

An Innovation Perspective on Design: Part 2

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Introduction

This paper examines critical new challenges in design thinking and innovation studies,¹ building on the innovation perspective on design discussed in Part 1 of this article.² Here, we argue that the design/design thinking field and innovation studies can learn from each other in interesting ways. For its part, innovation studies could benefit from understanding the range of different design processes, approaches, and categories that contribute to industrial development and economic growth, as well as to strategic advantages for individual firms. From a theoretical standpoint, innovation scholars would gain from fully conceptualizing design and its role in business, the economy, and the wider society, and from incorporating design into successive generations of the innovation theories and models now common in innovation research.

Emerging empirical evidence in innovation studies shows that design is a driver of innovation and productivity in the United Kingdom, and probably in all advanced economies.³ The methods and measurement techniques used in innovation could address the contribution of design in much more detail and reveal the ways in which design creates value across the industrial and service sectors. Theoretically, we argue in the paper, design and innovation studies together could offer a convincing alternative to the traditional view of the firm as a rational, machine-like entity by drawing on the social and creative character of businesses revealed in design thinking.

In Section 1, we assess the antecedents to modern design thinking and the interpretation of design as a general problem-solving activity. We show why design should be viewed not simply as problem-solving but more importantly as a knowledge generation and integration activity. In Section 2, we illustrate the indeterminate nature of design, elaborating on the unique, complex, and “wicked” nature of design challenges. From the innovation field, we also show the importance of understanding the subjective character of “capability” in meeting design challenges, emphasizing the importance of human knowledge, skills, experience, and capacity for learning. Section 3 examines some of the ideas and insights from leading American scholars concerned with design appreciation,

- 1 In a recent conference at Weatherhead School of Management (June 2010), key speakers (e.g., Buchanan and Collopy) criticized the term design “thinking” as too centered (by implication) on rational, left/logical brain activity. Design “sensing” was offered as one possible alternative. The two terms are used here interchangeably, along with design appreciation.
- 2 M. Hobday, A. Boddington, and A. Grantham, “An Innovation Perspective on Design: Part 1,” *Design Issues* 27:4 (Summer 2011), 5-15.
- 3 NESTA, *The Innovation Index: Measuring the UK's Investment in Innovation and Its Effects* (London: National Endowment for Science, Technology and the Arts, 2009).

while Section 4 tries to relate modern design sensing to the broader context of human-centered approaches to management. Finally, we conclude by suggesting some of the benefits that could arise from a more integrated design/innovation approach that combines insights and methods from both areas.

Section 1: From Design to Design Thinking: Antecedents to Design Thinking

The interpretation of design as a general problem-solving activity has a long-standing tradition, rooted in ideas from social planning theorists—notably Horst Rittel, who formulated the notion of “wicked problems.”⁴ Wicked problems are seemingly intractable, knotted clusters of interdependent problems or challenges, occurring under conditions of uncertainty and having multiple potential solutions. Conklin recently applied issue-based information systems to wicked problems in design through the application of collaborative, social information and communication technologies.⁵ Similarly, Armand Hatchuel takes Herbert Simon’s work on design science and bounded rationality as a starting point for approaching wicked problems, and from there proposes a new, contemporary appreciation for design—not as a rational problem-solving activity, but as a socially based, solutions-generating process that is capable of offering the means to address a wide range of wicked problems and challenges.⁶

Building on the work of Rittel, Conklin argues that we are in transition from an age of science to an age of design. He proposes that the past two centuries were predominantly scientifically driven, focused on explaining the natural world through science and then transforming it by inventing and harnessing technologies. The goal of management science was to predict and control the future, using facts and problem-solving techniques as the primary means to achieving these goals. The problems to be solved, although complicated, were not in the “wicked” category; instead, they were relatively tame and self-contained, and external conditions were comparatively stable.

While Conklin’s arguments concerning an age of design are attractive to many of us living in today’s fast-moving, high-tech world, the likelihood is that wicked problems have always existed and that, today, we merely confront a new generation of wicked problems. In fact, wicked problems exist in relation to the capabilities (i.e., the accumulated skill, experience, and knowledge) of the engineers, designers, planners, and other professionals confronting such problems. The earlier problems that seem relatively simplistic by current standards might well have appeared equally as daunting to the pioneering designers of past centuries as the design problems facing engineers, designers, and planners of today.⁷

4 H. W. Rittel and M. M. Webber, “Dilemmas in General Theory of Planning,” *Policy Sciences* 4:2 (1973), 155-69.

5 J. Conklin, *Dialogue Mapping: Building Shared Understanding of Wicked Problems* (London: Wiley, 2005).

6 A. Hatchuel, “Towards Design Theory and Expandable Rationality: the Unfinished Programme of Herbert Simon,” *Journal of Management and Governance* 5:3-4 (2002), 260-73.

7 We return to the issue of design capability in more detail in Section 2.

Indeed, successive generations often think they exist under special conditions of turbulence and dramatic change beyond those of previous generations. For example, consider Karl Marx's description of the industrial and social changes he saw:

constant revolution of production, uninterrupted disturbance of all social conditions, everlasting uncertainty and agitation ... All fixed, fast frozen relations ... and opinions are swept away, all new formed ones become antiquated before they can ossify ... The need of a constantly expanding markets for its products ... over the whole surface of the globe ... All old-established national industries have been destroyed or are daily being destroyed. They are dislodged by new industries, whose introduction becomes a life and death question for all civilised nations ... so also in intellectual production. The intellectual creations of individual nations become common property ... and from numerous national and local literatures, there arises a world literature.⁸

Similarly, a century later, Joseph Schumpeter, the grandfather of innovation studies, developed the concept of creative destruction to describe what he saw as:

... a process of qualitative change ... of revolutions ... of industrial mutation ... that incessantly revolutionizes the economic structure *from within*, incessantly destroying the old one, incessantly creating a new one.⁹

Schumpeter stressed the creative role of the entrepreneur in generating new products and technologies as well as entire business sectors:

It is not that kind of competition [price competition] which counts but the competition from the new commodity, the new technology, the new source of supply, the new type of organization ... – competition which commands a decisive cost or quality advantage and which strikes not at the margins of the profits and the outputs of the existing firms but at their foundations and their very lives.¹⁰

Despite his potential underestimation of previous challenges, Conklin's modern observation nevertheless has merit. As he argues, today's wicked problems cannot be solved using scientific facts, description, prediction, or control alone. Today's wicked problems undoubtedly require the creation and development of shared narratives and new social meanings to mobilize the capabilities for developing solutions to the specific challenges of the day.

Hatchuel reaches similar conclusions to those of Conklin.¹¹ Working through Herbert Simon's notions of design science and heuristics, Hatchuel shows how Simon's ideas are limited because

8 K. Marx and F. Engels, *The Communist Manifesto* (Middlesex: Penguin Books, 1967), 83.

9 J. A. Schumpeter, *Capitalism, Socialism, and Democracy* (London: George Allen & Unwin Ltd., 1943). Cited in A. Bergek, C. Berggren, and T. Magnusson, "Creative Accumulation: Integrating New and Established Technologies in Periods of Discontinuous Change," *Working paper: Knowledge Integration and Innovation in Transnational Enterprise Research Group*, Linköping University, Sweden: Department of Management and Engineering (2010), 3.

10 Ibid.

11 Conklin, *Wicked Problems*.

they are rooted in problem-solving and bounded rationality. He proposes a new term, “expandable rationality,” to describe the design process, using a paradigm of design that can provide solutions to Rittel’s wicked problems. Like Conklin and others, Hatchuel identifies the importance of collective social interaction, arguing that we need to appreciate the social dynamics of the design process as an essential part of design itself.

Also like Conklin, Hatchuel argues for the need to create learning devices (e.g., prototypes) as a means to understand and test possible solutions to complex or wicked problems. Hatchuel proposes a wider application of design theories, recognizing their relevance to economics, innovation, and organizational theory. Building on Simon’s initial critique of growth through optimization and perfect choice theory, Hatchuel suggests that design should not be viewed simply as a problem-solving activity but also as a knowledge generation and integration activity. Economic growth and the expansion of wealth rely in part on the design and creation of new spaces for technological possibility. These spaces, in turn, require the human ability to design and create stories, forms, and concepts that underpin business and wider economic innovation.

Section 2: The Indeterminacy of Design Challenges

In a landmark article, Buchanan develops a critique of Simon’s rational problem-solving approach to design.¹² Based on further elaboration of Rittel’s wicked problems, Buchanan shows how design challenges are unique and complex and have multiple possible solutions. They are therefore indeterminate in nature and rarely, if ever, have a single solution, as in the case of trivial or routine problems. As an approach to wicked problems, Buchanan argues that design has “no special subject matter of its own, apart from what a designer conceives it to be. The subject matter of design is potentially *universal* in scope, because design thinking may be applied to any area of human experience.”¹³ [original italics]. In this statement, Buchanan justifies the claim that the new field of design thinking can be applied not only to business management, but also to all other complex, indeterminate social and economic challenges.

One problem with the discourse being described is that it tends to imbue “the wicked problem” and, with it, the “solution” with an overly objective character. All design challenges, and the projects in which they are addressed, have an equally important *subjective* dimension. For example, if Business A faces a wicked problem but has carried out a dozen similar wicked projects before, then it is not as wicked a problem as the exact same problem facing Business B, which is new to this class of problem. Therefore, the exact same “problem” might be more or less wicked, depending on the capability (i.e., the experience, knowledge, and skill) of the observer. In fact, Business A, despite its greater experience in certain projects, might find a different class of relatively simple projects very

12 R. Buchanan, “Wicked Problems in Design Thinking,” *Design Issues* 8:2 (1992), 5-21.

13 *Ibid.*, 16.

“wicked” because of its lack of experience in that kind of project. Business A might also find that its capability turns out to be a handicap or incompetence when it faces a new class of problem but is locked into a particular way of working—a phenomenon called core rigidity in the innovation literature.¹⁴

This subjective notion of “capability” implies the need to examine the subject (e.g., the designer or design team) in relation to the object (i.e., the challenge at hand). In discussing a design challenge, we *always* need to consider the human knowledge, skills, experience, and *capacity for learning* to know whether, and to what extent, a problem is wicked in the first place. The object cannot be divorced from the subject. Therefore, we need to recognize and develop the notion of design capability as an important dimension of design and design thinking.

What is meant by the term “design thinking” has been understood in a number of different ways. For example, Rowe conceptualizes design thinking in terms of socially and geographically contextualized decision-making.¹⁵ Martin, in contrast, characterizes design thinking as an “... unwavering focus on creative designs of systems ...” for both innovation and efficiency.¹⁶ For Brown, design thinking is a model that allows firms to integrate design into their core activities as a spur to innovation.¹⁷ He reflects recent work on design thinking in management studies that seeks to elevate design and the skills of designers to a core strategic function in the management of the firm, rather than seeing them as a technical task or discipline.

Various tools from design are offered as valuable instruments for generating solutions. From architecture, such tools include various forms of visualization, including drawings, sketches, computer graphics, and prototypes; from new product design, companies like IDEO (a design consultancy) and Frog Design propose creative processes that include “un-focus” groups and ethnographic techniques.¹⁸

Whether the promises of design thinking can be fulfilled is still up for debate. For example, Jahnke is sceptical about design thinking as a workable innovation model for firms, arguing that design is chronically under-researched and poorly understood as a business function.¹⁹ Although IDEO is often put forward as an exemplar, Jahnke argues that “[t]hese accounts are fairly superficial and do not in any detail describe experiences from the process of implementing design thinking. To add to this lack of knowledge, few, if any, empirical academic studies have as yet sought to understand the implications of applying design thinking as a model for innovation.”²⁰

14 D. Leonard-Barton, “Core Capabilities and Core Rigidities: a Paradox in Managing New Product Development,” *Strategic Management Journal* 13:S1 (1992), 111-25.

15 P. G. Rowe, *Design Thinking* (Cambridge: MIT Press, 1987).

16 R. L. Martin, *The Design of Business: Why Design Thinking Is the Next Competitive Advantage* (Boston: Harvard Business Press, 2009), 7.

17 T. Brown, “Design Thinking,” *Harvard Business Review* 86:6 (2008), 84-92; T. Brown, *Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation* (New York: Harper Business, 2009).

18 Brown, “Design Thinking,” H. Esslinger, *A Fine Line: How Design Strategies are Shaping the Future of Business* (San Francisco: Jossey-Bass, 2009).

19 M. Jahnke, *Innovation Through Design Thinking: An Experimental Study of the Implementation of Design Thinking in Non-designerly Firms: Report for the Doctoral Education Seminar on 25% Level* (Gothenburg: HDK, School of Design and Crafts, Business & Design Lab, The Faculty of Fine, Applied and Performing Arts, University of Gothenburg, 2009).

20 *Ibid.*, 5.

Section 3: The Design Thinking School

Design thinking or design sensing ideas are most deeply explored by American scholars, including Buchanan, Boland, and Collopy of the Weatherhead School of Management. Similarly, Yoo et al. make the distinction between organization design as a noun, and organizational designing as a verb; the latter, they say, is an action undertaken by a person or a group according to their vision, culture, and purpose.²¹ They use the term design “Gestalt” to capture the approach, or organizing pattern, of the renowned architect Frank O. Gehry and his practice, Gehry Partners. Yoo et al. argue that this Gestalt is made up not only of a vision but also of multiple representation technologies and a strong commitment to a user-engaged, collaborative process of design and construction. This process of organization designing, they argue, is becoming more important as the experiential- and knowledge-based parts of the economy expand.

Collopy captures the spirit of design thinking/sensing through the traditional caricature of the left brain (logical/analytical) versus right brain (creative/imaginative) distinctions.²² He argues that managers need to engage both sides of their brains to function well. Modern management and management education have evolved with a strong left/logical emphasis, using process models, objectives, data, decision-making procedures, management by measurement, and other such tools. More attention needs to be given to empathy, emotion, perception, and imagination in management, especially when facing complex, fast moving, uncertain, and difficult challenges. As Collopy contends, designers and design thinkers are arguing for a massive improvement in our understanding of how to apply “the right-hand side” to management. The ultimate goal is a holistic, integrated “left-right” approach. In the meantime, this movement requires a huge rebalancing effort in favor of the right-hand design side.

Collopy builds on previous work with Boland, in which they argue in favor of a “design attitude” to management, contrasting this approach with the conventional “decision attitude” to problem-solving.²³ They show how management education and practice have relied far too heavily on a narrow, limited, and technically rational approach that has left little room for the imagination and creativity. Typically, a manager is portrayed as an individual who faces a set of decision alternatives and has to make an optimum choice. In contrast, a design attitude assumes that the main challenge is to generate and develop alternative solutions from which to choose. In the design view, the choice is a relatively trivial exercise. From a business and financial perspective, it makes much more sense to expand the range of options so that the “wrong” choice (from currently available decision alternatives) can be avoided and all the benefits of a broader set of well-informed choices on a key area

21 Y. Yoo, R. J. Boland, and K. Lyytinen, “From Organization Design to Organization Designing,” *Organization Science* 17:2 (2006), 215-29.

22 F. Collopy, *Firing on All Eight Cylinders, Position Statement for the “Convergence: Managing and Designing” Conference* (Cleveland, Weatherhead School of Management, June 17-19, 2010).

23 R. J. Boland and F. Collopy, “Design Matters for Management,” in *Managing as Designing*, eds. R. J. Boland and F. Collopy (Stanford, Stanford Business Books, 2004).

(e.g., new product, process innovation, business strategy, or organizational structure) can be considered. They argue that the decision attitude only really applies in a clearly defined, stable environment, where all the main alternatives are well-known. However, in the most challenging areas—strategy, innovation, new market creation, people management, and leadership—stability and boundaries are not the norm. And when alternatives are unknown, a design attitude is required. In historical terms, the scientific basis of modern management needs to be replaced or at least rebalanced in favor of a creative, design-based approach to management according to Collopy.

Taking this further, Lucy Kimbell argues much of the design thinking discourse focuses on what managers do or should do, in terms of both individual and group action.²⁴ Kimbell, in contrast, draws on theories of organizational practice to provide a new conceptual approach that situates design, designers, and their collaborators—especially clients and users—within the larger organizational context. Kimbell offers two concepts that enable us to better understand design: first, using the verb, “design-as-practice” (rather like Yoo et al., as well as Mintzberg’s “strategy as practice”),²⁵ Kimbell encourages the examination of “what designers do”—what goes on (as far as we can know) in their minds and in their shared, embodied, and situated routines, as well as in their relationships with the artifacts they use, make, and work with; second, she uses the noun, “designs-in-practice,” which stresses the emergent nature of design outcomes and the particular outputs of designers, including blueprints, models, specifications, visual representations, and final products (recognizing also that the “final” may well continue to be redesigned by the user after delivery). Kimbell applies this conceptual approach to an example of service design, showing the usefulness of viewing design in the context of actual practice.

In articulating these concepts, Kimbell draws on the earlier work of management psychologists and theoreticians of practice— notably, Schön and Weick, who have much to offer the field of design sensing because they go beyond the “rational vs. non-rational” debate. They open up the black box of the process of designing and look at what is actually designed.²⁶ Further research along these lines could help provide insight on the tools and processes used by designers that relate to the wider world of management.

From the perspective of organizational psychology, Weick notes that “[d]esign is usually portrayed as a forethought that leads to an intention.”²⁷ However, he argues, “beginnings are rare, middles are common. People, whether designers or clients, are always in the middle of something, which means that designing is as much about re-design, interruption, resumption, continuity,

24 L. Kimbell, *Design Practices in Design Thinking*, Mimeo (Oxford: Said Business School, 2010).

25 H. Mintzberg, “Crafting Strategy,” *Harvard Business Review* 65:4 (1987), 66-75; Kimbell, *Design Practices in Design Thinking*, 12-3.

26 D. A. Schön, *The Reflective Practitioner: How Professionals Think in Action* (London: Basic Books Inc., 1983); D. A. Schön, “Designing: Rules, Types and Worlds,” in *Managing as Designing*, eds. R. J. Boland and F. Collopy (Stanford, Stanford Business Books, 2004); K. E. Weick, “Rethinking Organizational Design,” in *Managing as Designing*; K. E. Weick, “Designing for Thrownness,” in *Managing as Designing*.

27 Weick, “Designing for Thrownness,” 74.

and re-contextualising, as it is about design, creation, invention, initiation, and contextualising.” Weick uses the idea of “thrownness” to capture this idea of the practice of re-design, indicating that designing is seldom, if ever, a “blank sheet” activity.

Section 4: Situating Design Thinking Within Management Studies

These intriguing new formulations of design do not yet tell us how design thinking differs as a management approach from other human-centered approaches to management. Of the many who have studied the differences, we can begin with Mary Parker Follett, who rejected the scientific management ideas of Frederick W. Taylor because she saw firms as social groups rather than simply as economic units.²⁸ Chester Barnard, later, developed the idea of informal organizations and processes as central to all forms of business activity.²⁹ Other more recent human-centered approaches are those of Goleman, on emotional intelligence and its advantages over analytical intelligence, Mintzberg, who views strategy as an emergent craft, and Checkland, working on “soft systems.”³⁰

In fact, the human, “soft” side of management has a tradition, probably as long as management itself, which means that we need to fully understand the distinctiveness of the design approach and to appreciate it within a comparative context so that we can identify clearly what design thinking brings to the table that other human-centered approaches do not. So far, this distinctiveness is not clear from the literature. Presumably, the different domains of design bring different insights and approaches. Within each domain, we need to understand the advantages and disadvantages of the different approaches, methodologies, tools, processes, assumptions, concepts, and bodies of knowledge. There likely is not one single “design thinking” toolkit for managers. In general, we need to know much more also about the skills and know-how that designers apply to their challenges and which ones can and cannot be transposed into different domains.

Leading proponents of design thinking (e.g., Buchanan, Conklin, and Hatchuel) argue that it potentially applies not only to management but also to other arenas of creative human activity where wicked problems are confronted. These arenas include public policy, education, health care, research, politics, and social and economic development, among others. In the case of solving wider social problems, including the planning of new environmentally sustainable cities, evidence already suggests that creative design thinking has a great deal to offer, not only in developed but also in developing countries.³¹ This observation again raises the issue of design capability and capability gaps. Not all countries and cultures encourage the development of capabilities in design. Given inequities, how can less developed but potentially capable

28 F. W. Taylor, *Principles and Methods of Scientific Management* (New York: Harper and Row, 1911); M. P. Follett, *The New State* (London: Longmans, 1918).

29 C. I. Barnard, *The Functions of the Executive* (Cambridge: Harvard Business Press, 1938).

30 D. Goleman, *Working with Emotional Intelligence* (London: Bloomsbury, 1998); H. Mintzberg, “Crafting Strategy,” P. Checkland, *Systems Thinking, Systems Practice* (Chichester: John Wiley, 1981).

31 S. Burnham, *Finding the Truth in Systems: In Praise of Design-Hacking* (London: Royal Society for the Arts, 2009).

32 V. Margolin, “Design, the Future and the Human Spirit,” *Design Issues* 23:3 (Summer 2007), 4-15.

- 33 For the role of design and designers in shaping the future, see also L. Kimbell, "Manifesto for the M(B)A in Designing Better Futures," in *The Handbook of Design Management*, eds. R. Cooper, S. Junginger, and T. Lockwood (Oxford: Berg, 2011).
- 34 C. Lindblom, "The Science of 'Muddling Through,'" *Public Administration Review* 19:2 (1959), 79-88. Lindblom's insights were later developed into "Logical Incrementalism" by Quinn (J. B. Quinn, *Strategies for Change: Logical Incrementalism* (Homewood, Irwin, 1980).
- 35 B. Klein, and W. Meckling, "Application of Operations Research to Development Decisions," *Operations Research* 6:3 (1958), 352-63; T. A. Marschak, "Strategy and Organization in a System Development Project," in *The Rate and Direction of Inventive Activity: Economic and Social Factors*, Conference of the Universities-National Bureau Committee for Economic Research and the Committee of the Social Science Research Council (Princeton, NJ: Princeton University Press, 1962); B. H. Klein, "The Decision Making Problem in Development," in *The Rate and Direction of Inventive Activity: Economic and Social Factors*, Conference of the Universities-National Bureau Committee for Economic Research and the Committee of the Social Science Research Council (Princeton NJ: Princeton University Press, 1962).
- 36 Mintzberg's use of the term "craft" rather than design also raises the issue of the gap/distance between design as "planning" of the new artifact, and the actual realization of it, via craft. Where does design end and craft/engineering implementation begin? Craft is presumably defined differently from design (and is not a subset of it) but has been shown to be a valuable concept in business strategy. So how does design thinking compare with and overlap with craft as practice? See Mintzberg, "Crafting Strategies," M. E. Porter, *Competitive Strategy: Techniques for Analyzing Industries and Competitors* (New York: The Free Press, 1980).
- 37 F. G. Hilmer and L. Donaldson, *Management Redeemed: Debunking the Fads that Undermine our Corporations* (New York: The Free Press, 1996).

populations learn from the more capable, more developed, and more effective ones? As Margolin argues, designers are trained in the main disciplines that create the artifacts, products, systems, networks, architectures, infrastructures and constructs that make up the social world.³² However, they are rarely represented in the major policy and academic debates about the future. He also argues that the design professions currently lack a sense of coherence or vision about the possibilities for "designing" the future, although they could potentially be an incredibly important force for realizing an improved future.³³

On the face of it, design thinking has great potential in its applicability to a broad spectrum of social, economic, environmental, and developmental challenges that rise to the level of wicked problems. But we need to understand this broader promise in greater depth, and we need evidence of results so far achieved in social and economic experiments. As in the case of business strategy and practice, we need to understand the distinctive essence of the principles and tools of design thinking compared with other approaches.

The need for understanding the particularity of design thinking is further emphasized when we consider that some of the new propositions made by design proponents mirror those of earlier scholars in some of these "other" domains. For example, writing in 1952, Charles Lindblom famously argued against the rational approach to public policy, showing that, despite its widespread application, it is deeply flawed analytically and in practice. In "The Science of Muddling Through," Lindblom argued that under conditions of uncertainty and incomplete information, "muddling through" in a step-by-step manner is the only rational way to proceed.³⁴ Indeed, Klein and Meckling and Marschak all made similar points in their research into R&D and U.S. military systems, concluding that, under conditions of uncertainty, decision making in significant and changing areas must involve creative learning and a progressive narrowing of options—very different from the "normal" rational task of scheduling and resource allocation.³⁵ In the field of business strategy, Henry Mintzberg interprets strategy as an iterative, human-centered "craft," rather than the more rational market positioning model of Porter and others.³⁶ More recently, Hilmer and Donaldson also show why, in general, management systems and tools need to be accompanied by informal human involvement, support, and guidance.³⁷

That scholars have questioned the rational approach to problems in other domains is not surprising. Because uncertainty and complexity tend to prevail in most important areas of strategy and policy, the critical challenge is to develop the learning capability of the organization, so that knowledge can be gradually gained from the environment and taken into account during the policy-making process or in any other wicked problem area.

For the broader application of design thinking to become more than a management fad, it must compete for its place among these other approaches to complexity and uncertainty in human activity, especially in management. Defining and then realizing its distinctive contribution to business and social issues is key. In fact, defining both the distinctive strengths and weaknesses in design thinking is necessary. Products, systems, and artifacts, the normal domains of design, are clearly quite different from groups of people and organizations. Nevertheless, the intentional application of cross-disciplinary design thinking in a creative, non-linear way may well bring new and interesting elements to the management of wicked problems. All these issues call for theoretical conceptualizations of design beyond what is currently available so that we might understand what design offers to management and its potential role in the economy, society, and politics.

Toward a Research Program of Innovation/Design Studies

In general, design and design thinking have been poorly conceptualized, researched, and taught by innovation studies. However, at this juncture, it is possible for the design/design thinking field and innovation studies to learn from each other in interesting and productive ways. Although we do not intend to outline here a complete innovation/design research program, we would like to highlight some of the research issues and questions arising from our discussion. The broader question of where design might “fit” within various branches of the social sciences is an interesting issue for further research.

For example, if innovation researchers take design more seriously, they might well discover that a wide range of different design processes, approaches, and categories already underpin industrial development, providing a source of economic growth and conferring individual firms with distinctive strategic advantage. From a theoretical standpoint, innovation scholars should begin to develop a more complete conceptualization of design so that they understand and model the crucial roles of design in business, the economy, and wider society. They might begin by applying the five successive generations of innovation theories and models to design to see how the roles and processes of design have changed over time.³⁸ As Hatchuel argues, design should be at the heart of mainstream theories of innovation and growth.³⁹ However, Hatchuel, so far, is a lonely voice as he points innovation studies in this direction.

From an empirical perspective, new statistical evidence from innovation studies shows that design is one of the four main drivers of innovation and productivity in the United Kingdom, and probably in all advanced economies.⁴⁰ Indeed, design is more important to productivity and innovation than R&D, which is the usual focus

38 R. Rothwell, “Towards the Fifth-Generation Innovation Process,” *International Marketing Review* 11:1 (1994), 7-31; J. E. Forrest, “Models of the Process of Technological Innovation,” *Technology Analysis and Strategic Management* 3:4 (1991), 439-52; M. Hobday, “Firm-Level Innovation Models: Perspectives on Research in Developed and Developing Countries,” *Technology Analysis & Strategic Management* 17:2 (2005), 121-46.

39 Hatchuel, *Towards Design Theory*.

40 NESTA, *The Innovation Index*.

of both innovation studies and government policy initiatives and investments. Those in innovation studies should apply their substantive methods and measurement techniques to design in much greater detail, not only to assess the contribution of design to the economy and particular industries, but also to illustrate the diverse roles of design in different industrial and service sectors.

When they are more purposefully combined, design and innovation studies can offer convincing alternatives to the traditional view of the firm as a rational, machine-like entity. For its part, design thinking highlights the social and creative character of businesses and counters the dominant decision-making view of the firm. It provides us with ways of understanding the Gestalt or organizing patterns of innovative leaders.⁴¹ Far too often, the rational, process-based, machine metaphor is the “default” position of innovation and technology management studies. Design thinking can lead to a major reorientation of innovation theory, research, and teaching, thereby moving toward a view of the firm as a creative, solutions-generating, social, and flexible organization.

This paper has focused primarily on the technical and business dimensions of innovation and design. However, we see that the wider application of design thinking goes beyond the technical and business domain to broader social, policy, and economic applications. Its main contribution is to offer new opportunities for problem-solving and solution generation through a collective social approach to wicked problems. This approach, based on design principles, not only challenges us intellectually but also promises to enhance mainstream management theory and education considerably by applying creative, dynamic, human-centered methods and techniques.

As suggested, one element from innovation studies that needs greater attention in design studies is design as a “capability.” Innovation studies should bring its knowledge of capabilities to the field of design to expand design beyond its usual treatment as process, activity, or output. In design studies, the capability dimension tends to be overlooked in discussions of wicked problems. However, the wicked problem at hand only ever exists in relation to the capabilities of the group attempting to solve the design problem. With strong capabilities, the challenge of wicked problems are diminished and with weak or partial capabilities, the reverse is true. In this manner, the innovation field can help design studies understand the subjective dimension of wicked problems and how the relevant experience, knowledge, and skill that make up capability are acquired through design learning processes. Innovation studies could also help to identify how mechanisms for design learning can be enhanced and improved, and how to recognize when a design capability becomes a handicap (e.g. when designers rely on the wrong kind of previously accumulated capabilities to develop

41 Yoo et al., “From Organization Design to Organization Designing.”

solutions to a new class of challenges). In these ways, innovation research can bring a very interesting new set of perspectives and insights into design sensing.

An innovation perspective can also allow us to understand the distinctiveness of design thinking as a solutions-oriented approach to management, showing how design thinking differs from the various other human-centred approaches to management. This way we could more clearly illustrate its distinctiveness as well as its strengths and weaknesses compared with other approaches. Such research would help contextualise design thinking within a wider historical, theoretical and managerial setting.

Another opportunity offered by a closer relationship between design thinking and innovation studies is in their application to small and micro-enterprises and entrepreneurial activity. The tendency, so far, has been to concentrate on large organizations. However, design thinking may shed fresh light on the issue of small and micro-enterprises, helping us to understand more fully the creative and social life of small firms through its human-centered lens. Emphasizing the human side of entrepreneurial activity overcomes the limitations of the traditional, more formal, process-based approaches that currently dominate in innovation studies.

These issues and challenges point to the possibility of a significant new research agenda arising from the combination of innovation and design studies. We have identified some of the synergies, but many others across the business, social, policy, economic, and developmental arenas are worth exploring. Our hope is that this paper stimulates interest not only in design/innovation research, but also in design/innovation theory and education.