Herbert A. Simon’s *The Sciences of the Artificial* has long been considered a seminal text for design theorists and researchers anxious to establish both a scientific status for design and the most inclusive possible definition for a “designer,” embodied in Simon’s oft-cited “[e]veryone designs who devises courses of action aimed at changing existing situations into preferred ones.” Similar to the earlier Design Methods movement, which defines design as a problem solving, process-oriented activity (rather than primarily concerned with the production of physical artifacts), Simon’s “science of design” was part of his broader project of unifying the social sciences with problem solving as the glue. This article revisits Simon’s ideas about design both to place them in context and to question their ongoing legacy for design researchers. Much contemporary design research, in its pursuit of academic respectability, remains aligned to Simon’s broader project, particularly in its definition of design as “scientific” problem solving. However, the repression of judgment, intuition, experience, and social interaction in Simon’s “logic of design” has had, and continues to have, profound implications for design research and practice.

### Cold War Problem Solving and the Military-Industrial-Academic Complex

Simon’s path to *The Sciences of the Artificial* is worth sketching to contextualize its theoretical framework. Simon’s undergraduate education in the 1930s at the University of Chicago was an important foundation; he studied there with logical positivist philosopher Rudolf Carnap and economist Henry Schultz before he began a doctorate in political science. What was later dubbed the “Chicago School” of political science—led by Charles Merriam, Chair of the Political Science Department—became Simon’s first intellectual home, and it was founded on the idea that scientific method could solve problems of social research. As opposed to a political science based in law or history, Merriam championed a political science that drew on the quantitative practices of natural science, including systematic observation, research labs, and the use of mathematics and statistics. Beyond purely theoretical research, Merriam also...
had a practical agenda, as he revealed in *New Aspects of Politics*: “Have we not reached the time, when it is necessary to adjust and adapt more intelligently, to apply the categories of science to the vastly important forces of social and political control?” The interdisciplinary research culture at the University of Chicago, founded on objectivity and faith in scientific methods, remained central to Simon’s later work. Reflecting on this period, Simon later recalled, the “social sciences, I thought, needed the same kind of rigor and the same mathematical underpinnings that had made the ‘hard’ sciences so brilliantly successful.” He would also continue Merriam’s mission of applying this scientific rigor to social actions and processes, including design.

Prompted by his participation in the Cowles Commission for Research in Economics seminars in the late 1940s, Simon described the excitement of interdisciplinary research in new areas (i.e., management theory, game theory, information theory, cybernetics, and statistical decision theory): “The ideas were all closely intertwined, with decision making at their core, and they quickly generated a scientific culture—an interlocking network of scientists with a real sense of community.” Evangelical in applying scientific methods to new professions, Simon’s initial contributions were in management fields, but he soon worked fluidly across disciplines. In his first book, *Administrative Behavior: A Study of Decision-Making Processes in Administrative Organizations*, published in 1947, Simon developed a framework based on decision making that re-conceptualized the description and analysis of bureaucratic organizations. He also outlined the key theme of his future research in the book’s introduction: the problem of “the process of choice which leads to action.”

Simon’s interest in decision making and management continued after he moved to Carnegie Institute of Technology (later Carnegie Mellon University) in 1949. There, he helped found the new Graduate School of Industrial Administration (GSIA). The GSIA, an institute devoted to interdisciplinary research based on empiricism, mathematical rigor, and behavioral psychology—with decision making at its core—had a major effect on later management education and research. Simon remained at Carnegie Mellon as Professor of Computer Science and Psychology, and, after winning the 1978 Nobel Prize for Economics, he was claimed by both computer scientists and psychologists as “our Nobel prize winner.”

By the 1950s, Simon was well positioned to take full advantage of the wealth of post-war research grants. The research patronage regime that thrived until the mid-1960s included private foundations (e.g., Ford, Carnegie, and Rockefeller Foundations), military institutes (e.g., RAND, the Office of Naval Research, the Air Force Office of Scientific Research, and the Army’s Operations Research Office), and government bodies (e.g., the National Institutes of Health). These foundations and institutes were tightly
interconnected through a handful of key intellectual entrepreneurs or “brokers” who served as program directors and on advisory councils. Historian Hunter Crowther-Heyck argues that “brokers like [Merrill] Flood and Simon helped build a patronage system with a coherent set of goals: specifically, to promote research that was mathematical, behavioral-functional, problem-centered, and interdisciplinary.”

Although various foundations sponsored his research, Simon’s problem-solving research was particularly indebted to his consultancy and collaborations at the RAND Corporation during the 1950s and 1960s.

Established by the Air Force following World War II, Project RAND (Research ANd Development) became the Santa Monica-based RAND Corporation in 1948. During the 1950s and 1960s—an era in which “the Department of Defense (DOD) became the biggest single patron of American science”—RAND was a particularly influential “think tank” that helped define American military strategy during the Cold War, including developing the policy of nuclear deterrence by “Mutually Assured Destruction.” In a convergence described later as the “military-industrial-academic complex,” many American intellectuals provided basic research for the defense industry during the Cold War. By the 1960s, “RAND’s roster of consultants numbered over 500” of America’s brightest intellects, including mathematicians John von Neumann and Albert Wohlstetter, economist Kenneth Arrow, and Simon’s future collaborator, Allen Newell, all attracted to the interdisciplinary research environment free from academic burdens. However, RAND’s research had a specifically military agenda and its problems included “launching and orbiting satellites, using atomic fission in airplane propulsion, maximizing the performance of airplanes, developing titanium and other advanced materials, and evaluating the damaging effects of nuclear bombs.” Research programs were organized under areas of interest for the Air Force, including strategic, tactical weapon and “command and control” systems.

RAND’s initial research foundation included operations research (the systematic study of military operations, such as bombing raids), systems engineering (the management of the design and development of technological systems), systems analysis (the comparison of systems that offered alternative solutions to problems), and system dynamics (the development of comparative system models used in policy making). Initially developed during the war, the new systems approaches provided a holistic vision of the interconnections between subparts of a system and their interfaces, as well as the understanding that a system included mechanical, electrical, and organizational components (e.g., a combination of missile technology and human operators). As for research methods, David Hounshell argues that RAND’s “brand of systems analysis, and its potent mix of mathematicians, logicians, economists, political scientists, and engineers helped to foster a major quantitative


This revolution was founded on a popular perception of the natural sciences’ theoretical (and financial) success and the widespread conviction that scientists, “whatever their field, were people who constructed formal theoretical models and then tested them in controlled experimental situations, preferably with sophisticated equipment.”

Simon was a RAND consultant from 1951 until 1976, and his work on problem solving and digital computing with collaborator Allen Newell was seminal in developing the new field of artificial intelligence. Wedded to the idea that human intelligence could be formally described by logical rules, Simon and his colleagues worked on simulating human information-processing capabilities on a digital computer at RAND’s Systems Research Laboratory. Simon and Newell’s research evolved from chess-playing computer programs in the 1950s to the 1960 General Problem Solver (designed with J. C. Shaw), “which captured in computer language their ideas about ‘means–ends analysis’ as a heuristic of human problem solving.”

The military ideal was ultimately mechanizing control of inventory and production schedules, as well as weaponry, such as guided missiles, anti-aircraft guns, and torpedoes, all of which required increasingly sophisticated decision making.

While at RAND in the 1950s, Simon’s research focus and methods shifted significantly from his earlier focus on decision making in organizations to problem solving specifically “in response to the concrete conditions of the Cold War and the practical goals of the military.” For the military, Simon and Newell’s work on artificial intelligence was appealing because it promised more reliable outcomes than human intelligence: “Artificial intelligence promised to allow the military to automate problem solving in strategic situations. In particular, simulating the mind as a closed system subject to technical manipulation enabled the military to integrate humans into their command and control systems.” In this artificial intelligence model, human intelligence was understood as a critical processing component or decision-maker within a complex system. RAND intellectuals “sought to build a ‘science of warfare,’ whereby the overall performance of the Air Force could be optimized,” both by prioritizing technological approaches and by emphasizing “absolute” solutions to complex problems. Although RAND’s attempt to change military planning “from an intuitive process into a more rigorous science” did not necessarily work in practice for the Air Force, “the rationality of systems analysis was a powerful weapon it [the Air Force] could use in policy debates to procure bigger budgets.”

The critique of the long-dominant Rational Economic Man model, which assumed that man as a decision-maker is capable of infinite information processing power, represented Simon’s contribution to economics, and in that critique, he was indebted to this 1950s problem-solving research. His later Nobel Prize was awarded

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19 Sent, “Herbert A. Simon as a Cyborg Scientist,” 383. Hounsell also argues that Simon’s methods and approaches were shaped by the Cold War context, in Hounshell, “The Cold War, Rand and the Generation of Knowledge, 1946–1962.”
20 Sent, “Herbert A. Simon as a Cyborg Scientist,” 381. This militarized model was challenged from various perspectives, although the best known, centered on the body and its experiences, is Hubert Dreyfus, What Computers Can’t Do: A Critique of Artificial Reason (Evanston, NY: Harper & Row, 1972).
“for his pioneering research into the decision-making process within economic organizations,” stemming from both *Administrative Behavior* and his 1950s articles, such as “A Behavioral Model of Rational Choice,” in which he first challenged the Rational Economic Man model.23 To counter the model, Simon argued that humans do not have the cognitive ability to recognize all possible alternatives and to calculate optimum solutions, so he proposed the ideas of “bounded rationality” and a “Satisficing Man” who makes satisfactory (rather than optimal) choices. Put simply, “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.”25 Simon’s “bounded rationality” thus described decision makers’ limited computational capacities.

In the militarized model of problem solving, the limitations of human processing power could be augmented by the promise of computers with potentially infinite processing power. Despite the turn toward computer processing power, the Satisficing Male at the top of the military or management pyramid still retained the ultimate power—that of determining goals and framing choices.

### From Cooking to Coding: Simon Commandeers Design

Simon’s “science of design,” outlined in his 1968 lecture, “The Science of Design: Creating the Artificial” and subsequently published in *The Sciences of the Artificial*, was a logical extension of his earlier research. One of three lectures in his MIT Karl Taylor Compton lecture series, “The Science of Design” was aimed primarily at an engineering audience and was described by Simon as “a prescription (a design!) for a curriculum in design.”26 Simon had some experience teaching engineering and architectural students at Illinois Institute of Technology in the 1940s and came to believe that, as with other professions, “engineering education needed less vocationalism and more science.”27 In his autobiography, Simon recalled that the architecture students were followers of Mies van der Rohe and Ludwig Hilbersheimer (a fellow Bauhaus alumni who taught city planning): “In this setting I felt less like a teacher than a missionary—one preaching not to tolerant pagans but to true believers of another faith...”28 In 1968, the Compton lectures represented a missionary opportunity for Simon to commandeer the design professions into his ever-expanding problem-solving vision.

At its heart, “The Science of Design” was a call for pedagogical reform. “In terms of the prevailing norms,” Simon argued, “academic respectability calls for subject matter that is intellectually tough, analytic, formalizable, and teachable. In the past, much, if not most, of what we knew about design and about the artificial sciences was intellectually soft, intuitive, informal, and cookbooky.”29 Not surprisingly, Simon proceeded to argue that design education suffers from a failure to engage with “the logic of optimization

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27 Ibid., 257.
28 Ibid., 98.
methods” (here Simon cites his RAND colleagues, such as von Neumann and Arrow), which can be formalized into “a standard mathematical problem.” Simon’s “science of design” thus frames design as a logical search for satisfactory criteria that fulfill a specific goal—and, of course, Simon and Newell’s General Problem Solver (GPS) is proposed as ideal for searching through “a (possibly large) environment in order to discover and assemble sequences of actions that will lead it from a given situation to a desired situation.”

Once design is reduced to problem solving, designers can augment their limited computational capacities by using computer programs to find the optimal solution.

For Simon, artificial intelligence had already started to revolutionize design. The issues in The Sciences of the Artificial were on Simon’s radar at least a decade before, when he offered engineering as an example of a field already using computer programs modeled on human decision-making processes to “design without human intervention.” This technology-driven revolution promised also to change design education.

Programs were designing electrical motors, generators, and transformers as early as 1956 and, by 1961, selecting investment portfolios. Such computer programs destroyed the mystery of intuition and synthesis, for their processes were completely open to examination. We could now understand, in whatever rigorous detail pleased us, just what a design process was. Understanding it, we could teach it, at the same level of rigor that we taught analysis.

Artificial intelligence could thus elevate design to a scientific, research-based practice and provide an “intellectually tough, analytic, formalizable, and teachable” pedagogical foundation.

Simon’s “science of design” is ultimately derived from his broader research aim over the previous two decades: developing an objective, value-neutral, quantifiable and mathematical field of research centered on problem solving. But more narrowly within an engineering educational context, for Simon, “design theory is aimed at broadening the capabilities of computers to aid design, drawing upon the tools of artificial intelligence and operations research.” In an essay on economics also included in The Sciences of the Artificial, Simon tellingly writes, “[o]perations research and artificial intelligence have enhanced the procedural rationality of economic actors, helping them to make better decisions.”

This paternal attitude toward decision-makers—an attitude that can be traced back to Administrative Behavior—is crucial in establishing an important position for professional problem-solvers and their technological aids. For Simon’s broader research agenda, not only are all kinds of professional (and many non-professional) activities essentially problem solving, but in an even more ambitious proposal, he argues that “scientific discovery is a form
of problem solving.” Late in his career, Simon even proposed unifying the disparate strands of literary theory through a cognitive science approach; literary criticism, he argued, was actually problem solving.36

If design, as Simon asserts, is ultimately a problem-solving activity, the “cookbooky” design pedagogy is unnecessary because computer programs can best solve problems. Indeed, Simon argues that “a considerable number of examples of actual design processes ... in the form of running computer programs: optimizing algorithms, search procedures, and special-purpose programs for designing motors, balancing assembly lines” already exist and that “[t]here is no question, since these programs exist, of the design process hiding behind the cloak of ‘judgment’ or ‘experience.’”37

Derived from his earlier problem-solving research, Simon’s design process operates within a closed, abstract system that is controlled and manipulated by a professional problem-solver and free from human judgment and experience. This model requires defining all aspects of the design process in terms of quantifiable, codifiable information and the designer as a type of expert computer coder. In an oft-cited 1973 paper that might have complicated this model, “The Structure of Ill-Structured Problems,” Simon suggests some design problems may be “ill-structured” and not immediately solvable. However, he proceeds to argue that although the General Problem Solver is not suitable for a complex architectural design project that is “ill-structured,” the whole can be broken down into “well-structured” sub-problems solvable by the program.38

For design research and education, Simon’s “science of design”—with its focus on problem solving—remains appealing as an opposing model to a “crafts”-oriented image of the designer. Freed from the system of master artisans and apprentices derived from the Bauhaus (and earlier manifestations), both design research and education, following Simon’s “scientific” lead, could legitimately enter the academic research system of the post-war university. This shift from studio practice to laboratory research entails a new subculture of scientific practices—training regimes, conceptual schemes embodied in research practices, and disciplinary training—to fashion the new designer (ironically modelled on a new apprenticeship system under an expert research scientist).39 Inherent in this shift is a negation of problem solving as a creative process (creativity is relegated to the realm of the crafts-person/artist); for Simon, “solving a problem simply means representing it so as to make the solution transparent.”40 With its rigor and appeal to universality, Simon’s logic of optimization promised knowledge that could be clearly and efficiently communicated, data that was free from the subjectivity of intuition, experience, and judgment. For design researchers, the “science of design” could potentially become “design as science.”


37 In a special issue of Stanford Humanities Review titled, “Bridging the Gap: Where Cognitive Science Meets Literary Criticism,” Simon’s paper does not engage with existing literary theory, except to dismiss it, and states that cognitive science can provide a new foundation. His monolithic vision of cognitive science is presented as a unified paradigm able to read poetry, for example, as a computer program. See Herbert Simon, “Literary Criticism: A Cognitive Approach,” Stanford Humanities Review 4, no. 1 (Spring 1995): 1–26.

38 Simon, The Sciences of the Artificial, 135.


41 Simon, The Sciences of the Artificial, 132.
The “Science of Design” in the 1960s

For later design researchers, Simon’s “science of design” was aligned with the roughly contemporaneous Design Methods movement—particularly the latter’s foundations in systems analysis, quantitative methods, and use of computers to aid the design process. From the 1950s, based at Germany’s Hochschule für Gestaltung (HfG Ulm), Horst Rittel began applying ideas from cybernetics and operational research to design before moving to Berkeley in 1963 to help found the Design Methods Group and journal. In England, L. Bruce Archer’s establishment of the Design Research Unit, at London’s Royal College of Art in 1964, followed by a series of conferences and the foundation of the Design Research Society in 1966, were further attempts to apply scientific methods to design. Christopher Alexander’s paper, “The Determination of Components for an Indian Village,” delivered at the Conference on Systematic and Intuitive Methods in Engineering, Industrial Design, Architecture and Communications in 1962, serves as a good example of this early design research. In it, Alexander describes his use of mathematical methods and an IBM 7090 computer to design an Indian village for 600 people. Each specific need of the villagers—from religious rituals to social divisions, family structures, leisure, agriculture, animal husbandry, employment, water, transportation, education, health, economics, and relation to local and national developments—was given a number. As numerical values, the villager’s needs were then connected as a set of interactions—“a complete structural description of the functional environment which contains the village and calls it into being. The beauty of this description is that we can now give it a mathematical interpretation, compatible with the real world facts, though nonetheless artificial....”

However, initial attempts by designers, engineers, and architects, such as Alexander to establish scientific design methods in the 1960s were largely abandoned by the time of Simon’s lectures, and designers associated with the Design Methods movement had already noted the limitations of mathematical logic in solving design problems. Although Alexander is still quoted today as an advocate of design as a systematic, problem-solving activity, by 1984, he had already “recanted” in a famous interview, arguing that while computers have helped solve some mundane problems, “[m]ost of the difficulties of design are not of the computable sort.” Simon’s *Sciences of the Artificial*, in both its first and subsequent editions, ignores the Design Methods movement and early design research such as Alexander’s, which had already tried and abandoned his rigorous problem-solving approach. In a paper roughly contemporaneous with the publication of *The Sciences of the Artificial*, Rittel and Melvin Weber proposed an alternative model of the design process based on “wicked” problems. Contrasting scientists’ problems as “tame,” planning or social problems are

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43 Bruce Archer, for example, made this point in “Systematic Method for Designers” in *Developments in Design Methodology*, 57–82. Archer’s essay was originally published in 1965.

44 Horst Rittel, interview by Donald P. Grant and Jean-Pierre Protzen, “Second Generation Design Methods,” in *Developments in Design Methodology*, 312.
“wicked,” they argued, and “rely upon elusive political judgment for resolution.” 46 Contrary to the logic of Simon’s military systems approach, no consistent, universal process can be followed, and problems are ultimately resolved rather than solved.

Acknowledging the social foundations of any design process, Rittel later called for “the understanding of designing as an argumentative process”—one in which judgment is crucial. Contrary to the assumed neutrality and objectivity of Simon’s problem solving, Rittel argued that all types of “planning are necessarily political, and not merely technical.” 47 That is, the designer as problem solver in Rittel’s model acknowledges the social and political agency of various stakeholders involved in the process. In contrast, Simon’s “science of design” is founded on a technocratic model of problem solving. “For Simon,” argues Frank Fischer, “the key to design lies in translating substantive decisions about goals and values into technical decisions about efficiency.” 48 Rooted in Administrative Behavior and his subsequent military and organizational research, Simon’s technocratic vision of design comprises a hierarchical chain of technical decisions directed by management at the top. Hiding behind a cloak of logical “optimization methods,” Simon’s “science of design” represented a potentially more efficient means of social and political control.

This point was not lost on Tomás Maldonado, who, in the context of the social and political unrest of the late 1960s, situated the “systems designers,” or the “New Utopians” who proclaimed the supposed “ideological neutrality” of their models, firmly within the repressive political establishment. 49 More recently, Victor Margolin also situates Simon’s “science of design” within the context of a 1960s counter-culture in which intellectuals such as Herbert Marcuse were beginning to question America’s military-industrial complex. 50 Both Maldonado’s and Marcuse’s critique of “technological rationality,” expose Simon’s model of design as problem solving, based on the assumption that the mind is a disembodied information processor unaffected by particular cultural or historical discourses, as anything but value-neutral. Freed of situated bodies, Simon’s “science of design” failed to engage with designing as a fundamentally social, political, cultural, and embodied activity.

Interestingly, outside the design research world, an entirely different perspective on Simon’s “science of design” emerged—one in which The Sciences of the Artificial was received quite differently. George A. Miller, for example, described the book as another chapter in Simon’s “pioneering contributions to cognitive psychology” and a visionary account of the field of “artificial intelligence.” 51 Falling between Simon’s 1960s papers, including “Motivational and Emotional Controls of Cognition,” and the monograph Human Problem Solving, co-authored by Allen Newell, this perspective makes sense. 52 Professional design, engineering, and architecture do

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47 Ibid., 326.
not appear in Simon’s later collections of papers (such as Models of Thought) and receive only fleeting interest after The Sciences of the Artificial. In the context of his complete oeuvre, Simon’s “science of design” can be seen as a brief engagement with engineering educational reform on the one hand and an extension of his problem-solving research and grand unification project for the social sciences on the other.

Simon’s Legacy in Design Research
Simon remains a venerated figure in design research circles, although the influence of The Sciences of the Artificial appears to be dissipating. In 2006, Kees Dorst argued that Simon’s “conceptual framework,” based on rational problem solving, “is still a dominant paradigm in the field.” In addition, a 2010 literature review found that Simon’s Sciences of the Artificial is still a dominant citation across the research fields of information systems, management, design, and engineering. Although Rittel and Weber’s “wicked problems” presented an alternative and popular characterization of design as a social and political problem-solving activity, other alternatives have emerged since. Simon’s “rational problem solving” model of the design process, for example, is often juxtaposed with Donald Schön’s “reflection-in-practice” (as outlined in The Reflective Practitioner), a model that allows for both professional expertise and intuition.

Judgment, another characteristic of design practice expelled in Simon’s “science of design,” has been recently rehabilitated as a sophisticated and complex (yet still subjective and elusive) practice by Harold Nelson and Erik Stolterman as “design judgment.” Including aesthetic and ethical considerations, they argue that design judgment is “a full and equal partner in any intellectual pursuit in design, on par with rational decision making.” In an ironic twist, even as digital technologies have become ever more ubiquitous since Simon’s original lectures, the interest in the roles of intuition, experience, and judgment in design practice has increased rather than declined.

However, the appeal of Simon’s rigorous “science of design” was part of a broader social scientific project “oriented more to the principles of prediction and control of behavior rather than to the values of human dignity, critical reflection, and democratic participation.” This promise of greater control has proven popular in recent characterizations of design thinking closely aligned to management. The logic of optimization promises greater predictability and profit while rigorously stripping judgment, intuition, and experience from systems and service design. Here, Simon’s “science of design” is remarkably similar to what sociologist George Ritzer characterized as “McDonaldization”—a model that “emphasizes efficiency, predictability, calculability, substitution of non-human for human technology, and control of uncertainty.” Not coincidentally, in his introduction to The Design of Business: Why Design...
Thinking Is the Next Competitive Advantage, Roger Martin describes Ray Kroc’s changes to the McDonald brothers’ original fast food service system:

Kroc saw that the Speedee Service System, innovative as it was, left too much to chance and judgment. He refined it meticulously, pursuing a vision of a perfectly standardized operation. He simplified the McDonald’s system down to an exact science, with a rigid set of rules that spelled out exactly how long to cook a hamburger, exactly how to hire people, exactly how to choose locations, exactly how to manage stores, and exactly how to franchise them.... In every phase of McDonald’s operations, judgment was removed, possibilities were removed, and variety was removed. Kroc relentlessly stripped away uncertainty, ambiguity, and judgment from the processes that emerged from the McDonald brothers’ original insight.61

Martin’s glowing assessment of Kroc’s method as an introduction to “design thinking” suggests the continuity and ongoing appeal of Simon’s “logic of optimization” in a contemporary business context as “innovation.”

To be fair, even within what was a dehumanizing approach, Simon left a small opening in his original “Science of Design” paper for social involvement and creativity. “Perhaps we should think of city planning,” he wrote, “as a valuable creative activity in which many members of a community can have the opportunity of participating—if we have the wits to organize the process that way.”62 This alternate vision of a potentially participatory design process was further developed in Simon’s later “Social Planning: Designing the Evolving Artifact,” a lecture delivered in 1980 and published in the second edition of The Sciences of the Artificial. While Simon evidently believed computer programs could handle engineering, industrial design, or architectural problems, he envisaged social planning as different. Extending his earlier management research, Simon acknowledged the possibility of “designing without final goals” because, in the dynamic social realm, changing situations over time create new goals. Simon’s social planning ideally aimed “to leave the next generation of decision makers with a better body of knowledge and a greater capacity for experience. The aim here is to enable them not just to evaluate alternatives better but especially to experience the world in more and richer ways.”63 Unlike the engineering designers and architects of “The Science of Design,” social planners require both judgment and experience because final goals are ultimately limited by the future’s unknowability.

Reflecting on this social dimension to Simon’s revised “science of design,” John Carroll, in “Social Planning: Designing the Evolving Artifact,” generously suggested that Simon may have

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63 Ibid., 163–64.
been sympathetic to the ideals of participatory design as it developed in the 1970s. However, even here, Carroll identified “Simon’s tendency to see relationships in terms of the underlying logic, but not the social dynamics.”

Carroll rightly sees the issue of communication as crucial to design processes, arguing that “[c]ommunicating directly with actors in order to understand their experience of their environments and their needs for new designs is not simple.”

The active involvement of clients and users in the design process is certainly absent from Simon’s earlier “science of design.”

More recently, Armand Hatchuel has tried to develop Simon’s “bounded rationality” further into an “expandable rationality” that might involve greater social interaction. He argues that Simon’s attempt to develop a formal design theory was unfinished, noting “Simon’s limited interest for the construction of social interaction, which is a key resource of design processes.” Highlighting the limitations of Simon’s problem-solving model, Hatchuel argues that “human agents are limited decision makers but ‘good’ natural designers (including social interaction as a design area).”

The limits of Simon’s “science of design” are also highlighted in Rabah Bousbaci’s overview of Simon’s “bounded rationality.” Among the later critics of Simon, Bousbaci first examines Carolyn R. Miller’s “rhetorical” perspective, in which she argues that problems of action are “essentially contestable.” Like Rittel’s, Miller’s perspective frames design as a form of interaction that always implies some kind of negotiation between people involved in the process. Then, adding to this essentially political dimension of design, Bousbaci concludes that “what really bounds rationality in human action is nothing more than all the other parts which comprise [sic] the human existence as a whole: poetics, rhetoric, hermeneutics, and ethics; because, when humans act, they act as whole humans.”

The issue of ethics is particularly critical here, and the interest in user-centered design, participatory design, and other variations on co-design since Simon’s Sciences of the Artificial confirms a shift away from his technocratic designer ideal to an acknowledgement of design’s ethical foundation. Design theorists, such as Clive Dilnot and Tony Fry, have recently extended this ethical foundation to include not only relations between designers, clients, and stakeholders, but also an understanding of sustainability as “embodied in practices and things.”

What is inescapable in all of these critiques of Simon’s “science of design” is the issue that remains when devising “courses of action aimed at changing existing situations into preferred ones”: Who determines the “courses of action” and whose “preferred situations” are we to design?

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65 Ibid., 17.
68 Ibid., 9.
71 Bousbaci, “‘Models of Man’ in Design Thinking,” 50.