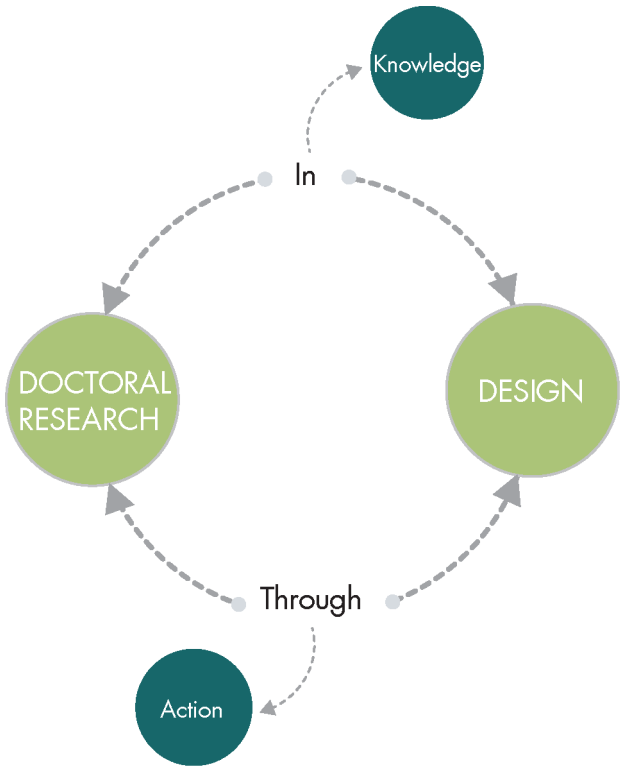
Design Research: Between Scientific Method and Project Praxis

Notes on Doctoral Research in Design 2012

Lucia Rampino (ed.)



Serie di architettura e design
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This book is part of a series that records research and teaching activity in the Politecnico di Milano's Design PhD Program, directed by Francesco Trabucco.

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On Design Research Methods

A Question of Method

Lucia Rampino, Politecnico di Milano

This book tackles an issue pivotal to all research: methodology; for any given piece of research has its "reliability is determined by its methodology" (Archer, 1995). Yet reliability, in design, is even more critical because design is a non-scientific discipline. For design, like architecture, is a border discipline, a bridge across the two main areas into which Western culture has traditionally divided: the sciences and the arts and humanities. "*The question of whether design is science or art is controversial because design is both science and art. The techniques of design combine the logical character of the scientific approach and the intuitive and artistic dimensions of the creative effort.*" (Borja de Mozota, 2003, p. 4)

However, while architecture's history is long indeed, design is a young discipline, whose boundaries have not had time to consolidate over centuries. Moreover, design is multidisciplinary in nature, welcoming contributions from other disciplines (e.g. material science, psychology, marketing, and art history). This multidisciplinary system is both design's strength, a discipline able to orchestrate other disciplines, and its weakness, depriving the designer of a specific, distinctive know-how universally recognized as 'designership.' §Being a young, multidisciplinary, border discipline leads to great debate over moot issues of what it means to do research using the tools and methods that belong to the discipline of design, of the very terms in which such research is possible. This book aims to make a contribution to such debate.

Scientific versus Design-oriented Research

In general, by "research," we mean scientific research, which is a measure of science's cultural success in the Western world (Archer, 1995). This cultural success can be seen as the main reason behind the desire to make design, too, a scientific discipline, a desire that can be traced both to ideas in the modern movement of the 1920s and to the "design methods movement" of the 1960s (Cross, 2000). In the scientific tradition, research

should be objective, systematic, and context-free (Archer, 2005), three adjectives that summarize the traditional model of academic research, which several design scholars have adopted, especially for the doctorate.

However, an alternative model, of research based on design practice, has been gaining credibility in recent years. Saikaly (2003) terms this approach to design research "reflexive and interpretative." At its extreme, the research process coincides with the design process and the research result is the practical result itself. Scholars have given this approach various names: the practice-centered approach (Saikaly, 2003), practice-led or artistic research (Rust, 2007), activity-based research (Kumar and Whitney, 2003), design-oriented research (Fallman, 2005). Indeed, doing a design project is the most natural thing for designers to do, although – as noted – the epistemological dimension of design praxis needs clearer defining.

So, even in research, design's dual nature shows, justifying this book's title: *Design Research: Between Scientific Method and Project Praxis*.

In my opinion, the scientific method should be the first notion taught to every PhD student, even in the design field. Indeed, the very issue of method belongs to the scientific tradition, something every researcher must be aware of. Then, once our PhD students own this basic knowledge, all the limits of applying scientific method to a nonscientific discipline like design should be explained and discussed. Thus, our PhD students may consciously refuse the scientific approach, opting for approaches nearer to the practical side of design. However, opting for a practice-led or artistic approach should be a mindful choice, not a shortcut to avoid facing the complex question of method.

Structure and Contents of the Book

This book's three sections progress from a more general treatment of the relationship between design and research toward more specific ones.

On the Role of Design

Part one analyzes the role of design in society. Alessandro Biamonti focuses on our present, Michel Bauwens on our near future, and Pietro Marani on our past. Biamonti, whose research focuses on interior design, emphasizing its anthropological aspects, discusses how design's role has changed in contemporary, networked society. Bauwens, a world-renowned theorist of peer-to-peer production, analyzes why open, distributed manufacturing is vital to ensuring our society a sustainable future. Should

this huge change in manufacturing become pervasive, the impact on design will be great. Marani, a well-known art historian and Leonardo da Vinci expert, stresses art history's role in training the contemporary designer, both in terms of knowledge acquired and research methodology to be learned.

On Design Research

Part two features a number of different viewpoints on design research, from both inside and outside the design discipline. Francesco Trabucco, coordinator of the Politecnico PhD in Design, contributes a deep and broad reflection that focuses on the distance between design and science and on the value of design in contemporary society. Tore Kristensen, head of the Doctoral School at Copenhagen Business School, offers some interesting remarks on doctoral research in design from an external observers point of view. Ilpo Koskinen holds a PhD in social science and is a professor at the Aalto University School of Art and Design. In 2011 he published *Design Research through Practice*, during the research for which he visited a number of design research centers, including the Indaco Department of the Politecnico di Milano. His article analyzes similarities and differences among design research, design practice, and art practice. Because Raffaella Mangiarotti is both a professor and a well-known designer, I asked her opinion on the role of professional practice as part of doctoral design research. Silvia Ferraris is a researcher in design: by interviewing a number of postdoc researchers in several other disciplines, she created an interesting reflection on the individualistic framework for design research – which is typical of the Politecnico di Milano – in comparison to the collaborative framework typical of other, more structured research fields.

On Design Research Methods

Part three deals in detail with the issue of method. The first article is devoted to a semantic clarification on the use (and abuse) of such terms as *method*, *approach*, and *tool*. Paolo Volontè, who holds two PhDs, one in sociology and one in philosophy, introduces us to the real scientific method, striving to clarify what features and aspects of it may prove useful for research in design. Thereafter, with Sara Colombo, I have attempted to bring order to the multitude of methods and approaches that a researcher in design has at his or her disposal when starting research. This systematization, based on a literature review, shows that all the methods can be divided into two main groups: *traditional research methods*, typical

of a research setting, and *practical design methods*, used both by practitioners in their professional activity and by researchers in an action-research approach. Given the multidisciplinary nature of design, these practical methods may come not only from design itself but also from other disciplines, such as engineering, ethnography or marketing.

Because action research is the typical approach of our PhD in Design, great attention is been paid it here. Beatrice Villari, who has been dealing with the issue of action research since her PhD thesis, discusses the action-research process in depth and analyzes its main features when implemented in a design-research setting. Roberta Gorno, who holds a PhD on the role of emotion in product design, provides an exhaustive description of one of the most interesting sets of practical design methods developed by a research group, the Design and Emotion Society. Finally, Alberto Colorni, an expert on the mathematical modeling of decision-making processes, and Alessandro Luè describe decision-making tools, giving us an interesting example of a set of practical methods that, developed within other disciplines, can prove useful to design in an action-research approach.

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On the Role of Design

Mind the Gap: How to Design in New Paradigms

Alessandro Biamonti, Politecnico di Milano

The Network Society

The network, as named by the famous sociologist and communication scholar Manuel Castells, is an open structure, based on *nodes* connected by *links*, free to expand itself by integrating new nodes, given their ability to be connected to the whole system. The links represent the supporting structure of *flows*, which run throughout the network. "The networking form of social organization has existed in other times and spaces" (Castells, 1996). Despite that, according to Castells, we can easily perceive how, during the last part of the twentieth century and, above all, the beginning of the twenty-first century, profound changes in the our society's morphology have appeared as a result of the big change in technology (from pure data processing to network technology). Indeed, we may note that Kevin Kelly's 1994 definition of "pure network," as "distributed, decentralized, collaborative, and adaptive," now fits not only our society's morphological model but also its communication model.

What's emerging from our *network society* is a new relationship between communication, time, and space. The connections created by information flows, which represent the production base of advanced economic systems, are not related to the nodes' geographic location. According to the founder of the Massachusetts Institute of Technology's Media Lab, Nicholas Negroponte, we can say digitization is more than simply reducing costs and increasing speed; it's a "change in the distribution of intelligence" (Negroponte, 1995) within the framework of a sort of virtual ubiquity. In this scenario, from the designer's point of view, two concepts provide a good representation of the changes in our society:

- Product-service system: product + service + communication, a hybrid artifact that includes all these components (Mauri, 1996);
- Knowledge economy: it is on our era's most valued raw material, knowledge, that a company's competitive position is based (Rooney, Heran, and Ninan, 2005).

These two concepts are part of the new peculiarities of *the network*, where the means of creating or increasing value follow one main rule: all the components, nodes, and flows, and the network as a whole, increase their value as interactions increase. This represents a fundamental innovation in the relationship between the use of a system and the value of the system itself. From an economic point of view, that phenomenon highlights a big change in our paradigms of competition. Unlike specialized competition historically, a strong interest in interdisciplinary collaboration is emerging, a sort of harmonizing-collaboration.

In keeping with this scenario, Richard Normann (Normann and Ramirez, 1998) shows how position on the value chain ought not to be the focus of contemporary strategy. Value, in our era, stems from co-creation by different economic factors that work not just to add value but to reinvent it, in a networked context: the *value constellation*. Paraphrasing Richard Normann, considering knowledge one of the greater values of our era, we note that a new paradigm is emerging with the rise of the network society. This marks the shift from a *knowledge chain* (transmitted in merely linear fashion from master to pupil, where position is more important than ability) to a *knowledge constellation* (with no hierarchical position, open-source, and a great deal of signal to transform into information).

Design and Production: the New Paradigm

The increasing complexity of contemporary society demands ever more complex products: hybrid and multi-logical, products full of new questions and challenges. These are not simply competitive products but products that redefine their markets and often transcend their original program goals to create a new market.

On the one hand, in this framework, Cagan and Vogel (2002) bring to bear the concept of *breakthrough products*, which they define through their value-opportunities chart,[1] along with the importance of the so-called fuzzy front end, the part of product development that starts with the process's general goals and covers the early stages of new product development.[2] The integration of separate disciplines, the importance of user's interests in critical decision making, the emergence of style and technology, and the

[1] The scheme proposed by Cagan and Vogel, in order to differentiate a product and contribute to the overall experience of use, takes into consideration the following values: emotion, ergonomics, aesthetics, identity, impact, core technology, quality, and extras.

[2] The main points of the fuzzy front end are: identifying (emerging trends), understanding (holistic product definition), conceptualizing (multiple concepts), realizing (product proposals for program approval).

management of the fuzzy front end all represent the structure of a breakthrough product.

On the other hand, a new role for a self-produced, anti-marketing, experimental approach is emerging in design. This way we can underline the emerging phenomenon of fab labs or fabrication laboratories (Gershenfeld, 2005), small-scale manufacturers employing digital fabrication techniques. The concept was developed at MIT's Media Lab, and now represents one of the most interesting scenarios concerning the relation between design and production, especially considering its worldwide spread.

And, considering the current worldwide crisis in mainstream manufacturing, this approach currently supplies the most interesting scenario in design studies and practices. Furthermore, it also represents an interesting way to explore new boundaries in our disciplines. For, more than an answer to contemporary needs, design should be a visionary activity that seeks solutions for the future. The etymological meaning of the Italian verb *progettare* is *gettare oltre*, i.e. "throwing beyond," thus referring to the action of building a bridge between present and future. Faced with such a new question, it is wise to consider design a tool to develop new questions, rather than a tool to provide new answers.

The way of working, for most of the major design masters throughout history, was to develop a project starting from exploratory research, as part of the process itself. The project's process included the time to develop research focused on the project's subjects.

Today, the increased speed of market processes (production and distribution), within the time-to-market approach, often defines speed itself as a quality (Maldonado, 1986, and Branzi, 1997). This new scenario, in which design is asked to provide solutions almost in real time, pushes the professional job toward a concept of "online design." This is nothing new if we consider that, as early as 1995, Nicholas Negroponte suggested that a software project could literally move around the world from east to west on a twenty-four-hour cycle, between different people and different groups, alternating work and rest time according to geographic location.

Thus, the opportunity to develop an 'online project' represents a historical acceleration of the design process. Using last century's common sense, that means having an extremely short time to think about solutions, too short to carry out adequate research, a situation that could lead to a *gap* between research and practice. On the one hand, pure research is working outside any time schedule. On the other hand, practice usually means working under pressure, nearly in real time.

This gap might be simultaneously conceptual and physical. Indeed, research and solutions are developed in different places, by different people. And a large flow of knowledge could get lost going through this gap. BE CAREFUL: the gap is our resource.

For it is place where a new design approach is emerging. It is a territory where independent designers are exploring new solutions for the future, using all the opportunities provided by technology, but free from the pressure of any market.

The gap is the land where, using our current sensitivities, design could work with other disciplines in order to analyze and understand, as well and deeply as possible, the various facets of our contemporary era.

Thanks to the emergence of social networking, increasingly characterized by a strong combination of technological development and biological approaches, the gap would become the next worldwide atelier. In this atelier design would play the role of facilitator between different disciplines and fields, some of them so new as to be difficult to label.

Mind the gap!

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The Role of Open Hardware and Peer Production in Ensuring a Sustainable World

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Introduction

This article attempts to list the reasons why I believe the trend towards open and distributed manufacturing is a vital part of ensuring a sustainable society.

For those that are not familiar with it, open hardware is a practice where designs are shared through open licenses in a community, and those designs can then be used by manufacturers, who can make and sell the product, eventually making a profit, but they cannot rely on any royalties from intellectual property. We will see later why open design and free hardware are also linked to new modes of production, i.e. open and distributed manufacturing.

The first reason that open hardware is a sustainable practice is that innovation cannot be privatized and taken away from the benefit of collective humanity. This is of crucial importance, for example, in renewable energy research and production. Baby boomers will recall the thriving renewable energy industry in California in the 1970s, the subsequent buy-back by oil companies, and the shelving of those innovations, which delayed more rapid progress for another 30 years. In an age of climate change, dwindling resources, and the post-oil-peak, we cannot afford this type of enclosure. Of course, intellectual property (IP) advocates will claim that IP is needed to protect innovations, but a sufficient number of studies have shown that IP, in the forms of patents, actually slows down innovation. Anyone active in opensource communities or public-domain science also knows from experience that shared innovation is happening on a continuous basis in open communities. Shared licenses for hardware designs insure that any innovation, produced anywhere in the world, benefits the whole of humanity and all members of the open ecosystem in particular. Another counter-argument, one I consider a more serious concern, is that expensive research and initial production

costs, will not be undertaken without sufficient IP protection, so that the investment can be recouped. The answer here is to adapt the model of science, i.e. insure collective funding so many enterprises can benefit from the advances.

The second reason that open hardware contributes to sustainability, and actually is 'inherently' sustainable, lies in the motivation behind the research, innovation, and production. For-profit companies that develop commodities for the market have a vested interest in creating non-sustainable products, and planned obsolescence is a general characteristic of industrial production, under the present economic system. Indeed, such companies must maintain a scarcity in order to continue to operate in the market. (There are some exceptions: think about the government-subsidized aerospace industry). But participants in open-design communities do not have any such incentive. Like their free software brethren, they develop shared designs for various reasons, including the famous 'scratching an itch,' i.e. solving their own problems. Because of this lack of perverse incentive, they can and do strive for optimal designs, which are inherently more sustainable. This means that any business partner in such an open ecology, who used shared designs to produce services or to make and sell products, has to use designs that are inherently more sustainable than anything that can be produced. Any commercial improvements that need to be made will be based on this level playing field of an optimally sustainable design.

The third reason that shared-design hardware contributes to sustainability lies in the design philosophy of production itself. Open-design communities not only think differently about the product or service they are working on but also think differently about the production process needed to produce those designs in the physical world. This is because designers are inherently interested in 'designing-for-making' and, therefore, are interested in lowering the threshold of participation, minimizing the required capital and degree of centralization. In other words, open hardware design is linked to its cousin: open and distributed manufacturing. An example can be seen in the Netherlands-based group known as "c,mm,n" whose design for the Common Car aims at modular development and a biodegradable skin. C,mm,n is not interested in making a car that rapidly grows obsolete and needs to be completely replaced. Or consider the eCars model, which allows any mechanic to download a conversion design to turn any car into a hybrid. This new model does not call for the centralized manufacturing of millions of cars; instead the model is of localized distributed production, nevertheless linked to global open-design communities.

Open hardware is related to the general trend of 3-D printing, personal fabricators, and multimachines that generally lower the threshold of participation. Localized production holds the promise of great savings in transportation costs, while losing none of the benefits of scale, because it can count on open, global, innovation-and-research communities. In a sense, scale becomes scope. It is the global scope of cooperation that allows scaling a re-localized manufacturing system into a global-local system.

The fourth argument is not related directly to shared designs, but to the use of networked technology in developing shared infrastructures. We are thinking here of how such infrastructures, with the radical reduction in transaction and coordination costs that they entail, have led to the emergence of a very strong sharing economy. Used fractional ownership of cars, for example, as in Zipcar carsharing, or real P2P sharing that allows for optimal collective use of privately owned cars, has a dramatic effect on the amount of physical production needed to insure a given amount of transportation. These shared infrastructures only become possible because of the availability of networked technologies, the same technology that underlies the emergence of open and shared design. Once we abandon the central requirement for private ownership of the means of production and change the focus on property to a focus on access and use, combined with more distributed forms of ownership of common stock, we can envision transforming property-based economics to an economics of provisioning, as outlined by Marvin Brown in *Civilizing the Economy*, or to a series of functions, or an "economy of functionalities" based on integrated product-service systems. This transformation, within the bounds of the present political economy, has been described by Botsman and Rogers in *What's Mine Is Yours* and by Lisa Gansky in *The Mesh*.

Challenges

There is, however, one serious challenge to the move from design to effective production.

The main issues center around the funding mechanism. Free knowledge and free software practices require only a minimal amount of specific, project-related capital, since they rest on the cooperation of bodyminds, with access to the generally available network infrastructure, and the materialization of the code still functions within the polarity of digital code. To put it in a rather simplistic fashion, it is sufficient to hit the execute button. None of this is true for open hardware, which is a much more