Design Thinking: Past, Present and Possible Futures

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This paper takes a critical look at the design thinking discourse, one that has different meanings depending on its context. Within the managerial realm, design thinking has been described as *the* best way to be creative and innovate, while within the design realm, design thinking may be partly ignored and taken for granted, despite a long history of academic development and debate. In the design area, we find five different discourses of 'designerly thinking', or ways to describe what designers do in practice, that have distinctly different epistemological roots. These different discourses do not stand in competition with each other but could be developed in parallel. We also observe that the management discourse has three distinct origins, but in general has a more superficial and popular character and is less academically anchored than the designerly one. Also, the management design thinking discourse seldom refers to designerly thinking and thereby hinders cumulative knowledge construction. We suggest further research to link the discourses.

Introduction

'Design thinking' is a concept used both in theory and practice. In the management realm it is so closely related to practice that some researchers say that there is no theoretical body, a comment frequently heard at the 2011 Cambridge Design Management Conference. Certainly there is an extensive literature, both academic and practitioner-oriented, in books, journals and the news media, and recently the popular press and semi-academic literature has displayed a zeal for the concept as if 'design thinking' is a panacea for the economy. Turning to the academic literature for a more reasoned treatment, we find, to our surprise, there is no sustained development of the concept. And even though there must be some relationships between the academic discourses of design(erly) thinking and the management discourse based on the same concepts, there are seldom references linking the two. It is as if design theorists such as Richard Buchanan (1992) and management writers such as Roger Martin (2009) coined the label of 'design thinking' to describe the thought processes of designing completely

independently of each other. This might be possible, but is hardly plausible.

It is therefore easy for the temporarily intensive discourse to be dismissed as hype or a fad (Johansson & Woodilla, 2010), thereby implying that design thinking is not an enduring concept to be used in academia or the management world. This path seems even more certain as some of the more prominent prophets of design thinking have renounced the concept, like Professor Bruce Nussbaum of Parsons – The New School of Design, formerly associate editor at *BusinessWeek*, who has turned away in favour of 'creative intelligence' (Nussbaum, 2011); Professor Fred Collopy of Case Western Reserve University, who has become increasingly 'bothered' by the term (Collopy, 2009), and Dean Roger Martin, Rotman School of Management, University of Toronto, who continues to explore different varieties of executive thinking. Continuing in this way, however, would be to make a messy situation too easy; instead, we propose stepping back and surveying the field to explore the roots and development of the discourse.

The paper is structured as follows. First, we discuss the demographics of the discourse,

how it has grown and what types of literature have been published, followed by the description and characteristics of the two main discourses, the designerly and the management discourses of design thinking. We identify five sub-discourses of the designerly thinking discourse and three origins of the management discourse, and critically review their content and contributions. Finally, we discuss relations between the two discourses and suggest possible research directions.

The Demographics of the Literature

In our previous work we observed two distinct discourses on design thinking: one in the design-based, scholarly literature, and the other in the widely accessible business media (Johansson & Woodilla, 2010). In this article our research questions centre around relationships between the two discourses and their sources: the types of literature, rather than the specific content. We searched the literature until we were satisfied and had reached the level of saturation.

We started with questions like, 'What is the literature on design thinking? What are the discourse streams and relative strengths, and What is different about the presentation in the different media?' We were interested in uncovering trends, recognizing important authors to follow, and appreciating differences in how the concept has been treated in the academic and non-academic press. We anticipated that there would be different discussions about the use of design thinking in education and empirical work with potentially different methodologies. We were also interested in uncovering what has been forgotten and themes that had potential for further development.

Our initial scoping search using academic electronic databases, journals, book publishers' lists and informal methods such as Google Scholar cast light on the structure and different streams in the overall discourse. We searched for 'design thinking', 'design' or 'thinking' in the title, subject, abstract or keywords, and reviewed the findings with a subject-matter expert. The resulting literature base provided the history of the development of the design thinking discourse. Later, when examining the character and structure of various sub-discourses, we refined the list by selecting academic and practitioner journal articles, and refereed conference papers available in the public domain that included 'design thinking' in the title, abstract or keywords, and books that were referenced frequently in scholarly papers. For this article,

some sources from the literature base were ignored as not directly related to our interests and others were added because they were key references for sources from our original list or written after our original search.

Identifying the Populations

The literature base consists of 168 items, of which more than 80 per cent date from after the year 2000. It includes books (31), academic refereed papers (48), professional/practitioner articles (28), refereed conference papers (7), magazines and newspaper articles (39) and web blogs (15). The numbers gradually increase by year, starting from Simon's (1969) foundational work about the nature of design, then design theorists' publications beginning in the 1980s, becoming more numerous around 1999, and reaching a high point in 2009. Management scholars first showed an interest in links between business and design in the mid-1980s, followed by scholars in other areas. The subject gathered popular media attention starting around 2004 and peaked in 2009. The development of the broad field is shown in Figure 1. Here the literature is divided into three genres: (1) books (black column), (2) substantial articles in academic (peer-reviewed) and respected practitioner journals (dark grey column), and (3) short pieces in the business press and online media (light grey column). Appendices A and B elaborate on the base literature list by categorizing the entries.

Books provide an elaborated argument where the author demonstrates proficiency in the field. Some books are theory-driven (e.g., Simon, 1969): the early books tend to be of this nature due to the publication norms of the field at the time. Other books present cases and examples that elaborate and develop theory (e.g., Rowe, 1987), or are 'recipes' for 'how to do design thinking' for practitioners (e.g., Leidtka & Ogilvie, 2011) or textbooks for students (e.g., Ambrose & Harris, 2010), with simplified arguments, diagrams and checklists, but little theory development. Most recent books are of this nature.

Articles in scholarly or academic journals and respected practitioner or professional journals are the foundational ground for any subject. We located articles that discussed the development of the design discourse, excluding those with an industrial or computer engineering technical focus because, as scholars in 'design management', we were unprepared to evaluate them appropriately. Not surprisingly, most of the articles developing theory on design thinking were in design journals, in particular UK-based *Design Studies* and US-based *Design Issues*. Some academic man-
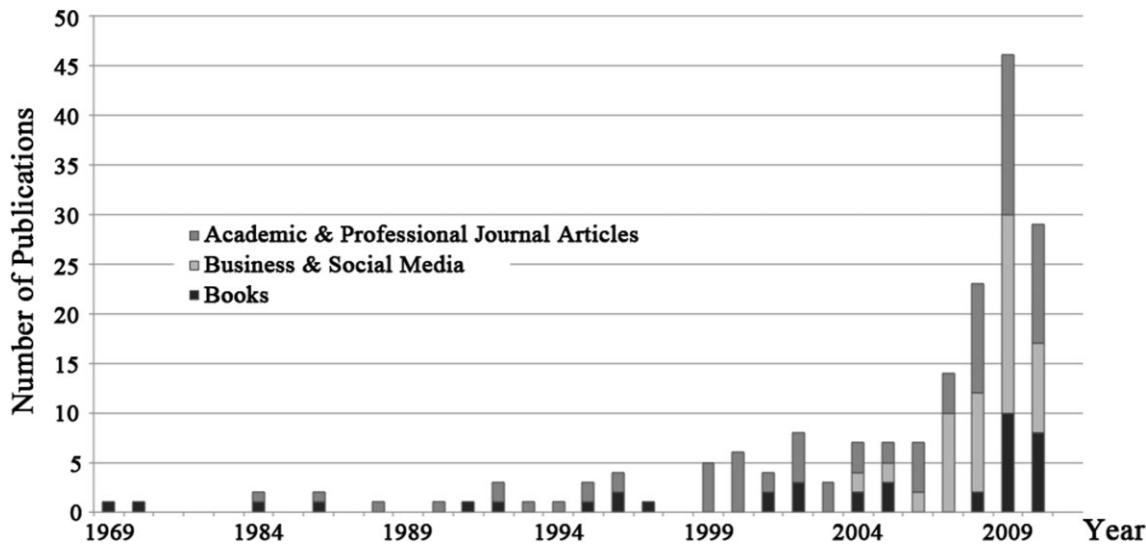
Figure 1. Timeline of Publications by Type

agement journals included conceptual articles related to design thinking, while professional journal articles tended to be explanations or case studies of successful practice. Two, *Harvard Business Review* and *Design Management Review*, deserve special mention: the former for its prestige among US executives and managers, and the latter for its long-standing focus on 'demonstrating the strategic role of design in business' (www.dmi.org). Finally, a few scholarly conference papers were included in our review to gauge trends in theory development; here our selection forms a convenient sample.

Using the 'trade' and 'popular' literature, culled from magazines, the business press and reputable online sources, is controversial as part of an academic literature review. We included these sources to gain a sense of the scope and timing of interest in the topic outside of academe and professional practice. Determining the total number of contributions in these areas is difficult, but the overall trend-line is revealing. The news media comment on changes in firm strategy or personnel (e.g., Birchall, 2008): the same event is likely to be taken up across several publications, effectively 'promoting' the use of design thinking in context. Magazines include interviews with 'experts' on the topic (e.g., Tischler, 2009): the interviewee is 'newsworthy' in some way or other, effectively establishing expertise in the field. Finally, many publications support regular blogs by subject-matter experts (e.g., Bruce Nussbaum at *BusinessWeek*, or Fred Collopy at *Fast Company*): this is the space where opinions are stated and viral news begins, such as the 'hot news' that 'design thinking is dead!'

The Nature of the Two Discourses: Designerly Thinking and Design Thinking

A simple way of discussing the discourse of design thinking is as two distinct discourses:

- One we call 'designerly thinking'. This refers to the academic construction of the professional designer's practice (practical skills and competence) and theoretical reflections around how to interpret and characterize this non-verbal competence of the designers. Designerly thinking links theory and practice from a design perspective, and is accordingly rooted in the academic field of design.
- The other discourse is 'design thinking'. We reserve this term for the discourse where design practice and competence are used beyond the design context (including art and architecture), for and with people without a scholarly background in design, particularly in management. 'Design thinking' then becomes a simplified version of 'designerly thinking' or a way of describing a designer's methods that is integrated into an academic or practical management discourse.

The Academic Discourses of Designerly Thinking

For the business world, design thinking might seem like a new concept from this side of the millennium, but within design research characteristics of designers' work and practice have been discussed for at least 40 years, while the management discourse of design thinking

developed over the last decade is only slightly related to the earlier discourse. The designerly part of the discourse forms an academic stream, with contributions from both designers and related disciplines (architecture, planning, design history, etc.). The aim has been purely academic, either understanding for its own sake or for communicating such understanding to students. The consultancy genre that is typical of the management discourse is generally absent and normative elements are much more rare. The writing style with excessive praise found in the management discourse is absent.

Theoretical perspectives can be categorized into five sub-discourses, identified as having clear roots and a substantial academic following, with the foundational work(s) within parentheses:

1. Design and designerly thinking as the *creation of artefacts* (Simon, 1969).
2. Design and designerly thinking as a *reflexive practice* (Schön, 1983).
3. Design and designerly thinking as a *problem-solving activity* (Buchanan, 1992 based on Rittel and Webber, 1973).
4. Design and designerly thinking as a *way of reasoning/making sense of things* (Lawson, 2006 [1980]; Cross, 2006, 2011).
5. Design and designerly thinking as *creation of meaning* (Krippendorff, 2006).

1. Design and Designerly Thinking as the Creation of Artefacts

Simon (1916–2001), winner of the 1978 Nobel Prize in Economics for his critique of the optimizing model of rational decision making and its replacement with the concept of bounded rationality, earned an international reputation as a founder of artificial intelligence. His research extended from computer science to cognitive psychology, business administration and economics, with design becoming an interest in his later years. Simon understood 'design' to encompass all conscious activities to create artefacts, and thereby differentiated it from natural science, social science and humanities – but not from engineering. His main concern was about research – what constitutes the character of design research? His point of departure was that design is about creation, while other sciences deal with what already exists. What, then, is research about creation? His seminal work, *The Sciences of the Artificial*, was an answer to that question, and a legitimization of an experimental approach to design research in academia.

As far as we know, Simon himself never used the term 'design thinking'. However,

with his cognitive approach to decision making and his often-quoted definition of design as 'the transformation of existing conditions into preferred ones' (Simon, 1996: 4), he is a reference point for the academic writings about design and design thinking. He is a foundational father of design research in the way Taylor was for management research.

What is striking about Simon's view of 'design thinking' is that he distinguished between activities that create something new and activities that deal with existing reality, but not between artistic creation and engineering. The difference between designers' and engineers' ways of thinking, something that is noticed and problematized in practice, therefore became a non-issue for Simon.

Another issue is Simon's epistemological platform. He was critical of positivistic approaches both in economics and in design. However, he created his argument within a neo-positivistic and rationalistic realm in order to have the positivists understand that their arguments were incorrect. Maybe it is not surprising that the neo-Simon movement (e.g., Hatchuel, 2002; Hatchuel & Weill, 2003) originated in engineering schools rather than from design management or design.

2. Design and Designerly Thinking as a Reflexive Practice

Schön (1930–1997) was originally a philosopher with pragmatism as his theoretical frame of reference. He first focused on the logics of inventions and later, with Argyris, turned to organizational learning. The last 20 years of his life were devoted to practice theory. In *The Reflective Practitioner*, Schön (1983) challenged both researchers and practitioners to reconsider the role of technical knowledge versus 'artistry' in developing professional excellence. The book can be read in many ways, such as from an organizational competence perspective or from a practice perspective (e.g., Schön & Wiggins, 1992). From a design thinking perspective, it is a critique of Simon's cognitive perspective. At a time when there was a big division made between positivism and hermeneutics, Simon, with his analytical reasoning, was close to positivism, while Schön, with his philosophical pragmatism, was close to hermeneutics. In contrast to Simon, Schön constructed a picture of the designer through a practice-based focus on the relation between creation and reflection-upon-the-creation that allows for constantly improved competence and re-creation. Such reflection, which Schön found in the work of both architects and psychoanalysts, became understood as the core of design work. This

reflection was not something that was separated from the practice as such, but was understood as part of the practice.

Schön also considered management practice, and noted that managers are well aware of the important areas of practice that fall outside of technical rationality. While managers deal with decisions under uncertainty through intuition, they build up an essentially unanalysable capacity for problem solving through long and varied practice rather than through studying theory or techniques. Managers reflect-in-action, but they seldom reflect on their reflection-in-action.

Differences between Simon and Schön's views of design have been discussed frequently (Bousbaci, 2008; Dorst, 1997). In our view, Simon created an objective framework for the field of design, while Schön fleshed it out with descriptions of designers in practice. Their writings, therefore, belong to quite different worlds from an epistemological point of view.

3. Design and Designerly Thinking as a Problem-Solving Activity

Buchanan's (1992) article about 'wicked problems' in design has become a foundational reference not only for the discourse about design thinking, but also for the whole design area. Buchanan presented designers' professional way of thinking as a matter of dealing with wicked problems, a class of social systems problems with a fundamental indeterminacy without a single solution and where much creativity is needed to find solutions.

Buchanan was the first to really take a designerly perspective on design thinking, building on Rittel and Webber's (1973) wicked problem approach as an alternative to the accepted step-by-step model of the design process with its two distinct phases: an analytic step of *problem definition*, followed by a synthetic sequence of *problem solution*. Buchanan introduced the concept of placements to describe the process of contextualization. Placements are 'tools' for intuitively or deliberately shaping a design situation, identifying the views of all participants, the issues of concern, and the intervention that becomes a working hypothesis for exploration and development, thereby letting the problem formulation and solution go hand in hand rather than as sequential steps. As Wylant (2010) notes, design thinking is the discipline of cycling through many contextual exercises of placements to understand 'how sense can be made of something and given this, the designer is then in a position to choose which contexts

should dominate and the manner in which they should' (p. 228). The notion of placements in response to worked problems dissolves the boundaries between modernist and postmodernist design thinking.

Buchanan's process perspective is concerned with gaining a deeper understanding of design thinking in an increasingly complex technological culture, so there can be communication among all participants engaged in the process of design. He suggests four distinct areas of design thinking as places of interventions where problems and solutions could be reconsidered: (1) symbolic and visual communications (or graphic design), (2) material objects (or industrial design), (3) activities and organizational services (or service design), (4) complex systems or environments for living, working, playing and learning (or interaction design).

4. Design and Designerly Thinking as a Practice-Based Activity and Way of Making Sense of Things

Lawson and Cross, who both trained as architects, each described and reflected on practical cases of designers thinking and working. Their interests spanned many years: Lawson's book, *How Designers Think: The Design Process Demystified*, has had four revisions since 1980, and Cross's research included design thinking workshops at Delft University of Technology in 1991, continued with a series of articles on 'designerly ways of knowing' (see Cross, 2006) and, recently, his book *Design Thinking* (2011). Cross works from ethnographic research to reveal what designers do during the activity of designing, while Lawson draws on the psychology of creative design processes to turn his research knowledge into forms designers can use.

Lawson and Cross could be seen as part of the reflexive tradition started by Schön. However, their texts are within a different discourse: they are practice-based through presenting examples rather than taking a philosophical perspective. Both Lawson and Cross use abductive processes to make sense of and generalize from observations, and hence find patterns that are grounded in practical experience and can be described through practical examples. Ultimately each scholar suggests a 'model' of the design process: Lawson in a number of process-driven steps that attempt to describe the complex processes of designing (2005: 289–301), and Cross in a recursive representation of the design strategy followed by creative designers (2011: 78).

Table 1. Comparison of Five Discourses of Design Thinking

Founder	Background	Epistemology	Core Concept
Simon	Economics & political science	Rationalism	The science of the artificial
Schön	Philosophy & music	Pragmatism	Reflection in action
Buchanan	Art history	Postmodernism	Wicked problems
Lawson & Cross	Design & architecture	Practice perspective	Designerly ways of knowing
Krippendorff	Philosophy & semantics	Hermeneutics	Creating meaning

5. Design and Designerly Thinking as Creation of Meaning (rather than Artefacts)

Starting from a philosophical and semantic background, Krippendorff (2006) defined design and designers' work as a matter of creating meaning (rather than artefacts as in Simon's notion). Compared with Simon, one could say that Krippendorff reversed the relation between the design object and its intention. For Simon the artefact is at the core, and he would probably say that meaning is an attribute, while for Krippendorff meaning is the core of the design process and the artefact becomes a medium for communicating these meanings.

Krippendorff is concerned with the textual and intertextual matter of discourse, 'the artefacts it constructs and leaves behind . . . (and) the connections created between these artefacts' (2006: 23–4). Design thinking concerns him only as articulated by designers, that is, when it creates a text that becomes part of the discourse of the design community. 'The primary aim of a discourse is to stay viable . . . to be kept alive within a community of its practitioners . . . [and] to justify its identity to outsiders' (2006: 24).

Unlike Simon's 'design science' (an explicitly organized, rational and wholly systematic approach to design, not just the utilization of scientific knowledge of artefacts, but design in some sense a scientific activity in itself), or Cross's 'science of design' (with accurate representations of design practices, designers, institutions of design, aesthetic conventions or history of particular designs), the semantic turn leads to Krippendorff's 'science for design', as 'a systematic collection of accounts of successful design practices, design methods, and their lessons, however abstract, codified or theorized, whose continuous rearticulation and evaluation within the design community amounts to a self-reflective reproduction of the design profession' (2006: 209). The semantic roots of Krippendorf's approach to meaning-making distinguishes it from the practices roots of Lawson and Cross.

Verganti (2009) extended Krippendorff's work to innovation processes, arguing that innovation in meaning is as important as technological innovations that are mostly related to the concept of innovation. One of his examples is Alessi's commercially successful kitchenware that gives radical new meanings to commonplace objects like a corkscrew and a lemon squeezer. Before they were designed, the company had an extensive collaboration with a psychologist, and the way the objects look – as stylized products rather than mundane tools – was based on frame theories of boundary objects to which individuals were especially attached (Verganti, 2009: 40–3). Nintendo's Wii is another example of a product that could not have been conceived by video game players before its appearance in the market, yet the console was a radical innovation in meaning, from an entertainment gadget for children to active physical entertainment, in the real world, through socialization (Verganti, 2009: 4–6). In other innovation research, winemakers have deliberately altered meanings for new wines (Dell'Era & Bellini, 2009), and design students have radically changed meanings of gender conveyed through chairs or objects to sit on (Jahnke & Hansson, 2010).

Comparison of the Five Discourses of Designerly Thinking

The five discourses of designerly ways of thinking can be compared as in Table 1. An argument could be made for collapsing these five discourse streams into three: creating a single practice-based approach by combining the frameworks of Schön, Buchanan, and Lawson and Cross, and placing 'designerly thinking in practice' in contrast to the rationalized, systematic study of design by Simon, and the meaning-creation of Krippendorff's hermeneutic approach. We prefer treating the practice-related approaches as three different discourse streams, based on the level of theoretical focus: Schön examines the designer's reflection-in-actions of problems encountered

in practice from an objective stance, theorizing 'about' the practice. Buchanan examines the nature of the problems themselves, and the designer's use of placements as 'tools' to intuitively or deliberately shape a design problem, while Lawson and Cross's empirically-based studies focus on the designer's specific awareness and abilities. We suggest that further theoretical investigation is needed to connect the three approaches in a meaningful and coherent manner.

Design scholars continue to discuss theoretical developments in the leading design journals, with one or two articles a year, out of a total of about 50 articles a year, and more infrequent articles in other journals and conference papers. Different theoretical perspectives have been used in research into designerly thinking: one stream of articles discusses research through protocol analysis to catch the ways designers are making sense of their own working processes (Galle & Kovács, 1996; Ho, 2001); another examines methods for teaching designerly thinking to design students through normative decision-based protocols (Leong & Clark, 2003; Oxman, 2004). In conceptual research, Liu (1996) followed the neo-positivistic tradition and considered designing as a combinational search based first on Simon's model, and then on Schön's ways of seeing, while Louridas (1999) drew on Schön's reflective practice, but also hinted towards a meaning-making perspective. In general, there has been a move towards the hermeneutics and practice perspective. We now return to the management focused and more popularized discourse.

'Design Thinking' within the Management Discourse

In general, the management design thinking discourse is less thoughtful and robust than contributions to the designerly thinking discourse that have been argued and reflected on by scholars over several decades. 'Design thinking' is much younger than 'designerly thinking', but it has grown rapidly. In one interpretation, 'design thinking' may also be a way for managers to 'understand design' in a more straightforward way than through the design management discourse that is built on a managerial platform.

When design management started as an academic area in the 1970s, it was taught by designers aiming to help management scholars and practitioners understand what design is and why it is relevant. The designers chose to talk about design in a managerial way, referencing Porter (Olson, Cooper & Slater, 1998), considering design as a metaphor (Leidtka,

2000), or through descriptions of successful cases (e.g., McCullagh, 2006). This approach using the management discourse might be understandable, but the result was probably counterproductive as such positivistic descriptions stripped design of its constructionist and contextualized meanings.

Both the design-based 'designerly thinking' and the management-oriented 'design thinking' discourses do the opposite. They start with the designers' way of thinking and invite managers to come and share this world rather than the opposite (Cooper, Junginger & Lockwood, 2009). Some authors highlight differences between the two functions and suggest ways to come together (Martin, 2007a; Leidtka, 2010). Managers became curious about designers' way of making sense of things on the designers' own terms.

The concept of 'design thinking' became a portal for the whole design area to contribute to innovation, and design thinking enabled innovation to supersede strategic management as a way to deal with a complex reality. Design as a strategic tool was first mentioned in 1984 (Kotler & Rath, 1984), but it was not until another 20 years later that there was any sustained discussion (cf., Fraser, 2007; Junginger, 2007; Martin, 2007a) with wicked problems (Camillus, 2008) and design thinking (Brown, 2009; Holloway, 2009).

The academic innovation area, anchored within engineering, and much occupied with statistical relationships and rational models of innovation (Johansson & Woodilla, 2009) was in need of more creativity. IDEO (www.ideo.com), the world's largest design company, started to market itself as 'an innovation company' rather than a design company: its practical experience made it trustworthy, and its co-operation with Stanford University provided academic credentials. This, plus a view of a more complex rationality than strategy could offer, boosted a design interest in the innovation discourse (Bruce & Bessant, 2002; Feldman & Boult, 2005; Ward, Runcie & Morris, 2009; Stevens & Moultrie, 2011).

With some experience from design practice, we find it hard to think about innovation without including design. And it is from an innovation perspective that the popularity of 'design thinking' has to be understood, as here the concept captures the design practice and the way designers make sense of their task, and 'a way of thinking' that non-designers can also use, or as a source of inspiration (Johansson & Woodilla, 2009), rather than being limited to a professional group of designers as Schön might argue. And here might be one of the keys to the popularity of the concept just after the millennium.

These various ways of working with design in the management area connect to three different origins of the design thinking discourse:

1. Design thinking as design company *IDEO's way of working* with design and innovation (Kelley, 2001, 2005; Brown, 2008, 2009).
2. Design thinking as a way to approach indeterminate organizational problems, and a *necessary skill for practising managers* (Dunne & Martin, 2006; Martin, 2009).
3. Design thinking as *part of management theory* (Boland & Collopy, 2004a).

1. Design Thinking as Design Company IDEO's Way of Working with Design and Innovation

Stories of IDEO's way of working successfully with product development innovations told by Tom Kelley, the founder's brother and general manager (Kelley, 2001) and the various persona and roles played by members of the design teams (Kelley, 2005) introduced the company's work to a broader audience than their local network. The books provided 'lessons in creativity' starting from the particular, then generalized to IDEO's point of view, a 'design practice' perspective using their 'secret formula' of a blend of methodologies, work culture and infrastructure. The CEO, Tim Brown, labelled the concept as 'design thinking', detailing steps in the process (2008), and providing stories to help everyone use IDEO's methods, particularly business people and social innovators (Brown & Wyatt, 2007).

While Brown's stories are compelling, there is no published theoretical framework other than his description of the circular process. Naturally there are links between the IDEO discourse of design thinking and the designerly discourses described earlier, even if they are not explicitly spelled out in references. Members of IDEO are all inspired by designers' work processes that are the grounds for the five designerly discourses, even if they are not all trained as professional designers (on the contrary, 'pure' designers are in the minority at the company). Maybe it is the experience of designers and non-designers working with the design process that inspired Brown to suggest that, 'everybody could do it' just by following the steps.

While no formal links exist between Palo Alto-headquartered IDEO and Boston-based Design Management Institute (DMI), many articles published by DMI (cf., Lockwood, 2009, 2010) communicate the same intention, to make the practices of designers accessible and meaningful to managers. Most often without theoretical grounding, at best they provide insightful anecdotes or lists of best practices that readers may wish to try for themselves.

2. Design Thinking as a Way to Approach Indeterminate Organizational Problems, and a Necessary Skill for Practising Managers

A closely related, yet very different discourse emanates from Roger Martin, Dean of the Rotman School of Business at the University of Toronto and a strategy consultant with a long-term interest in the cognitive processes of successful executives and their need for more than analytical thinking (Martin, 2007b). Working with IDEO led Martin to use the concept of design thinking to reconceptualize his earlier models (Martin, 2009), and promote teaching how to do design thinking to management students (Dunne & Martin, 2006). Martin placed his arguments within the context of management, using examples of company successes, and returned to these same companies to illustrate his model of 'the knowledge funnel' and the need to use both the right and left halves of the brain. His message gained widespread acceptance among practising managers, who from there became curious about design thinking. Design thinking in this discourse, as an ongoing cycle of generating ideas (abduction), predicting consequences (deduction), testing, and generalizing (induction), became a way to approach indeterminate organizational problems, a necessary skill for practising managers familiar with cognitively grounded arguments, and hence a necessary component of management education. At the same time, for all its clarity welcomed by managers, Martin's argument has been stripped of the 'messiness' of a designer's approach, and thereby separated from connections with IDEO.

Dunne and Martin (2006) brought the notion of teaching design thinking into the Academy of Management, while the business press highlighted design-based, interdisciplinary programs (Wong, 2009). Similarly to the theoretical discourse, the education streams have remained separate (Melles, Howard & Thompson-Whiteside, 2012), with design thinking within design-based education drawing on Schön (Oxman, 1999, 2004), or Simon for engineering applications (Dym et al., 2005), and management-based offerings being concerned with pedagogical foundations (cf., Wang & Wang, 2011).

As a result of Martin's wide reach as a speaker and author, design thinking has been promoted as a useful process in different disciplines, including library administration (Bell, 2008), in hospitals (Uehira & Kay, 2009), legal practice management (Szabo, 2010), and

HR (Birchall-Spencer, 2010). In the management area he has influenced work in strategy (Fraser, 2007) and organizational change and development (Sato et al., 2010), and has inspired the creation of a design thinking toolkit for managers (Leidtka & Ogilvie, 2011), although these authors later comment that for best results designers should lead the process (Leidtka & Ogilvie, 2012).

3. Design Thinking as Part of Management Theory

A third use of the term 'design thinking' emanates from Richard Boland and Frank Collopy, who are academic researchers and professors in management information systems. Their inspiration came from architect Frank Gehry's way of working on the new building for Weatherhead School of Management in Cleveland, and subsequently captured in a book of essays by scholars invited to a workshop to celebrate the opening of the building and reflect on ways managers are designers as well and decision makers (Boland & Collopy, 2004b). Boland and Collopy interchangeably use the concept 'design thinking' and 'the design attitude' (expectations and orientations one brings to a design project; 2004b: 9), thereby pointing less towards design as a way of working or a work process with distinct characteristics (as stressed in the IDEO version) and more towards cognitive characteristics (similar to Martin). Previously in organization and management theory, design had been considered at the organizational level (cf., Romme, 2003).

Boland and Collopy credit Simon with developing a theory of the design attitude for managers, and subsequently distinguish this from a decision attitude. If there is a common foundation for the various essays, it may be found in Simon's notion of design projects as 'the urge to change an existing state of affairs into a more preferred one' (2004b: 10). However, most of the contributors to this more theoretical but yet quite diverse discourse stream are world-renowned scholars who use the design situation as an application of their own frameworks of thinking and theorizing. Boland (2004) himself looks upon organizations in general and states that managing is very similar to designing in more general characteristics: like art, it is all but a rational process.

One insightful comment highlights the extent to which we are limited by our vocabularies, quoting Cooperrider, 'words are fateful – words make worlds' (Boland & Collopy, 2004c: 266), hence they conclude the book with suggestions for a new 'design vocabulary for management' based on the work of the conference. Yet there seem to be no traces of this new vocabulary reported in business or academic texts, maybe because the sources of individual concepts come from different epistemological orientations.

The legacy of this opportunity to reflect on 'managing as designing' is difficult to assess. It may be inferred as one impetus for special journal issues relating design or designing to organization science or development (e.g., Dunbar & Starbuck, 2006; Bate, 2007; Jelinek, Romme & Boland, 2008). Also academic conferences have provided calls or opportunities for scholarly conversations connecting designing with managing, for example, the Academy of Management 2011 Professional Development Workshop 'Creating Design Thinkers', the Cambridge Academic Design Management Conference 2011, or the theme of the European Group for Organization Studies 2011 Colloquium 'Design!?' Maybe a more robust academic conversation on 'design thinking' within the management realm will emerge with time.

Comparison of the Three Management Discourses of Design Thinking

The management discourses of design thinking can be compared as in Table 2.

Other frameworks exist that synthesize the area 'design thinking'. Following a literature review concentrating mainly on the practice-based literatures, Hassi and Laakso (2011) concluded that the concept of design thinking in the management discourse consists of three elements: (1) a set of practices, (2) cognitive approaches and (3) mindsets. Rylander (2009) compares the two discourses of 'design thinking' and 'knowledge work' and considers 'design thinking' as practical knowledge, open-ended problems, a social identity of celebrating creativity, and visual forms of dominant sensemaking modes. These statements make the dominant management discourse of 'knowledge work' appear purely cognitive and lacking 'embodied knowledge' that is so important to designers. Kimbell's (2011) critical review of the entire literature found three different ways of describing design thinking: (1) as a cognitive style of individual designers engaged in problem solving, (2) as a general theory of design as a field or discipline focused on taming wicked problems, and (3) as an organizational resource for businesses and other organizations in need of innovation. She proposes attending to the situated, embodied routines of designers and offers a useful way to rethink design thinking. Any of these frameworks can be the starting point for

Table 2. Comparison of the Three Management Discourses of Design Thinking

Originator	Audience	Discourse Character	Academic Connections	Relation to Practice
IDEO design company (Tom Kelley & Tim Brown)	Company managers (potential customers)	IDEO success cases (written for managers)	Grounded in experience rather than research. Connections to innovation research	Kelley: How 'we' (IDEO) do design thinking. Brown: how anyone can use design thinking
Roger Martin	Educators (academics & consultants) Company managers	Success cases from production companies used to illustrate theory development (managerial thinking)	Grounded in cognitive science & management science. Builds on planning theories ('wicked problems')	How successful production companies do design thinking. How 'any' company (manager/individual) can do design thinking
Richard Boland & Fred Collopy	Academic researchers & educators	Short essays where established (management) scholars apply their theoretical perspective to the design area	Grounded in individual researchers' own theoretical perspectives. Inspired by Gehry's architectural practice or contact with design	Design thinking as analogy & alternative

further investigation. However, we think it is important to look closely at the discourse roots and maintain epistemological clarity.

Relation between 'Designerly Thinking' and 'Design Thinking'

Similarities and Differences

Both designerly thinking and design thinking refer to an ongoing *design practice*, a reality that is not a discrete and coherent practice, and is far from standardized, but is nevertheless the basis for generalizations, descriptions and theories made in both discourses. They belong to different genres of writing. The designerly discourse is a more scholarly discourse, where the different authors refer to and quote each other, either as followers or in opposition/as alternatives. Two of the design thinking discourses are written for a business or managerial audience, where convention does not require strict referencing and positioning the text in relation to other texts. Consequently, scholars need to treat much of what is written in the design thinking discourse as anecdotal, rather than theoretically or empirically based. Further research may examine the assumptions and connections, but the material itself cannot be taken as the foundation for further research. The third origin of the design thinking discourse – Gehry-inspired and facilitated by Boland and Collopy – uses Simon as the point of theoretical departure, then connects to other organization and management concepts. Boland and Collopy use design thinking not so much with interest or focus on the designers' way of thinking, or for giving managers inspiration to think like designers, but more to demonstrate that managers already do think like designers (which happens only on a very abstract level).

What's left out in Translation

Design thinking can be seen as a translation of designerly thinking into a popularized, management version. As with any translation, nuances of meaning may be left out, and acknowledging these 'left out dimensions' is important academic work. We have found two dimensions that are strikingly omitted in translating 'designerly thinking' into 'design thinking':

1. Design thinking is often equated to creativity: Sometimes the popular version 'design thinking' is presented as a way to make managers think more creatively. But being creative is only part of the competence and practice of the designer's work.

2. Design thinking is often equated to a toolbox: Sometimes the popular versions focus on the designer's specific methods taken out of context, as tools ready for use, but the person using the tools must have the knowledge and skill – competence that comes with training – to know when to use them.

To talk about design and leaving the designer out is like talking about musicians and leaving the music out: a musician is identified by his or her instrument and the style of music played. Just as there is never a generic 'musician', the design thinking discourse is not one but many, as are the designerly discourses. Therefore there is little use in trying to find a single definition or description of the practice of design thinking. To do so would be to concentrate on an elegant model 'to know', without the ability to turn it into action through 'doing' detailed processes (Pfeffer & Sutton, 1999).

Possible Futures: How Design Thinking can be Nurtured by Closer Connections with Designerly Thinking

As with many novel ideas and processes promoted by business consultants (such as management by objectives or business process re-engineering), the design thinking discourse will most probably die if it does not acquire a scholarly base that relates more to designerly thinking. Firm academic links will preserve valuable parts of the practice for managerial use and provide designers with fresh insights into how to make connections with the management world. Below we suggest avenues for further research.

Example 1. Teamwork has been an important aspect of IDEO's work, and accordingly an implicit part of the design thinking discourse as presented by Kelley and Brown. Teamwork is already an important area of research within the management area (e.g., Hackman, 1989), and also an area with research efforts within the designerly discourse (e.g., Stempfle, 2002). Therefore the design thinking discourse would gain from a deeper relation to existing theories of teamwork. For example, we would welcome an empirical study of multidisciplinary teamwork practices, as at IDEO, conducted by established teamwork researchers with connections to both design and management.

Example 2. Design and innovation is another theme within design thinking. Here the non-theoretical but popular discourse of design thinking would benefit from a closer relation with the hermeneutic stream of the

designerly thinking discourse. Looking at the whole design process as a matter of meaning creation provides new perspectives on both design and innovation (Verganti, 2009; Jahnke, 2012). We therefore would welcome studies of designers' meaning creation in the practice of innovation from a designerly point of view.

Example 3. The design thinking discourses build upon a notion that managers' ways of thinking and problem solving are different from designers. At the same time, Boland and colleagues maintain that managers are quite capable of using designers' ways of reasoning as well: a statement that assumes that the differences are complex and probably inherit some ambiguity and paradox. As a way to investigate both differences and similarities, the whole design thinking area would gain from close ethnographic research that could replace descriptive anecdotes and build up an academic body of knowledge. One possibility could be situations similar to that at Intuit, as described by Martin (2011), but using an ethnographic approach and an analysis framework that draws from the tradition described by Cross (cf., Cross, 1999). The objective of such a stream of research would be to attempt to understand what is happening naturally in the setting, and to interpret the data gathered in a systematic way to see what implications could be formed from the data.

Concluding Reflections

As social constructionists we regard an approach that begins with the question, 'What is design thinking?' as an essentialist trap. We do not believe that there is a unique meaning of 'design thinking', and accordingly we should not look for one. Instead, we look for where and how the concept is used in different situations, both theoretical and practical, and what meaning is given to the concept. In this article we have identified multiple discourses with distinctly different meanings and assumptions given to the concept 'design thinking': five scholarly discourses grounded within the design research area, and three discourses within the managerial area, of which two are grounded in management research and one in design practice.

The five designerly discourses are all aware of the others, being followers, alternatives or in clear opposition to each other. There is also some awareness between the three identified management discourses: Martin links to IDEO, the Boland and Collopy-inspired discourses have common ground in Simon, with interpretations that spread in different

directions depending on the theoretical tradition of the author.

When it comes to links between the design and management discourses ('designerly thinking' and 'design thinking') there are few links between them. Out of the three management discourses, two (IDEO and Martin) are linked to design practice by IDEO – but do not refer to academic research within design (even if there must be some connections because both IDEO's founder and design research come from similar experiences in industrial design education). Within the design discourses, we have located a single reference to the managerial discourse of design thinking – as a 'business model' (Piotrowski, 2011).

The Designerly Ways of Thinking

The five different discourses with different epistemological underpinnings that we refer to collectively as a 'designerly way of thinking' each have both forerunners and followers that exist as parallel tracks. Anyone wishing to make an academic contribution therefore needs to have this pluralistic perspective in mind, because without recognizing the plurality and identifying the specific perspective, it is impossible to make an academic contribution. Academic knowledge always needs to take earlier knowledge into consideration, and to build upon a similar epistemology (this holds even for a critique that takes distance from a specific discourse). From an academic perspective, this plurality in discourses within designerly ways of thinking is not a sign of weakness but rather a sign of maturity.

The Management Discourse of 'Design Thinking'

The management discourse of 'design thinking' is united as a fad, yet there is far from a single meaning. Rather, the concept of design thinking seems to consist of different streams that are united only because they are not analytical. Perhaps those designers and design researchers who are not comfortable with the concept 'design thinking' associate it with a more cognitive approach and a distinction between thinking and doing. Conversely, management practitioners like the concept 'design thinking' because it gives a label to something that is needed within management, but unless it is articulated, it remains undervalued. The normative descriptions are written with industrial leaders as the target group. Though it is understandable that many people would like a clear-cut definition of design thinking, such a quest for unity is counterproductive for the academic development of the area that we believe it deserves.

Acknowledgements

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Appendix A. Literature Demographics (Figure 1): Categorized Articles, Books and Presentations

DESIGNERLY THINKING

Stream	Medium	Reference	Focus
1-Creation of artefacts	Book	Simon, H. (1969) *The Sciences of the Artificial*. MIT Press.	Conceptual
	Prof Jnl	Vogel, C. (2009) Notes on the Evolution of Design Thinking: A Work in Progress. *Design Management Review*, 20, 16–27.	Conceptual
1-Creation of artefacts & 2-Reflexive Practice	Acad Jnl	Dorst, K. and Dijkhuis, J. (1995) Comparing Paradigms for Describing Design Activity. *Design Studies*, 16, 261–74.	Conceptual
		Liu, Y, (1996). Is Designing One Search or Two? A Model of Design Thinking involving Symbolism and Connectionism. *Design Issues*, 17, 435–49.	Conceptual
1-Creation of artefacts & 5-Creation of Meaning	Acad Jnl	Louridas, P. (1999) Design as Bricolage: Anthropology Meets Design Thinking. *Design Studies*, 20, 517–35.	Conceptual
2-Reflexive Practice	Acad Jnl	Rylander, A. (2009). Design Thinking as Knowledge Work: Epistemological Foundations and Practical Implications. *Design Management Journal*, 5, 7–19.	Conceptual
		Schön, D. (1988) Designing: Rules, Types and Words. *Design Studies*, 9, 181–90.	Conceptual
		Schön, D. & Wiggins, G. (1992) Kinds of Seeing and their Functions in Designing. *Design Studies*, 13, 135–56.	Conceptual
	Book	Schön, D. (1984) *The Reflective Practitioner: How Professionals Think In Action*. Basic Books.	Conceptual
		Schön, D. (1986) *The Design Studio: An Exploration of Its Traditions and Potentials*. Intl Specialized Book Service Inc.	Conceptual
2-Reflexive Practice & 5-Creation of Meaning	Acad Jnl	Bousbaci, R. (2008) 'Models of Man' in Design Thinking: The 'Bounded Rationality' Episode. *Design Issues*, 24, 38–52.	Conceptual

Appendix A. *Continued*

DESIGNERLY THINKING

Stream	Medium	Reference	Focus
3-Problem Solving Activity	Acad Jnl	Buchanan, R. (1992) Wicked Problems in Design Thinking. *Design Issues*, 8, 5–21.	Conceptual
		Ho, C. (2001) Some Phenomena of Problem Decomposition Strategy for Design Thinking: Differences between Novices and Experts. *Design Studies*, 22, 27–45.	Empirical
		Owen, C. (2007) Design Thinking: Notes on its Nature and Use. *Design Research Quarterly*, 2, 16–27.	Conceptual
		Oxman, R. (2004) Think-Maps: Teaching Design Thinking in Design Education. *Design Studies*, 25, 63–91.	Design Education
		Whyte, J., Ewenstein, B., Hales, M & Tidd, J. (2008) Visualizing Knowledge in Project-Based Work. *Long Range Planning*, 41, 74–92.	Empirical
	Book	Ambrose, G. & Harris, P. (2010) *Basics Design: Design Thinking*. AVA Publishing.	How-to
		Shamiyeh, M. (Ed.) (2010) *Creating Desired Futures: Solving Complex Business Problems with Design Thinking*. Birkhäuser Architecture.	Conceptual
	Conf Prsnt	Owen, C. (2005) Design Thinking. What It Is. Why It Is Different. Where It Has New Value. International Conference on Design Research and Education for the Future, the Gwangju Design Biennale.	Conceptual
	Prof Jnl	Junginger, S. (2007) Learning to Design: Giving Purpose to Heart, Hand and Mind. *Journal of Business Strategy*, 28, 59–65.	Design Education for Management
3-Problem Solving Activity	Report	Owen, C. (2006) Design Thinking: Driving Innovation. The Business Process Management Institute, White Paper, September.	Conceptual
3-Problem Solving Activity & 4-Way of Reasoning	Acad Jnl	Dörner, D. (1999) Approaching Design Thinking Research. *Design Studies*, 20, 407–15.	Conceptual
	Book	Buchanan, R (Ed.) and Margolin, V. (Ed.) (1995) *Discovering Design: Explorations in Design Studies*. University of Chicago Press.	Conceptual
3-Problem Solving Activity & 5-Creation of Meaning	Acad Jnl	Wylant, B. (2008) Design Thinking and the Experience of Innovation. *Design Issues*, 24, 3–14.	Conceptual

Appendix A. *Continued*

DESIGNERLY THINKING

Stream	Medium	Reference	Focus
4-Way of Reasoning	Acad Jnl	Carmel-Gilfilen, C. and Portillo, M. (2010). Developmental Trajectories in Design Thinking: An Examination of Criteria. *Design Studies*, 31, 74–91.	Empirical
		Cross, N. (1990) The Nature and Nurture of Design Ability. *Design Studies*, 11, 127–40.	Conceptual
		Dorst, K. and Cross, N. (1999) Creativity in the Design Process: Co-Evolution of Problem–Solution. *Design Studies*, 22, 425–37.	Conceptual
		Galle, P. And Kovacs, L. (1996) Replication Protocol Analysis: A Method for the Study of Real-World Design Thinking. *Design Studies*, 17, 181–200.	Conceptual
		Gloppen, J. (2009) Perspectives on Design Leadership and Design Thinking and How They Relate to European Service Industries. *Design Management Journal*, 4, 33–47.	Case
		Goldschmidt, G. (1994) On Visual Design Thinking: the Vis Kids of Architecture. *Design Studies*, 15, 158–74	Conceptual
		Goldtschmidt, G. (1995) The Designer as a Team of One. *Design Studies*, 16, 189–209.	Conceptual
		Stempfle, J. & Badke-Schaub, P. (2002) Thinking in Design Teams – An Analysis of Team Communication. *Design Studies*, 23, 473–96.	Conceptual & Empirical
		Taura, T, Yoshimi, T. & Ikai, T. (2002) Study of Gazing Points in Design Situation: A Proposal and Practice of an Analytical Method Based on the Explanation of Design Activities. *Design Studies*, 23, 165–85.	Empirical
	Book	Cross, N. (Ed.) (1992) *Research in design thinking*. Delft Univ Press.	Anthology
		Lawson, B. (2005) *How Designers Think: The Design Process Demystified*, 4th edn. Architectural Press.	Conceptual
		Rowe, P. (1991) *Design Thinking*. MIT Press.	Conceptual
		Thackara, J. (1997) *Winners!: How Today's Successful Companies Innovate by Design*. Gower Pub Co.	Case
	Conf Prsnt	Johansson, U. & Woodilla, J. (2009) Towards an Epistemelogical Merger of Design Thinking, Strategy and Innovation. 8th European Academy Of Design Conference	Conceptual
5-Creation of Meaning	Book	Krippendorff, K. (2005) *The Semantic Turn: A New Foundation for Design*. CRC Press.	Conceptual
		Verganti, R. (2009) *Design Driven Innovation: Changing the Rules of Competition by Radically Innovating What Things Mean*. Harvard Business Press.	Conceptual & Case

Appendix A. *Continued*

DESIGNERLY THINKING

Stream	Medium	Reference	Focus
No Specific Category of Designerly Thinking	Acad Jnl	Leong, B. & Clark, H. (2003) Culture-Based Knowledge Towards New Design Thinking and Practice – A Dialogue. *Design Issues*, 19, 48–58.	Personal Experience
		Papantonopoulos, S. (2004) How System Designers Think: A Study of Design Thinking in Human Factors Engineering. *Ergonomics*, 47,1528–48.	Engineering
No Specific Category	**Acad Jnl**	Senturer, A. & Istek. C. (2000) Discourse as Representation of Design Thinking and Beyond: Considering the Tripod of Architecture – Media, Education, & Practice. *Journal of Art & Design Education*, 19, 72–85.	Conceptual
	Book	LeMasson, P., Weil, B. and Hatchuel, A. (2005) *Strategic Management of Innovation and Design*. Cambridge University Press.	Conceptual
		Margolin, V. (Ed.) and Buchanan, R. (ed.) (1996) *The Idea of Design*. MIT Press.	Anthology
		Wigum, K. (2009) *Radical Design Thinking: Thoughts and Tools for Long Term Solutions*. VDM Verlag.	How-to

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Stream	Medium	Reference	Focus
1-IDEO's Way of Working	Acad Jnl	Callaghan, E. (2008). Personalities of Design Thinking. *Design Management Journal*, 4, 20–32.	Conceptual
	Book	Berger, W. (2010) *CAD Monkeys, Dinosaur Babies, and T-Shaped People: Inside the World of Design Thinking and How It Can Spark Creativity and Innovation*. Penguin.	Conceptual & Case
		Brown, T. (2009). *Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation*. HarperBusiness.	How-to
		Esslinger, H. (2009) *A Fine Line: How Design Strategies are Shaping the Future of Business*. Jossey-Bass.	Conceptual
		Gaynor, G. (2002) *Innovation by Design: What It Takes To Keep Your Company on the Cutting Edge*. AMACOM.	Conceptual
		Kelley, T. with Littman, J. (2001) *The Art of Innovation: Lessons in Creativity from IDEO, America's Leading Design Firm*. Crown Business.	Case-based
		Kelley, T. with Littmann, J. (2005) *The Ten Faces of Innovation: IDEO's Strategies for Defeating the Devil's Advocate and Driving Creativity Throughout Your Organization*. Doubleday.	Case-based

Appendix A. *Continued*

DESIGN THINKING

Stream	Medium	Reference	Focus
	Prof Jnl	Brown, T. (2008) Design Thinking. *Harvard Business Review*, 86, 84–96.	How-to
		Brown, T. and Wyatt, J. (2010). Design Thinking for Social Innovation. *Stanford Social Innovation Review*, pp. 31–5.	How-to
		Lockwood, T. (2010) Design Thinking in Business: An Interview with Gianfranco Zaccai. *Design Management Review*, 21, 16–24.	Case
		McCullagh, K. (2006). Stepping Up: Design Thinking Has Uncovered Real Opportunities. *Design Management Review*, 21, 36–9.	Case
		Porcini, M. (2009) Your New Design Process Is Not Enough – Hire Design Thinkers! *Design Management Review*, 20, 6–18.	Case-based
		Sato, S. (2009) Beyond Good: Great Innovations through Design. *Journal of Business Strategy*, 30, 40–9.	Conceptual
		Sato, S., Lucente, S., Meyer, D. & Mrazek, D. (2010) Design Thinking to Make Organization Change and Development More Responsive. *Design Management Review*, 21, 42–52.	Conceptual & Case
		Uehira, T. & Kay, C. (2009) Using Design Thinking to Improve Patient Experiences in Japanese Hospitals: A Case Study. *Journal of Business Strategy*, 30, 6–12.	Empirical
		Ward, A, Runcie, E. & Morris, L. (2009). Embedding Innovation: Design Thinking for Small Enterprises. *Journal of Business Strategy*, 30, 78–84.	Case-based
1-IDEO's Way of Working & 2-Skill for Managers	Book	Lockwood, T. (Ed.) (2009) *Design Thinking: Integrating Innovation, Customer Experience, and Brand Value*. Allworth Press.	Anthology
2-NecessarySkill for Practicing Managers	Acad Jnl	Beckman, S. & Barry, M. (2007) Innovation as a Learning Process: Embedding Design Thinking. *California Management Review*, 50, 25–56	Conceptual
		Dunne, D. and Martin, R. (2006) Design Thinking and How It Will Change Management Education: An Interview and Discussion. *Academy of Management Learning and Education*, 5, 512–23.	Conceptual & Promotional
		Oster, G. (2008) Derailing Design Thinking. *International Journal of Leadership Studies*, 4, 107–15.	Conceptual

Appendix A. *Continued*

DESIGN THINKING

Stream	Medium	Reference	Focus
	Book	Martin, R. (2009) *The Design of Business: Why Design Thinking is the Next Competitive Advantage*. Harvard Business School Press.	Conceptual
		Neumeier, M. (2008) *The Designful Company: How to Build a Culture of Nonstop Innovation*. Peachpit Press.	Conceptual
		Prahalad, D. and Sawhney, R. (2010). *Predictable Magic: Unleash the Power of Design Strategy to Transform Your Business*. Pearson Prentice Hall.	Conceptual
	Prof Jnl	Bell, S. (2008) Design Thinking: A Design Approach To The Delivery Of Outstanding Service Can Help Put the User Experience First. *American Libraries*, 39, 44–9.	Promotional
		Birchell-Spencer, M. (2010) Companies That Employ Design Thinking Will Tap into Innovations, Longevity and Competitive Advantage, says Roger Martin. *HR Professional*, 27, 51–7.	Promotional
		Carr, S., Halloday, A., King, A., Leidtka, J., and Lockwood, T. (2010). The Influence of Design Thinking in Business: Some Preliminary Observations. *Design Management Review*, 21, 58–63.	Empirical
		Clark, K. and Smith, R. (2008) Unleashing the Power of Design Thinking. *Design Management Review*, 19, 8–15.	Promotional
		Cooper, R., Junginger, S. and Lockwood, T. (2009). Design Thinking and Design Management: A Research and Practice Perspective. *Design Management Review*, 20, 46–55.	Conceptual
		Drews, C. (2009) Unleashing the Full Potential of Design Thinking as a Business Method. *Design Management Review*, 20, 38–44.	Empirical & Promotional
		Fraser, H. (2009) Designing Business: New Models for Success. *Design Management Review*, 20, 56–65.	How-to
		Hackett, J. (2009) Innovation is Good, Fitness is Better. *Journal of Business Strategy*, 30, 85–90.	Conceptual
		Holloway, M. (2009) How Tangible is your Strategy? How Design Thinking can Turn your Strategy into Reality. *Journal of Business Strategy*, 30, 50–6.	Case
		Leavy, B. (2010) Design Thinking – A New Mental Model of Value Innovation. *Strategy & Leadership*, 38, 5–14.	Conceptual
		Martin, R. (2010) Design thinking: achieving insights via the 'knowledge funnel'. *Strategy & Leadership*, 38, 37–41.	Conceptual
		Merholtz, P. (2010). Why Design Thinking Won't Save You. *Harvard Business Review*, 88, 18.	Critique
		Szabo, M. (2010) Design Thinking in Legal Practice Management. *Design Management Review*, 21, 44–46.	Promotional

Appendix A. *Continued*

DESIGN THINKING

Stream	Medium	Reference	Focus
3-Part of Management Theory	Acad Jnl	Romme, G. (2004) Action Research, Emancipation and Design Thinking. *Journal of Community & Applied Social psychology*, 14, 495–9.	Conceptual
	Book	Boland, R. and Collopy, F. (eds.) (2004) *Managing as Designing*. Stanford Business Books.	Conceptual
3-Part of Management Theory	Book	Rasmus, D. (2010) *Management by Design: Applying Design Principles to the Work Experience*. Wiley.	How-to
No specific category	Acad Jnl	Lockwood, T. (2009) Frameworks of Design Thinking. *Design Management Journal*, 4, 3.	Editor Introduction
	Prof Jnl	Lockwood, T. (2009). Transition: How to Become a More Design-Minded Organization. *Design Management Review*, 20, 28–37.	Editor Introduction
		Walton, T. (2010) Insights on Business and Design Thinking. *Design Management Review*, 21, 3.	Editor Introduction

NOT CLASSIFIED INTO EITHER DESIGNERLY THINKING OR DESIGN THINKING

	Medium	Reference	Focus
	Acad Jnl	Brereton, M. and McGarry, B. (2000). An observational study of how objects support engineering design thinking and communication: implications for the design of tangible media. CHI'00. Proceedings of the SIGCHI conference on Human factors in computing systems	Engineering
		Bross, J., Acar, A., Schilf, P. And Meinel, C. (2009) Spurring Design Thinking through Educational Weblogging. Proceedings of the International Conference on Computational Science and Engineering.	Engineering
		Cao, Q. and Protzen, J-P. (1999). Managing Design Information: Issue-Based Information Systems and Fuzzy Reasoning System. *Design Studies*, 20, 343–62.	Engineering
		Casakin, H., Davidovitch, N, and Roberta, M. (2010). Creative Thinking as a Predictor of Creative Problem Solving in Architectural Design Students. *Psychology of Aesthetics, Creativity and the Arts*, 4, 31–35.	Design Education
		Eckert, C. and Martin, S. (2000) Sources of Inspiration: A Language of Design. *Design Studies*, 21, 523–38.	Not relevant

Appendix A. *Continued*

NOT CLASSIFIED INTO EITHER DESIGNERLY THINKING OR DESIGN THINKING

Medium	Reference	Focus
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	Maier, J. & Fadel, G. (2009) Affordance Based Design: A Relational Theory for Design. *Research in Engineering Design*, 20, 23–7.	Engineering
	Morozumi, M., Shimokawa, Y. & Homma, R. (2002). Schematic Design System for Flexible and Multi-Aspect Design Thinking. *Automation in Construction*, 11, 147–59.	Engineering
	Nagai, Y. & Noguchi, H. (2003) An Experimental Study on the Design Thinking Process Started from Difficult Keywords: Modeling the Thinking Process of Creative Design. *Journal of Engineering Design*, 14, 429–37.	Engineering
	Oxman, R. (2002) The Thinking Eye: Visual Re-Cognition in Design Emergence. *Design Studies*, 23, 135–64.	Not relevant
	Smith, G. & Browne, G. (1993) Conceptual Foundations of Design Problem Solving. *Systems, Man and Cybernetics*, 23, 1209–19.	Engineering
	Tovey, M. (1986) Thinking Styles and Modelllng Systems. *Design Studies*, 7, 20–30.	Article not available
	Ulusoy, Z. (1999) To Design Versus to Understand Design: The Role of Graphic Representations and Verbal Expressions. *Design Studies*, 20, 123–30.	Design Education
	VanDerLugt, R. (2000). Developing a Graphic Tool for Creative Problem Solving in Design Groups. *Design Studies*, 21, 505–22.	Not relevant
	Vyas, K. (2006). Design History: An Alternative Approach. *Design Issues*, 22, 27–34.	Not relevant
	Yang, M. (2009) Observations on Concept Generation and Sketching in Engineering Design. *Research in Engineering Design*, 20, 1–11.	Engineering

Not Classified	Medium	Reference	Focus
	Book	Blaszxyl, R. (2002) *Imagining consumers: Design and innovation from Wedgewood to Corning (Studies in industry and society)*. The Johns Hopkins University Press.	Not relevant (Design)
		Eris, O. (2004) *Effective Inquiry for Innovative Engineering Design: From Basic Principles to Application*. Springer.	Engineering
		Jones, A. (2008) *The Innovation Acid Test: Growth through Design and Differentiation*. Triarchy Press.	Engineering
		Mitchell, T. (1996). *New Thinking in Design: Conversations on Theory and Practice*. Wiley.	Design

Appendix A. *Continued*

NOT CLASSIFIED INTO EITHER DESIGNERLY THINKING OR DESIGN THINKING

Not Classified	Medium	Reference	Focus
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		Eris, O. (2003) Asking Generative Design Questions: A Fundamental Cognitive Mechanism in Design Thinking. International Conference on Engineering Design ICED 03 Stockholm.	Engineering
		Janis, N. (2000) Design as a framework for innovative thinking and learning: how can design thinking reform education? IDATER Conference, Loughborough.	Education
		Oxman, R. (2006). Digital Design Thinking: In the New Media is the New Pedagogy. CAADRIA, Kumamoto, Japan.	Design Education
		Wong, C. (200) Some Phenomena of Design Thinking in the Concept Generation Stage Using Computer Media. Proceedings of the Fifth Conference on Computer Aided Architectural Design Research in Asia Singapore, pp. 255–63	Engineering
	Prof Jnl	Kotler, P. and Rath, A. (1994) Design: A Powerful but Neglected Strategic Tool. *Journal of Business Strategy*, 5, 16–21.	Article not available
	Teaching Case	Feinberg, B. and Thomke, S. (2009) Design Thinking and Innovation at Apple. Harvard Business School Cases.	Case

Note: Shaded references are used in the article text.
Acad Jnl = Academic or scholarly peer reviewed journal
Prof Jnl = Professional or practitioner journal
Conf Prsnt = Peer reviewed conference presentation

Appendix B. Literature Demographics: Newspaper, Magazine and Web/Blog Posts (Not Classified)

Magazine Articles

Anon. (2004) Audi Design Foundation. *Design Week*, 19(Apr30), 4.

Anon. (2007, Oct5) Sustaining the Dream. *BusinessWeek*, p17.

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Anon. (2008) Design Thinking + Doing. *Creativity*, 16(11), 28.

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Armit, G, (2010, Jun3) Beyond Design Thinking: Why Hybrid Design Is the Next New Thing. *FastCompany* http://www.fastcompany.com/1656288/beyond-design-thinking-why-hybriddesign-is-the-next-new-thing

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Chan, D. (2010, Sep1) Hybrid Thinking: Designed Thinking. http://catalystsdr.com/2009/09/hybrid-thinking-designed-thinking

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Grace, R. (2010) 'Design thinking' drives Dow Corning change. *Plastics News*, 21(44), 12.

Hempel, J. (2007) How Venture Philanthropists Use Design Thinking To Help Solve Real-World Problems. *Business Week*, Mar 12, pp.8–13.

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Lowe, C. (2005) The NHS needs design. *Design Week*, 20(3), 13.

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Merritt, J. & Lavelle, L. (2005, Aug1) Tomorrow's B-School? It might be a D-School. *BusinessWeek*, p80–81.

Rae, J. (2008, Jul29) P&G Changes Its Game. *BusinessWeek*, p9.

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West, H. (2007, Oct5) The Cross-Discipline Design Imperative. *BusinessWeek*, p16.

Newspaper Articles

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improve-democracy

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text.