

## **FROM TINKERING METHODS TO DESIGN THINKING: PRIMORDIAL THOUGHTS IN DESIGN RESEARCH**

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### **ABSTRACT**

Design thinking as explored by Bernard Roth from the Stanford d.School, Roger Martin from the Rothman School of Management, and the IDEO merger trio by Tom and David Kelley, as well as current its CEO Tim Brown, dominates the narrative of the contemporary schools of design thinking since the late '90s. This article aims to investigate the underlying philosophies, authors, and events that laid the foundation in which these contemporary designers based their strategies on planning for complex environments. To satisfy this intent, the turbulent origin of design methods is explored, following the post-war environment that allowed these ideas to flourish, the generations of methods in design from the '60s to the '90s, and the encroachment of design methods to the embodiment of a commercialized design thinking methodology.

**Keywords:** Design tactics and methods, Research methodologies and methods, Design theory, Collaborative design

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## 1 INTRODUCTION

Since the 2000's the Information Technology industry around the Silicon Valley has turned to design as a source of innovation, specifically the concept of Design Thinking orbiting the methodologies developed by the brothers Kelley with IDEO, and the Stanford d.School. However the core elements in these procedures dates back to the raise of design research methods in the '60s, and most of its techniques were generated by various sources throughout the decades since then. As thoroughly as its length permits, this articles aims at exploring a timeline of these sources through authors, currents, and tools that are foundation to contemporary methodologies.

Starting with the post-war effervescent environment that allowed these new ideas to flourish, this article aims to understand the generations of design research methods as viewed in (Rittel and Webber, 1973), followed by the exploration of unique tools created by designers to tackle complex issues, as well as revealing alternative schools outside the Euro-American circle that had influence in the development of Design Thinking in the Silicon Valley. This historical approach aims at identifying the contributions that shaped contemporary design thinkers, and spotting overlooked techniques that could lead to new approaches.

After the exposition of this myriad of influences, the article will attempt to reverse-engineering Design Thinking in the brothers Kelley perspective, through a review of their book "*Creative Confidence*" (2013), looking to learn how Design Consultants act to define the desired scope, and problem framing in a given challenge, pointing the steps that propelled Design Thinking as a tool for competitive advantage and innovation. Lastly, some of the most poignant critics to these methodologies are exposed, observing them through three different scopes: its financial inclination to conservatism and its intrinsic ties to capitalism, its structural methods and segmentation of stages, and its detachment to the responsibility over the consequence of its products.

## 2 THE GENESIS OF METHODS IN DESIGN

The role of Design as a discipline in the second world war, both in communication strategies and product standardization, gave the field enough perceived value to become increasingly significant in the following decades, fostering attempts to develop a functional theory for design activities (Bayazit, 2004, pp. 22–23). However, these attempts were, mostly, springs of the modernist movement concerned in creating an absolute design to artifacts, more preoccupied with the making an object *per se*, rather than with its process making nor with the consequences of doing so.

According to Huppertz (2015) (Huppertz, 2015, p. 29), it was on the '60s that designers would gain momentum and raise interest in the logistics surrounding the products they designed and how they were "used, sold, distributed and reused within a broader network of activities, people and services." The lateral thinking that allowed this systemic interest to emerge was generated by the improvements applied to the product engineering, and the systematization that occurred in the '40s and '50s, boasted by the technological enhancement of systems through computational efficiency. It has inspired designers to seek a systematic rigor to the development of a universal methodology, in the attempt to legitimize design respectability as an academic field. Huppertz perception is reinforced by this excerpt of Herbert Simon (1969), "*The Sciences of the Artificial*" (Simon, 1969, p. 435):

"In terms of the prevailing norms, academic respectability calls for subject matter that is intellectually tough, analytic, formalizable, and teachable. In the past much, if not most, of what we knew about design and about the artificial sciences was intellectually soft, intuitive, informal, and cook-booky."

Jon Christopher Jones, who reached increased relevance writing regularly about ergonomics, methodologies, automation and design policies all throughout the '50s<sup>1</sup>, wrote, in 1959, the essay "*Systematic Design Methods*" that would, ultimately, lead to the cornerstone "*Conference on Design Methods: On Systematic and Intuitive Methods in Engineering, Industrial design, Architecture, and Communications*" that took place in London in September of 1962.

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<sup>1</sup> Some of Jones' relevant articles to the topic are: "Human Aspects of Engineering Design." (1952); "Ergonomics, Human Data for Design." (1954); "Traditional and Modern Design Methods." (1957)

## 2.1 1st generation of methods

The “*Conference on Design Methods*” was a seismic shift in the study of design as a discipline in the ’60s. John Chris Jones evaluating that time in his article “*What is Designing (2009)*” (Jones, 2009, p. 77), characterizes it by a time when there was a genuine attempt to peel design from outside interference, and to apply a one-size-fits-all solution to design as process, which led to widely varied interpretations on how to achieve the task.

Jones (Jones, 2009, pp. 78–79) observes that the ‘methods proposed by theorists were just as diverse as their descriptions of a design process.’ and that instead of focusing on design products, they focused on the inner structures of the term design. Huppertz, in the book “*Design: Critical and Primary Sources: Professional Practices and Design Theories*” (Huppertz, 2015, p. 9) also picks on the 1st generation of design methods, stating that similarly to the modernist attempt to universalize taste and form, the search of an unified theory of design would prove to be problematic.

By the end of the ’60s there was a generalized sentiment that the initiatives and concepts generated throughout the decade were too diverse to be combined in any reasonable manner. One of the icons from the first generation, Christopher Alexander created a manifesto against the resultant methodologies of the decade, Alexander (as cited in Bayazit, 2004) (Bayazit, 2004, p. 20) wrote

“The odd thing is that people have lost sight completely of this objective[...]. I feel that a terrific part of it has become an intellectual game.”

Closing to the end of the decade, in 1969, Herbert Simon published the iconic “*Science of the Artificial*”, and, in 1970, John Chris Jones published “*Design Methods: Seeds of Human Futures*”. These writings were fundamental to the further development of Design Methods in the ’70s, despite their substantial differences.

Simons’ book was the first to mention design as a way of thinking or particular science, his approach was heavily influenced by an engineering of design and human psychology point of view. He expanded the term *Artificial* to explain that everything that was planned, one way or another, related to the realm of design, and design as a process, which led him to the definition of design as (Simon, 1969, p. 69) “courses of action aimed at changing existing situations into preferred ones.” Simon was more concerned with optimizing the methods of design to make their streamlining viable, leading him to be the precursor of concepts on HCI<sup>2</sup> and Informational Architecture. On the other hand, Jones (2009 defined design as the action to “initiate change in man-made things.” Jones (Jones, 2009, pp. 78–79) would argue that the material and components given to a producer started the process of change, which would be completed by the “the evolutionary effects upon society-at-large of the systems that each new product forms a part.” By choosing to embrace the complexity generated by reinserting new designs or redesigned artifacts to their environment and the systematic effects that rise from it, Jones gives a taste of what would be later characterized as “*Wicked Problems*” (Rittel and Webber, 1973, p. 160).

## 2.2 Wicked problems and the 2nd generation

In 1973, they published the seminal article “*Dilemmas in a General Theory of Planning*”(1973) in which Horst Rittel and Melvin Webber, debated the idea that problems could be quantified, understood, and could have a clear path of action. The authors suggested that designers “ought to be asking what systems do, instead of what they are made of, and more so who they are being built for” (Rittel and Webber, 1973, p. 157). It was also in this article that they coined the design research on methods done prior to the ’70s as “the First Generation of Design Methods”, grammatical venture that Bayazit (Bayazit, 2004, p. 18) claims to have been crucial to protect the first attempts on finding a common ground for design as a discipline.

What Rittel and Webber sought to develop was a framework for identifying planning problems, which he believed to be inherently wicked. For them, these problems could never be truly solved but only resolved, given the right circumstances. These problems are “ill-formulated, information is confusing, there are many clients and decision makers with conflicting values, and the ramifications in the whole system are thoroughly confusing.” These characteristics were then expanded in 10 definitions (Rittel and Webber, 1973, pp. 161–167) to spot ‘Wicked Problems’ and how to interact with them.

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<sup>2</sup> Human Computer Interaction

Rittels' "Wicked Problems" model aspired to be an alternative to the linear structure explored until then, arguing that an issue with these type of challenges is that they have indeterminacy, meaning that there are no conditions or limits to the effect they have on systems around them. Bayazit (Bayazit, 2004, pp. 19–20) explicate that as a consequence, now users were starting to become key in the design decisions and figuring out what their goals and concerns one was a key component to this revised approach. That summed to the concern with the actual repercussion of design decisions, situated this new generation of methods to be more resembling of the cultural insurgences that characterized its revolutionary time-frame.

### 2.3 The design thinker toolkit

Another important name for the period was Bruce Archer with valid contributions<sup>3</sup> to the design research field, in 1979 he wrote "Whatever Became of Design Methodology" (Archer, 1979) published in the recently founded publication "Design Studies". In this article, he wondered about the distinction between the way designers think and traditional scientific ways, asserting that the way designers think can be as powerful as scholarly methods when applied to problems of their own capacity, he called this the "designerly way of thinking".

Another author that published in the inaugural edition of the "Design Studies" journal was Jane Darke, her article "The Primary Generator and the Design Process" propose a new model that would merge the problem focus orientation common to engineers, and the solution focus orientation habitual amongst architects, through the use of "Conjecture-Analysis"<sup>4</sup>. Method that would later influence the studies of Abduct Reasoning by Nigel Cross (Cross, 1982, p. 224) and Roger Martin (Martin and Martin, 2009, pp. 94–97)

The Editor-in-Chief of the Design Studies publications was Nigel Cross (Cross, 1982), who seemingly inspired by Archer's nomenclature wrote "Designerly Ways of Knowing" in the "Design Studies" issue of 1982. In this seminal article, he construes design as a third way between sciences and the humanities, (Cross, 1982, p. 221) Figure 1 is inspired by Cross's definition regarding the study, the appropriate methods, and the values in each segment of knowledge, with the proposition of design as a separate field.

Nigels Cross' Designerly Way of Knowing	Study	Methods	Values
Sciences	the natural world	controlled experiment, classification, analysis	objectivity, rationality, neutrality, and a concern for truth
Humanities	human experience	analogy, metaphor, criticism, evaluation	subjectivity, imagination, commitment, and a concern for justice
Design	the artificial world	modeling, formation of patterns, synthesis	practicality, ingenuity, empathy, and a concern for 'appropriateness'

Figure 1. Nigel cross contrasting science, humanities, and design

The propagation of dedicated design research conferences, publications, and groups around the world in the '80s encouraged further development of methodologies that started with the 2nd generation in the '70s. Alongside Archer and Nigel, Donald Schön and Peter Rowe also have focused on understanding what defined a design professional, to the extent of what was, specifically, different in a design process, and how designers consistently got to unconventional solutions.

Donald Schön's (1983) biggest contribution to the period was the book "The Reflective Practitioner: How Professionals Think in Action". In the book, he observes the crisis in confidence that happened after the '60s, and the unease of the decades that followed, characterized by frustrated professionals that could not account for, nor explain, processes that were critical to the successful accomplishment of their duties.

<sup>3</sup> Archer, in 1967, helped to found the Design Research Society in England, won the Kauffman Design Research Award in 1967, and was awarded a doctorate by the Royal College in 1968

<sup>4</sup> a variety reduction mechanism through the analysis of external constraints, and the designers cognitive structures

Schön explored an ethnographic lens on the learning by doing, extracted from the model of Technical Rationality<sup>5</sup> The practitioner allows (Schon, 1983) “himself to experience surprise, puzzlement, or confusion in a situation which he finds uncertain or unique,[...] which serves to generate both a new understanding of the phenomenon and a change in the situation.” This perspective inspired the iterative and scrappy nature of contemporary Design Thinking schools, an environment where the professional can feel comfortable to experiment with the unknown.

Peter Rowe’s book “*Design Thinking*” from 1987, examines the quintessential aspects of creative problem-solvers. According to Rowe (Rowe, 1987, p. 39), planners need to explain what happens when their design goes beyond matters of procedure. From an architecture viewpoint, Rowe investigates case studies to come up with what he calls “*Procedural Aspects of Design Thinking*”, proposing several tools<sup>6</sup> and frameworks to evaluate a design project in different phases of development.

Through the ’60s ’70s, the Scandinavian Design movement was at full speed, however it went in a different direction than their Euro-American counterpart. Jo Szczepanska, in the 2017 article “*Design thinking origin story plus some of the people who made it all happen*”, claims that Scandinavian design projects encouraged everyone to take part in the design decisions (Szczepanska, 2017), different than the assembly of elite teams dedicated to solving the methodological questions in the US, UK, and Germany. In the ’80s the Scandinavian approach made its way west, gaining momentum with the idea of *Participatory Design*, where designers act as curators of experiences that involve the whole community. Tools<sup>7</sup> and techniques, that are mainstream in Design Thinking projects nowadays, started then to be introduced to non-designers in order to enhance participation.

### 3 SILICON VALLEY DESIGN METHODS

IDEO, established in 1991 by merging of Bill Moggridges’ ID Two, Mike Nuttalls’ Matrix Design, and David Kelley Kelleys’ Design, would turn in the ’00s into one of the most active agents in disseminating Design Thinking, especially, in the business and entrepreneurial circles. One of its founder Tom Kelley, released, in 2001, the best-seller “*Art of Innovation*”, which alongside “*Design of Business*” by Roger Martin (2002), and “*Change by Design*” by Tim Brown (2008) are often the introductory books to anyone interested in the term Design Thinking. In this section, methodologies from these authors will be explored more in depth, looking to identify elements that were incorporated by them.

The organic growth design experienced since the 1980s was, in the 2000s, enhanced by the perception of the designer as the medium through which innovation was triggered (Brown, 2008, pp. 50–53). The definition given by the brothers Kelley (Kelley and Kelley, 2013, p. 18) states that Design Thinking is “a way of finding human needs and creating new solutions using the tools and mindsets of design practitioners. [...] It relies on their natural human ability to be intuitive, to recognize patterns, and to construct meaningful and functional ideas.” this is the core of the approach taught by Stanford d.School and IDEO, evaluating the success of a product or service based three core characteristics: feasibility, viability, desirability.

As seen in Kelley (Kelley and Kelley, 2013, p. 20), *feasibility* regards the technical inventiveness of a project, and is taught thoroughly in Science and Engineering tracks; *Viability* concerns to the marketability of a project, Kelley mentions that companies, naturally, already dedicate a lot of resources to its studies. *Desirability* then is the area that offers more room for the designer to operate, defined in Kelley (Kelley and Kelley, 2013) as being “about deeply understanding human needs, [...] about understanding why people do what they do, with the goal of understanding what they might do in the future.” Which has roots in the ethnographic studies realized by Schön (Schon, 1983, p. 12), and its preoccupation of designing with the user as the pivot point.

The methodologies proposed by IDEO and Stanford d.School are very similar, comprised in a series of iterative steps (Kelley and Kelley, 2013, pp. 15–17): *Inspiration, Synthesis, Ideation + Experimentation, and Implementation*. Having these stages as guides to what should be focused at a given moment, and iterating as through them as necessary.

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<sup>5</sup> Technical Rationality—the view of professional knowledge which has most powerfully shaped both our thinking about the professions and the institutional relations of research, education, and practice.

<sup>6</sup> Heuristic Reasoning, Decision-Trees, Environmental Relations, Anthropometric Analogies, Typologies.

<sup>7</sup> ‘Mock-up Environment’, Future Circles, Organizational Games, Co-operative Prototyping, Ethnographic field research.

1. *Inspiration* - Empathy is the leading word for this step focusing on observing people in their natural context to trigger insights;
2. *Synthesis* - Consists on the processing of the information gathered in the first step, allowing the designer to dilute the research into *actionable frameworks* through *abductive reasoning*, making inferences based on observed users' behaviors. It uses similar logic to the Conjecture-Analysis structure delineated by Jane Darke (Darke, 1979);
3. *Ideation and Experimentation* - refers to the educated solution generation phase, guided by the previously established frameworks. It is when designers present and test quickly assembled prototypes of the imagined solutions to users, or to personas inspired by them. Comparable to the Scandinavian strategies of *organizational games*, and *co-operative prototyping* (Szczepanska, 2017).
4. *Implementation* - The last step is where a road-map for the project is consolidated, the design is refined, and the product/service is shipped to be put to the use by the final users.

### 3.1 Design thinking as its own enterprise

The business-oriented methodologies that emerged in the 2000s have played a vital role in expanding Design Thinking as a self-sufficient field, and in raising its perceived value through the creation of tools, and optimization of techniques that are used in a myriad of projects today. As Barry Katz points in the book *"Make it New"* (2015) IDEO has successfully built its reputation "by the synthesis of industrial design and mechanical engineering" (Katz, 2015, p. 161). Even though the economy now is more about systems design and its applications, the Silicon Valley Design Thinking companies seem to have accomplished the elevation of design to managerial circles, expanding their role to active controlling the steps towards revenue-generating heuristics and algorithms. Curiously, this is also one of its biggest criticisms (Huppertz, 2015, p. 9).

Huppertz (Huppertz, 2015, p. 7) points out to the contradiction of having *Design and Management combined*, since the first strives for "exploratory futures and the second craves for predictability and control," the author also eludes to the problem of having *Competitive Advantage* as the biggest decoy for Design Thinking. The ability to promote ever faster cycles of continuous innovation (Brown, 2008, p. 62), a chanted mantra among Silicon Valley Design Thinking gurus, fails to engage these innovations consequences on the social, ethical, and environmental dimensions.

Guy Julier, in the book *"Economies of Desig"* (2017) states that design is inextricably connected to capitalism, and its spread is concomitant with the raise of Neoliberal practices intensified since the '80s. He evaluates the systematic effects of ordinary design products like mobile applications (Julier, 2017, p. 13) in the stream of their production flow (i.e battery, operating systems, memory capacity, network provision), rippling their unceasing need for updates to the whole chain of systems that are influenced by their use. To Julier, these model of obsolescent design plays a discursive role, and needs to be aware of its potential to reinforce prejudicial conventions, and its responsibility over stimulation of unwanted behavior.

Another critic to IDEOs' methodology can be found in Buchanans' article *"Wicked Problems in Design Thinking"* (1992) regarding the fragmentation of its scope and problem framing, or its *"Place-ments"*<sup>8</sup> as he would call. Buchanan argues that there are many forms of step-by-step design processes (Buchanan, 1992, pp. 97–98), Silicon Valley Design Thinking linear methodology fits on his description of the *"Problem definition x Problem Solution"* model, with analytic sequence in the first step and synthetic sequence in the second, or, as named in IDEOs' terminology, Divergent and Convergent Thinking.

Latours' (Latour, 2008) view corroborates with Buchanan's concerns regarding the closed set of "didactic, descriptive, confining, and bullet-proof solutions" proposed in Design Thinking methodologies like IDEOs'. The implications of that are a disregard for the complex nature of design problems as seen in Rittels' *Wicked Problems*, which claims that design issues are not susceptible to any linear analysis or process (Buchanan, 1992, pp. 98–99). The appeal of this quasi-Tayloristic approach practiced in the Silicon Valley is reinforced on Jones (Jones, 2009, pp. 78–79) characterized by the pressure over design to become more scientific, with more predictable results, which might cost designers their ability to contemplate unlikely scenarios.

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<sup>8</sup> Tools by which a designer intuitively or deliberately shapes a design situation

Julier (Julier, 2017, p. 17), defines as the symbolic role of the designer to “make change appear reasonable, to show *in potentia* [...] and to act in the leading edge of cultural production.” This article aimed to be an introduction to Silicon Valley companies’ vision of Design Thinking, to recognize its role to contemporary Design Thinking, and to address some of its critics. Hoping that designers can apply the semiotic role Julier attributes to them, through the craft of a discipline that is more social, more participatory, and more environmentally responsible, in which the designer act as a orchestrator to invite the participation of the people involved, so they can help to initiate change in the artifacts they interact with and collectively deliberate in their own preferred futures.

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