to the degree of Ph.D. in Design) deal with these issues in a suitable and precise manner. This paper is an attempt in this direction. I would like to propose in the following sections a more “philosophical” approach to describing the phenomenon of the “generation game” and the other theoretical shifts that have structured the evolution of design thinking. My arguments will be based on the philosophical idea of “models of man”; models which are implicit or postulated in any design discourse. In order to clarify the issue, I will take an example from Herbert Simon’s work in the field of economics; the field in which he received the Nobel Prize:

Traditional economic theory postulates an “economic man,” who, in the course of being “economic,” is also “rational.”

This man is assumed to have knowledge of the relevant aspects of his environment?? He is assumed also to have a well-organized and stable system of preferences, and a skill in computation that enables him to calculate, for the alternative courses of action that are available to him, which of these will permit him to reach the highest attainable point on his preference scale.¹¹

As does economic theory which postulates an “economic man,” each design theory, unless it puts forward its philosophical assumptions, assumes as well a particular view (i.e., a model of the designer). Some other theoretical discourses in the field of design are more concerned with the users of design results. In the same way, these theories assume an implicit view (i.e., a model of the user).¹² I will

argue, therefore, that each shift in the evolution of design thinking in fact corresponds to a major shift in the implicit models of the designer included within the analogous theoretical discourses.

The “first-generation” design methods had accomplished a shift from the romantic, intuitive, and artistic model of the designer in order to embrace a very logical and rationalist one (i.e., the “analysis/synthesis” model, of which Alexander’s *Notes on the Synthesis of Form* is a good example). This logical and rationalist view has its obvious and deep origins in the mechanical world of René Descartes’s philosophy. This was exposed in his *Discourse on Method* (1637), especially the very well-known statements of the second and third precepts of Descartes’s method:

The second was to divide each of the problems I was examining in as many parts as I could, as many as should be necessary to solve them.

The third, to develop my thoughts in order, beginning with the simplest and easiest to understand matters, in order to reach by degrees, little by little, to the most complex knowledge, assuming an orderliness among them which did not at all naturally seem to follow one from the other.

In design thinking, this shift gained more importance during the period which Herbert Lindinger characterizes as the “fourth phase” of the reestablishment of the Bauhaus tradition in Ulm, Germany after the Second World War (from 1953 to 1968). This specific phase took place between 1958 and 1962; and Lindinger introduced it with the very symptomatic title of “Planning Mania.” During this short phase, the school program witnessed a strong thrust towards scientific topics and planning methodologies:

Planning methodology took such a hold that some students made it almost a religion. It seemed only a matter of time before scientific precision, system, and the computer ... would free design of all its irksome, irrational weaknesses.¹³

Since the early 1980s, design thinking had entered a more complex view in which designers, according to Donald Schön, should be seen more as reflective practitioners.¹⁴ The reflective practitioner is indeed a post-rationalist model of the designer.¹⁵ The reflective turn was the last paradigmatic shift, and it also has been described by Donald Schön as a move from the realm of “technical rationality” to a rationality of reflection-in-action.¹⁶ Furthermore, at a methodological level, this shift leads design theorists to gradually abandon the very rationalist and logical concept of “problem” (and the entire instrumental view of design as a “problem-solving process”) in order to adopt the more pragmatic and phenomenological concept of “situation.”¹⁷

We now are faced with the remaining question: how had the gap between the rationalist and the reflective view of the designer (i.e., the entire period occupied by the second- and third-generation design methods) been bridged in design thinking? What was the implicit model of the designer during this specific period in design thinking? This intermediate period, between the mid-1960s and the early 1980s, was central in the history and evolution of design thinking for two reasons. First, before embracing the reflective paradigm of the 1980s, research in design thinking had explored a “median” position which can be appropriately labeled as “the wicked problems theory of design.”¹⁸ This characterization can be extended to embrace all of the major theoretical works of the second- and third-generation design methods. Second, these two generations have brought to design knowledge some remarkable concepts that are still used with great relevance in design discourses—concepts such as “wicked problems” by Rittel and Webber; “solution-focused strategy” design by Lawson; design “conjectures” by Hillier, Musgrove, and O’Sullivan; design “primary generator” by Darke;¹⁹ and, finally, even though they were not considered as members of the entire movement of design methods, Simon’s concept of “ill-structured problems,” and Newell and Simon’s concepts of “problem space” and “generative processes.”²⁰

The design thinking delivered by these two generations mainly was recognized as one which moved away from the very rationalist and systematic ambitions of the first generation, in which researchers tried to give a complete account of the designer’s operations. However, the main underlying idea of all these works is based on their common view of design as predominantly a “problem-solving process,” and to this extent one notices that all of these authors continued to use the concepts of “problem” and “solution” to describe design activities.²¹ As a consequence of the intrinsic nature of seeing design as a problem-solving process, the authors of the two generations somehow maintained some shared beliefs in a certain degree of rationality, logics, and objectivity which fundamentally characterize the design process. However, such a process cannot be totally rational and logical due to the accepted high complexity of design problems. As a result, they may implicitly assume a particular idea of a designer armed with what Simon has conceptualized more precisely as a “bounded rationality.” Such a view of the designer therefore can be considered as the main “model of man” of the second- and third-generation design methods. I propose to call this period the “bounded rationality episode” in design thinking.

The following sections are principally related to the concept of “bounded rationality.” This concept originates from Herbert Simon’s theoretical works in the field of psychology. It was developed in one of his several distinguished works, *Administrative Behavior*. I will first present some of the important historical and theoretical elements

which describe the coming of this idea. After this historical overview, I will attempt to show how the idea of “bounded rationality” appears in Newell and Simon’s concepts of “problem space” and “generative processes.” This will lead directly to an interpretation of two key concepts introduced by researchers of the second- and third-generation design methods: the concept of wicked problems conveyed by Horst W. J. Rittel, and the concept of primary generator developed by Jane Darke. I will conclude this paper by revealing two points of view considered as very critical of Simon’s conception of rationality.

The Concept of “Bounded Rationality”: A Historical and Theoretical Overview²²

In *Administrative Behavior*, Simon developed the foundations of his theory about the rationality and the psychology of decision making, especially in administrative organizations.²³ But, in more general terms, Simon perceives decision making and some other complex cognitive behaviors as problem-solving activities in which the human brain plays the role of an information-processing system. Therefore, he later developed with a colleague a comprehensive theory in another seminal work entitled *Human Problem Solving*. Generally, the idea of bounded rationality arises in this context of psychological and cognitive investigations. It took place mainly within the large area of interest left behind by traditional psychology (i.e., behaviorism), especially its inability to describe, in an acceptable manner, some complex cognitive behaviors such as rational choices, games, decision making, and problem solving in general.²⁴ Peter Rowe gives us an interesting description of some assumptions of behaviorism:

The behaviorist position began as a reaction to what proponents termed the mentalism of earlier doctrines. It was a fundamental rejection of all attempts to study inner mental processes in which distinctions were made between a concept of mind and a concept of body. Instead, the behaviorists postulated that human behavior, including problem solving, could only be adequately explained in nonmentalistic, concrete terms. By concrete terms they meant observable, measurable, and replicable patterns of physical behavior. Investigations within the position quickly gave rise to the now familiar stimulus-response, or S-R models of behavior, founded on the assumption that given a particular external stimulus, one could predict a certain response with complete assurance.²⁵

This static and deterministic orientation of behaviorism, which is commonly expressed in terms of direct correlations between environmental stimulus and human response (i.e., the behavior), has in fact a hidden assumption which resides within the idea of the “empty organism.”²⁶ This concept expresses the functional void or emptiness,

in terms of information processing, between the two poles S and R. This means a fundamental incapability for the organism to process the information brought by the stimulus in order to satisfy its own goals. In other words, such a view of human beings allows no place for purposive behaviors or rational behaviors which can require the processing of that information:

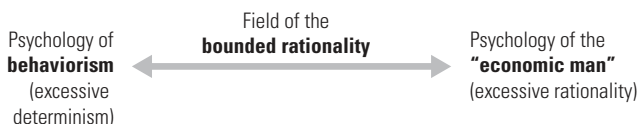
The behaviors commonly elicited when people (or animals) are placed in problem-solving situations (and are motivated toward a goal) are called *adaptive*, or *rational*. These terms denote that the behavior is appropriate to the goal in the light of the problem environment: it is the behavior demanded by the situation.²⁷

On the other hand, before 1945, the year that the first edition of *Administrative Behavior* was published, there have been numerous theoretical accounts of rational behaviors provided by social sciences, especially sociology and economics, in which Simon could find some philosophical foundations to support his theoretical enterprise about human rationality. Unfortunately, this was not the case:

The social sciences suffer from a case of acute schizophrenia in their treatment of rationality. At one extreme we have the economists, who attribute to economic man a preposterously omniscient rationality. Economic man has a complete and consistent system of preferences that allows him always to choose among the alternatives open to him.... At the other extreme, we have those tendencies in social psychology traceable to Freud that try to reduce all cognition to affect.... The past generation of behavioral scientists has been busy, following Freud, showing that people aren't nearly as rational as they thought themselves to be. Perhaps the next generation is going to have to show that they are far more rational than we now describe them as being—with a rationality less grandiose than that proclaimed by economics.²⁸

So when the time came to understand and acquire insights into the field of individuals' behavior within an administrative environment, Simon was simply not satisfied with these two extreme positions (see figure 2). There was a sort of a "fallow land" between them that comprised a great number of human behaviors of which these theories gave no accounts. Therefore, Simon proposed the concepts of "bounded rationality" and "satisficing" with which he endorsed an "intermediate" position.

Figure 2
Herbert Simon's concept of bounded rationality.



Indeed, whoever has observed these types of behavior will notice that the rationality which underlies them has no close relationship to the total rational behavior of the “economic man.” However, if the administrative behavior is not totally rational, it is obvious that although it contains some rationality in its intentions, this rationality is limited. This is what can be described as an “intended rational behavior,” or a “behavior of limited rationality”:

Administrative theory is peculiarly the theory of intended and bounded rationality—of the behavior of human beings who *satisfice* because they have not the wits to *maximize*.²⁹

Therefore, the concept of bounded rationality will be particularly suited to describe human actions in situations that endure some degree of uncertainty. The uncertainty, in Simon’s view, is principally due to the inability of the human mind to acquire all of the necessary information required by a totally rationalist decision-making activity:

The capacity of the human mind for formulating and solving complex problems is very small compared with the size of the problems whose solution is required for objectively rational behavior in the real world...³⁰

It was this theory of behaviors with a bounded rationality, initially developed to describe decision making in administrative organizations, which later was extended to become a general theory of human problem solving.

Yet one question remains unanswered: if none of the social sciences theories have brought any satisfaction for Simon’s investigations, where will he find the necessary and adequate philosophical elements to build and secure the foundations of his own theory? It is a difficult question which undoubtedly can provide the motivation for developing a research paper of its own. The answering of it, however, can hardly escape the idea that some influences stemmed from the philosophy of pragmatism. Therefore, some of the foundations of the psychological side of Simon’s model of “man with a bounded rationality” are based on the philosophy of pragmatism. Pragmatism is a philosophical school of thought initiated in the United States in the second half of the nineteenth century. It used to be described as an empirical theory of knowledge in which action, and especially its practical consequences, plays a fundamental role. In order to put forward their ideas, each of the most important pragmatist philosophers (Charles S. Peirce, Williams James, John Dewey, and F. C. S. Schiller) have introduced a psychological view of the human condition in which action and a great number of related concepts (such as intention, situation, meaning, end, habit, conduct, etc.) play a significant role. Therefore, some of the principal insights that Simon was searching for, and could not find within the psychology of behaviorism and the other social sciences in order to develop

his own psychology of human rational problem solving, were later found within the psychological parts of the pragmatist philosophers works.³¹ We will see now how two specific methodological concepts have emerged from this philosophical view of human rationality.

Newell and Simon's Concepts of "Problem Space" and "Generative Processes"

We will begin with the central concept which is used regularly and instinctively in design discourses: the concept of "problem." Newell and Simon give this description:

A person is confronted with a problem when he wants something and does not know immediately what series of actions he can perform to get it. The desired object may be very tangible (an apple to eat) or abstract (an elegant proof for a theorem). It may be specific (that particular apple over there) or quite general (something to appease hunger). It may be a physical object (an apple) or a set of symbols (the proof of a theorem).³²

This characterization of the idea of problem may be considered as a very instrumental one, and it reminds us of the frequent mathematical modeling: $A \rightarrow B$, where A represents an initial state, B a desired state, and the arrow (\rightarrow) represents the process of problem solving; that is how to get from A to B.³³ But the significance of this simplistic mathematical model becomes evident only when we understand that the state of knowledge we acquire about A and B is "not problematic": the problem indeed lies in the path from A to B. However, if we consider in a much closer way the main methodological concepts to which Simon's theory of bounded rationality gave birth, we will notice a certain hidden complexity. Peter Rowe summarized it in these words:

First, there is a problem space whose elements are knowledge states, some of which represent solutions to a problem. Second, there are one or more generative processes, or operations, that allow one to take knowledge states as inputs, or as starting positions, and produce new knowledge states as output... Third, there are one or more test procedures that allow the problem solver to compare those knowledge states that are presumed to incorporate solution properties with a specification of the solution state.³⁴

"Problem space" and "Generative processes" are two key methodological concepts of Newell and Simon's problem-solving model, and each of them expresses the bounded rationality of the designer who can use this model. The idea of problem space expresses the problematic state to be changed and corrected. The solution, on the other hand, is delivered by the means of one or more generative processes:

Every problem-solving effort must begin with creating a representation for the problem—a *problem space* in which the search for the solution can take place.³⁵

The significance here is the fact that a problem space is, above all, a matter of knowledge (i.e., the state of knowledge the problem solver (the designer) has about the problematic state). Therefore, the first sign of the designer's bounded rationality appears here. Since such knowledge cannot be complete and comprehensive, the problem space then is described by Newell and Simon simply as a "representation"³⁶ (not the total and objective reality) of the problematic state. Thus, one can imagine that there can be more than just one representation for the same problematic state. This is very important because in another seminal work, *The Sciences of the Artificial*, Simon will give a definition of a designer as everyone "who devises courses of action aimed at changing existing situations into preferred ones."³⁷ The idea of the "existing situation" is equivalent to the concept of "problem space," and the two are similar to cognitive constructed realities (i.e., cognitive representations), which help the problem solver to frame an existing state and attain it intelligibly. This implies that the solution is strongly dependant on the way in which the existing state has been framed as a problem. This last element was a compelling insight of second- and third- generation design methods, and Simon had emphasized this in one section of the chapter devoted to "the science of design" in *The Sciences of the Artificial*. That section's title is: "Problem Solving as Change in Representation."

...solving a problem simply means representing it so as to make [its] solution transparent. If the problem solving could actually be organized in these terms, the issue of representation would indeed become central. But even if it cannot if this is too exaggerated a view? a deeper understanding of how representations are created and how they contribute to the solution of problems will become an essential component in the future theory of design.³⁸

The second indication of the designer's bounded rationality lies in the concept of generative processes. Basically, the generative processes include different instrumental methods suited to tackle specific problems: methods such as trial-and-error procedures, means-ends analysis, heuristic searches, and the generator-test cycle.³⁹ Once the designer has chosen and created an adequate representation of the problem (a problem space), he then selects one or more generative processes that lead him not to the single and true solution, but to the most satisfying one. Therefore, one can argue that it was the misunderstanding of this fundamental characteristic of the problem space concept (i.e., as a created representation) which

frequently led to the reduction of the inherently complex design process to a simple matter of generative processes; and Peter Rowe, once again, had aptly noticed this trend:

Those who study problem-solving behavior generally make comparisons among problem solvers according to differences in their methods of problems representation, solution generation, and solution evaluation. Clearly these three sub-classes of activity are interdependent. The choice of solution generation strategy may markedly affect the manner in which a problem is represented and the manner in which solutions are evaluated. It is generally in terms of solution generation strategy that problem-solving procedures are described.⁴⁰

Some “Bounded Rationality” Ingredients in Second- and Third-Generation Design Methods

In order to illustrate the dissemination of the bounded rationality current in design thinking, I will briefly deal with two major theoretical works which I consider very representative of the two generations of design methods: Horst Rittel’s concept of wicked problems, and Jane Darke’s concept of primary generator.

According to Richard Buchanan,⁴¹ the phrase “wicked problems” was borrowed by Rittel from the philosopher Karl Popper.⁴² Ten important, related characteristics of this concept were reported by Rittel and Webber,⁴³ and it was very interesting to notice the several occurrences of the adverb “no” in some of them. This can be considered as a clear indication of what Buchanan depicts as the indeterminacy of design problems⁴⁴ and, ultimately, the bounded character of the rationality which underlies design realities and objects. The first several characteristics express the idea that wicked problems have *no* definitive formulation—“the formulation of a wicked problem *is* the problem!”⁴⁵—and the fact that they have *no* stopping rule—“there are no criteria for sufficient understanding.”⁴⁶ Consequently, “the choice of an explanation (i.e., a representation) to the problem determines the nature of the resolution.”⁴⁷ Herbert Simon probably would say here: “Since the search for a solution occurs in a problem space, the creation of a representation for the problem therefore *is* the problem.” Furthermore, solutions to wicked problems are *not* true-or-false but good-or-bad—“Assessments of proposed solutions are expressed as ‘good’ or ‘bad’ or, more likely, as ‘better or worse’ or ‘satisfying’ or ‘good enough.’”⁴⁸ Finally, every wicked problem is essentially unique—“there are no classes of wicked problems.”⁴⁹ In an epistemological sense, this last characteristic clearly means that a general science of problems, in which design problems are just a subclass, cannot exist. Such a statement then is very close to Donald Schön’s idea that every design situation is essentially unique. The logical or rationalist approaches are

not completely suited to understand such problems. This is why Schön recommends a *dia*-logical conversation with the materials of the situation.

The Cartesian and rationalist method, as we have mentioned above,⁵⁰ was a great influence on the philosophy of the first generation design methods. With the introduction of Rittel's concept of wicked problems, the Popperian philosophy and thoughts—especially the idea of conjecture—emerged as important philosophical arguments to replace the Cartesian model. It was Brian Lawson who launched in his doctoral thesis of 1972⁵¹ the idea that architects' strategies of the design process are solution-focused ones; in opposition to scientists' approaches, which are problem-focused. Such orientation seems to be very analogous to the role of the Popperian idea of conjecture in the growth of scientific knowledge and discovery; and on which Hillier et al. also have based their arguments in their 1972 paper.⁵²

As a representative of third-generation design methods, Jane Darke's paper, "The Primary Generator and the Design Process"⁵³ was significant since, in some sense, it completed Lawson's and Hillier's previous theoretical works on the same topic. For Hillier et al., and also for Darke, the idea of conjecture refers to an important characteristic of design which "is seen as a process of 'variety reduction' with the very large number of potential solutions."⁵⁴ In addition to this, Darke conveys the insightful suggestion that this "greatest variety reduction or narrowing down of the range of solutions occurs early in the process."⁵⁵ Darke proposes, therefore, the concept of the primary generator to summarize this phenomenon, which basically consists of the use of a few simple objectives in architects' approaches to design in order to attain an initial concept.⁵⁶ Jane Darke refers clearly to the bounded character of the rationality with which architects engage in the resolution of design problems, especially when she tries to describe what causes the emergence of what she calls the "visual concept":

In other cases it appears that a certain amount of preliminary analysis takes place before the visual concept arises. It seems normal, however, for there to be a "rationality gap": either the visual concept springs to mind *before* the rational justifications for such a form, or the analysis does not dictate *this particular* concept rather than others.⁵⁷

...any particular primary generator may be *capable* of justification on rational grounds, but at the point when it enters the design process it is usually more of an article of faith on the part of the architect.⁵⁸

In the second section of this paper, I mentioned that each design theory assumes a particular view or a model of the designer. Also, each design theory may assume a certain view of the people to whom the design result or product is intended (i.e., the users). I will end this section by showing that it was remarkable how, in the conclusion of her paper, Darke raises these two critical issues, and proposes some orientation for future research in this field:

The author [Darke] feels that the most interesting direction for design research to take now is to find further ways of “looking inside the designer’s head,” of exploring subjectivity. The denial of the value of the subjective and the hope that the building would “design itself” now seem to be products of a scientific rather than a scientific way of thinking.⁵⁹

The image of the user implied by this attitude was a mechanistic one, an anthropometric manikin with certain environmental needs but no emotional responses.... A revaluation of subjectivity in design can lead to a revaluation of the subjective responses of the user, and hopefully to a more responsive architecture. Such an architecture will reflect the diversity and anarchy of human life, just as research on design methods should reflect the diversity in approaches to design.⁶⁰

Conclusion

I would like to conclude this paper by emphasizing some elements of two authors’ critiques of Simon’s view of rationality. These authors address, in particular, two main issues in Simon’s intellectual approach to decision making, problem solving, and design. The first is Simon’s perspective of “cognitive” orientation of these complex human behaviors, especially the subject of uncertainty. Cognitive orientation here means that design activity has its *raison d’être* in the existence of a problem, which is essentially a problem of knowledge. Carolyn R. Miller, in a paper entitled “The Rhetoric of Decision Science, or Herbert A. Simon Says,”⁶¹ criticizes Simon’s cognitive approach on the issue of uncertainty. She brings some theoretical elements from the discipline of rhetoric (especially the Aristotelian *Rhetoric* in order to deal more adequately with this issue:

Simon’s definition of bounded rationality in terms of the disparity between the capacity of the human mind and the size of the problems implies that uncertainty lies in the discrepancy between information available and information needed; that is, uncertainty is wholly a problem of knowledge.... By contrast, Aristotle observes that uncertainty concerns not knowledge but human actions. Our imperfect knowledge, of course, makes deliberation about our actions

more difficult, but, as Aristotle says, we do not waste time deliberating about questions with only one possible answer.... Problems of knowledge presuppose no real conflict—except between people and the limits of available information. Problems of action involve conflict between people.... Problems of action are “essentially contestable”; problems of knowledge are not.... The task in solving a problem of action is not to acquire more information or to modify a calculus; it is, rather, to exercise what Aristotle called practical reason....⁶²

Beyond the topic of uncertainty, the second issue which raises criticism in Simon’s approach; specifically his attitude to design; was brought by Donald Schön. The author detects in Simon’s view a clear expression of what he calls technical rationality—or the instrumental view of human reason and human action—which, according to him, underlies the epistemology of a great number of professional disciplines since their establishment in the nineteenth century:

He (Simon) saw designing as instrumental problem solving; in its best and purest form, a process of optimization. This view ignores the most important functions of designing in situations of uncertainty, uniqueness, and conflict where instrumental problem solving—and certainly optimization—occupy a secondary place, if they have a place at all.⁶³

As we can see from these two critiques, it was the dominant role Simon assigned to rational knowledge in human action which is questioned. Miller sets a place for rhetoric in human action; and Schön, on the other hand, argues that human action is not just a matter of scientific and technical rationality. In Simon’s concept of “bounded rationality,” I rather see an opportunity for a wise and careful use of rationality, especially in design practice. Rationality, whether scientific or technical, has to play a role, but it must be moderate. Thus, from a phenomenological perspective, I prefer to focus not on the concept of “bounded rationality” itself, but on what really “bounds” rationality within human action. The great danger then is to restrict the bounding factors to simply a matter of knowledge. Rationality is one part of all human faculties and condition. Therefore, what really bounds rationality in human action is nothing more than all the other parts which comprise the human existence as a whole: poetics, rhetoric, hermeneutics, and ethics; because, when humans act, they act as whole humans.

Acknowledgment

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- 1 Nigel Cross, Kees Dorst, and Norbert N. Roozenburg, Preface to *Research in Design Thinking*, Nigel Cross, Kees Dorst, and Norbert N Roozenburg, eds. (Delft: Delft University Press, 1992), 1. See also Peter Rowe, *Design Thinking* (Cambridge: MIT Press, 1987).
- 2 I borrow the phrase “generation game” from Nigel Cross, “The Coming of Post-industrial Design,” *Design Studies* 2:1 (1981). See also Geoffrey Broadbent, “The Developments of Design Methods” in *Developments in Design Methodology*, Nigel Cross, ed. (New York: Wiley, 1984).
- 3 1967 is the year in which the Design Methods in Architecture Symposium was held in Portsmouth, UK. For more on this symposium, see *Design Methods in Architecture*, Geoffrey Broadbent and Anthony Ward, eds. (London: Lund Humphries, 1969).
- 4 See especially the introduction of Christopher Alexander’s *Notes on the Synthesis of Form* (Cambridge, MA: Harvard University Press, 1964), whose subtitle is: “The Need for Rationality.” For more on the proponents of this first generation, see the proceedings of the 1962 first conference on design methods published in *Conference on Design Methods*, John Christopher Jones and D.G. Thornley, eds. (New York: Pergamon Press, 1963).
- 5 Horst Rittel, “Second-Generation Design Methods” in *The DMG 5th Anniversary Report: DMG Occasional Paper* 1 (1972): 5–10. Also reproduced in *Developments in Design Methodology*, Nigel Cross, ed. (New York: Wiley, 1984).
- 6 Christopher Alexander et al., *A Pattern Language: Towns, Buildings, Construction* (New York: Oxford University Press, 1977).
- 7 Nigel Cross, “The Coming of Post-industrial Design,” *Design Studies* 2:1 (1981), 4.
- 8 See the following authors in “Part Three: The Nature of Design Activity” in *Developments in Design Methodology*, Nigel Cross, ed. (New York: Wiley, 1984): Jane Darke, “The Primary Generator and the Design Process”; Omer Akin, “An Exploration of the Design Process”; and Bryan Lawson, “Cognitive Strategies in Architectural Design.”
- 9 Donald Schön, *The Reflective Practitioner: How Professionals Think in Action?* (New York: Basic Books, 1983); *Educating the Reflective Practitioner* (San Francisco: Jossey-Bass, 1990).
- 10 For more on this topic, see Rabah Bousbaci and Alain Findeli, “More Acting and Less Making: A Place for Ethics in Architecture’s Epistemology,” *Design Philosophy Papers* 4 (2005); www.desphilosophy.com/dpp/home.html (accessed April 29, 2007); Alain Findeli and Rabah Bousbaci, “The Eclipse of the Object in Design Project Theories,” *The Design Journal* 8:3 (2005): 35–49.
- 11 Herbert A. Simon, *Models of Man: Social and Rational* (New York: Wiley and Sons, 1957), 241.
- 12 Some insights about this issue are well developed by Aren Kortguzu, “From Function to Emotion: A Critical Essay on the History of Design Arguments,” *The Design Journal* 6:2 (2003): 49–59.
- 13 *Ulm Design*, Herbert Lindinger, ed. (Cambridge, MA: MIT Press, 1991), 11.
- 14 Donald Schön, *The Reflective Practitioner* (1983).
- 15 See especially Chapter 3 in Schön (1983).
- 16 See especially Donald Schön, “Towards a New Epistemology of Practice: A Response to the Crisis of Professional Knowledge” in *Learning and Development: A Global Perspective*, Alan Thomas and Edward W. Ploman, eds. (Toronto: OISE Press, 1986).
- 17 Donald Schön, “Designing as Reflective Conversation with the Materials of a Design Situation,” *Research in Engineering Design* 3:3 (1992): 131–148.
- 18 See Richard Buchanan, “Wicked Problems in Design Thinking” in *The Idea of Design*, Victor Margolin and Richard Buchanan, eds. (Cambridge, MA: The MIT Press, 1995), 12.
- 19 For more about these authors and their concepts, see their texts in Cross (1984).
- 20 Allan Newell and Herbert A. Simon, *Human Problem Solving* (Englewood Cliffs, NJ: Prentice-Hall, 1972).
- 21 “Once again we confront the attempt to turn the incalculable into the calculable. But there can be no ‘solution’ to a state of affairs that never had the structure of a ‘problem’ in the first place” in Wilson C. St John, *Architectural Reflections: Studies in the Philosophy and Practice of Architecture* (Oxford: Butterworth, 1992), 45.
- 22 This section and the next one were adapted (and translated) from Rabah Bousbaci, *Les modèles théoriques de l’architecture: de l’exaltation du faire à la réhabilitation de l’agir dans le bâtir* (Ph.D. thesis, University of Montreal, 2002). This thesis was directed by Professor Alain Findeli.
- 23 Herbert A. Simon, *Administrative Behavior. A Study of Decision-Making Processes in Administrative Organizations* (New York: The Free Press, MacMillan, 2nd edition, 1957). See particularly chapter 4: “Rationality in Administrative Behavior” and chapter 5: “The Psychology of Administrative Decisions,” which represent the heart of this book.
- 24 For more about the behaviorist school of thought’s inability to describe some of the human and animal complex behaviors, see Rowe, *Design Thinking*, 50, and Newell and Simon, *Human Problem Solving* For a more historical overview about this issue, see the chapter entitled “Historical Addendum” in Newell and Simon, *Human Problem Solving*, 873.
- 25 Rowe, *Design Thinking*, 44.
- 26 See Newell and Simon, *Human Problem Solving*, 875.
- 27 *Ibid.*, 53.
- 28 Herbert A. Simon, *Administrative Behavior*, xxiii.
- 29 *Ibid.*, xxiv.
- 30 Herbert A. Simon, *Models of Man, Social and Rational* (New York: Wiley, 1957), 198.
- 31 In *Administrative Behavior*, 80, Simon refers explicitly to Williams James’s *The Principles of Psychology*; to John Dewey’s *Human Nature and Conduct* and to some analysis of E. C. Tolman in *Purposive Behavior in Animals and Men*.
- 32 Newell and Simon, *Human Problem Solving*, 72.

- 33 For more about this model, see Tom Heath's analysis in *Method in Architecture* (Toronto: Wiley, 1984), 126–127.
- 34 Rowe, *Design Thinking*, 51–52.
- 35 Herbert A. Simon, *The Sciences of the Artificial* (Cambridge, MA: The MIT Press, 3rd edition, 1996), 108.
- 36 See Newell and Simon, *Human Problem Solving*, 59.
- 37 Simon *The Sciences of the Artificial*, 111.
- 38 *Ibid.*, 132.
- 39 For more, see Newell and Simon, *Human Problem Solving*, 87; Rowe, *Design Thinking*, 56; and Simon, *The Sciences of the Artificial*, 121 and 128.
- 40 Rowe, *Design Thinking*, 56.
- 41 See footnote 36 in Buchanan, "Wicked Problems in Design Thinking": 14.
- 42 Karl Popper, *Conjectures and Refutations: The Growth of Scientific Knowledge* (London: Routledge and Kegan Paul, 1963). Hillier, Musgrove, and O'Sullivan also borrow from this philosopher's thinking the idea of design *conjecture*. See Hillier, Musgrove, and O'Sullivan in *Developments in Design Methodology*, Nigel Cross, ed.
- 43 For all the references here, I will use the 1984 edition. See Rittel, Horst, and Webber, "Planning Problems Are Wicked Problems" in *Developments in Design Methodology*, Nigel Cross, ed. Originally published as part of "Dilemmas in a General Theory of Planning," *Policy Sciences* 4 (1973).
- 44 Buchanan, "Wicked Problems in Design Thinking," 14.
- 45 Rittel and Webber, "Planning Problems Are Wicked Problems," 137.
- 46 *Ibid.*, 138.
- 47 *Ibid.*, 142.
- 48 *Ibid.*, 139.
- 49 *Ibid.*, 141.
- 50 See the statements of the 2nd and 3rd precepts of Descartes's *Discourse on Method* in section 2.
- 51 See Bryan R. Lawson, "Cognitive Strategies in Architectural Design" in *Developments in Design Methodology*, Nigel Cross, ed.
- 52 Bill Hillier, John Musgrove, and Pat O'Sullivan, "Knowledge and Design" in *Developments in Design Methodology*, Nigel Cross, ed. Originally published in *Environmental Design: Research and Practice*, W. J. Mitchell, ed. (Los Angeles: University of California, 1972).
- 53 For all the references here, I will use the 1984 edition. See Jane Darke, "The Primary Generator and the Design Process" in *Developments in Design Methodology*, Nigel Cross, ed. Originally published in *Design Studies* 1:1 (1979).
- 54 Darke, "The Primary Generator and the Design Process," 180.
- 55 *Ibid.*, 180.
- 56 *Ibid.*
- 57 *Ibid.*, 180–181.
- 58 *Ibid.*, 181.
- 59 *Ibid.*, 187.
- 60 *Ibid.*
- 61 Carolyn R. Miller, "The Rhetoric of Decision Science, or Herbert A. Simon Says" in *The Rhetorical Turn: Invention and Persuasion in the Conduct of Inquiry*, Herbert W. Simons, ed. (Chicago: University of Chicago Press, 1990).
- 62 *Ibid.*, 175–176. On the idea of "practical reason," which means "ethics" in Aristotelian philosophy, see Bousbaci and Findeli, "More Acting and Less Making: A Place for Ethics in Architecture's Epistemology."
- 63 Donald Schön, *Educating the Reflective Practitioner*, 41.