

Design re-thinking. Some issues about doctoral programmes in design

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ABSTRACT

Different philosophical assumptions, aims, structures, contents and processes underlie the Ph.D. programmes in design offered in different socio-cultural contexts. In order to get a deep understanding of the actual state of doctoral research in design, a comparative study of ten selected programmes was developed. The study covered universities from the North of America, Europe, Asia and Australia.

Each case study was divided in three parts. A first part was related to the study of the doctoral programme. The second part was the study of selected Ph.D. theses. And finally an interview took place with one of the programme advisors.

In this paper I will present the results of the comparative study. The points to be discussed are:

- (i) The different philosophical assumptions that guide doctoral programmes in design; How these different philosophical assumptions led to different learning experiences and contributed to the development of different skills and competencies;
- (ii) The different positions and roles of the design project in different research settings.

I will conclude the paper by introducing two points that deserve further exploration. The first one is related to the practice-centred Ph.D. programmes in design. The other one concerns the reasons why the role of the design project in doctoral research is evolving and gaining more status.

INTRODUCTION

'Design research is alive and well, and living in an increasing number of places.'¹ (Cross, 1999). Doctoral programmes² in design are one of these places. The purpose of doctoral studies in university disciplines is to learn to do research through the development of an original contribution to knowledge (Phillips and Pugh, 2000). Therefore the ' [...] concern in design research has to be the development, articulation and communication of design knowledge.' (Cross, 1999)

Most of the Ph.D. programmes in design were launched during the 1990s³. They are offered in different socio-cultural contexts and belong to different educational systems. The epistemological and methodological issues related to design research are still at the center of the debates of the international community of design researchers. In order to get a deep understanding of the different philosophical assumptions, aims, structures, contents and processes that underlie and guide these Ph.D. programmes, and the different positions and roles of the design project in different research settings, a comparative study of 11 programmes was developed. Each programme formed a case study. Each case study was divided in three parts: the study of the doctoral programme, the study of selected Ph.D. theses developed within the programme and an interview with one of the programme advisors.

In this paper I will present the results of the comparative study. These results were summarized, analyzed and interpreted under a constructivist research paradigm. The points to be discussed are:

- (i) The different philosophical assumptions that guide doctoral programmes in design; How these different philosophical assumptions lead to different learning experiences and contribute to the development of different professional skills and competencies;
- (ii) The different positions and roles of the design project in different research settings.

I will conclude the paper by introducing further questions related to the design project within a doctoral research in design, and to the reason why it is gaining more status in the research process.

THE SELECTION OF THE PH.D. PROGRAMMES

Different socio-cultural contexts and different educational systems⁴ were taken in consideration in the selection of the Ph.D. programmes. The study covered the North of America, Europe, Asia and Australia. Respectively, the selected countries were Canada, the United States of America, France, Germany, Great Britain, Italy, Japan and Australia.

Two factors were retained important in the selection of each programme. From one hand it was taken in consideration the developments and contributions of its faculty members and groups of research to the design discipline. From the other hand it depended from the areas of research of each programme⁵. The selected programmes were:

- In Canada the doctoral programme offered at the University of Alberta: *Art and Design*;
- In the United States of America the doctoral programme offered at the Massachusetts Institute of Technology: *Design and Computation*;
- In France the doctoral programme offered at the Ecole Nationale Supérieure des Arts et Métiers - ENSAM Chambéry: *Eco-conception de produits et procédés*;
- In Germany the doctoral programme offered at the University of Wuppertal: *Computational Design*;
- In Great Britain⁶ the doctoral programmes offered at the Open University: *Design and Innovation*, The Royal College of Art: *Interaction Design* and at Sheffield Hallam University: *Art and Design*;
- In Italy, the doctoral programme offered at the Politecnico di Milano: *Industrial Design and Multimedia Communication*;
- In Japan, the doctoral programme offered at Chiba University: *Science of Design and Architecture*; and
- In Australia, the doctoral programme offered at the University of Sydney: *Design Computing and Cognition*.

THE STRUCTURE OF EACH CASE STUDY

Each case study was divided in three parts. The first one was the study of the doctoral programme. The second one was the study of two or three selected PhD theses developed within the programme. The third part was an interview with one of the programme advisors.

STUDY OF THE PROGRAMME

The study was articulated in a description, an analysis and an interpretation of each programme. The description of the programme was divided in four parts. The first part was about some general information related to the

programme (the entry requirements and the average length of time in study). The second part described the research activity (the areas and groups of research and the general research phases). The third part was about the curriculum (the philosophy of the programme and the intentions, its history and evolution, the content and the sequence of study). The fourth part was about the people involved in the programme (the number of the faculty members, the number of Ph.D. candidates and the number of graduated doctors).

In this part of the study the material was collected through the information available on the web sites of the doctoral programmes and through the exchange of some e-mails with faculty members. In four cases⁷, there wasn't enough information accessible through the web site. In these cases, the interviewed advisors provided all the needed information for the study. A report was developed for each programme. The format of the report is in figure 1.

1. Technical information
1.1 Source of information
1.2 Date of collecting the material

2. Identification
2.1 Title of the programme
2.2 Institution
2.3 Faculty and Department
2.4 Year started
2.5 Address
2.6 Tel
2.7 Fax
2.8 e-mail
2.9 web

3. Description
3.1 General information
3.1.1 Entry requirements
3.1.2 Period of study
3.2 Research
3.2.1 Areas of research
3.2.2 Groups/Units of research
3.2.3 Research phases
3.3 Curriculum
3.3.1 Philosophy
3.3.2 Intention
3.3.3 Content
3.3.4 Sequence of study
3.4 People
3.4.1 Number of the faculty members
3.4.2 Number of the PhD candidates
3.4.3 Number of the PhD graduates

4. Analysis

5. Interpretation

Figure 1: the report format of the study of a doctoral programme.

STUDY OF SELECTED PHD THESES

This part of the case studies concerned the Ph.D. theses developed within the programme. The study was the description, the analysis and the interpretation of the motivations of the research, the aims, the plan of work, the methodology, the strategies of inquiry and the related methods, the results and discussion and finally the theoretical contribution and the practical outcomes.

In some of the cases, electronic copies of the theses were accessible from the programmes' web site. In the other cases, the authors of the selected theses provided a digital copy. A report was developed, as shown in figure 2, for each selected thesis.

<p>1. Technical information</p> <p>1.1 Source of information</p> <p>1.2 Date of collecting the material</p>
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<p>2. Identification</p> <p>2.1 Title</p> <p>2.2 Author</p> <p>2.3 Year of registration</p> <p>2.4 Year of completion</p> <p>2.5 Principal advisor</p> <p>2.6 Other advisor/s</p> <p>2.7 Nature of the thesis</p>
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<p>3. Description</p> <p>3.1 Abstract</p> <p>3.2 Motivation</p> <p>3.2 Structure of the thesis</p> <p>3.3 Aims of the study</p> <p>3.4 Methodology</p> <p>3.5 Results and discussion</p> <p>3.6 Contribution (Theoretical and/or practical)</p>
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<p>4. Analysis</p>

<p>5. Interpretation</p>

Figure 2: the report format of the study of a doctoral thesis.

INTERVIEW WITH AN ADVISOR

The third part of each case study was the development of an interview with one of the advisors of the doctoral candidates. The objective of each interview was to reveal the particularity of each programme, the underlying philosophical assumptions and the qualities that the programme intends to simulate and develop in the Ph.D. candidates.

In most of the cases the interview was done by telephone. Each interview was reported in a document. The format of the document is in the figure 3.

1. Circumstances 1.1 Place 1.2 Date 1.3 Time
2. Advisors' profile 2.1 Name and last name 2.2 Title 2.3 Education 2.4 Research interests 2.5 Number of supervised Ph.D.
3. Interview
4. Analysis
5. Interpretation

Figure 3: the report format of the interview.

THE PHILOSOPHICAL ASSUMPTIONS OF DOCTORAL RESEARCH IN DESIGN

Two different philosophical assumptions underlied and guided research in the ten case studies of doctoral programmes in design, a scientific approach for inquiry and a reflexive, interpretive one.

SCIENTIFIC APPROACH FOR DESIGN RESEARCH

The scientific approach for design research is intended as the traditional and conventional model of academic research. In this methodological approach, doctoral research in design was similar to doctoral research in the already established academic disciplines. Research was based on the scientific approach for inquiry, which also guided the research process. In all of the ten studied cases of PhD programmes in design doctoral candidates could choose this approach for their research projects. In five of these programmes⁸, this was explicitly the only permitted approach.

In most of the cases, the research process was the sequence of the following phases:

Identification of a problematic area;

Articulation of a research question;

Development of a literature search;

Development of the methodology of research:

Selection of the paradigm of research;

Selection of the strategies of research;

Selection of the methods of research;

Development of the empirical works;

Presentation of the results (objective findings);

Articulation of the discussion (subjective findings);

Statement of the limitations of the research;

Statement of the contributions of the research;

Proposal of the future work.

METHODS USED IN THE SCIENTIFIC APPROACH

In this kind of research, doctoral candidates learned the 'methodology' of scientific research. They articulated a research problem. They choose a paradigm of research, selected the appropriate strategies for their research and the methods for collecting empirical material. Then they learned how to analyze and interpret empirical material. In most of the studied cases, the doctoral candidates used qualitative research methods. In few cases the doctoral candidates used quantitative methods.

THE THESES DEVELOPED IN THE SCIENTIFIC APPROACH

In this research setting the doctoral theses⁹ adopted the model of traditional academic doctoral theses. Most of the Ph.D. candidates divided their theses in the following seven parts:

- Introduction
- Problematic area
- Literature search
- Empirical works
- Results
- Discussion
- Conclusion

REFLEXIVE AND INTERPRETIVE APPROACH FOR DESIGN RESEARCH

In five from the ten studied PhD programmes¹⁰, beside the traditional scientific approach for doctoral research in design, it was possible to undertake a research based on design practice. In this latter setting the research process was guided by a reflexive and interpretive approach to inquiry. The choice depended mostly from the interests and future objectives of the doctoral candidates.

Two different orientations existed when research was based on design practice. The first one and the most common one was the practice-oriented research. The other one was the practice-centered research, a relatively new approach for design research. In both orientations, the design project had a significant position and role during the whole research process.

PRACTICE-ORIENTED RESEARCH

Practice-oriented research is '[...]combining academic research with creative studio-based projects[...]' (Seago and Dunne, 1999). Whether labeled, 'Ph.D. by project'¹¹ or 'ricerca progettuale'¹², its greatest challenge is to involve '[...] the coherent linkage of the written and studio aspects of the project within a research context.' (Seago and Dunne, 1999).

METHODS USED IN THE PRACTICE-ORIENTED RESEARCH

In the studied theses¹³, action research methods were the principal used methods. Seago and Dunne (1999) defined action research in a design research context as a '[...] research in which the process of making or designing an artefact constitutes the methodology.' Beside action research methods, doctoral candidates used different design methods in the development of their prototypes.

In practice-oriented research doctoral candidates individuated and undertook different research processes. Their different learning experiences were based on reflexivity and interpretivism rather than on scientific rationality. In all the studied cases doctoral candidates carried out creative design project/s and learned how to situate the findings developed through the design project/s in a research context.

THE THESES DEVELOPED IN THE PRACTICE-ORIENTED RESEARCH

Since it's a relatively new approach for doctoral research in design, there isn't any established structure for the development of this kind of theses. In the studied cases, different structures were individuated. In this research setting, an additional visual part, related to the design project/s, was added to the traditional written part of a doctoral thesis.

PRACTICE-CENTRED RESEARCH

Practice-centered research is when design practice '[...] is a form of research, [...].' (Press, 1995), and where '[...]knowledge may be found in or through artefacts.' (Rust et al, 2000). In only two of the ten doctoral programmes¹⁴, doctoral candidates could undertake a practice-centered research. It's the newest approach for doctoral research in design and it is the most debated and criticized.

About the problems related to this methodology of research in design, Findeli (2000) stated that 'It has no scientific recognition [...], since there is usually no discourse attached to it, no intention of generalizability except technological, and no "accumulative" effect in the theoretical realm [...].'

METHODS USED IN THE PRACTICE-CENTERED RESEARCH

In this research setting, design practice was considered as a fundamental tool of research. In the two studied theses¹⁵ creative design methods were used. These methods could be divided in craft methods and design-by-drawing methods. Therefor doctoral candidates experienced a learning process '[...]conducted largely through an investigative, experimental use of practical design activities.' (Rust, 2001). Three repetitive phases were individuated in the development of the design project/s: the creative reasoning phase, followed by the development of a prototype and then the evaluation of the prototype.

THE THESES DEVELOPED IN THE PRACTICE-CENTERED RESEARCH

In each studied programme, only one thesis was completed. In this approach for design research 'a great number of drawings and three-dimensional objects, which together represented and made explicit the processes which had been followed.'(Rust, 2001), were developed.

Doctoral candidates faced major problems in structuring the form and content of their theses, since they had to combine verbal and visual material. One of the two doctoral candidates¹⁶, used composite images to establish the structure of the narrative. The sequence of images described the reasoning process.

A COMPARISON OF THE ADOPTED MODELS IN DESIGN RESEARCH

The comparative study demonstrated, as shown in figure 4, that actually three methodological approaches underlie doctoral programmes in design, the research-oriented methodological approach, the practice-oriented

one and the practice-centered one. They are based and guided by two different philosophical assumptions for inquiry in design research.

In research-oriented Ph.D. programmes, design research was guided by a scientific approach for inquiry. Doctoral candidates learned how to undertake and develop academic rigorous research projects. They used qualitative or/and quantitative research methods. These methods were adopted respectively from the social science research methods and the natural science research methods.

In practice-oriented Ph.D. programmes, design research was guided by a reflexive and interpretive approach for inquiry. Doctoral candidates learned how to develop professional creative design projects and how to situate these projects and the relative findings in a research context. They used action research methods adopted from the social science research methods, and design methods related to design practice.

In practice-centered Ph.D. programmes, design research was guided by a reflexive and interpretive approach for inquiry. Doctoral candidates learned how to develop professional creative design projects, how to evaluate these projects and how to describe the different phases of the design process using both verbal and visual material. They used different design methods.

Nature of Ph.D.	Methods used	Adopted model
Research-oriented	Quantitative methods	Natural sciences
	Qualitative methods	Social sciences
Practice-oriented	Action research methods	Social sciences
	and Design methods	Design practice
Practice-centered	Design methods	Design practice

Figure 4: A comparison of the different methodological approaches of doctoral research in design.

THE DESIGN PROJECT IN DIFFERENT RESEARCH SETTINGS

In the three different methodological approaches for doctoral research in design, the design project occupied different positions and had different roles in the whole research process and in the development of knowledge.

In most of the studied cases of the research-oriented doctoral theses, the design project presented the context of the problematic area. It was considered as a departure point for the whole research. Doctoral candidates choose a specific area of design practice. In this area they individuated a problem related to the design projects and articulated their research question around this problem. In trying to understand the problem and offering an available solution, doctoral candidates contributed to the development of knowledge in a specific area of design.

In the practice-oriented research, the development of a design project guided the whole research process. The process of invention of the design project was used as a mode of discourse in the development of the dissertation. In this setting, research through the design process explores '[...]an approach that allows the development of critical responses and a sceptical sensibility towards the ideological nature of design [...]' (Dunne and Seago, 1999).

In the practice-centred research, The design project constituted all the phases of the research. The problematic area, the process of the research, the methods used and the outcome were all related to the development of an artefact. The artefact was considered to be all the drawings and prototypes produced . In this case, '[...]knowledge may be found in or through artefacts.' (Rust, 2000).

FURTHER QUESTIONS

In an international survey about the motivations for pursuing a Ph.D. in design developed before the Doctoral Education in Design conference held in October 1998 at the Ohio State University, the authors (Melica et al, 1999) declared that 'the results and findings of this study may be of interest to individuals involved with postgraduate studies in design at a variety of different levels - including those who are developing new doctoral programmes or recruiting for existing programmes, and those who are themselves considering making the commitment to pursue a Ph.D. degree in design.' The same issues and facts concern this study.

Two major points deserve further exploration. The first one is related to the practice-centred Ph.D. programmes in design. The other one concerns the reasons why the role of the design project in doctoral research is evolving and gaining more status.

FURTHER STUDIES ABOUT THE PRACTICE-CENTRED APPROACH

The results of the study demonstrated that two different orientations existed in the reflexive and interpretive approach for inquiry in doctoral research, the practice-oriented and the practice-centered one. In the latter one, doctoral candidates developed professional creative design projects, evaluated these projects and described the different phases of the design process through textual description and the use of visual material. In this setting further studies should focus on the following topics:

- Which epistemological base underlie and guide this approach for doctoral research;
- What makes practice count as research;
- What is the difference between a programme that offers the title of Doctor in Design and the programme that offers the title of Doctor of philosophy in design; and
- How supervisors of doctoral candidates should assess, evaluate and judge the work and the results in this research setting.

NEW CONTRIBUTIONS, THE DESIGN PROJECT AND DOCTORAL RESEARCH

In the past three decades, new contributions from different scientific disciplines were introduced. They had important implications on the design process and by consequence on design research.

In epistemology, contributions of J. Piaget and in particular his edited articles in the *Encyclopédie de la Pléiade* (that he directed in 1967) constituted an important landmark. He introduced the constructivist paradigm, where '[...] knowledge is connected to an action that modifies the object and reaches it only through the transformations introduced by this action [...] Frontiers between the subject and the object had no more reasons to exist.' (Piaget, 1967). This '[...] have led to the reconsideration of 'field' research methods, and to the study of the role and place of researchers in this type of setting.' (Avenier and Nourry, 1999).

In the *Sciences of the artificial* of Herbert Simon, published in 1969, he separated human knowledge in two sectors, the 'sciences of the natural' and the 'sciences of the artificial' (Findeli, 2001). Although his proposal was committed to positivism and informed largely by engineering, it clearly claimed the originality of design thinking. It also contained the seeds of a new approach to design and therefore a new logic of the design process (K. Krippendorf, 1999).

Other important contributions are those of Donald Schon. *The reflective practitioner* appeared in 1983. *Educating the reflective practitioner* appeared in 1987. The introduction of the latter represents 'one of the

most convincing arguments against applied science epistemology in the field of design [...]'¹⁷. Both H. Simon and D. Schon contributed to a paradigm shift in design thinking.

Finally systems and complexity theories had a major impact on most academic disciplines. Originally 'During the 1950s, von Bertalanffy elaborated a general systems theory that finally opened the systemic problematic.' (Morin, 19779). Lately Jean -Louis Le Moigne '[...], has been very active in trying to provide the most sound, comprehensive, systematic and critical epistemological basis for all professional disciplines.' (Findeli, 2001). In the last decade, the potential of complex systems theory for design has been identified by many authors like Alain Findeli from Canada and Wolfgang Jonas from Germany.

All these contributions lead to the reconsideration of the epistemological and methodological issues of the design project. The design project moved from a problem-based approach to a systems-based approach (Findeli, 2001). A methodological shift occurred, from the hard systems methods to the soft-systems methods (Broadbent, 2002). A growing recognition of the breakdown of societal consensus (Toffler, 1970), led to involve more diverse stakeholders, designer and user were included in the process.

This affected design research. New proposals arose. Whether labeled 'practice-led research' by Nigel Cross or 'recherche-project' by Alain Findeli¹⁸, they presented a new direction in design research. This approach for design research is supposed to privilege the design project as a terrain for the research. The research questions will be studied 'in situation'. It supposes to complete the learning acquired during a traditional Ph.D., by developing a 'complex intelligence'. As a consequence, the Ph.D. candidate will not only learn established methods of research, but will also learn methods that will permit him to interact in complex, dynamic and evolutive environments, specific characteristics of a design project.

This approach for design research, as described above, implicates several research questions that constitute a research agenda for design research. Further studies might focus on:

The epistemological base for this approach;

The methodological implications; and

The methods and tools required for this research setting.

NOTES

1. With this statement Nigel Cross started his article 'Design research: a disciplined conversation' published in Design Issues, volume 15, number 2, pp 5-10, a special issue dedicated to design research.
2. Different kinds of doctoral programmes in design do exist. In this paper I refer to Ph.D. programmes in design. For an in-depth study about this topic, refer to Ken Friedmans' article 'Form and structure of the doctorate in design: Prelude to a multilogue' published in the proceeding of the conference Doctoral education in design: foundations for the future, La Clusaz France 8-12 July 2000, edited by D. Durling and K. Friedman.
3. A research developed within the Politecnico di Milano in 1999 focused on the mapping of the undergraduate and postgraduate design programmes offered in 9 selected countries. One of the results of the study was that most of the Ph.D. programmes in design were launched during the 1990s.
4. The comparative study covered four different educational systems:
 - The American/English educational system;
 - The French educational system;
 - The German educational system;
 - The Italian educational system.
5. The study covered different areas of doctoral research in design: interaction design, Design theory, new product development, information design, visual culture, design computing and cognition, etc.
6. In Great Britain doctoral education in design presents the richest context from a methodological point of view. The reason is that many changes concerning graduate education in the creative and performing arts and design took place in the last decade. For an in-depth study of this issue, refer to Bruce Archer paper 'A background to doctoral awards' published in the proceeding of the conference Doctoral education in design: foundations for the future, La Clusaz France 8-12 July 2000, edited by D. Durling and K. Friedman.
7. These cases are:
 - In Canada the doctoral programme offered at the University of Alberta;
 - In France the doctoral programme offered at the Ecole Nationale Supérieure des Arts et Métiers - ENSAM Chambéry;
 - In Germany the doctoral programme offered at the University of Wuppertal;
 - In Japan the doctoral programme offered at Chiba University.
8. These Ph.D. programmes are:
 - In Canada the doctoral programme offered at the University of Alberta;
 - In the United States of America the doctoral programme offered at the Massachusetts Institute of Technology;
 - In Great Britain the doctoral programme offered at the Open University;
 - In Japan the doctoral programme offered at Chiba University; and
 - In Australia the doctoral programme offered at the University of Sydney.
9. For exemple in the following theses:

Colakoglu, B. M., 2000. Design by grammar: algorithmic design in an architectural context. Ph.D. thesis, Massachusetts Institute of Technology.

Eckert, C., 1997. Intelligent support for knitwear design. Ph.D. thesis, Open University.

Tang, H.-H., 2002. Exploring the roles of sketches and knowledge in the interlinked and multimode design process using protocol analysis. Ph.D. thesis, University of Sydney.
10. These Ph.D. programmes are:
 - In France the doctoral programme offered at the Ecole Nationale Supérieure des Arts et Métiers - ENSAM Chambéry;
 - In Germany the doctoral programme offered at the University of Wuppertal;
 - In Great Britain the doctoral programmes offered at the Royal College of Art and at Sheffield Hallam University; and
 - In Italy the doctoral programme offered at the Politecnico di Milano.
11. 'Ph.D. by project' is the name given to this kind of research at the Royal College of Art in Great Britain.

12. 'Ricerca progettuale' is the name given to this kind of research at the Politecnico di Milano.

13. The theses selected from the Royal College of Art and from the Politecnico di Milano are:

Dunne, A., 1999. *Hertzian Tales: electronic products, aesthetic experience and critical design*. Ph.D. thesis, Royal College of Art;

Ferguson, I., 1996. *The development of solid state diffusion bonded mokume gane*. Ph.D. thesis, Royal College of Art

Dominoni, A., 2000. *Disegno industriale per la progettazione spaziale*. Ph.D. thesis, Politecnico di Milano.

Ingaramo, M., 2003. *Lo sviluppo delle attrezzature per il lavoro intellettuale*. Ph.D. thesis, Politecnico di Milano.

14. These Ph.D. programmes are:

In Great Britain the doctoral programme offered at Sheffield Hallam University; and

In Italy the doctoral programme offered at the Politecnico di Milano.

15. The theses are:

Faicchia, M., 2003. *Weightless projects*. Ph.D. thesis, Politecnico di Milano.

Whiteley, G., 2000. *An articulated skeletal analogy of the human upper-limb*. Ph.D. thesis, Sheffield Hallam University.

16. In this case Graham Whiteley from the Sheffield Hallam University.

17. In the article, "Rethinking design education for the 21st century: theoretical, methodological, and ethical discussion", Alain Findeli declares that the two major paradigms that design thinking adopted are applied art and applied science. He argues that their roots are in the nineteenth century and that they must be considered outdated. He introduces and discusses the "involved science" paradigm. For an in-depth study, refer to *Design Issues*, volume 17, number 1, Winter 2001, pp 5-17.

18. Refer to the article by Alain Findeli published on *Design Issues*, volume 15, number 2.

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