

# Spacing Innovation and Learning in Design Organizations

by

**Cristobal García-Herrera**

Bachelor of Science in Sociology, Institute of Sociology,  
Pontificia Universidad Católica de Chile, 1999

Bachelor of Arts in Philosophy, Faculty of Philosophy  
Pontificia Universidad Católica de Chile, 2001

SUBMITTED TO THE DEPARTMENT OF COMPARATIVE MEDIA STUDIES IN  
PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF SCIENCE  
AT THE  
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

JUNE 2004

© 2004 Cristobal García Herrera. All rights reserved.

The author hereby grants to MIT permission to reproduce  
and to distribute publicly paper and electronic copies of  
this thesis document in whole or in part.

Signature of Author: \_\_\_\_\_  
Department of Comparative Media Studies  
May 10<sup>th</sup>, 2004

Certified by: \_\_\_\_\_  
Joseph Dumit  
Professor of Science, Technology and Society  
Thesis Supervisor

Accepted by: \_\_\_\_\_  
Henry Jenkins  
Director of Comparative Media Studies Program

## COMMITTEE MEMBERS

### Paul Duguid

Research Specialist in Social and Cultural Studies in Education, UC Berkeley  
Professor Industrial and Organizational Sociology, Copenhagen Business School

### Paul Carlile

Professor MIT Sloan School of Management

### Francis Duffy

Professor MIT Architecture, Founder DEGW

# Spacing Innovation and Learning in Design Organizations

by

Cristobal García Herrera

Submitted to the Department of Comparative Media Studies on  
May 21<sup>st</sup>, 2004 in Partial Fulfillment of the Requirements for  
the Degree of Master of Science in Comparative Media Studies

## ABSTRACT

The main research question of this thesis is the following: What is the relationship between spaces and innovation in the context of design organizations such as IDEO, the MIT Media Lab and Design Continuum? This thesis explores the relationship between four types of spaces, namely, 1) urban, 2) building 3) workplace and 4) users and innovation and creative practices of these three case studies.

Drawing mainly on visual ethnography, the thesis shows how the four organizations' *situated spaces-in-use* shape their innovation, learning and knowledge sharing practices. The findings are used to complement and expand existing theories, to reflect on the "spacing" of the three design organizations under study and to contribute to the outline of this interdisciplinary emerging field of research.

Thesis Supervisor: Joseph Dumit

Title: Associate Professor of Science, Technology and Society (STS)

For Josefina  
and  
our own co-evolution

To Francisco Varela  
for inspiration

---

## Table of Contents

Prologue .....	7
Acknowledgements .....	11
<b>Introduction</b> .....	<b>14</b>
i. Roadmap for Thesis .....	17
ii. Some Definitions .....	18
iii. Methods .....	19
<b>Chapter 1: Looking at Organizational Learning and Innovation Practices</b> .....	<b>20</b>
1.1 Understanding Innovation and Situated Actions .....	23
1.2 From the Ground Up: Human Coping, Situated Learning and Social Practice .....	27
1.3 From situated action to communities and networks of practice .....	32
1.4 Organizational Practices and Knowledge Creation .....	39
<b>Chapter 2: Urban Ecologies for Innovation in Design Organizations</b> .....	<b>48</b>
2.1 The persistence of the local in the global design economy .....	53
2.2 The Water of Cambridge (or the place of the MIT Media Lab) .....	55
2.3 Clustering with IDEO .....	60
2.4 Design Continuum and its urban places: between West Newton and Milan .....	70
2.5 Buildings of IDEO, Continuum and Media Lab.....	75
2.5.1 Media Lab Building .....	76
2.5.2 IDEO's Buildings: Simplicity and Flexible design .....	78
2.5.3 Continuum's Generic and Random Buildings .....	79
<b>Chapter 3: Workplace Evolution in IDEO, MIT Media Lab and Design Continuum</b> .....	<b>81</b>
3.1 Spacing Communication, learning and Creativity in the Workplace .....	82
3.1.1 Understanding Process and Work Practice .....	87
3.2 IDEO's Process and Spaces .....	88
3.2.1 How does IDEO support its work process spatially? .....	89
3.3 Design Continuum Co-Evolution? .....	96
3.3.1 Agility and Evolution in Continuum: between the past and present .....	97
3.3.2 Opening up the Space: agility and situational readiness .....	102
3.3.3 Playfulness and Physical Icons at Continuum .....	103
3.4 MIT Media Laboratory .....	109
3.4.1 Understanding vision, process and spatial practice .....	109
3.4.2 The Glass Philosophy .....	114
3.4.3 Justification of spatial choices: numbers, evaluation and use .....	115
3.4.4 Playfulness and Physical Objects .....	117

---

3.4.5	Collaboration and Boundaries .....	118
3.4.6	Power and Territorialities in the Workplace Game .....	122
3.4.7	Fostering informal and serendipitous face-to-face encounters .....	125
3.4.8	Places for “Inspiration” or the quest for innovation funding .....	128
<b>4.</b>	<b>Chapter 4: Users in Design Organizations .....</b>	<b>130</b>
4.1	From User-centered to Community and Network-centered Design .....	131
4.2	IDEO and the construction of users .....	136
4.3	MIT Media Lab and the “lead-users” inside the lab .....	145
4.3.1	Users at the Cube, a playful environment at the Media Lab .....	146
4.3.2	Discourses on and about Users .....	147
4.3.3	The missing context(s) .....	147
Box 1	The case of the Computer Clubhouse .....	154
Box 2	The case of Topobo at the Tangible Media group .....	155
<b>5.</b>	<b>Summary, Implications and Conclusions .....</b>	<b>158</b>
5.1	Urban Places as the larger context for innovation in design .....	161
5.2	Workplace Making Styles .....	163
5.3	Spacing and Making Users .....	171
5.4	The Bottom Line: Tacit Knowledge Creation and Sharing .....	173
<b>6.</b>	<b>References .....</b>	<b>176</b>

## Prologue

There is always a genealogy behind any research endeavor. This is not an exception. I came to MIT to study the interaction between technology and society and the emergence of new social practices. I was enrolled, formally, at MIT in a program of media and communication and I found more than that. Being in a new and interdisciplinary program at MIT was an opportunity to move, leak, and think across boundaries. And I tried to do just that.

I was trained in a German (and somewhat French) sociological tradition that tended to think of culture (and religion, in some spaces) as a sort of *Geist* affecting how people do their work, learn, relate to each other, among other things. I also did formal studies in philosophy where I started my exploration of the practical and existential philosophies of Heidegger and Wittgenstein.

Prior arriving at MIT, I was working as both a researcher and a consultant in the area of information and communication technologies in my country of origin, Chile. In my research group, we were looking at the way users relate to cell phones, e-services such as *e-banking*, *e-commerce* and *e-learning* and comparing patterns of use across media (TV vs. Internet). We were studying users in a *contextual vacuum*, i.e., as individual users without paying attention to the social context of use and consumption, nor about their spaces.

Such research and professional experience opened up to me glimpses of the value of organizational knowledge of the firms providing IT services to the users. Explicit interests about their workplaces and uses of space were yet to appear.

One decisive moment of this research journey took place at Harvard Graduate School of Education where I attended a talk between Howard Gardner and John Seely Brown. They talked about practices, learning, information ecologies and innovation in a way that was linked with my previous understanding of practices and cognition. This talk opened up ways of thinking and seeing that were tacit and not articulated in my perspective.

Another important moment was a presentation about scalable learning communities by William J. Mitchell about the evolution of learning spaces from the old atelier to augmented classrooms and collaborative buildings.

I started to find new and insightful views on learning, practice, organization, communities and innovation. I directed my attention to related work conducted at the West Coast, especially the Bay Area. I put my hands on some of the research that came out of Xerox PARC and IRL (Institute for Research on Learning) as well as a few but key (for me) Berkeley and Stanford scholars. Slowly, I started to observe some connections between such West coast worlds and certain MIT trajectories.

I started tracking these conversations in books, articles and people. Then I came under the influence of Lave and Wenger, Brown and Duguid, Varela, Rosch and Thompson, Nardi, Flores and Winograd, Suchman, Nonaka, Tuomi, among others. I found the connection with management and organizational scholars such as Wanda Orlikowski and Peter Senge here at MIT who have been working under an “enaction” perspective for several years out of the tradition of system dynamics (Forrester), organizational psychology (Schein), organizations as interpretation systems (Daft and Weick, 1984), and Giddens’ structuration, among others.

Being a lurker at SOCNET also has allowed me to observe the active network of practitioners of social network analysis (SNA), its wide applications including organizational analysis but the missing spatial exploration, and also to envision further cross-fertilization between SNA and my current perspective.

During an insightful workshop led by Frank Duffy at MIT, I started to realize the importance of space design for organizational change and business strategy, i.e., the workplace as an often overlooked critical resource for innovation. That workshop also introduced me to several practitioners in the field as well as to the work by Bill Porter, Michael Joroff, Chuck Kukla and Donald Schön in the MIT Architecture department. I found more connections than I expected.



In one of our thesis lab meetings on Monday nights, Suzanne Gibbs from IDEO presented her work at that organization. IDEO's type of work and culture resonated strongly with the perspectives I was reading about and the directions I wanted to pursue.

In the first place, I decided to study information technologies and their impacts on social networks and communities of practice. Very early in the research process, I found out that the communication technologies were nothing but normal at IDEO (just email, an intranet and videoconferencing, from time to time). I did not have a full access to gather specific data about social networks among people. Instead, what I started to find was that face-to-face interactions, team dynamics, user contexts and their respective spaces were and are crucial resources for innovation and creativity.

IDEO was the entry point to the amazing world of the design organizations. The MIT Media Lab was around the corner and because of its physical and cultural proximity, I did not realize that there was an opportunity to explore its innovation practices. I remember a night in the summer of 2003 when the idea to study the lab suddenly came up. Design Continuum entered the research scene later due to a "media arts and science" course I took, where a field trip to Continuum was arranged.

As I said, my initial interest to study the use of communication technologies shifted towards consideration of spaces and workplaces. My first intuition—driven by a sort of tunnel-vision on communication technologies—was that organizational innovation has to do with the adoption and use of such technologies. These technologies are indeed important for an organization, including design-oriented ones.

However, their main uses such as email and the general IT architecture are easily adopted, implemented and widespread among organizations. Therefore, as Carr (2003) suggested in a provocative article entitled "IT doesn't matter", IT become can commodities, losing a great deal of their

competitive advantage. This is a controversial statement that has opened up a discussion that is beyond the scope of this research.<sup>1</sup>

However, Carr's argument points to empirical evidence that I also found in the cases of IDEO, Design Continuum and MIT Media Lab, all innovative and creative organizations. These organizations do use email, software, intranets and even produce software (in the case of the lab) but their competitive advantage was not in IT use itself. It was (is) in the use of a effective process, a vision of technologies and in the use of collaborative spaces. Certainly people do use IT and software to coordinate and to create, but much more of the creativity and innovation has to do with the fact of being-together in a shared place and have freedom to design and experiment. That are some of the reasons the people go to work to Continuum, IDEO and MIT Media Lab.

In the overall shape of my argument, I am not claiming by any mean that IT is not important, but rather that for IT and innovation to be valuable, design organizations—and probably others—need agile workplaces. In that agility, I argue, meaningful places that render the shared memory and enable fruitful evolutive interactions play a key role.

Thus, it turned out that space and places or, what I call "spaces-in-use," are critical assets and resources for enabling innovation and creativity in the cases of IDEO, Design Continuum and the MIT Media Lab.

---

<sup>1</sup> This debate was started off by Nicholas Carr in his HBR article (2003) that has sparked reactions by Intel's Craig Barrett, Steve Lohr, John Hagel and John Seely Brown, General Motors' Ralph Szygenda, Bill Gates, besides articles in the Information Week, New York Times, Computer World, Fortune, USA Today, Washington Post, NPR, among others.

## Acknowledgments

In the process of research and writing this thesis many people have helped me in different ways. I have been lucky enough to be in an intellectual atmosphere that has allowed me to enter these worlds of knowledge, spaces, innovation and creativity. After all, I am writing about the relationship between people and spaces. Without the support, encouragement and time of these people, this writing could not have been possible at all.

Thanks to my advisors Paul Duguid, Paul Carlile, Joe Dumit and Frank Duffy that encouraged me and helped me, throughout the process, to sharp my research questions, read carefully, handle my fieldwork and overall strategy as well as my further goals. Thanks to Joe and to Paul Carlile for stepping out at critical junctures. Special mention deserves Paul Duguid. Besides being one of the sources of inspiration due to his work on communities of practice, innovation and the social character of information, he encouraged me early on to pursue this track of research when I first contacted him with my research proposal in early June 2003. Later on, as an advisor for this thesis, even being away from the MIT context, he has commented many pieces of my work, always offering critical and wise insights that have fostered my thinking and learning.

My CMS class of 2004 were helpful in kicking off this process of the ground in the Spring of 2003 in our Theories and Methods II seminar led by William Uricchio and later in our informal thesis gatherings. Henry Jenkins also provided valuable feedback in different stages of this research, especially when framing my exploration about users and just after the first formal presentation of my work. Thanks also to Chris Pomiecko and Susan Stapleton, at CMS headquarters, for always being ready and nice to process and answer my requests.

I am very indebted to my friend Suzanne Gibbs. As I commented in the prologue, she first introduced me to IDEO's world in a guest lecture at our thesis lab at MIT. Suzanne has been amazingly great and helpful during the process. She has sent me relevant material, contacted me with peers at IDEO London, Boston, San Francisco and Palo Alto and tried to obtain a formal access to IDEO for me, which was not possible. In February 2004 she received me at her place in San Francisco and introduced me to several researchers and designers at IDEO San Francisco and Palo Alto.

At the MIT Media Lab I owe gratitude to faculty, graduate students and friends. I want to thank Walter Bender, Ted Selker, Mitch Resnick, Chris Csikszentmihlyi and Glorianna Davenport for their valuable insights into their work and experiences at the lab. I want to thank William Mitchell for intellectual support and for pointing me valuable research resources, Sandy Pentland for our discussions regarding networks, wearables computers and spaces and to Greg Tucker for priceless insights about the lab's workplace evolution.

I want also to thank Leo Burd, Leo Bonnani, Aggelos Bletsas, Manu Prakash, Ben Vigoda, and Simon Schiessl for sharing with me their research and work experiences. Also I want to thank Cati Vaucelle, Valentina Nissi and Michael Crew at Media Lab Europe in Dublin.

I owe a great deal of my own participation on the lab life to my friends Tad Hirsh, always asking sharp questions and ready for action, Saoirse Higgins for her sensibility and the Irish-Chilean connection, Amanda Parkes for fun and insights into design, and Hayes Raffle for his friendship and for our conversations. I am, especially, indebted to Amanda's and Hayes' wonderful work on *topobo* that I have been lucky enough to be involved with.

At IDEO, I want to thanks Eric Saperstein at Boston, Maura Shea at IDEO London, Jane Fulton Suri and David Webster at IDEO SF, Rajat Paharia, Phil Frei and Bill Moggridge at IDEO Palo Alto.

At Design Continuum, I want to thank the insightful perspectives on space and design of Harry West and John Costello at Continuum Boston and Steve Masterson and Martin Broen at Continuum Milan.

At a critical juncture related to the access, always difficult, to one of the organizations, Dorothy Leonard pointed me out people and resources in the Boston area. I would like to thank Peter Miscovich from PWC for intellectual support, dialogue and materials, and for inviting me to present an earlier version of this work to his workplace group in NYC. Thanks to Hubert Dreyfus for his critical comments on an early draft of one of the chapters and to Terry Winograd for a stimulating conversation at Stanford in February of 2004.

At MIT Sloan (where this thesis also belongs, I think), I found wonderful researchers and people. I am intellectually and practically indebted to the "enaction" workshop of Peter Senge and Wanda Orlikowski where I learn a great deal of practices of organizational learning. Thanks to Wanda, Paul Carlile, Eric Von Hippel and to Otto Scharmer for their intellectual encouragement on my endeavor. Also I would like to thank the members of the Doctoral seminar of Lotte Baylin, such a great learning experience in how to carry out research. Thanks to the people of the IAP seminar on workingSPACES, where I got in touch with key practitioners and readings about office design and organizational performance.

Also within MIT but in STS and Architecture, I want to thank Sherry Turkle for her stimulating comments and Chuck Kukla for his critical insights. Thanks also to Susan Silbey and the Ethnography Seminar members (and friends) Esra Ozkan, Ruthanne Huisling and Natasha Mayers.

Last but not least, I want to thank my friends Yannis Zavoletas, Michael Epstein, Claudio Magnasco, Trini Montalva, Soledad Concha and lovely Shelompa for our conversations about architecture, story-telling and learning.

Finally, thanks to my parents, always supporting from the distance and to Josefina for always being here and there and to whom this thesis is dedicated.

## Introduction

The main research question of this thesis is the following: What is the relationship between spaces and innovation in the context of design organizations such as IDEO, the MIT Media Lab and Design Continuum? In other words, my research objective is to explore how “spacing”, i.e., *situated space-in-use* shapes knowledge creation and sharing in these three design organizations.

My theoretical framework, i.e., the lens I am using to look at and to construct my objects of study brings forth a practice-viewpoint on organizational knowledge and workplace making, a few influential accounts on innovation studies, social learning and knowledge management. It is not my goal to cover all the relevant literature accumulated in areas such as knowledge management, firm theory, innovation studies and office architecture. My goal is to open a coherent path to study the interrelationship among these areas in the context of design organizations.

I hope my contribution would set forth an overlapping framework for looking at and taking action on the spaces that influence the creation of knowledge and the cultivation of innovation. In other words, my particular lens focuses at the way spaces interact, reflect and condition innovation and knowledge-sharing practices in the context of design organizations<sup>2</sup>.

Both the exploration and design of organizational spaces requires an interdisciplinary approach. Whether we look at the broader urban space—usually explored by urban planners, geographers, architects, sociologists, economists and real estate people—or we look at the ongoing practices within a particular office—usually explored by ethnographers, human resource people, architects, psychologists and organizational theorists—we are looking at

---

<sup>2</sup> Though not a design firm in the proper sense, MIT Media Lab can be considered as a design organization due to several reasons such as its historical relationship with architecture, the prominence of key designers such as John Maeda, Cynthia Breazeal (both related to the current Simplicity Design initiative), Ted Selker Patti Maes, Hiroshi Ishii, Joe Paradiso as well as designers of educational technologies as Seymour Papert, Mitchell Resnick, David Cavallo, Tod Machover, among others. My exploration looks closer at the work and the spaces-in-use by some of these design-oriented people.

complex spaces of practice where different communities interact and, sometimes, collide. The space has a lot to do with the way such communities interact and evolve (appear and disrupt) over time.

Though architects have been trained on space design and good architects have both skills and intuition in envisioning innovative spaces, an exploration on spaces-in-use *vis a vis* organizational cultures also requires researchers and designers from social, communication and organization sciences.

Organizational design is a practical evolving field that calls for an interdisciplinary approach, as Horgen, Joroff, Porter and Schön (1999) argue, “Workplace-making involves many different practitioners and stake-holders whose partly cooperative, partly antagonistic interactions greatly determine the quality of the outcome.” (Horgen *et al*: 40)

One of the aims of this research is to explore and describe how situated spaces are key—either fostering or constraining—knowledge creation, sharing, and thus, innovation in the context of design firms explored, namely IDEO, the MIT Media Lab and Design Continuum. Certainly there are more factors, besides spaces, at play in this relationship such as capital, culture and leadership.

I focus on spaces, but try to show some of the spatial implications regarding capital investment (such as “it is possible to innovate without capital,” especially in *workplace making*), cultural change (where some organizational cultures are better equipped for “spacing innovation”) and leadership (it is possible to distinguish different outcomes depending on a top-down or bottom-up managerial approach).

In all, my goal is to show how situated spaces-in-use (“spacing”) underlies the emergence of workplace-making, organizational agility and readiness for innovation.

Organizational *spaces-in-use* are explored and analyzed according to four types of structuration of space. I am focusing on the particularities of spacing of “space” in the context of design-oriented organizational practices.

I have to acknowledge that space is fundamentally related to time. Space and time are “the fundamental, material dimensions of human life” (Castells, 1996/2000: 407). As Giddens (1984) has proposed, social practices emerge out of a “binding” of time and space. I focus my exploration, as I said, on organizational spaces or, rather, on the “spacing”, “placing” and “embodiment” of organizations.

I remain silent about the relationship with time and “timing.” But I tend to privilege space over time because human agency and change are more actionable in space than time. Probably here, I am closer to Castells when he argues that “unlike most classical social theories, which assume the domination of space by time, I propose the hypothesis that space organizes time in the network society.” (Castells, Idem) This discussion is beyond the scope of this thesis, concerned with four related types of space and organizational structuration:

- 2) Urban Space
- 3) Building
- 4) Workplace
- 5) Users Experience

With the exception of the building space briefly analyzed in chapter 2 and 3, I devote one chapter to each kind of space and to the particularities of “spacing” in each of the three design organizations. These material dimensions are part of the answer to my questions and a toolkit to assess organizational innovation from a spatial point of view. These material dimensions of space and the cases of study form the following table:



	<b>IDEO</b>	<b>Continuum</b>	<b>Media Lab</b>
<b>Urban</b>			
<b>Building</b>			
<b>Workplace</b>			
<b>Users</b>			

At the end of the thesis and through the discussions and evidence showed in chapters 2, 3 and 4, I fill up these grids with experiences, stories, practices and spaces related to each one of these three organizations.

### **Roadmap for Thesis**

The first chapter is devoted to the theories, choices, and epistemological foundations that inform my research questions, explorations and propositions. I present and discuss theories of innovation, practical and embodied cognition, situated action and learning as the basis for thinking of work as a situated practice, ecologies and peripheries of participation, communities and networks of practice and a brief introduction of tacit and explicit knowledge issues in organizations.

The second chapter is about the urban and ecological space of the organizations, that is, the space and surroundings of its location. Here I start the spatial analysis in more detail. I use Castells' double logic of the urban

condition in terms of the space of flows and the space of places to analyze IDEO's, the Media Lab's and Design Continuum's urban spaces and its relationship with organizational learning. I also comment on the building spaces that certainly are a boundary between the urban space and the workplace.

The third chapter describes, analyzes and elaborates in the workplace experience of these organizations. It describes their process and explores how places are construct and how spaces are used to support the organizational process. I introduce key concepts such as organizational "agility" and co-evolution between work (process) and workplace (people, artifacts, materials), also refer to as "workplace making" and "process architecture." The chapter compares the process and practices of workplace making in the three organizations.

The fourth chapter analyzes the users' space in the cases of study, that is, the experience of the end-customers. Rather than being a space in the proper sense, this is a experience, i.e., the users' experience with products, services, technologies and environments. This experiential space may or may not be part of the organizational embodiment, according to factors and organizational choices that I discuss in the chapter. But it is, as I try to show, a fundamental context for successful design.

Finally, in the conclusion section, I summarize my findings, discuss their implications, make some suggestions and pose areas for further research.

Each chapter is contained in itself and can be read separately from the others. However, the overall picture will emerge, I suspect, from the interaction among them all.

### **Definitions and Key Concepts: innovation, learning and creativity**

I will be using several concepts and notions. Some are more important than others. As starting definitions of these key concepts, I offer the following definitions:

- Creativity:** a process of developing and expressing novel ideas that are likely to be useful (Leonard and Swap 1999)
- Innovation:** the embodiment, combination, and/or synthesis of knowledge in novel, relevant, valued new products, processes or services (Leonard and Swap 1999)
- Organizational Learning:** the social and spatial process by which communities and networks of practice foster creativity and innovation.

These definitions will be transformed and complemented during the research and discussion process that follows as I look at them through the lens of space in the case of design organizations.

## Methods

The methodology used for this research was a combination of in-depth interviews, ethnographies, photos, videos and secondary sources such as articles, quantitative studies, and on-line materials about people and spaces of IDEO, Design Continuum and the Media Lab. I did thirty in-depth interviews and ten ethnographic observations.<sup>3</sup>

The fieldwork and data collection was conducted from September 2003 to February 2004 in the three sites of study. For obvious reasons of proximity and research connections, the ethnographic access to MIT Media Lab was deeper and longer than the ones at IDEO and Design Continuum.

The domain of explanation and implication of the connections between organizational spaces and innovation are restricted to design firms and research labs of the type of those considered here. Through that specific domain of explanation/application, I propose some lessons, dimensions, theoretical perspectives and analysis useful, I suspect, to think and to act in organizational innovation in other contexts.

---

<sup>3</sup> One of my assumptions is that the researcher is also part of the world or space under study and interpretation. In that sense and also because I write within a tradition the “I” is member of a “we.”

## 1. Looking at Organizations, Knowledge and Innovation

Being a social scientist with an emerging interest in practice theory in these times of technological intermediation and ubiquitous computing has been a personal (and thus intellectual) experience related to the questions that I am trying to answer and the solutions that I want to propose here. Information and communication technologies have been intertwining with social practices. The history of technology has been a process of interaction, dialogue and feedback between artifacts, patterns of use and people (Bijker *et al*, 1987; Williams, 1972; De Sola Pool, 1981; Castells, 2000) Some researchers (Castells, 1996; Negroponte, 1995) claim that the microelectronics-based information revolution constitutes a discontinuity in the evolution of society and therefore, represents a paradigmatic shift. Others (Giddens, 1990) argue that we are experiencing a radicalization of the modernization process, whose origins can be traced back to the XVII century.

Besides the continuity/discontinuity issue concerning the “big picture” of the “socio-technical present”, I think that for an understanding of the actual and future impacts of technological change and innovation in our lives, we need an account of the *social practices* that are on the background.

By social practice I mean the complex network of tools, activities linguistic uses, expectations and what we take for granted in our interactions. In other words, social practices mean the way people live, work and learn. A study of social practices means the exploration of the social and spatial resources that are at hand to do the work (in case of designers) and to use and succeed with products (in the case of users).

In the background of my own understanding of social practices, human agency, and learning we can find traces of Heidegger. As one of the leading philosophers, who has introduced Heidegger to the American landscape, puts it: “This wide influence [in thinkers like Sartre, Merleau-Ponty, Gadamer, Arendt, Foucault, Bourdieu, Derrida, Taylor and Rorty] is due to the fact that Heidegger does not ground his thinking in average, everyday *concepts*, but in

average, everyday *practice*; in what people do, not in what they say they do (...) Rather than thinking of action as based on beliefs and desires, Heidegger describes what actually goes on in our everyday skillful coping with things and people and how we are socialized into a shared world.” (Dreyfus *et al*, 1992:2) This influence is also felt in Flores and Winograd (1986), an important account about language, human understanding and computer design that I discuss later.

Besides Heidegger there are other influences such as Dewey, late Wittgenstein, Foucault, Donald Schön and Francisco Varela. In different realms and with different goals in mind they also share a concern with the body and its practical implications in learning, language uses grounded in cultural forms micro-politics, reflective practice and cognition.<sup>4</sup> This tradition can be understood as a sort of pragmatic and body-based phenomenology.

I used some of these accounts to refer to the relationship between design work and space such as the ongoing making of the *places*, that is, of the shared worlds that we construct through language and meaningful physical materials that might prompt awareness, learning and innovation.

A second tradition that I bring to the table through other authors has to do with a branch of the structuralism in the field of social science (sociology and psychology) where the work of Vigotsky (1935), Levi-Strauss (1965) Bourdieu (1977) and Giddens<sup>5</sup> (1984) appeared as a possible ground for an activity and practice-based perspective on learning and human action.

A third body of knowledge I used, especially methodologically, is the branch of sociology called ethnomethodology that explores the rendering of social practices in the making. Garfinkel (1967), Goffman (1959), Blumer (1969), Cicourel (1974) bring forth the field of research of situated meaningful practices, which draw on G.H. Mead’s foundation of human action. These

---

<sup>4</sup> Both Nietzsche and Kierkegaard, though again with different agendas, pioneered the exploration of the body in philosophy and, thus, in life. For an account of this tradition, see Lakoff and Johnson (1999) *Philosophy in the Flesh: The Embodied Mind and Its Challenge to Western Thought* .

<sup>5</sup> Giddens is probably the most influenced by phenomenology, as he uses Bergson’s *duree* to explain the everyday coping of knowledgeable agents in the process of structuration.

researchers did not study technologies nor spaces in organizations. Out of this tradition but intersecting with science and technology studies, researchers such as Lucy Suchman (1987) and, to a certain extent, participants of the early SCOT program such as Pinch and Bijker (1987) and ANT (actor-network theory) proponents such as Callon (1987), Law (1987) and Latour (1987) started to study the intimate relationship between social practices and technology. I present briefly Suchman's account on situated actions, useful for my spatial organizational exploration.

These last two bodies of knowledge, plus probably other trajectories, enable the apparition on the scene of the important works of Julian Orr (1996), Lave (1988) and Lave and Wenger (1991), Wenger (1998) as well as Brown and Duguid (1991, 2000) and Tuomi (1999, 2002). I describe in more detail these perspectives below and try to use them to inform my exploration, findings and propositions related to space-in-use and innovation.<sup>6</sup>

These traditions and perspectives, among others, shape my access and understanding of organization and management sciences as well as the way I pursue my research.

I studied a bit of organization science with Dario Rodriguez, a Luhmannian scholar that introduced me to systems theory (cybernetics and biology) where I first encountered the work of Gregory Bateson (1970) and Maturana and Varela (1982). Although grounds for some organizational perspectives, including my own, the above was more a foundation in systems theory than an initiation on organization science. Such initiation, though acquainted with organizations through my own professional experience, took place here at MIT while sitting in different classes and buildings, learning about the way of doing things of people in these three organizations as well as reading related bodies of literature. I sketch and elaborate on some of these influential theories of and for practice below.

---

<sup>6</sup> This tradition has been called by Tuomi the "Vygotskian" tradition (2003).

## 1.1 Understanding Innovation, Practice and Situated Actions

There is an interesting progression in how organizational change has come to be seen over the last fifteen years or so. At the beginning of this period, the language of organizational change tended to stress the company's need to adapt to a rapidly changing environment. This was the so-called *external forces view* of the firm and based on a *technical-rational* view of managerial control over human action (work). According to (1999) Horgen and Joroff *et al*, "Later, perhaps in the mid-eighties, the language began to shift toward stressing the organization's responsibility for -and capability of—the design of its future. More recently still, the language has come to emphasize the need for organizational learning" (Horgen et al, 1999: 5) This shift in language involves a process of evolution on some organizational practices and related mind-sets to evaluate and program current actions that comes closer to an enacted view of organizational practice and situated learning.

This shift—still ongoing—has been made possible by the discourse and practice by several researchers and managers that started to call into question several ingrained assumptions in research as well as in management about organizational innovation, human action, work practice and learning processes. Due to questions of space I am not able here to offer a genealogy of such intellectual and practical trajectory. Instead, I offer the reader a brief account of it, highlighting those meaningful and useful elements for my own trajectory.

In this brief account of organizational knowledge, social learning and innovation research, I will describe some of the theories and perspectives that I use to frame my research into organizational spaces. I complement this framework in the following chapters with specifications related to the different types of space.

I start by describing a pioneering work written in the late sixties on the nature of innovation of the 1960s that will be complemented in advance, a couple few of accounts on the characteristics of human understanding, action

and learning written in the late eighties (Suchman, Flores and Winograd and Lave and Wenger), and then, some key researchers and practitioners (Brown & Duguid, Nonaka & Takeuchi, Senge, Scharmer and Tuomi, among others) about issues of knowledge generation and organizational learning during the nineties and early years of the 2000s.

Thirty-five years ago, Donald Schön (1967) noted a “rational(istic)” view<sup>7</sup> embedded in corporate discourse and practice on innovation in a pioneering though not much cited work: “Phrases in common use like ‘the management of research’ and ‘the organization of invention’ suggest the rational model of invention which thrives in the atmosphere of large organizations: the corporation, the government bureau, the research organization. Under this model, invention is seen as the conversion of knowledge to technology.” (Schön, 1967:3) It might be said here that Schön distinguishes between the terms invention, innovation, and diffusion on his vocabulary, i.e., he uses the term “invention” to mean the process of bringing new technology into being, “innovation” to mean the process of bringing invention into use, and “diffusion”, the spread of its use beyond the first instance. (Schön, 1967) He also argued that the rationalistic view, once present in invention, tends to permeate the other two.

According to this rational model, the process of invention is like other corporate activities, for example, sales, accounting or production and, like other corporate functions, lends itself to analysis, management and evaluation. Seen in this way, invention, i.e., the process of bringing new technology into being, has a number of properties. In Schön’s definition:

“1. It is a goal-directed process in which you know what you are going to do before you begin to do it (...) The technical objective (it is assumed) determines the technologies required for invention.

---

<sup>7</sup> This rational view can be also seen, to a certain extent, as what Habermas terms as “instrumental” rationality as opposed to “communicative” action. (Habermas, 1980)



2. The process is orderly. It is a series of steps toward a goal, each one paving the way for those to follow. First comes the definition of the problem, then alternative routes to its solution (...) When new ideas are required, their generation is made into a separate phase.

3. Invention is essentially an intellectual process. While it is not cerebral, in the sense of requiring nothing but thought, paper and pencil, invention is essentially a matter of applying intelligence to problem solving” (Schön,1967:4-5)

Such a “rational view” is, in Schön’s opinion, frequently found as an official public view which “plays an important part in the organizational handling of invention and innovation, in spite of private and unofficial opinion” (Schön, 1967:7). The fact that invention is a process does not in itself contradict the rational view, at least, at first glance. But attention to the *processes* involved in invention reveal its “nonrational side.” Schön moves then to explain the nonrational side:

“To begin with, invention often works backward. It often moves not from a clearly defined goal to the discovery of technical means but from observation of a phenomenon to exploration of a use for it. Often, invention consists in exploiting a phenomenon that pops up while someone is trying to do something else” (Idem:11)

According to this nonrational view, invention does not move in a straight line. Neither does it simply consist of defining a need and seeking means to fill it, or in defining a technique and finding uses for it. Therefore, in the process of invention, *need* and *technique* determine one another.

The recurrence of those views on the handling of invention influences the view and practice of innovation. Therefore, one might suspect that the rational view about the invention process led to rational views on innovation, i.e., the process of bringing invention into use.

In this rational view, innovation is “essentially similar to other major functions of a firm. It can be managed. It must be analyzed into its component parts and made subject to rational control.” (Schön, 1967: 19) The rational view of innovation assumes that invention is a series of orderly steps intelligently directed toward an objective spelled out in advance. It regards innovation, then, as a manageable process, like other functions of the firm, in which risks are controlled by the mechanisms of justification and review.

This *rational view* of innovation is grounded not only in a linear, goal-oriented and ready-to-control vision of the corporation, but also in a “rationalistic” (Flores and Winograd, 1986) and “planning account” (Suchman, 1987) of human cognition and learning. Therefore, the rational view of innovation, argues Schön, “ignores or violates actual corporate experience. In the light of that experience, the notion of innovation as an orderly, goal-oriented, risk-reducing process must appear as a myth.” (Idem:21)

The preeminence of such rational, linear and problem-solving view on innovation stems from several factors. During the post war period, as exemplified by production-oriented mode of both Taylorism and Fordism, this view and practice was successful. The mind as a computer and the organization as a machine were two influential information-processing metaphors related to great achievements in science and technology. At the same time, such metaphors tended to overlook semantic and pragmatic dimensions of knowledge, information and innovation.

As we move towards knowledge and experience-based economies, there is an increasing need to address issues of experience, interpretation, learning and organizational agility in order to be able to respond quickly to the environment and global economy demands.<sup>8</sup>

In the context of organizational research, the technical-rational viewpoint has been identified as an approach based “on the assumption that the professional can know in advance, at least conceptually, what the results

---

<sup>8</sup> Richard Lester and Michael Piore, at MIT, tackle this issue of innovation as not only a problem-solving activity but rather an interpretation endeavor, precisely, for thinking about the new challenges of productivity in the global economy. See their *Innovation: The Missing Dimension*, HUP, 2004.

of his or her activities will be (...) Technical-rational practitioners tend to hold stereotypical view of the workplace (What is an office? What is a laboratory?)” (Horgen, Joroff, Porter and Schön 1999:39). In other words, the technical-rational viewpoint is constructed upon a formal representation of work activities and not in an immersed and situated understanding of them. Such formal and “rational” understanding might constrain the (spatial) support and nurture of work activities.

Now, I elaborate more on the characteristics of the situated corporate and organizational practices by describing two important accounts that intersect traditions of phenomenology, hermeneutics, computer science and ethnomethodology.

## 1.2 From the Ground up: Human Coping, Social Practice and Learning

Both Flores’ and Winograd’s *Understanding Computers and Cognition* (1986) and Suchman’s *Plans and Situated Actions* (1987) are books written in the context of human learning, natural language and software design. Both of them have been influential in setting up new foundations and directions for “machine” design because they have addressed the roots of human understanding and practice. They have also been influential in my own understanding of human agency and learning, that is, in the lens to look at work practice.

Any substantive view about organizational knowledge and innovation, in my opinion, has to start from a discussion (and a choice) of the fundamentals of human learning and social practice. By social practice, I mean, following Tuomi (2002) and others (Giddens 1985, Brown and Duguid 2000), the complex network of tools, shared meanings, activities, linguistic uses, concepts, and expectations. In short, how people live, learn and work.

Both books and their authors start from somewhat similar premises. Flores and Winograd, using hermeneutics, systems theory (Maturana and

Varela) and, speech acts critique the rational and problem-solving view on learning, language and action that resonate with that of Schön's. Suchman, in turn, draws on ethnomethodology traditions to look at how action and conversations are really carried out in practice. Flores and Winograd carried out a critique of the pervasive Western and Cartesian "tradition of rationalism and logical empiricism that can be traced back at least to Plato (...) The tradition finds its highest level expression in mathematics and logic, and has greatly influenced the development of linguistics and cognitive psychology." (Flores and Winograd, 1987: 14) In today's organizational context of inquiry, such tradition has had an important impact on the way communication, control, and action are pursued. That is to say, in the discipline of modern management (Simon, 1976; Newell and Simon, 1972) the "rationalistic tradition" is embedded in mathematical analyses of decision making and in behavioral analyses of human conduct. In Simon's view, "The task of rational decision is to select that one of the strategies which is followed by the preferred set of consequences." (Simon, 1976: 67)

In this discipline, decision making is characterized as a process of information gathering and processing (decision-making). Rational behavior, in turn, is seen "as a consequence of choosing among alternatives according to an evaluation of outcomes." (Winograd and Flores, 1986:20) As well as in Schön's critiqued "rational view on invention/innovation," Simon argues that rational decision making is a process of choosing among alternatives, which involves a series of orderly steps and, thus, can be planned and controlled in advance.

Those rationalistic accounts on human understanding rely on a idealization of action rarely achieved in a real situation. According to Flores and Winograd (1987), "It is impossible for the behavior of a single, isolated individual to reach any high degree of rationality (...) Actual [situated] behavior falls short, in at least three ways (...): knowledge of consequences is always fragmentary (...) values can be only imperfectly anticipated (...) In actual behavior, only a very few of all these possible alternatives ever come to mind." (Idem: 21) In other words, practice does not follow management theory.

Work practice and human learning do not follow cognitivist assumptions based on the idea of cognition being a systematic and internal manipulation of representations of an external and objective world. Drawing on Heideggerian insights of “thrownness” and “breakdown,” Flores and Winograd conclude that models of rationalistic problem solving do not reflect how actions are really determined, learning achieved and social action constituted.

In Lucy Suchman’s *Plans and Situated Actions*, she aimed to disclose some of the underlying materialities of purposeful and meaningful human action in relation to computer interaction. The focus of the book is on the complex and evolutive issue of “mutual intelligibility: namely, the relation between observable behavior and the process, not available to direct observation, that make behavior meaningful.” (Suchman, 1987:2)

Suchman critiques the *rational view* on human action when considered as a plan (as something we say we do) and not as a situated action (what we actually do). By a *situated action* she means that “every course of action depends in essential ways upon its material and social circumstances. Rather than attempting to abstract action away from its circumstances and represent it as a rational plan, the approach is to study how people use their circumstances to achieve intelligent action.” (Idem: 50) I use this approach for my exploration of situated spaces-in-use.

Suchman uses a somewhat “Dreydeggerian”<sup>9</sup> and ethnomethodology-based account when critiquing the (formal) representations in cognition, the description of the *human coping* with things and the importance of breakdowns in ongoing activity to explain the nature of *situated actions* and the difference with rational plans.

The Suchman’s argument that resonates with Heidegger’s “thrownness” (ongoing coping) and “breakdown” in perception goes as follows: when we are coping with the world (equipment, artifacts, tools) in a “ready-to-hand”

---

<sup>9</sup> Dreydegger is a name that was suggested by John Searle to refer to Hubert Dreyfus’ particular interpretation of Heidegger’s philosophy. Dreyfus has been an influential phenomenological philosopher, active since the 1960s on AI and cognitive science debates as well as an important source for contemporary discussions around technology. Dreydegger.org is a website that contains some of his works.

manner (talking, driving, walking, working in a space), the action is proceeding smoothly and, thus, it is transparent to us and the equipment and tools tend to disappear of the center of attention. In contrast, the so-called “unready-to-hand” (also termed *present-at-hand*) comprises occasions, notes Suchman, “wherein equipment that is involved in some practical activity becomes unwieldy, temporarily broken, or unavailable. At such times, inspection and practical problem-solving occur, aimed at repairing or eliminating the disturbance in order to “get going again.” (Idem: 53).

Our *tacit* and *ongoing coping* with everyday things (equipment) either at home or at work is suddenly interrupted by a breakdown of experience. A change in the context takes place and we move into a *present-at-hand* mode. Then, we are provided with explicit, “know that” knowledge to solve that particular problem within a space of possibilities. In other words, situated action and learning are not made explicit by rules and procedures. Rather, Suchman argues, “when situated action becomes in some way problematic, rules and procedures are explicated for purposes of deliberation and the action, which is otherwise neither rule-based nor procedural, is then made accountable to the agents.” (Idem:54) So, the fact that we can explain something does not mean that the explanation drives behavior. The fact that human action and language are not grounded in rules but in shared tacit practices (life world) was first highlighted by Wittgenstein and has been widely discussed in philosophy and social sciences.

This situated and enacted view of human learning is based on three basic foundations. First, our implicit beliefs and assumptions cannot all be made explicit and cannot be completely articulated. But in the interplay between the tacit assumptions (knowledge) and explicit ones is where the learning (and innovation) happens. It is through a process of awareness of such tacit assumptions and beliefs that learning (thus, change and innovation) happens. In the case studies, I will look at how such *awareness* is enhanced through spatial practices.

Second, practical understanding is more fundamental than detached theoretical understanding. We have primary access to the world through practical involvement, structural coupling and readiness-to-hand. That is to say, there is neither a gap between cognition systems -like you and I- and the world -like this text and its context- nor representations that connect the inner with the outside world. As Varela *et al* put it, “we are in a world that seems to be there before reflection begins, but that world is not separate from us.”<sup>10</sup> (Varela, Thompson and Rosch 1991: 3). In our cases we will see how space both designs practices and it is designed by them in a co-evolution that sometimes is more coherent, sometimes is less. [how space might support cognition]

Third, due to the above, we do not relate to things primarily through having representations of them. The classic example here is that of a hammer being used by someone engaged in driving a nail to whom (the person doing the hammering), the hammer as such does not exist: “It is a part of the background of readiness-to-hand that is taken for granted without explicit recognition or identification as an object. It is part of the hammerer’s world, but is not present any more than are the tendons of the hammerer’s arm.” (Flores and Winograd, *Idem*) Therefore, since our knowledge, artifacts and information depends on being in a world that is inseparable from our bodies, our language, and our social history, i.e., since there is no separation between the world and the knower, the whole notion of (mental) representation becomes useless (obsolete) and misleading.<sup>11</sup>

This phenomenological approach rejecting the gap between knower and world has been also advanced by the branch of social sciences called ethnomethodology. George Herbert Mead, for example, has challenged the

---

<sup>10</sup> A similar description of cognition and of existence, more generally, is proposed by Flores and Winograd when they say that “A person is not an individual subject or ego, but a manifestation of Dasein within a space of possibilities, situated within a world and within a tradition.” (Flores and Winograd, 1986:33)

<sup>11</sup> Describing the issues and challenges that arises from calling into question the notion of *representation* and its effects in cognitive science, linguistics, AI and social sciences are certainly beyond the scope of this thesis. For discussions on these issues, please refer to Heidegger (1927), Wittgenstein (1951), Varela, Thompson and Rosch (1991), Andy Clark (1997), Winograd and Flores (1986), Dennet (1978), Fodor (1981), Minsky (1986), Papert (1980), Searle (1980), Dreyfus (1979), among many others.

traditional assumptions regarding the origins of the common-sense world and purposeful action. On Mead's account, interaction is a condition for that world, while that world is a condition for intentional action and learning. For my analytical purposes concerning the exploration of innovation in design organizations, this co-origination of world and embodied minds unveils a fundamental relationship between cognition, context and space. It also opens up some implications for thinking about collective work and supporting spaces.

The challenge posed by ethnomethodology to common-sense reasoning (of orthodox sociology) is nicely put by Lucy Suchman:

The notion that we act in response to an objectively given social world is replaced by the assumption that our everyday social practices render the world publicly available and mutually intelligible (Suchman, *Idem*:57)

The rationalistic and traditional managerial discourse/practice has been mostly concerned with providing rules and procedures and, thus has overlooked the characteristics of situated actions. At the same time, managerial control has overlooked the spaces of breakdowns and the non-canonical possibilities opened up by their communicational structures.

### **1.3 From situated action to communities and networks of practice**

The rejection of the gap between world and knower and the affirmation of a co-evolutive process has implications not only in the field known as epistemology, but also in social practice generally, and both in organizational and educational practices, specifically.

In tracing this sort of genealogy on situated action and learning -that also has other sources and references-, now I describe what has come to be considered, in some circles, the seeds of a new theory-for-practice on knowledge management, as evidenced in recent books and conference proceedings (Huysman, 2003; Carlile, 2000, 2002; Alatta, 2003; Bandini et al, 2003; Arnold and Smith, 2003). Those seeds are to be found in the context of the work of the Institute of Research on Learning (IRL) and Xerox PARC. I am



referring to the works by Lave (1988) and Lave & Wenger (1991) and by Brown and Duguid (1991) and Orr (1990), among others.<sup>12</sup> With these developments, a situated learning model and enacted view of the firm was going to emerge and start to influence both the language and practice of organizational management.

The situated action model is strongly linked with the concept/experience of community, its forms of membership and social identities. This model outlines an holistic theory of practice where “persons, actions and the world are implicated in all thought, speech, knowing and learning [and thus] activities, tasks, functions and understandings do not exist in isolation; they are part of broader systems of relations in which they have meaning.” (Lave and Wenger, 1991:52) The unit of analysis is thus not the individual, not the environment, but a relation between the two (Nardi, 1996).

In bibliographic terms, this model been influential in developing both a vocabulary and a practice-theory for addressing the situatedness of experience (Suchman, 1987), identity, membership and learning (Wenger and Lave, 1991), the resources and constraints of actual non-canonical practices across communities within organizations for thriving working, learning and innovation (Brown and Duguid, 1991), the economies of meaning and negotiation of identities among members of interacting communities of practice (Wenger, 1998) and the knowledge sharing potentials of boundaries across practices (Carlile, 2002), among others.

Now I describe and comment some of such seeds and situated historical emergences of this model.

---

<sup>12</sup> It is not a coincidence that most, or at least, a substantial deal of writing within this tradition has been done by pairs, triads or communities of *reflective practitioners*. That does not mean that we cannot distinguish “individuals” and “authors” within such scalable communities.

A central contribution to this field was the work by Jane Lave and Etienne Wenger, both working at the IRL. Such “central” contribution is the notion of communities of practice and of legitimate peripheral participation.

The notion of *legitimate peripheral participation* (LPP) is brought about by Lave and Wenger as a “descriptor of engagement in social practice that entails learning as an integral constituent (...) crea[ting] a landscape -shapes, degrees, textures- of community membership (...) Peripherality suggests that there are multiple, varied, more- or less-engaged and -inclusive ways of being located in the fields of participation defined by a community (...) *Changing locations* and perspectives are part of actors’ learning trajectories, developing identities, and forms of membership.” (Lave and Wenger, 1991:35-6)

Though *fuzzy* for American social sciences, it is a powerful tool or analysis frame to think about interaction, learning and innovation through an unified and interconnected view. Lave and Wenger originally developed the notion of legitimate peripheral participation in communities of practice as a critique of school-based learning.

Rather than thinking in ego-centric and individual positioning terms, they are proposing a *ecological* and *participatory* view of work practices. That is to say, a work activity or group at IDEO or Media Lab or even in their surroundings, are practices that have relationships of membership. In other words, if we focus on some practices of interest in such organizations, we are also connecting with some *marginal practices* in its *peripheral space* that suggest, “an opening, a way of gaining access to sources for understanding through growing involvement.” (Lave and Wenger, 1991:37). That interaction, change and transformation in an ecology through growing involvement of peripheral practices (other groups, clients, sponsors, and users) is key for enabling or constraining innovation, as I show in chapters 2, 3, and 4.

In opposition to social networks analysis (SNA<sup>13</sup>) that starts from individual nodes towards complex networks of strong, weak and latent ties,

---

<sup>13</sup> Even though SNA has strong theoretical and methodological foundations from both mathematics and applied physics (Watts 2003 and László Barabási, 2002) and social sciences (Granovetter, Strauss,

legitimate peripheral participation starts from a matrix or ecology, thinking always of the individual as situated and embodied within a space and a background. From this perspective, the individual (or the firm) is not longer the “atomic individual”. It is a social and embodied system that would learn by reading its background, coupling with its environment and, of course, by participating in such shared practices.

The relational feature of LPP is describe by their authors noting that “The ambiguous potentialities of legitimate peripherality reflect the concept’s pivotal role in providing access to a *nexus of relations* otherwise not perceived as connected.” (Idem: 36, *my emphasis*). So, whatever practices we look at they are going to be related to manifest, marginal and latent practices: “peripherality is also a positive term, whose most salient conceptual antonyms are *unrelatedness* or *irrelevance* to ongoing activity.” (Idem: 37, emphasis in the original).

I am presenting LLP a sort of innovation in the vocabulary of the social sciences. Though a theoretical resemblance might be found in Vygotsky’s model of social learning and his concept of a *zone of proximal development*, it seems that Lave’s and Wenger’s LLP stands for a more flexible and refined model for thinking about social practice and (situated) learning. In Vygotsky’s view, an evolutive process of interaction between phenotype, culture, and individual ontogenic development produces stocks of knowledge such as language. The environment, in this view, plays an important role leading to the configuration of the zone of proximal development as that range of possible action and thinking in which an individual could perform with support from his environment (Vygotsky, 1978; van der Veer and Valsiner, 1994; Tuomi, 2002).

---

Berkovitz, Wellman, Borgatti and many, many others), the knowledge gathered by their surveys usually is explicit and both formulated and answer by common-sense reasoning. An attempt conducted at MIT Media Lab using wearable computers to track SNA data (who talk to whom, length and mode of conversation, position but not voice recognition nor conversation analysis) could be used at some point (if this *use* and framework is put into play) for tracking not only networks of individual members but contexts, situated activities and shared practices of such members. I recall Madcap develop at PARC, a technology to track momentums in talks (Brown and Duguid, 2000)

Rather than emphasizing the interaction among these three structures of evolution (phenotype, culture and individual), LLP stresses participation, growing involvement and membership (from peripheral to full) as key to situated learning. Moreover, as Brown and Duguid (1991) put it, "This practice of inclusion and empowerment of peripheral participants is a *learning* experience. Learning seems to be related to participation in a community of practice and, thus, it has to be understood in its broader sense" (Brown and Duguid, 1991). In other words, learning is "never simply a process of transfer or assimilation of information: Learning, transformation, and change are always implicated in one another" (Lave and Wenger, 1991: 57).

Therefore, learning always implies a transformation within temporal and spatial shared field of practices because "learning is an integral part of *generative* social practice in the lived-in world" (Idem, 35).

Under this perspective, the space of an organization is not the one conformed by competing forces, but constituted by interacting and conflicting relationships of membership and access to practices. LLP, in turn, is useful not only to map internal learning activities, but also peripheral, i.e., related practices, which are not longer considered "external" or "outsider".

An application of this practice-based framework for the analysis of organizational learning is introduced by Brown and Duguid (1991).

Drawing on the work by Julian Orr (1987, 1990, 1996), Lave and Wenger (1990), Suchman (1987) and Weick and Daft (1984), Brown and Duguid (1991) offer an insightful and pioneering *unified* view of working, learning and innovating in communities of practice. Since this view is also part of my explicit and tacit *common-ground* (Clark 1992), let me revisit this insightful piece in the following paragraphs.

Using Suchman's difference between plans (what we say we do) and situated actions (what we actually do), they argue that "Recent ethnographic studies of workplace practices indicate that the ways people actually work usually differ fundamentally from the ways organizations describe that work in

manuals, training programs, organizational charts, and job descriptions (...) Formal descriptions of work (e.g., "office procedures") and of learning (e.g., "subject matter") are abstracted from actual practice. They inevitably and intentionally omit the details (...) Thus education, training, and technology design generally focus on abstract representations to the detriment, if not exclusion of actual practice." (Brown and Duguid, 1991:41-42)

Such (rationalistic) managerial focus on a *formal representation* of work practices decreases the level of understanding of those work practices and obscures the extent to which those can be nurtured and supported (by "places" in my cases of research) to foster learning and innovation.

In this context of organizational research, one of the problems, according to Brown and Duguid, is that "managers develop a conceptual outlook that cannot comprehend the importance of noncanonical practices. People are typically viewed as performing their jobs according to formal job descriptions, despite the fact that daily evidence points to the contrary" (Brown and Duguid, Idem)

Such account not only challenge managerial mindsets and leadership strategies, but also research methodologies to explore work practices, organizational culture and space-in-use, in my particular case. For that reason, ethnographic studies of workplace have turned out to be useful tools for finding out about actual and meaningful practices and, thus, for designing new systems (Greenbaum and Kyng, 1991) and office spaces (Duffy, 1999)

In a well-known ethnography about Xerox service technicians (the so-called "reps"), Julian Orr (1996) has showed that their work is rarely well understood because management view "do not focus on what is done in accomplishing a given job" (Orr, 1990: 3). In other words, management's view tend to overlook the activities involved in getting work done, i.e., situated learning at the workplace.

Canonical practices are formal descriptions of work. They are abstracted notions of how work, as espoused by management, is supposed to be. It is prescriptive. Canonical work practices can be understood as the *opus*

*operatum*.<sup>14</sup> It separates work from learning, and values abstract knowledge over actual practice. More significantly, it separates learners from workers (Duguid and Brown 1991).

Organizational theory (both from theorists and the vernacular from current managers), so to speak, is far removed from what actually happens in practice. Moreover, the focus on the *rational* and *linear* view of the process, fails to notice (and to nurture and use) key resources embedded on these “lateral” and “informal” stories, rumors, *know-hows*, spaces-in-use and work-related narratives. As Brown and Duguid (1991) put it, “Many organizations are willing to assume that complex tasks can be successfully mapped onto a set of simple, Tayloristic, canonical steps that can be followed without need of significant understanding or insight.” (Brown and Duguid, *Idem*: 46).

Such overlooking of the ongoing practice due to a rational and *process-based* view can be problematic in, at least, two senses. On the one hand, it can increase the gap between noncanonical practice and canonical discourse of practice and, thus, diminish opportunities for organizational learning and change over time. On the other hand, such gap can lead to important loss of knowledge within organizations.

The problems around such gap are described by Brown and Duguid in relation to the firm’s capacities for innovation, “Canonical accounts of work are not only hard to apply and hard to learn. They are also hard to change. Yet the actual behaviors of communities-of-practice are constantly changing both as newcomers replace old timers and as the demands of practice force the community to revise its relationship to its environment.” (*Idem*: 50)

Therefore, everyday practice and its textures are central for understanding work and, thus situated learning and change in the workplace.

---

<sup>14</sup> Bourdieu (1973) distinguishes the *modus operandi* from the *opus operatum*. The *modus operandi* is the way a task, as it unfolds over time, looks to someone at work on it, while many of the options and dilemmas remain unresolved. The *opus operatum*, the finished view, tends to see the action in terms of the task alone and cannot see the way in which the process of doing the task is actually structured by the constantly changing conditions of work and the world. (Brown and Duguid 1991)

Even though managers can claim they do understand practice and what is going on, usually what they have is an abstract representation of the actual practice. In a more fundamental level of this gap between represented and actual practice, there is a gap between science and experience, as it has been argued “The problem is not that we don't know enough about the brain or about biology, the problem is that we don't know enough about experience (...) Everybody thinks they know about experience, I claim we don't.” (Varela in Scharmer, Nonaka, Senge, Arthur et al, 2000).

What we learn from these descriptions is that organizations may direct their eyes and hands to these noncanonical practices not as informal or even deviant forces (Bernard, 2003) but rather as important resources for learning. In this view, one of the means to harness learning and innovation capacities is the “design of an organizational architecture and the ways communities are linked to each other.” (Brown and Duguid, 1991)

This perspective opens up indirectly the exploration path that I am pursuing here: that is, how space can enable or constrain fruitful linking of *communities* and *networks of practice*<sup>15</sup> within organizations.

#### 1.4 Organizational Practices and Knowledge Creation

Before entering into the spatial analysis of knowledge and innovation in the context of the design organizations, I want to elaborate more in a key issue that has been implicit in the discussion so far, which is the “knowledge” issue itself.. We have only slightly touched such issue and its implications. That is, when we were describing the ways the social practice is structured as a

---

<sup>15</sup> The notion of “networks of practice” relates to people that have practice and knowledge in common, but most of the members are personally unknown to one another. The links between the members of such networks are usually more indirect than direct –newsletters, Websites, Bulletin boards, listservs and so forth. Networks of this sort “are notable for their reach-a reach now extended and fortified by information technology. Members don't interact with one another directly to any significant degree and when coordination and communication take place, they are quite explicit. Collectively, such social systems don't take action and produce little knowledge.” The notion of community of practice, on the other side, focuses on *subsections* of these larger networks of practice: “They are usually face-to-face communities that continually negotiate with, communicate with, and coordinate with each other directly in the course of work. And this negotiation, communication and coordination is highly implicit” (Brown and Duguid, 2001: 143)

everyday coping with the network of tools *ready-to-hand* as well as with breakdowns in their perception system or when we were grounding our analysis on situated learning, peripheral participation and communities of practice we were assuming a particular relationship to knowledge. We were in the realm of knowledge without noticing it. We were tacitly implicating takes on knowledge issues (because of my own selection of frames and the way they operate). We were already on our track.

What do mean by knowledge in this context? How can we approach it in relationship both with my frames and questions and my empirical exploration?

Knowledge is a multifaceted concept with multifaceted meanings. As Ikujiro Nonaka (1994) claims, "The history of philosophy since the classical Greek period can be regarded as a never-ending search for the meaning of knowledge" (Nonaka, 1994). In the field of organization and innovation research, organizational knowledge -though huge- is an area that can be still demarcated in a meaningful way. Analysis about the knowledge society go back to Peter Drucker (1968), Daniel Bell with his post-industrial society (1973), knowledge capitalism (Alan Barton-Jones, 1999), networked society and informational economy (Castells, 1996/2000) and the influential "knowledge-creating company" (Nonaka & Takeuchi, 1995) that we will discuss below, among many others.

In management theory and practice, after the "reengineering" period, the "knowledge management" fad emerged. Researchers and practitioners were concerned about how to maintain and manage knowledge. Famous phrases such as "If HP knew what HP knows, we would be three times as profitable" sparked several insightful researchers (Prusak and Davenport, 1998; Leonard-Barton 1995).

The generally accepted (linear) view usually starts by a differentiation among data, information and knowledge. Such view sees data as simple facts



that become information as data is combined into meaningful structures, which subsequently become knowledge as meaningful information is put into a context and when it can be used to make predictions.

In this vein, Burton-Jones claims that data, information and knowledge are often used loosely to describe the same phenomena, which can lead to inconsistency and semantic confusion. Therefore, he proposes the traditional differentiation where “data are defined as any signals which can be sent by an originator to a recipient -human or otherwise. Information is defined as data which are intelligible to the recipient. Finally, knowledge is defined as the cumulative stock of information and skills derived from use of information by the recipient.” (Burton-Jones, 1999:5) Whereas data have low value and meaning, knowledge is up in the pyramid -information in-between- with high value and meaning.

Similarly, Prusak and Davenport (1998) uses a linear description that starts with data as a “set of discrete, objective facts about events [or] as structures records of transactions” (Davenport and Prusak, 1998:2). They took a syntactic view (Shannon and Weaver 1949) on information, which is a *message* usually in the form of a document or an audible or visible communication that has a sender and a receiver. Information must inform: “it’s data that makes a difference” (Davenport and Prusak, 1998: 3), which resembles Bateson’s account on the “difference that makes a difference.” Unlike data, information in their view has meaning because “data becomes information when its creator adds meaning.” (Idem:4). In this account knowledge is also seen at the top of the pyramid but comprising somewhat complex ingredients and elements than in Burton-Jones’ former description: “Knowledge is a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knowers.” (Idem: 5)

Though richer and complex, this definition seems too broad (experience, values, contextual information and expert insight) and, thus inoperative for our purposes. It also carries a Cartesian flavor when it states that originates and is applied “in the minds of knowers”, without taking into consideration the embodiment of knowers and collective meaning and, thus, their social space of possibilities. Underlying this model of knowledge as a “higher form of information” is the idea that knowledge has to be extracted from its raw materials, and in the process, meaning has to be added to them.

Tuomi (2002) critiques such linear and bottom-up perspective of the knowledge pyramid, trying to show through a phenomenological approach that data emerges only after we have information, and that information emerges only after we already have knowledge. How this can be at all?

Tuomi works out his critique to traditional views on knowledge management, based on influential philosophies of knowledge of the 19<sup>th</sup> and 20<sup>th</sup> century, akin to the framework and insights we have presented here. These philosophies depart from an understanding of human beings as embodied minds in-the-world and, thus, always operating according to a pre-understanding. Therefore, it is easy to see that raw data do not exist, and that even the most elementary perception is already influenced by potential uses, expectations, context, and theoretical constructs.

The empirical and linear model of data-information-knowledge has been heavily criticized by several prominent philosophers of knowledge such as Bergson, James, Husserl, Heidegger, Mead, Merleau-Ponty, and Polanyi.

Although their criticisms have approached the problem of objectivistic and empiricist knowledge from somewhat different directions, “they share the fundamental insight that the world as an object of human knowing exists only as an interpreted world that is completely infused with meaning.

A human cognition cannot see simple facts without these facts being part of its current meaning structure. Moreover, much of this meaning structure is unarticulated background against which articulation and explication happens.” (Tuomi, 1999:5)

Therefore, such tacit and yet to be articulated background is key for knowledge creation and, thus, for innovation to happen. All knowledge and information is created not out of nothing (raw material without meaning) but from our current participation in social practice and collective meaning. Knowledge and information is only intelligible, readable and useful against such background of common practices. Not only a building or a workplace but also a city can act as spatial backgrounds for creative cognition and learning to happen. Such spaces can carry the cultural practice needed to create new knowledge.

The design and use of spaces, as I try to show in the following chapters, play a fundamental role in creating “shared meanings” and “places” that would enable our tacit knowing capacity to create new knowledge by enhancing the body awareness. This fact of tacit knowing as an “indispensable part of all knowledge” (Polanyi 1966: 20) helps us clarify the above statement of knowledge as already infused with meaning as well as connect us back with the experiences of embodied cognition.

Michael Polanyi, the chemist and philosopher, author of the influential *Personal Knowledge* (1958) and *The Tacit Dimension* (1966) first came with an account of the fundamental role of tacit knowledge and its relationship with external (explicit) knowledge. In his elaboration on the fact of tacit knowing he clearly states the fundamental work of perception and, specifically, of the human body: “Our body is the ultimate instrument of all our external [explicit] knowledge, whether intellectual or practical.” (Polanyi 1966: 15) In other words, we rely on our awareness of contacts of our body with things, objects, ideas, products outside for *attending* to these things. Spaces that foster awareness on our body will enable knowledge creation.

This distinction has been influential in setting up further discussions and elaborations on the field. In fact, in the discussion on organizational knowledge, there are two main issues that structure a good deal of the debate, namely, i) individual vs. social and ii) explicit vs. tacit knowledge.

On the one hand, some scholars treat knowledge as an objective, stable, divisible and taxonomic entity that individuals in organizations create, codify, transfer and utilize in planning and production (Nelson and Winter 1982; Levitt and March 1988, Nonaka 1994). On the other hand, others researchers characterize knowledge as inherently indeterminate, socially constructed, emergent and embedded in social practices (Boland and Tenkasi 1995, Tsoukas 1996, Brown and Duguid 1991, 2000).

In regard with the second dimension of discussion, the knowledge debate is further divided along Polanyi's (1966) classic distinction between tacit and explicit knowledge. Whereas Nonaka (1994) and Nonaka and Takeuchi (1995), conceptually separate these two types of knowledge and argue that the knowledge creation process involves their interaction through individual and collective externalization and internalization, Tsoukas (1996) and Brown and Duguid (2000) sees the two as "mutually constituted ...(and) inseparable."

Therefore, in the latter, as in Polanyi, tacit knowing is an indispensable dimension of all types of knowing and not, as in Nonaka (1995) and Nonaka and Takeuchi (1995), a dimension at work in certain "conversions" of knowledge (from tacit to tacit -*socialization*- or from tacit to explicit -*externalization*-) and absent in others such as *combination* -from explicit to explicit- and internalization -from explicit to tacit knowledge-. These processes of socialization, externalization, combination and internalization form the so-called SECI model.

I will be not using Nonaka's SECI model of knowledge conversion, but Nonaka's *et al's* reflection on space along the lines of Ba (place) in order to connect tacit knowing with the creation of new knowledge, prototypes and products through agile and meaningful spaces.

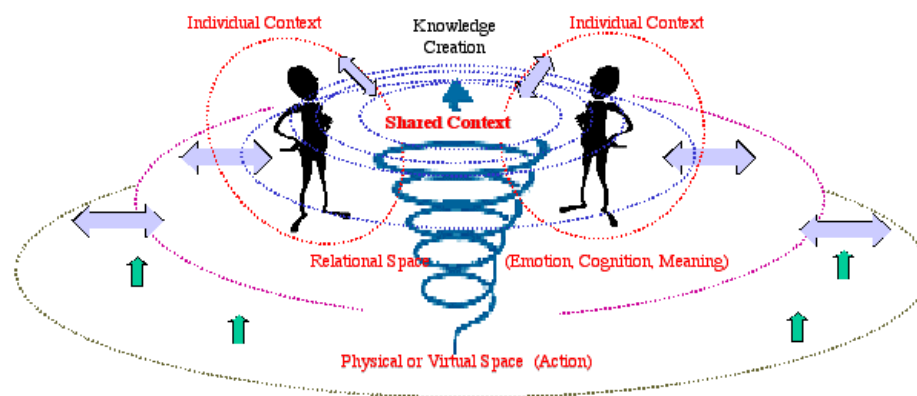
Nonaka and collaborators also developed a model of knowledge creation spaces, which is relevant for our purposes of introducing *space* as a multidimensional context for knowledge and innovation in design organizations. We believe, say Nonaka, Toyama and Scharmer (2001), that the single most

important factor shaping the quality of knowledge creation is the quality of place. Using the Japanese concept *ba* that roughly translates as "place" they introduce spatial consideration in organizational knowledge creation. According to the Japanese philosopher Kitaro Nishida (1921, 1970), each *ba* has a physical, a relational, and a spiritual dimension.

Knowledge is created in situated action (Suchman, 1987). The knowledge-creating process is always context-specific in terms of time, space, and relationships between people.

Ba is here defined as a *shared context in motion* in which knowledge is created, shared, and utilized (Nonaka, Toyama, and Konno, 2000). Ba is the context shared by those who interact with each other, a process through which the context itself evolves through a self-transcending process of knowledge creation. Ba provides the energy, quality, and place for individual knowledge conversions and for moving along the knowledge spiral. It is the shared space for emerging relationships. Knowledge emerges out of *ba*.

Figure 1: Ba as Shared Context in Motion



Individual contexts are shared at Ba (inter-subjectivity), and the shared context and individual contexts expand themselves through interaction (trans-subjectivity).

According to Nonaka and Konno (1998), i) tacit-to-tacit conversion occurs in *originating ba* as the space of social interaction (individuals' mental models and skills are converted into common terms and concepts), ii) tacit-to-explicit conversion in *interacting ba*, later called *dialoguing ba* (Nonaka, Toyama and Konno, 2000) and is often organized as cross-functional teams and task forces, iii) explicit-to-explicit in *cyber ba*, which offers a context for combination of existing explicit knowledge (supported by email, databases and information systems), and iv) explicit-to-tacit conversion in *exercising ba*, which is the context of internalization where individuals embody explicit knowledge that is communicated through virtual media (written manuals and simulation programs) and the limits are transcended through action (Nonaka, Toyama, and Konno, 2000; Tuomi, 2002).

I will not use these specific categories in my empirical exploration of the emergences of Ba. It is not clear which ba is the urban space or the users space in my case. I guess the *workplace dimension* is across originating and dialoguing ba. But certainly there is a relationship between ba and the physical place, as Nonaka, Toyama and Scharmer (2001) exemplify with a story from the Japanese NTT DoCoMo where "a room was created for the i-mode team to have conversations with each other and experts in various fields. Casually referred as "Club Mari," the room was well furnished and drinks were stocked so that everyone can relax and communicate freely. At Club Mari, participants exchange their ideas and viewpoints, and created new ideas.

Ba exists on several ontological levels. Individuals form the ba of teams, that in turn form the ba of organization. Then, the market environment forms the ba for the organization. According to Nonaka *et al*, innovation and strategic management in firms becomes a problem of leading and organizing bas and their interactions (Nonaka, Toyama and Nagata, 2000)

This contextual and broad view on knowledge space is a good introduction for my empirical exploration on the spatial resources and constraints of the design organizations under study. Since I think that

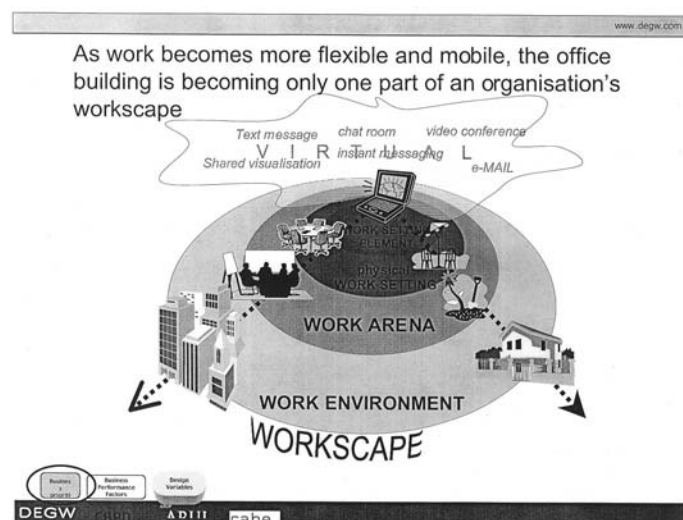
cognition, learning and work are part of much broader systems of meaning and identity, I will start my exploration from the contextual/peripheral/urban space of the firms and from there I will move towards buildings, office spaces and situated work practices.

That is my methodological choice for trying to answer this fundamental question: what is the role that the different material dimensions of space play in fostering learning, creativity and innovation?

## 2. Urban Ecologies for Innovation in Design Organizations

An embodied mind and situated learning perspective as the base for a practice-theory of knowledge and innovation that is concerned with shared places, contexts and peripheries is certainly deeply related to the spatial dimensions of social practice, that is, the spatial conditions of the way organizations do their work. Since I understand and interpret human beings and work practices as part of broader systems of action and meaning, so organizations have to be understood and analyzed from an *ecological perspective*. An ecological perspective of space means that each object or work space (a room, a office, a building, a project space, a cafeteria) is related to broader spatial areas, geographical position, complementary work practices and urban networks.

The function, value and ability to drive change of an organization is derived from its relationship and quality of embodiment within the surrounding space, usually considered as the city, the cluster, the region or the country. This connectedness to the broader space can become a source of competitive advantage, growth, and organizational learning, but at the same time such opportunities might be lost if not explored, epistemic differences may arise due to boundaries in practice and cultural styles, i.e., in the way the people do their work (as different or indifferent from others in the urban ecology) and, thus constrain the possibilities of complementation and synergies in their work.





An exploration of the interaction between the material dimensions of space and innovation of IDEO, the MIT Media Lab and Design Continuum should not only consider the office and team work space, but also the *urban location* and its particular relationship (enabling or constraining) to their work practices and, thus, to their source of competitiveness. That is, such exploration has to take into account the ecological space of the organization.

With that epistemological decision, I am making a choice to move away from the methodological individualism that conceives knowledge either inside the human mind (or brain) or inside the firm. I claim that such “individuality” (the mind, the building and the organization) is already in a shared space that conditions the emergence of organizations and their continuing structuration, competitive advantage and change. By considering the firm as node in an info-electronic network (which is the consequence of the firm-based view) it is easier to overlook the potentialities and resources of the location, physical environments, latent networks and “ecologies of knowledge” (Brown and Duguid, 2001).

In this field the literature usually focuses either on the regional-urban space of knowledge creation and competitive advantage (Marshall, 1920; Porter, 1990; Saxenian, 1995; Kenney and Florida, 2004; Brown and Duguid, 2000; Sassen, 1998) or the office space of communication, innovation and agility (Allen, 1977, 1997; Stone and Luchetti, 1985; Porter, Horgen, Joroff and Schön, 1999; Joroff and Bell, 2001; Duffy, 1996, 2000; and Leonard and Swap, 1999). The former has drawn increasing attention especially over the last years and the latter is still a developing area.

My intention is to connect the different spaces of organizational practices from the urban to the workplace in a coherent multi-dimensional framework for understanding the spatial embodiment of the design organizations.

The four dimensions of the framework (urban, building, workplace and users) are connected in theory and practice. That is, users live and work in a place and are moving around a location, buildings are in a position within a

location as well as enclosing workplace practices. Such workplaces, as I show in the next chapter, can be made of more or less shared practices, depending on the type of work and on the supporting spaces.

Therefore, at a fundamental level—one not widely perceived—there are, some shared practices across the different material dimensions of space of an organization. At the same time, there are boundaries and differences across such dimensions and even, as I shall describe later, within the same space at issue (within a building or in the same floor of an organization).

In all, I think starting with the urban space for the exploration is a consistent decision in my overall strategy of studying organizational learning from a situated and social perspective through the lens of the space.

Overlooking both the spatial connections, resources and boundaries of organizational embodiment can be risky for performance, the bottom line. Due to that, managers might mislead their investment or decision-making, overlook resources and potential disruptions, and ultimately obscure vision. Such oversight has been prompted by discourses that go back to McLuhan's global village (1964) as well as Toffler's electronic cottages (1980), Negroponte's "everyone's your neighbor" (1996) Cairncross's "death of the distance" (1997) or Kevin Kelly's "New Rules for the New Economy" (1998) that inhabits a space rather than a place.<sup>16</sup>

Besides discursive politics, the urban space, or rather the "urban place," has a lot do with innovation and creative industries, as several neoclassic social scientists (Lucas 1998, Porter 1990, Frey and DeVol 2000, Glaeser 1998) and social scientists from other traditions (from Robert Park and Jane Jacobs to Wilbur Thompson and Manuel Castells) have pointed out. Others like Richard Florida (2002) who is trying to move away from the human capital theory as the key for understanding regional growth (Glaeser 1998) towards a "creative capital theory" has claimed that "Place and community are more critical

---

<sup>16</sup> These discourses, as crystallized in *The Economist*, in Toffler's presentations and workshops, in *Wired* magazine, in sponsors' meetings at the MIT Media Lab and so forth, were not neutral or, rather, they are political discourses in the broad sense as they influence how some people observe and read the world, make decisions, think about technology and its relationship to spaces and social practice.

factors than ever before. And a good deal of the reason for this is that rather than inhabiting an abstract “space” as Kelly suggests, the economy itself increasingly takes form around real concentrations of people in real places.” (Florida, 2002:219).

My understanding of the creative ecologies follow to a certain extent Florida’s perspective. But I claim that it is not only the movement and concentrations of people but also their interactions with space, uses of buildings and creation of places. It is not creative people by itself but their co-construction of spaces, supported by larger ecologies, infrastructure and network of flows. The ecologies and regional advantage might flourish precisely by the emergence of latent connections among complementary resources and knowledge. Clusters and ecologies are indeed important for economic growth and innovation, but each one has its own specificity, local strength and mysteries that need to be explored according to the type of organization circumstances. For instance, for a design organization Silicon Valley, Route 128 can mean totally different things. So, my aim in this chapter is to look ecologically but locally, attending at the specific resources that urban places bring forth.

Looking at this *ecological and relational* space of the organization has an important implication, related to the overcoming of the firm-based perspective that usually draws a sharp and useless distinction between the firm’s interior and exterior. As the Berkeley researcher AnnaLee Saxenian has pointed out, “By drawing a sharp distinction between what occurs inside and what occurs outside the firm, scholars<sup>17</sup> overlook the complex and historically-evolved relations between the internal organization of firms and their connections to one another and the social structures and institutions of a particular locality.” (Saxenian, 1999: 1)

The *urban, geographical or ecological space* is one of the material dimensions of space that I analyze in the context of the Media Lab, IDEO and

---

<sup>17</sup> Saxenian is referring to economic geographers and regional scientists such as Marshall (1920), Storper (1989), Scott (1988), Vernon (1960) and “newcomers” as Paul Krugman (1991) and Michael Porter (1990).

Design Continuum. I claim that urban space of innovation is intertwined with the local practices of the working places. This seems an obvious statement, but usually it is overlooked by researchers and even practitioners, probably because of a mind-set that tends to think of outside practices (environment) as unrelated to workplaces, sometimes at a pace of urban transformation that is difficult to notice.<sup>18</sup> However, even in a peripheral area, material practices have some degree of connectedness as researchers in social networks, in physics and in consciousness research have showed.<sup>19</sup> Such connectedness varies according to the local characteristics (nature and nurture) of a region.

A useful distinction to understand the complex urban logic (ecologies, connections and localities) is the one proposed by the prominent sociologist Manuel Castells between “spaces of flows” and “spaces of places.”

Castells (1990;2000) refers to *space of flows* as “the material arrangements that allow for simultaneity of social practices without territorial contiguity. It is not a purely electronic space. It is made up, first of all, of a technological infrastructure of information systems, telecommunications, and transportation lines. It is also made of networks of interaction, and the goals and tasks of each network configure a different space of flows. Thus, financial markets [Wall Street], high-technology manufacturing [Silicon Valley, Route 128 where IDEO offices are], business services, entertainment [Hollywood, San Francisco’s South of Market], science and technology [Cambridge, where MIT Media Lab is], drug traffic, fashion design [Milan, where Design Continuum is], art [Manhattan], sports or religion constitute a specific network with a specific technological system and various territorial profiles. The space of flows is made

---

<sup>18</sup> In a deep level, this difficulty to notice is due to our everyday coping with things as described by Heidegger in the experience of the Dasein.

<sup>19</sup> Social networks analysts, without paying too much attention to spatial materialities, have called this phenomenon “degrees of separation” based on the pioneering work by Stanley Milgram (1967). In physics, modern quantum field theory conceives objects as manifestations of underlying and connecting fields. The global consciousness project (GCP) has come up with evidence to support scientifically that “we may have direct communication links with each other, and that our intentions can have effects in the world despite physical barriers and separations.” (in <http://noosphere.princeton.edu/>)

up of nodes and hubs. Hubs are communication sites, airports, harbors, train, or bus stations that organize exchanges of all kinds.” (Castells, 2000:19-20)

Though increasingly important in a networked economy, the space of flows is only one dimension of the emerging spatial transformation. Most people live, work, and construct their meaning around places. So do the designers and users in the context of design organizations and in the cases of the Media Lab, IDEO and Design Continuum.

The other component of the urban logic is constituted around the concept/experience of “places.” It is the most common form of spatial existence for humankind. Place can be understood, according to Castells, “as the locale whose form, function, and meaning are self-contained within the boundaries of territorial contiguity. People tend to construct their life in reference to places, be they their homes, their neighborhoods, their cities, their regions, their countries.” (Idem:20) And, as I show below and in the next chapter, the urban place, the building and, especially, the workplace are critical factors for innovation situated in the space of places that require a detailed analysis.

## **2.1 The persistence of the local in the global-design economy**

If we look at the space of flows, roughly speaking, the MIT Media Lab, IDEO and Design Continuum shares a similar position in the space of flows. Within their scale of operation as medium-sized organizations, according to Cheskin (2003), with 100 to 999 employees and with presence in at least two continents, these organizations are connected with nodes and strategic/design networks to the “space of flows” through hubs, firms and financial markets. That is, they are connected with themselves (other offices) and with other firms in the form of “clients” (IDEO, DC) or sponsors (ML). IDEO has offices in Palo Alto, San Francisco, Boston (Lexington), Chicago, Boulder, London, Munich and Tokyo. Design Continuum has offices in Boston (West Newton), Milan and

Seoul. The Media Lab is based at MIT in Cambridge, Massachusetts and has an European Partner in Dublin, the Media Lab Europe (MLE).

Even though they have offices or a brand worldwide, they all are having problems becoming organizations with spread global practices, that is, to use their competitive knowledge to replicate their local strength, share their knowledge, and act as a collective mind (Weick and Roberts, 1993). According to interviews, ongoing reorganization (in the case of IDEO) and to financial problems (to start the construction of the new building in the case of the Media Lab), these organizations, though connected nodes in the *space of flows*, they have problems and difficulties moving their knowledge and respective communities globally, i.e., across spaces and regional offices. They are important and competitive in the cluster of origin—think of IDEO in Silicon Valley or Media Lab in MIT—but less influential and competitive in other regions.

Their knowledge and communities are, to a certain degree, still local and place-based. The urban place and location shape the organization's learning and performance. Unfortunately for infoenthusiasts, there is something in the urban ecology that specifies the organizations' configuration and, thus, complicates its "replication" or, what I call, "clonation."

I am not claiming a deterministic view of space or a parochial account of places. I am trying to direct the attention to the urban *routines* and *textures* that surround the process and practices of meaning and knowledge creation in the context of these design organizations.

Even though it is possible to think of a global design process (as it is claimed by IDEO and Continuum) or of a "media arts and science" global idea (in the case of the Media Lab), what we have is a robust local practice stimulated by surrounding constituencies. In other words, though they might claim to have a global process or to have a process that is "consciously managed" which moves learning from one context to another (from a particular project to another or using a particular technology), there are some differences in the knowledge that is produced in each location.

Why? Because there is something in their *spatial embodiment* of the organization. Two questions will guide me in the empirical exploration of such ecological embodiment of each design organization's location as the context of shared practices and, thus, of knowledge creation:

Can innovation be global, i.e., move from one location to another or, in other words, from the space of places to the space of flows?

How can a place-based innovation can become a global practice across geographic boundaries?

## 2.2 The Water of Cambridge (or the place of MIT Media Lab)

The MIT Media Laboratory was founded by Nicholas Negroponte and Jerome Wiesner in 1985—though started informally earlier—as a research lab integrated with an academic program at MIT in Cambridge, Massachusetts. Since its establishment, the relationship to MIT, in terms of spaces, culture, people and brand, has been fundamental for its development.

The Media laboratory was set up to “enable technologies for expression and understanding by people and machines” not only in the context of MIT and the U.S., but also to extend its influence and “thoughtful leadership” in media technologies to other contexts. Such vision is still held by the current administration, as Walter Bender, the Media Lab's Executive Director, notes:

We are very much focused internationally just because that's where people are, that's where ideas are, that's where resources are. We certainly try to be somewhat opportunistic in terms of trying to engage people in places we think are exciting and energetic for thinking [WB, 2003].

Bender goes on to argue that not only the lab but the interdisciplinary idea of “media arts and sciences” deserves to exist in more than one place:

It is not just a lab, but it is also an idea. And that idea should exist than more than this place. It should exist all around the world. So, one of the goals it has been to see if you can plant that seed elsewhere. [WB 2003]

Nicholas Negroponte, ML's chairman, is a respected figure worldwide who usually "spends 80% of his time circling the globe, combining admonition with invitation and creating a 'global Media Lab' through his network of contacts" (K. Haase, 1998) in industry, governments and academia. Negroponte is aware of the increasing importance of global sponsorship of the lab as well as of the multi-cultural (international) dimensions of its students:

The Media Lab is at a stage where it is becoming more global, and not just in terms of its sponsors [50 percent of the Media Lab's external funding comes from beyond the US, and more than half of that comes from Europe] About 35 percent of MIT's Media Lab students come from outside the United States. So we have a foreign presence in the place, but the place doesn't have a foreign presence. [NN 1999]

Since the late nineties, there have been efforts aiming to build models and replicate MIT ML's practices throughout the world. The ML's administration and faculty has led efforts to build the Media Lab's partners in Heidelberg, Germany, Paris, India (Media Lab Asia), South Korea, New Zealand and Media Lab Europe located in Dublin.

Media Lab Europe in Dublin was started "after negotiating with several European governments over the past two years" because "Ireland was the best location for its second facility." (Negroponte 1999) Why in an island, not even in the UK, relatively far away from Continental Europe? The answer given by Negroponte, though not convincing, was along these supposedly *clear* lines:

Clearly, this was the most serious and attractive country due to Ireland's historic strength as a center for artistic and literary achievement. [NN 1999]

In Heidelberg, Germany, after half a year of groundwork toward building a ML partner there, "irreconcilable differences between MIT and the patron of the proposed laboratory eventually led to the dissolution of the relationship." (Haase, 1998) In India, the Media Lab helped to start off the ambitious project Media Lab Asia "Innovating for the next five billion people" a few years ago. Again, problems with the local management culture put aside MIT ML in its execution and direction.





MIT Media Lab Wiesner Building (e-15)

Media Lab, MIT Campus, Cambridge, MA

Regarding the culture and the supposed organizational replication and local extension, Walter Bender says, “when we started the lab we had a problem because MIT is a big, well-established place and it casts a big shadow. And if you want to grow something new under a big shadow it is difficult. So, one thing you have to figure out how to find is a little sunlight. But then, when you have grown big as well and you can reach to the canopy and you also cast a big shadow.” (Bender, 2003)

However, it is difficult to find and cultivate such little sunlight. The Media Lab has encountered important limits and constraints in its project of becoming a “global lab.” Although “Media Lab Europe” is in Dublin (not present in the rest of the European space of places), Media Lab South Pacific is in New Zealand and seems loosely connected, and the Indian government-led lab in India is running independently, the practices and knowledge of the Media Lab are still based in an urban local place, within the territorial contiguity of MIT, in Cambridge, Massachusetts. Much of the research, the inspirations (from the MIT environment and from ‘emeritus’ thinkers as Minsky and Papert), large consortium meetings, massive sponsors visits, new directions and most corporate and NSF funding comes to and from the building in Cambridge.

For instance, the building, the place, the atmosphere and feeling of the people-and-place is rather different in Dublin’s Media Lab. I visited Media Lab in Dublin in late January 2004 and spoke with five researchers there. There are

some similar research groups such as Story Networks (led by Glorianna Davenport's and similar to her Cambridge's Interactive Cinema), Common Sense led by Kenneth Haase, certainly resonating with the research of his former advisor Marvin Minsky, Everyday Learning led by Carol Strohecker, somewhat similar to Resnick's and other groups in learning, among only eight projects in MLE.

The building, located in the former hopstore of the Guinness Brewery (see photo below), is quite different. Frankly, the building is quite the opposite as it is made up of brick and mortar and the walls and floors inside are made-up of wood that gives a sense of a natural system (resembling IDEO SF). The transparency is not achieved by glass walls or partitions but by open space populated by individual work areas (desks). An institutional difference with the MIT Media Lab is that Media Lab Europe does not grant degrees. It is a research institution, usually with no formal students, but researchers. There are some researchers pursuing degrees, but they are doing it at universities such as Trinity College of Dublin.

Even though digital technologies are far-reaching, some knowledge—know how, tacit knowing and contextual knowledge— are sticky (Brown and Duguid, 2000) and difficult to transfer and, thus, to replicate and grow by itself without supporting work practice and place.<sup>20</sup> The differences in practice make difficult the creation of a global practice of media lab innovation, i.e., more than one similar laboratory in another urban context.

Digital technologies are not enough to encourage the sharing of knowledge, especially tacit knowledge, which is the critical asset for a research laboratory. Only some research groups have been able to leak over the Atlantic to this place.

---

<sup>20</sup> We note a change in the language to refer to organizational culture and change. From the notion of replication (Haase) to *growing* metaphors about the “biological” life of an organization such as the media lab. As with every organism and organization, their environments and spatial embodiments –spaces that support the structure and cognition- are fundamental for performance.



In this scenario, the Media Lab, an interdisciplinary organization trying to do innovation, has taken risks as any endeavor aimed towards innovation.<sup>21</sup> Those global efforts trying to harmonize local strengths with different “embedding circumstances” (Giddens 1990) that bring about cultural and managerial “resistances” have been an experience for some people at the lab:

“We also shoot ourselves in the foot every once in a while because we are passionate about something and we take a risk. And sometimes the risk doesn’t pan out. We went to India because we felt it was the right thing to do. I think that even though starting a Lab there, from the MIT perspective was perhaps unsuccessful, the Lab is running—but we are not managing it. Ironically, I am not particularly happy about have to manage far-flung things anyway. We can plant a seed and let it grow.” [WB 2003]

To further use this metaphor, sometimes the seed can hardly grow if the weather conditions, soil characteristics and care are not well suited or if such conditions are not recognized nor honored in their potentials and constraints. The *soil* for the plant and the *place* for knowledge creation are fundamental, but their “materialities” have to be recognized for the plant to grow, nurture to be useful and knowledge to be created.

---

<sup>21</sup> Risk and capital are important factors in innovation, but not the only ones, as I shall argue later when discussing the situational readiness and awareness of workplace making.

If we analyze some of the conversations and language to refer to the work and research conducted at the ML, the word “Cambridge” and “MIT” appear more than often in the discourse. That is not a coincidence. It refers, for better or worse, to one key but usually overlooked factor in innovation practice, the place of abundant shared meanings and practices, i.e., the place with the more complete context for lab’s innovation.

We have pretty good students here at MIT. That’s win-win kind of situation. We subscribe to a thesis that *there is intelligence alive outside* of Cambridge, Massachusetts. There is actually a lot of real smart people out there and any time we engage them we benefit. [WB 2003]

It is the power and strength of the ecology of Cambridge in Massachusetts and the local knowledge of MIT. Something that seems interesting, exportable and innovative, however, sticks within the territorial boundaries of MIT and, sometimes, within the lab building.

### 2.3 Clustering with IDEO

IDEO Inc. is in the midst of an organizational transformation at the time of the writing of this thesis. Formally, they look and feel global in cyberspace (if you visit their website [www.ideo.com](http://www.ideo.com), for instance).



However, as the practices and experiences of designers reveal, IDEO is still West Coast-based and U.S.-centered because it was founded in the

proximity of Stanford as the “high-tech firm for low-tech companies” in Palo Alto within Silicon Valley. Its market size seems also to be bigger in the US (5 offices) than in Europe (2 offices) or in Tokyo (small and part-time office). Most of the corporate literature and research about IDEO (Hargadon and Sutton 1997, Hargadon 2003) have been based in the Bay Area, either Palo Alto or San Francisco.

The importance of *technology* and *design* ecologies appears in IDEO’s executive discourse about the way it approaches global markets and clients. As Bill Moggridge, co-founder and IDEO’s principal puts it,

Almost half of our people are in PA. So, we are pretty focused in terms of our strength here, in the Silicon Valley. The Silicon Valley relationship gives us a reason to be here. For the same kind of reason, our Boston office is close to Route 128. The combination of a great University and important technology center is a reason for us to be here (Palo Alto) and in Boston. As for London, Munich and Chicago, they are slightly different. They are not global technology centers, but they are important centers of culture and design. [BM 2004]

IDEO is trying to become a more global and sustainable firm by affirming local presence elsewhere and decreasing its West Coast dependency. In other words, they are trying not only to be successful *communities* of practice (which they already are in each office ecology, specially in the West Coast) but *networks* of practice that can transfer specific knowledge and deal efficiently with clients, wherever they might be. How can IDEO be global, if their expertise is place-based and they don’t share their whole realm of practices? What can be done to improve organizational learning across locations and business performance if, as Moggridge notes, “most of our knowledge is tacit knowledge”?

“It is a problem” says Moggridge, arguing that “part of the reason for our new structure, including global practices is to enhance the ability to share across locations. We do a lot of moving of people around. You can volunteer to swap: if you live in London, you can come to PA for a year or maybe you come for a project, which is 6 months or something. So, you get the movement of tacit knowledge through the movement of people and also by trying to make collaborations across geographic barriers. I do believe that person-to-person, face-to-face, the physical being together is an enormous important part of creating knowledge.” [BM 2004]

Each office space has its own culture—type of work and workplace—and communities of practices that historically have tended to diverge or even

oppose one another. Even in the case of the West Coast offices that are much more in contact to each other, representing the Bay Area local strength, historically there has been a cultural battle between the engineering culture based in Palo Alto and the design-concept culture based in San Francisco, as one engineer notes:

Very different cultures to the point part of their own itself definition of cultures was flight into the other and say: 'we are definitely not that' That was very easy to reinforce ... And it is always going to be something that has to be handle culturally and I think with middle-love affair of PA and SF, respect and engage with each other as a culture. There are still differences. There's a lot to be done to handle that relationship. [DW 2004]

In terms of management, IDEO has used a horizontal structure giving a great deal of autonomy to each studio, a physical-based organization. This structure has in effect created a collective sense-making of many loosely IDEO's connected to the Bay Area, especially to IDEO Palo Alto (6 studios).

For many insiders, IDEO is an interesting local firm with global potentialities, trying to reorganize its process through the different "practices" (the people that do the same work) across locations in order to address specific demands globally in a more effective way.

David Webster, an engineer at IDEO, is aware of these processes and changes. He just moved from one Palo Alto "studio" (old name for IDEO's structure) to the consumer experience "practice" (new name for structure) based originally in San Francisco but intended to comprise all the practitioners and members of such practices of each location:

I think geographic location is only one of many factors there. I think it's really interesting because the company is at this time [Feb. 2004] evolving into something different and better very quickly. When I came to IDEO 6 years ago, it was pretty Palo Alto and Stanford centric. That was the sort of Bay Area prominent culture. The company offer was kind of an augmentation of that. Palo Alto then felt like it was geographically on the center of that thinking. Our thinking and our offer to the world has evolved that isn't so tightly tied to *Stanford product design thinking*. Therefore, this leads to a normalization of the significance of each location and a contribution to IDEO's global thinking and offer to the world. [DW 2004]

One of the challenges is "to make it feel like we are one IDEO across all the locations" (Webster, 2004), that there is a common strategy, know-how and thoughtful leaders to offer to certain sectors of clients. In that way IDEO

might be able to have a sustainable business, healthier financially, and recognizable in different regions of the world.

Similarly to the case of the ML, the reference to a *place* reveals some resources and constraints for the design and innovation practices of IDEO: “These thoughtful leaders are not necessarily based in the Bay Area, but if they are, part of our role is to make sure that they have a connection to and representation in each of the geographical location.” (Webster, 2004).

While being in the Bay Area is an important resource for connecting with clients’ needs given the present network of companies and relevant knowledge for design and product development, that location has also been a constraint in terms of the type of design (Stanford product design), the specific Valley expectations and demands that differ from elsewhere, affecting the coherent evolution as a firm.

Nobody would argue that being in Silicon Valley is a constraint. Neither do I. Being in that place and doing the work they have been doing so far has led them to a certain model of design practice. Such ecology has shaped the design organization, by defining a local way of doing things, difficult to transfer to other urban ecologies, which, in turn, has implied a certain constraint for growing beyond that model.

Similar to the difference between rational plans and situated actions highlighted by Lucy Suchman, there is a difference between a work space in the context of the *space of flows* and the work space in the *space of places*.

IDEO’s work space in the space of flows means that IDEO SF or PA are in a network of excellence in the midst of a cluster connected by hubs and nodes (airports, highways, hotels) to all over the world, to a certain extent.

But, is it like this for the people working there on an everyday basis? What does it mean to live and work in a space of flows?

The meaning, as I referred above, is constructed in places. The meaning creation done in the context of design firms, also happens in places. What

about the meaning constructed through day-to-day interactions by the communities and teams within the organization and its environment?

Jane Fulton-Suri, a psychologist working for more than sixteen years at IDEO, reflects on her *experience* of IDEO's work space and location:

The location matters. It's quite paradoxical that the old IDEO interior space was less open and agile, but it was located in a more lively location [it was on North Beach, SF] so everyday when you go out you jump into a lively and diverse set of cultures. Now, the office is located on Pier 28 Annex at The Embarcadero area under the bay bridge] However, a lot of people pass by and people run by in skateboards and play out there. It is not too difficult to be reminded about the rest of humanity. But it isn't the same of being up there ...we where on the fourth floor of a building that was right above a café and restaurants, that was very vibrant ... [JFS 2004]

Thus, it means the details and textures of an office location, i.e., the situated "place" where meaning is constructed through research, design, visualization and implementation in a process where IDEO interacts with its members and its environments (people and clients).

The *place* of everyday activity plays a key role. From the perspective of situated people (what are they really doing and how they are relating to the surroundings of the urban place) and not from the perspective of financial networks, usually, the "place" differs from the "space" of flows. Overlooking this difference can obscure both the spatial potentialities of latent resources at hand as well as specific flaws of the location related with situated demands of designers to the urban places.

Design work practices and meaning creation, i.e., innovation in products, experiences and environments happens in rich *places*. At IDEO, for instance, everybody talks and looks for "inspiration" as the key for emphatic design. In fact, it is part of their method to inspire clients, users and themselves. The location and surroundings are certainly relevant to understand and to design experiences, which is at the core of what IDEO does.

It seems obvious, but it is not: the location of the design firm in the space of places can play a critical role in the performance of inspiration and empathy. Designers and human factors researchers go from the Pier 28 to Fisherman Wharf for quick methods and go to Oakland or Pacific Heights depending on the users' values and experiences they are looking for.



Stimulating locations and places matter indeed, though it is difficult to measure their impact on the overall performance of the firm, controlling by other factors. Since there are also other factors involved, there is no one formal nor final measure of the effect of an urban space. The most important factors are rather difficult to measure, but that does not mean that they do not matter. They do and usually a great deal.<sup>22</sup>

There is, sometimes, a trade-off between a stimulating location and the cost of real estate. It is the trade-off between *Effectiveness* and *Expressiveness* vs. *Efficiency* (DEGW, 2003). Efficiency measures are usually cost-driven, i.e., work out in favor of a node in the space of flows rather than a “meaningful” location in the space of places. The easiest things to measure are often the least important (DEGW, 2003). As for user-centered design firms is concerned, “inspirational” locations as well as places to bring clients, explore users and get inspiration are indeed important and can bring competitive and unforeseen resources.

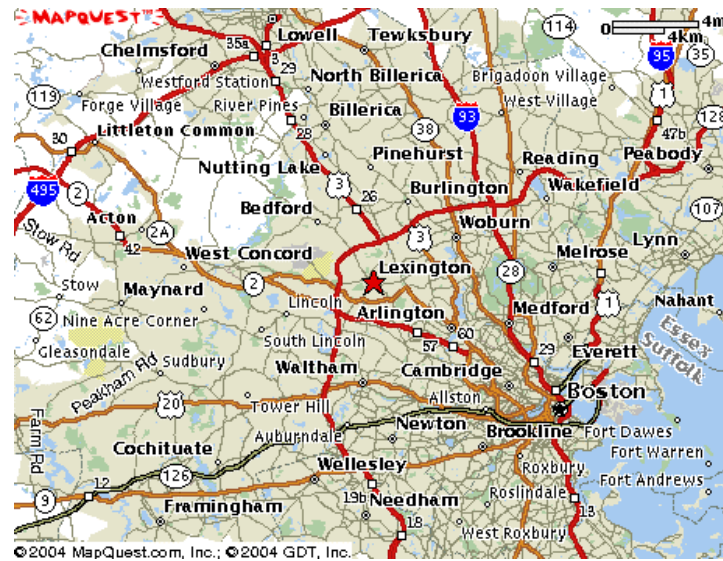
An example with IDEO Boston might be useful here to make this point clearer. In terms of the space of flows, IDEO Boston is closer to Route 128 in Massachusetts, one of the “milieux of innovation” (Castells & Hall, 1994) around the world where synergistic interaction is facilitated by territorial complexes of research, design and production.

So, IDEO Boston is in this spatial clustering of flows of capital, technology, companies and design. The executive discourse of IDEO senior management reinforces the relationship with such spatial cluster, “Our Boston office is close to Route 128. The combination of an important technology center is a reason for us to be in Boston” (Moggridge, 2003)

But again, what does it mean to be and to work in a global spatial cluster like “Route 128”?

---

<sup>22</sup> Further research will try to measure, in a more formal way, these location aspects of design.



In this case, this means to be and to work in Lexington, not in Boston, Cambridge, Somerville, or Brookline. The global discourse and formal representations (the symbolic picture that the mind supposedly construct rationally and may drive decision-making) changes when we look at the *textures* of both geography and everyday practice.

One of the employees at IDEO Lexington comments about his *situated activity* in terms of the location:

One of the problems we have here is the location. We are in this location based on where everybody sort of converges, where the highway systems are ...in the midst of an industrial park where there is not too much happening outside ... whereas being in Cambridge would be much more vibrant for our work [ES 2003].

Suddenly, the cluster is not a “cluster.” The high-technology route unfolds as a meaningless place on the space of flows. Or rather, as a “place” that hardly emerges out of the space of flows. Especially for designers and human factors researchers disclosing the meaning, values and styles of people-using-products, Lexington has nothing but regional advantage.

Eric Saperstein, an IDEO old-timer reflects upon his experience in other IDEO locations, besides Lexington (Route 128):

Our PI offices are in High (Forrester) Street in Palo Alto basically where Stanford University, kind of the Silicon Valley area where everybody would be coming in and out. The Bay area office where Suzanne works is down over the Pier. I was there [in SF] for about 4 and a half years ... It was a great thing to be part of ... It is a working studio as well has its sort ... pleasure, it's underneath the bay bridge, it has look over the water, and you are outside with people, you are always ... you walk out of your door and you meet with people [ES 2004]

The designer was aware of the quality of the urban places and its effects on social interaction and, thus, in design performance.



IDEO Boston (Lexington)



IDEO San Francisco

Urban and geographical space influence internal practices and organizational cultures. Even a building or an office has a *periphery* that can bring resources and insights, if taken into account. There is certainly an identity of being an IDEO office—you can feel it—yet the so-called “external” space and its knowledge related practices (complementary firms in the area, clients, users) might affect “internal” design routines and methods.

As the human mind is an embodied mind in-the-world, an organization is spatially embodied within a location. To a certain extent, organizations have bodies and both managers and communities have to nurture them. Its cognition as an organization depends on the broader *ecological* space (communities, networks, widespread, trust, human-scale infrastructure, urban facilities, cafés) on where it is located because “knowledge depends on being in a world that is inseparable from our bodies, our language, and our social history -in

short, from our embodiment.” (Varela, Thompson, Rosch 1991:149) Tacit knowledge, one of the key assets of design organizations, is created out of the evolving physical coupling with the environment.

The larger *spatial embodiment* of an office or building affects its performance and learning (Brand 1994) as a system of practices, whether more or less shared and connected. The idea put forward by the infoenthusiasts about the “death of the distance” (Cairncross 1997), “electronic cottages” (Toffler 1980) or about real-time spatial economy through information and communication technologies usually overlooks the textures of spaces, their relatedness and social life that might improve or constrain organizational performance. Such infoenthusiast assumptions usually assume a neutral space. (Virilio 1995)

In the case of urban areas such as cities, Jane Jacobs (1961/1993) describes a somewhat technical-rational approach on city planning (What is a Cluster?, What is a City?) and formal (neutral) representation of space that have tended to drive city-planning. According to this insightful researcher, practitioners of city design “have ignored the study of success and failure in real life, have been incurious about the reasons for unexpected success, and are guided instead by principles derived from the behavior and appearance of towns, suburbs, tuberculosis sanatoria, fairs, and imaginary dream cities -from anything but cities themselves.” (Jacobs, 1993:9)

For similar reasons I am arguing that the use of principles derived from the appearances of clusters or “creative places” that overlook both *real* constraints and resources might induce loss of social learning and, thus, loss of knowledge.

If we take this ecological view about working spaces and offices, we can address issues of organizational performance. In fact we can compare IDEO Boston and IDEO San Francisco by looking at the larger spaces of their embodiment.

Why does IDEO Lexington feel a bit left out and its business performance not as efficient (profitable) as the Bay Area offices?<sup>23</sup> If “internal” spaces and organizational culture are somewhat similar—though smaller in Boston—there might be something with their *spatial embodiment* (location), i.e., a difference between Silicon Valley and Route 128.

What is it in the respective ecologies of IDEO’s embodiment? I try to answer this question by using both the experience of human factors designers and scholarly research on regional advantage.

AnnaLee Saxenian (1994) offers us some insights to solve this spatial puzzle. There is something in the Valley’s ecology that improves IDEO’s organizational performance better than Route 128 does:

Silicon Valley has a regional network-based industrial system that promotes learning and mutual adjustment among specialist producers of a complex of related technologies. The region’s dense social networks and open labor markets encourage entrepreneurship and experimentation. Companies compete intensely while at the same time learning from each other about changing markets and technologies through informal communications and collaborative practices (...) The Route 128 region, in contrast, is dominated by autarkic (self-sufficient) corporations that internalize a wide range of productive activities. Practices of secrecy and corporate loyalty govern relations between firms and their customers, suppliers, and competitors, reinforcing a regional culture that encourage stability and self-reliance. Corporate hierarchies ensure that authority remains centralized and information tends to flow vertically. (Saxenian 1994: 3-4)

With this difference in the spatial ecologies of knowledge or organizational embodiment, IDEO as a brokering firm (Hargadon and Sutton 1997) that usually operates in “structural holes” (Burt 1992) across industries certainly faces different environments that impact its performance. Its

---

<sup>23</sup> This assumption is based on confidential information provided by IDEO Inc.

networking capabilities to connect with other firms (or possible clients) in the same space are, in the case of Route 128, diminished.

If the experience of designers is coherent with the data of scholars about IDEO's ecological space, what is the reason to be present near Route 128? The answer relates to the position on the space of flows. But what about the space of places and the urban place for meaning creation? That location and the associated real estate decision can start to be challenged. Why not move to Cambridge (increasingly important not only due to the academic cluster but because of the concentration of biotech firms)? If the real estate cost is still high in certain areas of Cambridge, why not move a bit north, for instance?

I am not going to do a financial analysis of that possibility, because it is beyond the scope of this research. I just want to highlight the emerging questions that appeared in the spatial embodiment analysis. It is not just a real estate (cost) issue, but one that comprises enabling the conditions for meaningful practices of design in relation to values and societal contexts.

#### **2.4 Design Continuum and Urban Places: between West Newton and Milan**

Design Continuum presents itself as a global firm with presence in America, Europe and Asia:

<p>At the moment with the three offices in America, Europe and Asia we covered the major places [spaces] and people that are looking for design. If someone is looking for developing something European, The American office will work with us to develop that. If someone to develop something America, we will align with the Boston office... [SM 2004]</p>
---

If we compare Continuum's public cyberspace (see its website's map below) with IDEO's we observe a neutral worldwide space, even without the geographic distinctions of IDEO's physical map. In fact, the only distinctions we observe in the world at large are Continuum's nodes in the form of circles in a neutral space of flows. That is not a coincidence. It shows some "institutional" claims.

In the interview conducted in Milan in February 2004, a Continuum's employee and I talked about the relationship between regional spaces and working practices, trying to elucidate how urban space impact the workplace as well as how the urban place is made by the design organization.

The official company discourse was trying to establish the independence of Continuum's organizational process from the spatial conditions. The variability of organizational cultures across offices was somewhat recognized by Steve Masterson, business developer at DC Milan, who argues that at Continuum there are "differences among the people as well, depending on which interns, which designers we have in here." (Masterson 2004) However, he was trying to stress the robustness of a 'global' process:

There is a Continuum, a process which I will talk through. It doesn't matter if you are in SF [they have a neutral space there, but not a working office], Australia, Boston, UK, whatever, we use the same process, we advocate the same process, we promote the same process. *We all work in the exactly same way.* What we are doing is we are supplementing our process with our personal experience, personal culture and personal skills. But we have a fairly robust process. [SM 2004]<sup>24</sup>

But, what does it mean having the same process when you are designing for different communities of users using different communities of designers?

Is this really a representation of what they are doing?



Let us explore, briefly, the spatial condition of two Continuum's offices, namely Milan and Boston. I start from the space that is farther from the MIT

---

<sup>24</sup> In chapter 3 we refer in more details to Design Continuum process, similar to IDEO's.

context. I introduce such Italian context by a first-person description that reminds us that the researcher is also part of the world under study.

This was an hectic and intense day. We departed early morning from Venice, took the train, stopped for one hour and half in Vicenza where we talked with an architect about our initiative on mobile technologies, local content production and cultural tourism. Then, we continued (I was with my friend and colleague Michael Epstein and he actually was present in the interview/conversation at Design Continuum) our way to Milan by train. We arrived at noon. It was a sunny day. My body was starting to get a cold. We took the "metro" (subway), got out at a station I don't remember and walked to Design Continuum. We passed by a supermarket, beautiful historical buildings and a construction area where they are starting to build new residence apartments. This area is about 15 minutes away from downtown Milan (Duomo) and it seems to be in an area of urban expansion. Compared to Design Continuum in West Newton (Boston), it is a much more urban area with richer immediate surroundings. Paradoxically, whereas Design Continuum in Milan seems in a much more "attractive" space of places (it should be said that Milan is also a key location, sometimes referred to as "the capital of fashion (design)," Continuum in West Newton it is within a less stimulating local area outside the greater Boston (though connected quickly by the Mass Pike 90 to the airport and downtown Boston) with not much immediate engaging surroundings for people that work in design, user cultures, styles and innovation. However, Continuum is in a central-location as regards to the space of flows not only because the headquarters are in Boston but also because their market share is bigger in the US. [CG, 2004, Meaning from the inside]

What does it mean to work and design in Milan? As we have described, one thing is the city (location) in the space of flows and other in the spaces of places, i.e., the everyday activity where communities of designers interacts with clients (and their respective communities) and users of present and future products.

Why Milan? The explanation by Continuum's people is as follows:

- 1) Milan as one of the European capital of (fashion) design. If you ask people where there is design in Europe they said in Italy, Milan [but also London, and Paris and Scandinavia]
- 2) From a business perspective, there are a lot of designers here, which is good for us because we can find them. Many, many designers come to Milan for the exact same reason. There some great design companies here, being in fashion, industrial design and engineering. So, there's a massive pool of expertise in design in Milan. This also make design cost-effective, believe it or not.
- 3) If you were here one year ago, on the other side of this building across the street was an industrial company, an engineering company, the whole lot. And it's all knocked down recently and they are making apartments with a little park. But the reason we are here is that we are 3 stops away from the "Duomo" [the cathedral], the heart of Milan. You are in the center of Milan in 10 minutes. But at the same time, we are very close to the "tangenziale" [highways in from of rings around Milan] and very close to the airport. Linate [not Malpenza] airport is 20 min. away and the Tangenziales are 10 minutes away. It's out, but it's also central. We have the feeling of being on the center, but we avoid the cost of being really at downtown Milan. [SM 2004]



Continuum's Milan office, though smaller than Boston's, seems better located, from a user-centered design perspective, because of its experiential connection with urban lifestyles, downtown and physical proximity to other design firms. Continuum's Milan immediate surroundings are a fashion and another design firm within an emerging mixed uses environment. The hypothesis I want to propose in this chapter is that such spatial embodiment of the design organization, in this case the situated life of Milan and West Newton makes a difference in the organizational cognition, that is, in its creativity and innovation related practices.

Continuum in Milan has a *urban place* that works better than Continuum in West Newton and IDEO in Lexington because it is a place of social interaction supported by an ecology of urban life. It is also well positioned in the space of flows as a node in the midst of Europe, close to Milan's downtown and airport.

The relationship between urban space and innovation is not only positive and valid in the register of the "space of flows" but rather, in the case of design organizations, in the "space of places."

#### 2.4.1 Boston Office at West Newton

I took my car and drove on the Mass Pike 90 from Cambridge to West Newton where Design Continuum (DC hereafter) is located. In fact, it just contiguous to the Mass Pike highway. I entered a very "generic building"—not identity or symbolic architecture—that hosts 3 floors of large open spaces with some conferences rooms. [CG 2003]

Entrance to Design Continuum (Boston)



Gas Station just on one side



Design Continuum is again well positioned on the spaces of flows, i.e., in “Boston” close to Logan airport and to downtown Boston by the Mass Pike 90. However, the place is in West Newton, not a very engaging and lively location. The office is surrounded by gas stations, garages, a *Dunkin Donuts* and a few “generic” spaces. That urban place forms part of the spatial background where they disclose latent meanings and become aware of tacit knowledge (needs and desires) of customers and, ultimately, users.

It is true, most of the work and learning happens “inside” the building (an issue that I discuss in the next chapter). But as I have shown and proposed, the peripheral practices and activities are related more than we think and, therefore, have an impact on organizational learning and design.

Out of the three cases of study, Design Continuum has the more random relationship to its building and working spaces:

To some extent the space is just a random variable because we rent this building because it is in a convenient location and it is not expensive. [HW 2004]
--

“Convenient location” means, as I said, that is closer to downtown Boston and Logan Airport since it is almost on a efficient space of flows (Mass Pike). Such convenient location has, however, a downside in terms of meaning space of places: “we would like to be downtown, rich spaces, kind of cool where people are, especially the younger folks. It would be cool to be in the South End in Boston or in Cambridge.” A similar experience was encountered at IDEO Lexington. In both cases, the preference—with a limited budget for real estate—is to stay closer to the space of flows, be the Route 128 or the Mass Pike with probably consequences in performance and inspiration. Real estate is a fixed cost of around 15% of the total cost in comparison with the cost of people around 65% of the total. Supporting and investing in space (location and office design) may have positives consequences in people’s productivity:

And it is a continuing source of frustration for us. The space is not really what we really want it to be. But, we looked at different alternatives and it is much more expensive. There is always
--

that trade-off. To some extent, space is what we design to be. Because we have changed here (co-evolution) Space is ...effects of ... And it is also just a random variable. We design for middle [brow] American groups, for everyday people. And most Americans and most people in the world don't live in places like that. (Harry West, 2004)

I will return to this issue of values and communities of users when I discuss the relationship between innovation, users space and location in chapter 4 and therefore we end this exploration where we start it, that is, the ecological space, but from the lens of users and customers.

Although "Buildings" are one of the material spaces of innovation and creativity and I describe some of its aspects below and in the next chapter, this is not a thesis of building architecture in the proper sense nor about buildings. I do not include a chapter on buildings. This is a thesis about building position along the space of flows and places as well as its use over time. It is about, within the constraints of the observation of the researcher, the co-evolution between work design practices and their physical spaces. Buildings disclose an urban place as well as enclose a workplace(s).

IDEO's and Continuum are rather generic buildings without any sort of monumentality. The MIT Media Lab building reflects some monumentality. It is certainly a member of an ecology of knowledge with marks and traces of monumentality. Below and in the next chapter I describe aspects of these buildings, especially the Media Lab's.

## 2.5 Buildings in Design Organizations

Buildings are boundary objects. Leigh Star (1989) first came up with the term boundary object to describe objects that serve to coordinate the perspectives of various constituencies for some purpose. In this sense, a building as an artifact is a "nexus of perspectives, and on various occasions can provide a form of coordination among these perspectives." (Wenger, 1998:105). Such perspectives in our cases include designers, faculty, clients, sponsors, students, architects, postal employees, city planners, among others.

Buildings create a certain *place* in the space of flows by enclosing it. Buildings put traces and mark symbolically the sometimes neutral space. Indeed, current trends in architecture are about creating new forms of monumentality (Castells, 2003).

Rather than an analysis or evaluation of the buildings, I offer some qualitative impressions on them based on my interviews and observations.

### 2.5.1 Media Lab Building

In our case studies, only the MIT Media Lab's Wiesner building unfolds a certain monumentality. The Wiesner building (named in honor of former MIT President, Jerome Wiesner) was designed by the famous architect, once student at MIT, I. M. Pei and Partners.<sup>25</sup> The building cost \$45 million and its construction started in 1982. The building was supposed to house a wide array of disciplines and people collaborating in research and development of digital technologies.

One of its main problems, according to my interviews, observations and to Stewart Brand (1994) who was a visiting scientist at the lab and decided to write a book entitled *How building learn* due to his shocking experience with the Wiesner building is "its impressive, useless and sterile atrium." (Brand 1994:53). The Media Lab's atrium "cuts people off from each other. There are three widely separated entrances (each huge and glassy), three elevators, few stairs and from nowhere can you see other humans in the five-story-high space." (Idem) The building was meant to be a monumental work of art, but as such it brought about important issues of rigidity and lack of adaptability. Such account is also felt by the administration: "This building did not come the way he (Negroponte) wanted to." (Tucker 2004)

Regarding the Wiesner building in the MIT ecology, there has also been concerns about the breakdown of such historical ecology of pragmatism and massive connectedness. As Robert Simha, chief planning officer at MIT from

---

<sup>25</sup> According to a 1991 poll of the American Institute of architects to be the "most influential living American architect." (in Brand 1994: 52)

1960 to 2000, points out, the Media Lab building “violates every principle that has guided MIT planning since 1916 [because] it is isolated from the campus-wide warren of corridors, drastically inefficient in usable space, and inflexible in layout.” (Simha in Brand 1994: 177)

The buildings that host IDEO and Design Continuum are rather “generic” (Eiseman), without unfolding any monumentality or conscious vision (and values). The Media Lab buildings (Wiesner and the projected one) carries a vision of how a building for a research lab might be. It is a vision of some authors and leaders (Negroponte), as it is put by the ML’s (facilities manager):

The idea behind the ML is the basic idea of mixing of disciplines in one environment [similar to IDEO], which is not an unusual idea. A lot of people have try to do it. But Negroponte really wanted to “realize” that idea into the architecture. He wanted a glass building, he wanted to be completely transparent. Everyone can see what everyone else is doing. All the time. Out of the belief that would prompt interactions, exchanges of ideas, creativity, and innovation. [GT 2004]



Wiesner Building

This form of monumentality is aligned, to a certain extent, with another monumental work of art in the current MIT’s “evolving campus” that features the new *Stata Center* for computational and informational sciences designed by another famous architect, Frank Gehry. Its function, symbolism and spaces-in-use within the MIT ecology is beyond the scope of this research.

### 2.5.2 IDEO's Buildings: Simplicity and Flexible design

IDEO has less self-conscious and monumental buildings. However, both IDEO Palo Alto and San Francisco buildings transmit values and meanings. They are not monumental or distinct works of architecture, but they communicate something. IDEO San Francisco is located in the Embarcadero area in San Francisco on the Pier 28.

It is underneath the Bay Bridge and you can see the water from one of the edges of the office. From the outside you didn't see too many distinctions. In fact, you are in front of a Pier and there are several doors (gates) that connect with the street. You enter through one of them where there are also parking lots. Then you arrive to the office and enter into a new world. [CG 2004]

The experience of the San Francisco office is described in the following terms (first person methodology) by one designer that used to work there for four years before coming to IDEO Boston:

I was there for about 4 and a half years ... It was a great thing to be part of ... It is a working studio as well has its sort ... pleasure, it's underneath the bay bridge, it has look over the water, and you are outside with people, you are always ... you walk out of your door and you meet with people, it's all San Francisco ... [ES 2004]

IDEO Palo Alto is composed by several buildings around High and Forrester Street. The buildings are quite simple from the exterior, nothing impressive or monumental, but with style and featuring glass in the façade. The central one—see photo below—where Senior executives and founders sit is the newest building in the Palo Alto area.

IDEO Palo Alto  
100 Forrester Avenue



It is a two-story building offices in the first and second floor, a kitchen and a common meeting area on the second floor, the reception, a hall and a displaying area that can be observed through the glass from the street. It was not designed by IDEO designers/architects.

In the words of an engineer there:

PA campus is the biggest office of IDEO. There is about 180 people here spread through 5 or 6 different buildings. This is the newest building right now where the Corporate head is, so the CEOs of companies they all sit up here ... [RR 2004]



Reception



Meeting area, 2<sup>nd</sup> Floor

### 2.5.3 Continuum's Generic and Random Buildings

Design Continuum has a even more random attitude to its space and building architecture. As I described in the preceding chapter, Design Continuum is located in 1220 Washington Street, West Newton in Massachusetts. The building was in the "space of flows" almost literally [just contiguous to the Mass Pike]. It possible to even hear the flows—along the highway—that creates



a source of internal noise on one side of the office, as John Costello, Principal of Industrial Design at Continuum notes:

This was a different space before we got here. And with a limited budget and a primarily concern about design. Also we had a concern about noise in an open space, although the noise has decreased a bit [JC 2004]



The relationship with the space at Continuum is somewhat problematic, as one the VP of strategy and innovation states:

The space is not really what we really want it to be. But, we look at different alternatives and it is much more money. There is always that trade-off. To the same extent, the space is what we design to be. We have changed here. Space is also just a random variable. [HW 2004]

Buildings communicate values, expectations and horizons guiding corporate strategy. Such spatial values can influence behavior, telling people how the company operates, what it values, where it has been and where is going (Seiler, 1984).

The building-in-use by Design Continuum has been leased for several years and has 45,525 square feet total. Part of that space is used for a start up company that is spinning off from Continuum. Design Continuum itself is using 40,000 square feet of this lease. Does this number mean anything? Certainly it means something in terms of real estate cost, usually calculated in a per square foot basis. But does it mean something about work practices or moreover about workplace making? I try to respond these issues in the next chapter.



### 3. Workplace Spaces in IDEO, Continuum and Media Lab

In the knowledge management and organizational learning literature, there are only a few accounts concerning how spaces -both the design and use of the workplace- might impact organizational practices and business performance of firms. The abundant literature on knowledge management, firm theory and innovation accumulated over the years has dealt with several aspects of information, knowledge flows and technologies within organizational settings. However, the spatial dimension(s) of such issues have been missing until recently. And, "vice versa, in the architectural literature, there is relatively little about organizational theory" (Duguid, 2003), meaning creation (creativity) and innovation research.<sup>26</sup>

Contemporary concerns have been the explorations around the effects of information and communication technologies (ICT) on organizations (Fulk and Steinfeld, 1990; Orlikowski and Yates, 1995; Feldman, 1987; Orlikowski, 1992; Contractor and Eisenberg, 1990) Garton and Wellman, 1995, Haythornwaite 2002), the importance of knowledge in product development and innovation (Nonaka, 1994; Leonard, 1995; Hargadon and Sutton, 1997; Carlile, 2002), the social and communal aspects of knowledge (Prusak and Cohen, 1995; Brown and Duguid, 1991; Wenger, 1998), among others.

In the areas of knowledge management, architecture and office design, there has been a few but influential accounts about work practice and office design. Some of them can be the foundational stones for an emerging research area on working spaces, organizational learning and innovation. Among these accounts, we encounter Tom Allen (1977, 1997), Stone and Luchetti (1985),

---

<sup>26</sup> Frank Gehry, probably unfolds a vision of architecture related to creativity, fun and play, all together for learning and innovation. At the time of writing, Gehry just inaugurated the new Stata Center at MIT for the informational, computational and intelligence sciences. Built instead of the MIT Building 20, the Stata Center raises interesting questions about envisioning a mixed environment to foster research and innovation in science and technology.

Porter, Horgen, Joroff and Schön (1999); Joroff and Bell (2001), Duffy (1996, 2000) and Leonard and Swap (1999), Nonaka, Toyama and Scharmer (2000) among others. More indirectly but insightful as well in their call for attention to contextual issues of knowledge, situated learning and enacted systems are Brown's and Duguid's (2000,2001) distinction between *networks* and *communities* of practices introduced in chapter 1, Von Hippel's and Tyre's (1997) spatial considerations of contextual and situated learning within organizations (1997) and Peter Senge's (1990, 1995) theory-and-practice on organizational learning, enacted systems, and "learning circles."

### 3.1 Spacing Communication, learning and Creativity in the Workplace

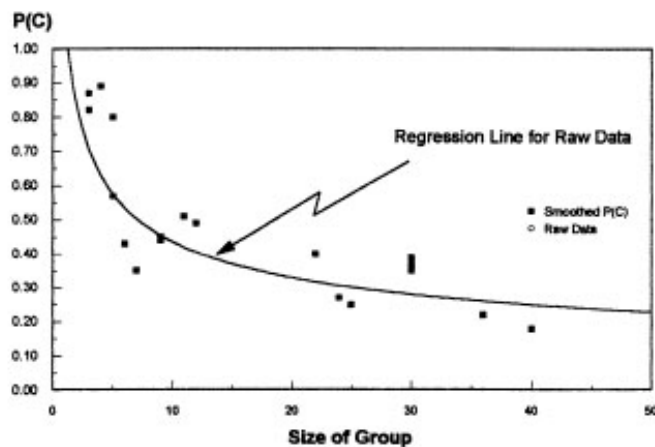
In this emerging area, the relationship between innovation and creativity, and space design and use is something yet to be proven and put into practice more frequently. Even though there are agile and creative workplaces out there, "The direct link between the design of physical space and creativity is unproven. [The] reliable research as exists tends to focus on facilitating communication rather than directly on enhancing creativity." (Leonard and Swap, 1999: 137) Early research on the area has been concentrated in communication as information processing. The IT hype about the virtual organization was built upon a vision of knowledge as data and information that has overlooked its semantic and pragmatic dimensions (Type III of communication in Allen's framework, see just below). Research on spatial practices that enhance meaning creation is needed as well as awareness on its evolution over time. Research and theory is needed not for theory's sake but for reflective practice (Schön 1983) and for enhancing awareness (Depraz, F.Varela and P.Vermersch, 1999; Senge, 2003; Orlikowski, 2002).

In practical terms, that means agility to foster innovation and creativity in the organizational space as Leonard and Swap (1999) notes, "any configuration of the physical environment that eliminates the barriers to

divergence, incubation, and convergence is likely to be helpful.” (Leonard and Swap, 1999: 137)

One of the first works that proved the correlation between distance and organizational communication was Tom Allen’s (1977, 1997). He studied the effects of physical layout on the probability of interaction in research laboratories and product development firms. Allen distinguishes between three types of communication, namely, communication to coordinate the work (Type I), communication to maintain staff knowledge of new developments in their areas of specialization (Type II) and communication to promote creativity (Type III). Information-processing type (I) of communication suffers least as a result of physical separation and Type III of communication that fosters creativity “is the *most* affected by separation.” (Allen, 1977:22) His data showed that the relationship between the likelihood of two people interacting and the physical distance between was strongly negative ( $r = - 0.84$ ).

#### Architecture and Communication



**Figure 7.** Probability of Regular Technical Communication as a Function of Departmental Size.

Moreover, Allen -working from a information processing paradigm- showed that the probability of interaction approach zero at about 25 meters. He showed that the decreasing communication pattern is repeated for both intra-departmental and inter-departmental communication. He also showed

strikingly that such pattern was the case for all types of media communication, including face-to-face and telephone.

As Leonard and Swap (1999) note about Allen's work, "Although this study was conducted prior to the advent of e-mail, the importance of proximity in facilitating that richest, multi-channel communication called 'face-to-face' is unlikely to have changed." (Leonard and Swap, 1999:141) Besides culture, space design could be an important resource or constraint for increasing communication. The lesson here is that proximity in office design does matter for organizational communication, knowledge creation and, specially for creative communication.

From an architectural and psychological perspective, Stone and Luchetti (1985) traced the genealogy of landscape partitioning (cubicle) and proposed an insightful move from workstations (fixed place) to activity settings that would allow "agile workplaces" for the communities of practice by enabling spontaneous interactions. The premise of the activity-setting approach is "that one place -an all-purpose workstation per person—no longer suffices. Instead, people need multiple workplaces (...) As tasks change, employees move to various specialized activity settings." (Stone and Luchetti, 1985:106)

The flexibility and *readiness-to-change* (for organizational *breakdowns*, using the vocabulary introduced in chapter 1) contained in the activity settings approach resonates with what has been termed as "agility" in working spaces research. Agility is "the ability to respond quickly and effectively to rapid change and high uncertainty. In the context of the workplace, that agility is achieved through the co-evolution of the workplace and work" (Joroff, Porter, Feinberg and Kukla, 2001:20).

The workplace agility and flexible activity settings also resonate with the situated character of learning and work practice. Such character calls for an ongoing and "just-on-place" spatial support for the situated activities and uncertainties that come up along the co-evolution of workplace and work.

The experience of *co-evolution* is central to my own understanding of organizations, their learning and *spatial embodiments*. Specifically, it is also central for the exploration of IDEO, Design Continuum and MIT Media Lab practices.

According to Joroff *et al* (2001), co-evolution is “only possible when the work is clearly understood. Work must be understood in *its particulars*, not merely by function or job classification. Once agility is achieved, the organization has the ability to alter workday activities with a minimum of friction and delay” (Joroff et al, *Idem*).

That is, work is a *situated* practice and, thus it requires situated objects, places and settings to support it. In other words, work spaces have to support the work that actually happens (situated actions, non-canonical practices) rather than espoused practices and representations of work in order to enable *co-evolution* and “workplace making.” By workplace making, the existing research refers to as the ongoing process for continual improvement where “people are willing to challenge assumptions about work, employees, workplaces and the ideal state of organizations” (Joroff et al, 2001: 25). It has also been called “process architecture” (Horgen, Joroff, Porter and Schön, 1999).

As I show below with my empirical exploration of the cases, there are different ways to achieve co-evolution and to support “workplace making” with spatial practices. There are also different levels, constraints and differences even within organizational cultures of such co-evolution and agility. In this sense, though there are similar characteristics within each organization, there are, as I showed in chapter 2, differences in practice and in experience across locations.

The three case studies have interesting features of co-evolution and workplace making over time. Their workplaces are recognizable and have identities that communicate values, experiences and expectations. Offices say “more about the organizational culture than articles, Web pages, and

announcements” (Leonard and Swap, 1999: 137) These particular offices spaces under study also present spatial practices and boundaries that constraint, I suspect, their co-evolution and, thus, innovation over time.

All the three organizations are populated by communities of practice and networks of practice (including the users). More precisely, IDEO, Media Lab and Design Continuum are “communities of communities of practice” (Brown and Duguid 2000, Tuomi 1999). The evidence for that are observations, interviews, and life-stories of the members. The degree of membership and coherence as well as the interaction with networks of practice vary according to each one of the design organizations due to their process and spaces.

Both the design firms and the (design) research lab enable the configuration of communities of practice, teams and research groups. The institutional and organizational framework allow and encourage -though sometimes not achieved in practice- collaboration and interaction. None of these three organizations is what might be called a hierarchically controlled firm or, as in Weber (1914) terms, a bureaucratic organization.

Moreover, since there is not *strong (rational-istic)* managerial control, they are pretty much *bottom-up* organizations where creativity, rapid prototyping and informal interaction is encouraged and usually occurred. However, by looking at their spaces and co-evolution between workplace and work, it is possible to observe and explore different patterns of workplace making and spatial evolution that might affect the way these organizations pursue innovation and learning.

Architects know about the relationship between buildings and human communication. As John Seiler points out, in a slightly behavioral way, “Buildings influence behavior by structuring relationships among members of the organization. They encourage some communication patterns and discourage others. They assign positions of importance to units of the organization. They have effects on behavior, planned or not.” (Seiler, 1984) In other words,

buildings, rooms, hallways, conference rooms, windows, partitions, (glass) walls, textures, interconnection among floors, amount and efficiency of elevators, among other features either enable or constrain the interaction and participation of communities and networks of practice.

They can enable knowledge to leak across practice by providing *shared places* for communities to interact. But at the same time it can constrain interaction, make knowledge sticky and create epistemic differences in practice. But this is not only an unilateral spatial effect on learning and practice. In turn, communities' practice, learning and meaning enacted through time impact the space configuration.

Overall, since workplaces and activity settings are the spatial embodiments of communities of practices and thus, of organizational cognition we have to look at how space is designed, used and enacted. Co-evolutive practices will enable, I suspect, communities of practice to "become ubiquitous sources of knowledge driving organizational change." (Brown and Duguid, 2000)

### 3.1.1 Understanding Process and Work Practice

The exploration of "workplace making" and of co-evolution between office lay out and work practice needs an account (a description) of the *nature of the work* carried out in the organizations under study. It is important, in my opinion, to understand their *practice*, i.e., what are they doing to accomplish their work and research activities, how work is done. Then, we will be able to explore and analyze how spaces and places might support the "workplace making" (process architecture) and find out which is the level (if any) and the main motive of the co-evolution.<sup>27</sup>

---

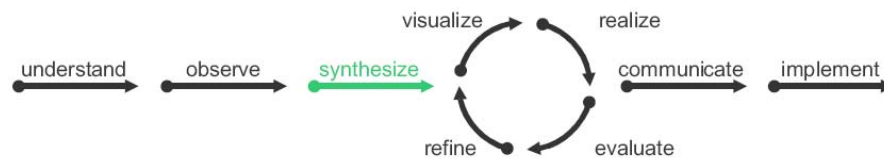
<sup>27</sup> This co-evolution is somewhat similar to what has been called "structural coupling", in the context of biology, between an autopoietic organism and its environment (Maturana & Varela, 1982). In the context of organizational research, Daft and Weick (1984), Rodriguez (1995), Senge (2000) and Orlikowski (2003) has applied an enaction perspective to the design –and thus the co-evolution- of organization's environments.

In the following pages, I describe work process and practice of IDEO, ML and Design Continuum.

### 3.2. IDEO's Process and Spaces

IDEO is a 350 people medium size firm (Cheskin 2003) dedicated to the user-centered design of products, services, environments and processes. A lot has been written about IDEO processes of brokering and practices of innovation (Sutton and Hargadon 1997, Kelley 2001, Peters 2000, Hargadon 2003). These researchers and practitioners have described IDEO's organizational structure (flat and project-based), the people (smart and irreverent), their process (frequent brainstorming and rapid prototyping), and the culture (always open and sharing).

The process used by IDEO to connect with social practice of users through the design of everyday objects is as follows<sup>28</sup>:



This is an elaborate view of the IDEO's design process: from understanding social practice (understand and observe) to the lab (visualize, realize, evaluate and refine) and back again (communicate and implement).

<sup>28</sup> Based on IDEO Inc. unpublished and proprietary materials. More details and examples in Cases Details.



According to David Kelley, IDEO's chairman and professor at Stanford, "Design has three activities: understand, observe and visualize. Remember, design is *messy*; designers try to understand the mess. They observe how their products will be used; design is about users and use. They visualize, which is the act of deciding what it is." (Kelley in Winograd, 1996).

Successful design and innovation are done by a community of designers that is able to look, anticipate and understand social practice as broader as they can. By the same token, Kelley argues that "Successful design is done by teams. Creative leaps might be taken by individuals, but design thrives on the different points of view found in teams. You want a multidisciplinary team, what we call *x-func* (cross-functional)." (Kelley, idem) Such *x-func* teams participate in work practices guided by a process within a shared tacit background. That participation and trajectories of the *x-func* teams in the collective mind shape the character of IDEO's communities of practice.

Firms like IDEO needs these sort of teams not in order to see clearer a problem to solve but to see broader and thus, open up all the possibilities for design. It is important to recognize, continues Kelley, "that there are zillions of possible solutions, rather than just one solution [...] After you look as broadly as you can, then you can feel more comfortable narrowing." (idem) In other words, successful design needs divergence as a first step of the creative process. Then convergence has to be achieved through visualization when something is decided. For Leonard and Swap (1999), divergence is the third step out of five in the so-called *creative process*, namely (1) preparation, (2) innovation opportunity, (3) divergence: generating options, (4) incubation, and (5) convergence: selecting options. In any case or model to be used or promoted, divergence and convergence are decisive steps of the process.

### 3.2.1 How does IDEO support its work process spatially?

IDEO has an interesting attitude to its workplace.<sup>29</sup> Rather than being extremely *conscious* they are *aware* of the co-evolving relationship between materials, conversations, demands, processes and routines.

IDEO's practice, depending on the location and on the type of task, enacts different types of work: some are more collaborative and others are more focused and narrow defined.

The attitude towards work space evolution depends of an understanding of the *nature* of the work, i.e., non-canonical practices that configurate job in its particulars. The nature of IDEO work is, in words of its co-founder, "we are primarily about interdisciplinary teams creating innovative solutions." (Moggridge, 2003)

That account about the type of the work lead to an attitude to IDEO's work spaces. Bill Moggridge is aware that enacting interdisciplinary teams is an ongoing difficult activity that requires both private and collaborative nurturing:

People who work in teams needs both personal private and collaborative environments. In order to work effectively they need to get along with their own stuff, but they also need to do stuff together. The nature of the space we have evolved for the collaboration very quite a lot. [BM 2004]

IDEO has evolved from a design firm in the conventional sense to a innovation firm that is trying to help their clients redesign their process, environments and work spaces. Their attitude to the space is intimately related to the new direction IDEO is going towards, i.e., strategic and conceptual work,

As we do more and more abstract and strategic work because we are interested in doing more about that type of work. Essentially moving from designing a thing for a client to helping the senior people in a client company progress their thinking and we find it's more and more important for us to have dedicated spaces [group memory] for project teams to withdraw and kick their thinking ... a couple of walls and there are attempts to put together heavy and very complex issues. (DW 2004)

---

<sup>29</sup> Tom Kelley, David's brother and founder of IDEO, is also concerned about the relationship between organizational learning and innovation. As he puts it, "For many companies, space is among the least considered, most over-looked tools in the innovation toolbox. The hundreds of companies I have seen firsthand spend a lot of time on structure and strategy and systems and staff. When it comes to space, however, they think of it as a mere utility. Space is treated as a threshold variable, made just good enough, except for an expensive flourish in the lobby or the main conference room. At IDEO we believe space matters ..." (Kelley 2001:146). As Michael Epstein once commented upon my work, IDEO has an interesting doubleness on its practice: it has not only interesting workplaces but also its work is increasingly about designing environments and workplaces to help its clients innovate.

In every office location that I have visited at IDEO (London, Boston, San Francisco and Palo Alto), they talked and used “project spaces” in their routine activities. In similar ways but with different frequencies, they all do it. In this ongoing transformation, IDEO is currently using an important amount of the overall space devoted to collaborative project rooms. These project spaces are different from “prototyping spaces” and have to do with what Moggridge refers to as “group memory”. Moggridge explains the genealogy of that *spatial practice* used to cope with new environments and strategic directions,

We work with Steelcase, we have been working a long time, it is the majority owner of IDEO. They are interested in ambient and environments and how the environment can be design to help companies to innovate. And we learn a lot from working for/with them. One of the ideas that they have come up is the idea of group memory, which we come up with them together. The idea was if you have a project space and you put all the information that belongs to that project up in that environment. You see that a lot in SF with these 8x4 foam cords walls. Then, you clustered with the info, the sketches, photographs, the writings, the images, the prototypes. Everything to do with the project. Then, it is possible for the project team members to walk from where they are sitting working into that project space and immediately be immerse in the project. [Moggridge, 2004]

The “project space” or “group memory” is a key knowledge management tool for sharing and cultivating concepts, ideas and visualizations. IDEO members brought together various contexts and worked together to create a Ba-physical, temporal and spiritual place- for a specific project (Nonaka, Toyama and Scharmer, 2001)

The “Group Memory”, IDEO’s KM tool



**Meaning from the inside (researcher as part of the world under study)**

These spaces are for working in particular project and with particular teams. The teams here changes all the time. And they have a specific spaces, with foam cards full of post-its and photos where they spark the conversation and analysis. Right now, I am going to assist to one session of a group. We will see. Just came back from a Human Factors and Design meeting. It took place in a small room surrounded by the four sides by sketches, concepts, photos, ideas, user categorization and a table with prototypes ... It was a sort of brainstorming in an enclosed Ba along with 2 human factors researchers, 1 interaction designer and myself throwing away ideas about the present and future of luxury. It was a sort of tangible brainstorm in a room [project space], where every idea was valid and useful and, thus, post-it in a foam cord. The space contained the history of the thinking and brainstorming. They said was a pretty typical meeting. [CG 2004]

According to the specialists in emergences of Ba, some boundaries should be set within which a meaningful shared context can emerge. This is sometimes called "cocooning," the practice of building a unique world or context (de Monthoux, 1996) and, thus protect it when it is necessary (Nonaka, Toyama and Scharmer 2001). But at the same time, ba is an "open place where participants with their own contexts can come and go and the shared context can evolve. Ba lets participants share time and space, and yet it transcends time and space. Ba also lets participants transcend self. To participate in a ba means to transcend one's own limited perspective or boundaries." (Idem:6)

However, to enable this sharing of contexts and knowledge creation across members a fundamental feature is needed prior to even think about the emergence of a Ba. That is, to have a shared practice. That's why is so difficult to create Ba across locations and through electronic networks, at least in the case of design organizations.

The group memory practice fits (and it is adopted) in different ways in each office because of the differences in practice. The San Francisco office due to the nature of its work is the best suited to co-evolve with that spatial practice. The Boston and Palo Alto office come from another genealogy of work, but it is in the midst of a reorganization,

The PA is a little bit constraint of space at the moment. We have an issue around trying to create that number project spaces, we are currently on the process of creating that (DW 2004)

Besides the project space, there are other kinds of space-supported work activities. Moggridge mentions two extremes in this continuum of IDEO work practice. On the one hand, there is the Toy practice, which is a very collaborative activity setting with the prototyping area in the back and the users (kids) testing area in the front:

If you look at the toy example that we've looked upstairs. Brandon Boyle is the leader of that team. He has evolved to an approach which brings people very much together in the prototyping area. There is a lot of space for the prototyping activities. It makes the actual private space very small, very intimately close to each other, tiny desks so the people can talk to each other across the room. They are really collaborating most of the time [BM, 2003]

On the other hand, you have activities like hard core engineering or software design that require more privacy and concentration.

It is precisely that sort of combination among styles of work that can speak the same language through a common process and being supported by space what gives competitive advantage.

The spaces are flexible enough to support IDEO creative practices. Despite the fact all IDEO offices have a similar feeling and layout -you can tell it's an IDEO office-, each office created and enacted a distinctive environment. The team dynamics changes with projects, and thus, there is a continuing rearrangement of teams, "project spaces" and "neighborhoods".

Below is a photo of the San Francisco office, located in the Pier 28 Annex at the Embarcadero area. Its floor, central and lateral beams are made of wood, which gives a sense of a living (natural) system and allows changes on it.



In IDEO's vernacular and live-through jargon, every office is populated not by groups or teams but by "neighborhoods" office-wise. The characteristic of a neighborhood is a shared place that congregates people and that can bring about trust, friendship and learning. Neighborhood is part of a spatial vocabulary to refer to communities. In talking about his experience at such *shared place*, an IDEO designer comments,

I would say that the **space** is really important to us. We are divided in a sort of **neighborhoods**. We hope to sit industrial designers next to each other, it's nice because they have community and they can talk to each other and help each other. But at the same time, we want "cross-fertilization", to get passed with disciplines, we want people thinking about bigger issues, like a engineer sits next to a designer. [ES 2003]

Twice a year -and sometimes more than that due to a specific project- they change position within the office. They refresh the everyday routines because the territoriality (and respective *sense-making*) is challenged. The very fact that someone changes its *body* position by sitting next to other person and thus alters its immediate conversational surrounding makes a difference in the work practice and collective sense-making. Spaces and materials are in IDEO to enable organizational agility, team dynamics and co-evolution from conventional design to more strategic type of work.

For instance, two specific examples of supporting spaces that enable agility and co-evolution are first, the movable walls that allow to create temporary *Bas* for divergence, incubation and divergence and, second the wood-made partitions that allowed recently (during 2003) to make holes for fostering knowledge sharing and growing involvement of neighborhoods.

Agile (Movable Walls)



Evolving (holes in partitions) at IDEO SF





Sean Corcoran, a studio manager at IDEO, has deliberately pushed the boundaries of a *fluid structure* with an initiative called “the fifteen-minute move.” When his studio was moving into a new office space, he challenged the engineers and designers to come up with office furniture and a layout that could be broken down and completely reassembled in fifteen minutes.

The offices had to remain the personal territories of the individuals working in them, but had to be relocatable about the space to keep up with the changing structures of each new project team. The solution was to embed more IT power, i.e., network and phone connections in the floor than necessary so that the studio staff can reconfigure the space at will and put all furniture on wheels so that everyone’s stuff moves without having to box everything (Hargadon, 2003). This practice of *fluid structure* allows a constant flow of people and new projects, building dense networks and communities among people across the company and facilitating to learn about each other’s distinct knowledge and skills. This practice of readiness to change and situational awareness is another example of IDEO’s organizational agility.



15 min. move Area at IDEO Palo Alto

### 3.3 Design Continuum Co-Evolution?

Design Continuum has a similar process to IDEO but lower levels of co-evolution between work practice and space. Continuum has indeed evolved over time but the depth and breadth of their “workplace making” seems lower (less visible) than IDEO’s to a visitant observer. Certainly it is much less conscious (than IDEO and MIT Media Lab). Continuum’s attitude to spaces and places is rather random.

In terms of identity, the Boston (West Newton) and Milan offices are very different. In fact you can’t tell whether you are in a Continuum office or not. They do have a design and somewhat sophisticated feeling but they are quite different because both of the building and the office layout.

Boston offices



Milan offices



I think that with Design Continuum a common topic around space that, I suspect, other medium-size design firms face as well. It is the bottom line of Real Estate departments and Facilities Management: the relation between space cost and space attitude. Since space is not viewed as a decisive factor in business performance, there is not enough investment and attention to space



practices. The problem is that the most important things, especially in a knowledge economy, are intangible and hard to measure. But that doesn't imply or mean that such factors don't exist. They do exist and do impact organizational performance. Sometimes, the outcome is a problematic relationship with the space that might affect the smoothness of co-evolution:

It is a continuing source of frustration for us. The space is not really what we really want it to be. But, we look at different alternatives and it is much more money. There is always that trade-off. To some extent, space is what we design to be. Because we have changed here. Space is ...effects of ... And it is also just a random variable. I think you can look at a whole bunch of different companies. I don't like most of these spaces. (HW, 2004)

### 3.3.1 Agility and Evolution: between the past and present

Since Continuum have a design process similar to IDEO and other design firms working at the crossroads of design, innovation and strategy with different industries, it also has a pretty dynamic environment that requires agile communities and teams:

Team dynamics change. They change with every project. Sometimes, it is more engineering, sometimes is more design, design strategy or industrial design. Depending upon the project, we will build the team around that. [HW 2004]

#### Continuum's Workplace at Boston (West Newton)

At the entrance there were a silk screen with a projection of moving red dots, yellow lines and a click-like "enter" sign. I went up the stairs, a room on my right hand, and the reception in front of you in the midst of a sort of corridor. On the right hand of the reception -attended by a nice girl- there is a conference room, a (public) telephone area, a small hall/reception area with 3 small sofas and a table with design magazines. Behind this small/reception area, there is a showcase area full of the products done and awards won so far by the firm. [CG 2004]



View from one side of the reception area

The first floor is a rather delicate place. Smooth. Corridors and spontaneous hallways connect the different places in an open plan floor. [CG 2004]



There are different types of flexible partitions. Some are synthetic and with a height that separate designers if they are seated but can communicate by eyesight if they are standing. In the above photo there is also a partition - standing height- that separates the informal meeting area from the workspaces on the side.

Hallways and other view of partitions. People talk quietly.



From the Central Area we need to have access to a lot and lot of conferences rooms without the feeling this is the corridor. We want to make everyone special, unique. But there is also a need to enclose space for clients. No client wants to know that we work for another client. So, they want to hear like “we are here for them”. [HW 2004]

At Continuum, they care more about the space for clients than for users. The users testing (basement) and playful area are not that engaging. Usually users come to this room (below) to have focus groups and discussions.



The Boston Office does not have a consistent work space. There is an important difference in the spatial practice between the first and ground floor. The first floor is more open space oriented and the ground floor has some wood-made cubicles, project spaces and shops for engineering work. It would be interesting for further research to explore differences in knowledge and meaning creation due to these differences in workplace making.

First Floor

Basement



This view is in part due to an asymmetry of co-evolution between work practice and supporting spaces. The first floor is the outcome of ten years of co-evolution, as Harry West notes,

Because we use to have cubes in the back space -if you go 10 years back- They are still around downstairs ... In the first floor, basically there was a [another] carpet and we changed the ceiling ...and all these walls we got down. Partly, we want to look it more interesting, so we put a lot of curve walls, a lot of spaces that ... we are designers ... we want to get away from the cubes. It was a sort of expectation 10 years ago: that everybody has their own space. As the company grew, we decide that we couldn't afford it and buy more Henry Miller cubes. So, we build around them downstairs. Those are the one that are downstairs (HW, 2004).<sup>30</sup>



Basement: This is an area for (individual) design, besides the project spaces (collective) Near is the shop for core engineering work

<sup>30</sup> In contrast with IDEO's buildings, designers from Continuum designed their own space. Despite the fact that workplace making is an ongoing activity of different communities that become situationally aware, usually, the design involve outside consultants that bring a refreshed view on the work practices, strategies and problems.

In the evolution there were also some socio-psychological factors involved such as privacy in the sense of ownership and issues of power and territorialities:

In any creative company there is **degrees of territoriality** involved [spaces and places of communities of practices] because we all have a private ownership in the product design. People in creative areas have even more private ownership than others. There is a great need to feel the ownership: "I did that, I design that ..." <sup>31</sup> Actually this is the motivation for working in a company like this ...

In this process of evolution, some changes have been done and states achieved just recently. It is an ongoing process of co-evolution, like a design game (Horgen, Joroff, Porter, Schön 1999) where different points of views, tactics, perspectives and even "power microphysics" might take place.

Space does make a difference. But it is hard to measure it with measures from the technical-rational tradition. The quantification of knowledge and meaning creation is still expected by most CEOs. There are also new minds sets already on the ground (Senge, Arthur, Scharmer, et al 2001). The stories and personal knowledge are still a powerful evidence to measure the impact of spatial change in organizational and business performance:

Since the last 2 years -we finally get rid of the cubicles- there is much more shared ownership [knowledge] and there's much less territoriality because people can talk. Also there's much more easier communication than we had few years ago. It's much more open. Not only physically, but mentally open, which is a really happy thing. (HW 2004)

Workplace making is not a linear process but one circular where "leaps occur, both forward and backward" (Horgen et al Idem: 58) Such process, similar to what Dewey refer to as design inquiry<sup>32</sup>, takes place under conditions of complexity and uncertainty. The many variables that are in play are interrelated such that a move intended to satisfy one is likely to have unintended effected on others:

<sup>31</sup> This point is similar to Moggridge's take on the "selfishness of the designer."

<sup>32</sup> For Dewey, inquiry is a process of intertwined thought and action that begins with doubt about a messy situation that is confusing, complex, or full of conflict. The process of inquiry moves through thinking and doing to a definition of the problem and to its resolution through action. As Brown and Cook (1999) point out, "Productive inquiry is that aspect of any activity where we are deliberately (though not always consciously) seeking what we need, in order to do what we want to do." (Cook and Brown 1999: 388)

Another factor has changed: if you are stuck around cubicles you cannot look at other people's faces and you keep doing what you are doing. Another factor is when you are around cubicles you can shout and talk much more louder. Now, in this open space is more quiet [HW 2004]

Though you cannot predict or invent the process architecture (workplace making), you can anticipate some of its clues, at least in a design organization:



"When the space is more open, changes comes more quickly." HW

### 3.3.3 Opening up the Space: agility and situational readiness

These changes in the work space and practices open up new possibilities of innovation in the sense of enabling new ways of work that foster new lines of product development. Research and action on "new work practices is as important as research on new products" (Brown, 1991).

In the case of Continuum, it is interesting to find out that changes in space are indeed related to new work practices, specifically, to new product development. Changes in spaces are related to new products, as West notes:

We modified the space ...quite a lot. Recently because we are making a push to develop more a medical products business ... a targeted diverse area. [HW 2004]

Innovation in product development is related to changes in spaces, i.e., agile co-evolution. If the workplace is altered and, thus, organizational sense-making and cognition, latent possibilities for innovation come up.

### 3.3.3 Playfulness and Physical Icons at Continuum

A dimension of workplace making, at least in design firms (probably in others orgs as well), is the interaction with prototypes. Some researchers on innovation have claimed that there might be a radical association between the “innovation process” and prototyping cultures. As Michael Schrage (2000) does in *Serious Play*, “The conventional wisdom that “innovation processes” drive prototype development is misleading.

Empirical observation of organizations with effective innovation cultures confirms just the opposite: changes in prototypes and simulations drive the innovation process.” It is the irruption of situated boundary objects (Brown, 2002) in the workplace that might act as triggers of process architecture. Physical objects, old and new, embody knowledge. They are often “emotion-laden, evoking personal memories, the sense of an era, or the feel of a culture.” (Leonard and Swap, 1999: 157) They are “evocative objects” to paraphrase the new research area outlined by the MIT psycho-sociologist Sherry Turkle (2004).

As well as people in our workplace, such objects are members of our environment and, therefore, co-evolve with us. And they can be important sources for innovation, if well positioned.

At Continuum, there are less prototypes, physical objects and “stuff” around than IDEO or MIT Media Lab. It is a different way to play with objects and prototypes, i.e., a different way to learn and to nurture innovation. The space is rather smooth, clean and open than full of stuff or “messy.”





In the ground floor where Continuum has its project spaces and engineering labs, they hang up their bikes, which is a practice, as far as I know, pioneered by IDEO. This is certainly a playful activity, but it is not clear its effect on work practice and creativity. It gives an atmospheric feeling, though. It is also an efficient use of the space. Continuum's project spaces are less flexible and less charged with stuff due, in part, to the immobility of the cubes that are fixed to the floor (Photos above). It's also something about its culture.



If as it is argued, the play with prototypes, simulations and situated boundary objects in the sense of a "physical browsing" (Moggridge) can foster the interaction across communities of practice and even, as Schrage claims, nurture the creation of teams, What is the impact on organizational performance of these different prototype and play environments?



Again, it is difficult to measure this intangible with traditional measures. There are some experiments that had tried to measure the impacts of physical objects or more specifically environmental issues such as color or noise.<sup>33</sup>

Regarding noise and multisensory sensory stimuli, which is at issue here, Taylor (1970) did an experiment to try to measure the relationship between sensory stimulation and creativity. Over a period of five weeks, experimental subjects were seated in a darkened room and stimulated with high-frequency signals from an oscillator, a rotating spiral wheel, incense, a floor vibrator, and loud music. Each week, both before and after being stimulated, they were given five minutes to draw a picture of a vase of flowers, using pencil and crayons. A panel of artists judged the drawings made following stimulation to be more creative than those made before. (Taylor in Leonard and Swap 1999).

Certainly it is tricky and risky to generalize from this example, but a hypothesis may come up to guide the exploration about environmental stimulation on innovation and creativity because “it does suggest that sensory stimulation may have beneficial effects on creativity.” (Leonard and Swap 1999: 147) That sensory stimulation is closely related to the kind of spaces, environment and atmosphere an organization want to enable, create, and to nurture to enhance creativity and innovation.

At IDEO there is ambient music (actually quite loud), situated boundary objects (the *technology box* or the *materials’ wall*), and, as I said, there is a lot of stuff around, even some messiness. Remember, David Kelley says, “design is *messy* and designers try to understand the mess.” (Kelley 1996)

On the other hand, Continuum is quiet (specially after its turn to open space), its products and awards are in a corner of the reception hall plus

---

<sup>33</sup> As regards to color, some experiments have used colored light projected directly into subjects’ eyes, while in others the subjects have been placed in rooms painted in a particular color. In both types of studies, red was found to be arousing, with increases in blood pressure, pulse, visual cortical activity, and reported headaches. Some subjects reported feeling overstimulated and had difficulty working in the red room. Blue is associated with opposite effects: lowered arousal levels, decreased blood pressure and pulse rate, and a general calming. (Leonard and Swap 1999, Mahnke 1996)

photos in the hallways where people pass by (usually not perceiving them in the *ongoing coping* mode of action), there are less collection of situated objects and materials around. It is also less messy.

What does it mean to be messy? How the messiness can be turned on in a competitive resource? What's the trade-off of having a messy environment?

Jane Fulton-Suri, a psychologist at IDEO San Francisco, notes that :

One of the thing about the mess is that it is not a mess. It is about something "(trans)apparent" [mutual intelligible] , so it prompts interactions. It evidences what people are thinking about and doing. [JFS, 2004]

Although some designers at IDEO SF say that sometimes it is difficult to concentrate in a specific task, because "there is always too many things going on in the messy environment," they like their evolving relation and are proud about their workplace. Overall, at IDEO the messiness is valued and created out of an evolving relationship with the workplace. The messiness has a performance value, which has to do with the generation and production of new ideas (knowledge).

In the literature and probably in the business managers' minds, IDEO and Design Continuum are usually represented as having *familiar* process and practices. After we explored their organizational workplaces, important differences come up that suggest that situated space-in-use has direct impact on culture and work practices that might impact their performance.

Harry West, VP of Strategy and Innovation at Continuum, when confronted with the issue of messiness at the workplace in a research interview, argued that:

To some extent that practice [of messy spaces] is good for generating ideas, but I am not sure how good is for MAKING CHOICES. In this company we are more about making choices than generating ideas.

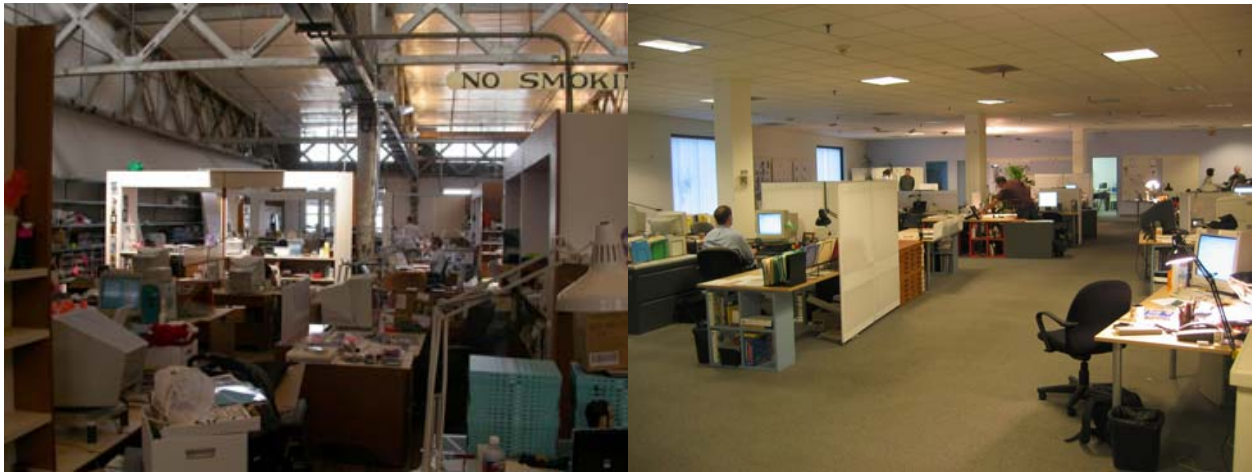
That is a way to stress one of the steps of the innovation process, that is, the moment (step) of convergence. Openness and messiness are key for divergence. "Group memory" spaces are fundamental for incubation as well as playful environments and meetings areas for preparation.

The spaces have to be flexible and dedicated enough to support the different kinds of work practices that are required in the innovation process, emphasizing those aspects related to the particular competitive advantage.

In the photos below it is possible to see their different attitude to their “spacing” and co-evolution that have an impact on their innovation process of generating ideas, prototypes and products.

IDEO SF

Design Continuum Boston



Another way of differentiating Continuum from IDEO, in Continuum’s discourse is to say that IDEO is a *brainstorming* culture. That is true and referred in several publications and videos about IDEO (Sutton and Hargadon 1997, Kelley 2001, Peters 2000) but it is also true that IDEO has evolved in its way of doing brainstorming and supporting it spatially over the years. Therefore, the project space or *group memory* is an outcome of workplace making due to a new strategic direction of IDEO. Even at IDEO Palo Alto’s engineering oriented work -not design or human factors brainstorming- you can see a more playful and full of physical objects environment. It is a different culture because of its ways of spacing objects, sketches and prototypes. It is a different way of learning that, I would argue, have consequences in their organizational agility and situational readiness.

IDEO Palo Alto



Finally, I would argue that innovation and creativity -and their ongoing supporting physical places- are not only about emphasizing either divergence (brainstorming and generating options) or convergence (making choices, selecting options) but rather about the two in an ongoing process with even more steps (Leonard and Swap 1999). Spaces and places, have to-be-there, supporting the different kinds of situated work practice -that needs to be really understood in its particulars- as well as evolving with the changing environment, new directions, projects and products that may appear on the horizon of uncertainties and possibilities.

IDEO SF



Continuum Boston



### 3.4 MIT Media Laboratory

#### 3.4.1 Understanding vision, process and spatial practice

The chairman and founder of MIT Media Lab, Nicholas Negroponte, shares a vision of innovation and creativity as opposed to managerial and rational views, which is consistent with my framework concerning non-rational innovation, communities and networks of practice as well as with the other case studies:

Many of the essentials of a fertile, creative environment are anathema to an orderly, well-run organization. In fact, the concept of "managing research" is an oxymoron. Setting short-term goals, then quickly testing to see if they will bear fruit is similarly absurd. Jerome Wiesner, former president of MIT and science advisor to President Kennedy, was fond of saying, "That's like planting a seedling and, a short while later, yanking it out to see if the roots are healthy."

The divergent type of both thinking and doing that are characteristic of the MIT Media Lab is reinforced when the executive direction paraphrases Alan Kay and Marvin Minsky, two big names and *authors* in Media Lab's culture. Alan Kay's vision that the "future has to be invented" or that "perspective is worth 50 points of IQ" have been ML's mantras for a while. Marvin Minsky, key figure in Artificial Intelligence, formerly prominent figure at the MIT A.I. lab and now influential "leader" of the Lab's current work in "societies of agents" without a central processor and in the connection between the world of atoms and bits, reinforces the idea of thoughtful perspective by saying that "you don't know something until you know it in more than three ways." (in Negroponte 2000)

The divergence of some of these thinkers-in-action is also stressed by another member of the ML's direction saying that:

Minsky takes nothing on face value and he always ask questions. And that's such a breath of fresh air. Whether you agree with him or not, he makes you think. [WB, 2003]

Though MIT Media Lab can be considered as a design organization for a comparative exploration on their spacing of innovation and creativity, Media Lab's process is different from both IDEO and Design Continuum. The reasons are evident. MIT Media Lab is a research lab hosted in a research University.

One thing is to innovate in the academic world -and indeed the ML has been innovating for almost twenty years- and another is to innovate in the market place, high tech industries and in social practice (that is, the way we live, work and learn). Being in a place like MIT, the former goal can be achieved quickly if you have resources, good work and interesting people. And the ML does. Being within MIT, as I showed in last chapter, is certainly a key spatial resource for innovating beyond the Wiesner building. When it comes to innovation in the sponsors' industrial worlds, it is rather difficult because it is about change, disruptions or radical incrementalism in production functions, breakthrough ideas and prototypes, change in consumer habits and in niche markets.

The Media Lab is pragmatically (and freedom of experimentation) in both worlds trying to capture opportunities for research, prototyping, development and corporate funding:

I think that dichotomy (industry or academia) is a false dichotomy. We don't think of ourselves in terms of academia versus industry. I think we think of ourselves in terms of generators of ideas and then figuring out what is the best way to get these ideas into the world in a practical way. Sometimes, that means to write a journal article, sometimes that means to start up a company, sometimes that means sending a student off to do something. There are a lot of different ways and, again, we try to be as opportunistic as we can. [WB 2003]

The constitution of ML's people is as follows: the faculty, senior research staff, and visiting scientists working in the Laboratory number more than 40, and close to 100 other staff members support the Laboratory's research, facilities, and administration. Students with backgrounds ranging from engineering, to physics, to education, to music make up the graduate student community, which totals 126, split almost evenly between master's and doctoral students. In addition, another 43 graduate students are formally based in other MIT departments, but carry out their research at the Media Laboratory. More than 200 undergraduates come to work at the Laboratory each year through MIT's Undergraduate Research Opportunities Program (UROP).

The Media Lab works in changing environment due to the always changing technology. Therefore, it is recognized that there is a constant

transformation of the building blocks they used to achieve their ends as well as the context of the people ML interacts with and the domains of application.

At the same time, there are some things such as the anti-managerial style (though the direction comes from the Research Scientist head of each group), the architectural genealogy and the culture of prototyping that have remained constant and serve as a sort of process for the lab:

- (1) The Lab from the very beginning has been driven from the “bottom-up” Ideas come from the bottom and from there they try to grow. It has never been a top-down organization, even in its embodiment as Nicholas Negroponte<sup>34</sup>;
- (2) We have a history that comes from architecture, not engineering. Twenty years ago we said, “Demo or Die”. Today we say, “Imagine and Realize.” [WB 2003]

Walter Bender reflects on the way the laboratory works and moves further,

We get together as a faculty periodically and we think strategically. We try to think of where are the interesting and important problems, and what resources do we need to address these problems. We tend to hire people who are not like ourselves. We tend to hire people who are going to bring new prospective to the Laboratory. We are lucky that because of Jerome Wiesner we were able to make an academic program wholly integrated with a research program. So, we have a lot of latitude in order to make our own academic appointments. We don't have to make appointments that are sort of narrowly define by anyone's field. We can make our appointments very broadly. This has been a key managerial issue. [WB 2003]

They are certainly conscious about their difference with industry and their strength as a producer and distributor of ideas,

Nothing we do here is ready to market (that's not what we do). It has to go to a “third party” to be ready to market. This “third party” is ideally one of our sponsors. Unlike industry we don't have to report to any stakeholders. So, we don't have to maximize profit, we can maximize the wealth of ideas instead. [WB 2003]

<sup>34</sup> That's a critical point. It seems to me that even though it is a bottom-up lab with generally free movement of the communities of practice, “the” vision of one leader is still relevant or , at least, has been till very recently as the proper Bender acknowledges, “I think that one thing that is changed a little bit over the years and, in particularly, over the last 3 or 4 years is that the managing (sic) is becoming more distributed. Whereas Nicholas is sort of ... still the last rock star. It is great to have a rock star because, first of all, he is brilliant and usually right. But at the same time he is really articulated. Very few people can tell a story the way Nicholas can tell a story. It has been a very powerful vehicle for getting the ideas out to the world. But at the same time there is a necessity: the lab has to grow beyond that model as we grow.”

The relationship with industrial sponsors has been historical and fundamental since the very beginnings of the lab in the mid-eighties:

The Lab has had a rich relationship with its industrial sponsors. The mixture changes—the balance changes due to any number of external factors—but they are always fundamental to the running of the Lab.

However, they are indeed aware of the potential of having partnership and sponsorships with more than one hundred companies. This is also one of the reasons to study the ML as a case of design and social practice innovation:

What it represents is not just a diverse portfolio in terms of funding, it also a diverse portfolio in terms of perspective of critique. And that's wonderfully important. The sponsors are looking for some insights; they are looking for efficiencies and innovations. They are also looking for potential disruptions. They are interested in this variety of insights. They are not just interested in what is going to help them do what they do today—they are also interested in the obstacles that may appear in the future.

“We hire people who are not like ourselves.” That means, among other things, that the lab promote, encourage the intellectual difference and try to build interdisciplinary work.<sup>35</sup> We cannot say (have not enough evidence) for sure to what extent this process promote “authors”, “individuals” or “communities of practice.” To a certain extent faculty is constituted by “authors” (leading explorers of digital technologies) who, in turn, lead communities of practices with high levels of rotation (masters and PhD students).<sup>36</sup>

In terms of my own spatial exploration of innovation and creativity, the Media Lab also embodies a vision of how its research spaces should look like.

---

<sup>35</sup> In the case of IDEO, the whole studio or practice has to agree, after a long process, with the hiring of a new member, which implies the fostering of communities and teams of practice.

<sup>36</sup> Regarding this rotation, loss of knowledge and search for novelty (difference, divergence), Bender notes that “You make a trade-off between holding onto and refining the old idea or creating a new idea. We have at least 25% turnover every year in this building. I think that's better. I think the old ideas can go with the students and they can refine those ideas that are old outside of the Lab. And new ideas can grow here. I think it is a trade-off. It is hard to stay young. Having a mechanism that sort makes you give up the old idea and then embracing new ideas. That's what advances universities. It is hard to do that in industry.” (2003)



This is in part due to the fact that the ML is part of the School of Architecture, not the School of Engineering that grew out of the MIT Architecture Machine group during the late seventies.<sup>37</sup> ML's is a conscious (intentional) approach on *space design* such as the collaboration spaces, the transparency, the atrium and the pathways for interaction and, in general, how a research lab should look like. In opposition as the supposedly bottom-up approach espoused in Bender's discourse, the architectural practice and the space-in-use (renovations and moving of groups) reveals a top-down orientation:

We do try—where we can—to eliminate artificial boundaries. We eliminate a lot of boundaries that are architectural. Space does matter and proximity does matter. So, you don't see a lot of cubicles around here and you don't see a lot of chopped up little spaces. That does make a difference. One thing I do top-down occasionally is to shuffle things around. Put different perspectives together. You create the environment, but you don't micro-manage the environment. [Bender, 2003]

There is a vision communicated through working spaces. It is a set of expected actions, namely, interaction, circulation, creativity and cross-fertilization among disciplines that are supposed to be enhanced by architecture (space design). Such vision is still in play [renovation and new building], but some initial conditions and uses of the building and technologies have changed so far as part of Media Lab's evolution, as Greg Tucker, Media Lab's facilities manager, describes historically:

Negroponte seems to grow this idea of the common space being the fount from which all the interactions and creativity and ideas are going to come from. When this building was built they put that in place, everywhere around the building, basically an office space surrounded by offices. Obviously, computer technology moved on. The terminal garden went away within 3 or 4 years from the time we opened. Everyone has a computer in their offices. The original

---

<sup>37</sup> Mitchell Resnick, a leading researcher on learning, technologies and creative practices, describes the ML in a way that resonates with the type of culture of an architecture school: "designing prototypes, critiquing the things you design, re-designing and also thinking in how new technologies ... the human dimension of new technologies, which is certainly part of architecture design: thinking how the things we create are going to fit into human society." (Resnick, 2003, interview)

impetus for drawing people into the central space was gone. But still it is the project area. The central spaces are projects areas where people can do things that don't fit in their offices.

### 3.4.2 The Glass Philosophy

Besides its prestige as an innovative research lab, the Media Lab and some of its leaders are also known as advocates of a type of technological determinism. Negroponte, founding figure and notable infoenthusiat, has been an important figure in developing and persuading about the pace of technological change. His best-seller *Being Digital* (1995), his columns on *Wired Magazine* and his roundtrips around the globe promoting Media Lab research have been some of the means to achieve presence and a brand in the global discourse. Negroponte's basic assumption is the difference between atoms, a fundamental unit of matter, and bits, the fundamental unit of information: "The change from atoms to bits is irrevocable and unstoppable" (Negroponte, 1995). We are thrown and driven by this technological revolution of digitalization, i.e., this transformation of atoms into bits. Currently, Negroponte and some faculty at the Media Lab are leading the supposedly "next big thing", which is the amount of embedded technology to be put into everyday objects, that is, the fusion of bits and atoms.

Clearly that is another subtle dimension of a sort of technology determinism, also with consequences in ML's workplace evolution, as much work is done with objects, "smart things" and tangible interfaces and not only, as in the past, with GUI, networking protocols, CAD/CAM software and the like.

It is beyond the scope of this research to address these fundamental issues of technological determinism and social construction of technology.<sup>38</sup>

---

<sup>38</sup> For issues on technology determinism see Kranzberg M. and Pursell, Carroll (1967) *Technology in Western Civilization*, Hughes, Thomas (1989) *American Genesis: A Century of Invention and Technological Enthusiasm* and Merritt Roe Smith and Marx Leo (1994) *Does Technology Drive History?* For social construction of technology insights see Bijker, W. and Pinch, T. (1987), Oudshoorn Nelly and Pinch, Trevor (eds.) (2003) *How Users Matter in The Co-Construction of Users and Technology*, and Brown and Duguid (2001) for the social resources of IT in *The Social Life of Information*.

My own understanding follows Manuel Castells' reasonable solution to the *false dilemma* of technological determinism because "Technology does not determine society: it embodies it. But nor does society determine technological innovation: it uses it." (Castells, 1996/2000:5)

I claim that space-in-use (in its different material dimensions) is a key element of the ongoing relationship between technology and society.

As for its currently working space and the yet to come new building, curiously, the Media Lab seems to embrace a sort of architectural determinism and top-down spatial approach:

We didn't ask the community whether they wanted all this transparency. The PIs didn't vote to do this. It was an top-down idea that said, "This is going to help" People are going to be uncomfortable with some of it because they are not going to like the glass. But we don't care. We want this, because we think that this only help our basic idea of having all these different disciplines in one place. It has a greater value than the conventional model of separate disciplines in separate buildings. [GT 2004]

### 3.4.3 Justification of spatial choices: numbers, evaluation and use

This research is not about the size of spaces or their formal (neutral) square feet but rather about the meaning and "social life" of spaces because that is what, at the end of the day, matters for organizational learning.<sup>39</sup> Such measurements are certainly important for the design and construction of new facilities, but not for the assessment nor enhancement of such learning.

Media Lab does not have any formal measurement of the building-in-use, space performance or an evaluation of the impact of the glass and transparency in the creative process:

We haven't conducted anything "formal or quantitative" in terms of studies of how space has been used. Everything that I can give you is anecdotal [GT 2004]

---

<sup>39</sup> In terms of such formal (neutral) measurements, The Media Lab space per PI (Principal Investigator) is around 1200 or 1300 SF. That includes their offices, the students' offices and their lab space. That is an average. The range is from as high as 2500 SF down to about 400 SF. The total of space, considering faculty (35) and visiting scientists is about 50.000 SF (1250 X 40 = 50.000 SF).

Their glass philosophy and architectural idea of transparency is justified in terms of values, vision and interaction outcomes of an expected effect:

Every time we have a reason to renovate the space we will convert the walls into glass. If you make everything glass and you get twenty fruitful interactions in a year that wouldn't happen otherwise, that's probably worth it. [GT 2004]

A current example is the transformation of the space in the fourth floor of the Wiesner building, just renovated with glass to prepare the movement of Hiroshi Ishii's Tangible Media group from 1 Cambridge Center back to the building:

Like the garden conference room, over where Hiroshi's group is now. That used to be separated from the corridor by a wall and now ...we put in glasses everywhere and a lot of cases, if we have a way, we just take all the walls entirely, just have nothing. But people would argue that spaces will get too noisy if the entire floor were open. In fact, it will be too noisy, so we will put glasses instead. There's something to be said for separating off the circulation, the main circulation from the lab. At that corner where Hiroshi is now, we actually took the hallway out entirely, we took the wall off between the hallway and the space. It used to be a wall. It was a solid wall, then we made it porous and then we took it out. [GT 2004]

In order to understand how space and places support innovation and creativity, it is important, as I have said, to explore and describe work in its particulars, i.e., not the represented practice but the actual practice carried out in a daily basis.

To a certain extent, the Media Lab has an academic process well defined (writing Thesis, papers and Dissertations) but a less-well defined process when it comes to relationship with sponsors, product development and the marketplace. The nature of their work is to do prototypes to spark and inspire sponsors and other research institutions. The direction (motivation engine) of research and development doesn't come from the sponsors but rather from the faculty (advisors) engaged in research and their particular conversations with sponsors and funding institutions.

### 3.4.5 Playfulness and Physical Objects

In some aspects such the messiness, openness and anti-managerial approach, the Media Lab is similar to IDEO. Besides, this faculty-dependent research orientation, ML shares some *cultural styles* with IDEO. According to one interviewee that used to work and research at the Media Lab's Tangible Media group and currently is member of the IDEO Palo Alto office, both organizations share an anti-management approach.<sup>40</sup> Both styles can be described as "chaotic, messy and with piles of things." (Frei, 2004)

Media Lab does not have studios (former structure of IDEO) nor practices (currently reorganization: shared *knowing* across locations) but have groups that shared practices (prototypes, code, ideas) and ideas in the same building. Most of the collaboration (prototypes and papers) seems to be intra-research group, as is also stated by Mitch Resnick, "I think in most of those groups you find a lot of collaboration *within* those groups." (MR, 2003) That discourse is confirmed by a quantitative study conducted to measure intra-group and inter-group communication across floors and buildings during the times of 1 Cambridge Center or "1CC" in the Fall 2002 (Kee, Shujimori, Morshead, Tsakonas, Kohlert, Allen and Henn 2002)

This is in partly due to the institutional *structuration* of the lab where graduate students and UROPs (undergrads that are paid to work in research projects in this lab and elsewhere at MIT) do the bulk of the prototype development, but at the same time they have to write thesis and dissertations to earn their respective degrees.

It is also because of the number of research groups (more than forty), the small number and rotating character of their members that sometimes create *boundaries* in practice as well as a lack of critical mass for team learning and innovation.

The MIT Media Lab research groups are important assets of the lab, as Resnick acknowledges commenting that "I do think some of the most important

---

<sup>40</sup> Remember Negroponte's argument that "managing research" is an oxymoron.

entities within the lab are the research groups that have a faculty member and a collection of graduate students.” (Idem) Such groups and, specially their students constitute the main *labor force* -and communities of practice- of the lab work process. But at the same time, the emphasis is on individuals that have to graduate individually with creative projects rather than on teams or communities that evolve collectively towards new directions of invention. The direction at the Media Lab comes, with some exceptions such as some of the current projects of Maeda’s Physical Language Workshop that came up by the interaction with sponsors, not from the environment (as in IDEO or Design Continuum) but from the head of advisors.

The cultural/institutional emphasis are on individual knowledge, in projects/prototypes that, most of the time, are the basis for a grade or, more important and frequently for graduation such as the common statement “I am trying to graduate with this project.”<sup>41</sup>

### 3.4.5 Collaboration and Boundaries

Media Lab’s discourse claims that there is a lot collaboration “among the students.” However, the traces of collaboration are less evident. Among faculty, there are different patterns of collaboration ranging from low collaboration (Ted Selker: “it is more difficult to collaborate formally than informally”), to medium-high collaboration (Mitch Resnick: “I collaborate with people in the area of learning and the ones involved in the Digital Consortium”) to high levels of collaboration as in the case of Joe Paradiso. Certainly there are other examples and particular ways of collaborate that are not addressed by this research.

---

<sup>41</sup> Ryan McKinley referring to his controversial project called “Government Information Awareness” ( ) aimed to 1) empower citizens by providing a single, comprehensive, easy-to-use repository of information on individuals, organizations, and corporations related to the government of the United States of America and 2) to allow citizens to submit intelligence about government-related issues, while maintaining their anonymity, and 3) to allow members of the government a chance to participate in the process. There has been important pressures from the government, non-identified groups (400 virus after two days it was launched) as well from news media (Fox News) to stop the “surveillance on the government.”

Another formal way of collaboration are the espoused alliances and consortiums such as the influential TTT (Things That Think), echoing the trends on embedded technologies and the intertwined future of bits and atoms, Digital Life, Digital Nations and the new Consumer Electronics (CElab) launched at the time of this writing.

In all, the formal discourse claim that the students “collaborate a lot.” However, the experience of observation and participation suggest that is not the case. There is sharing and a sort of “collective intelligence” (a language, the knowledge of ongoing projects and “crazy ideas” around that might spark creativity) but when it comes to collaboration inside and outside the lab (start-up) is less common and less visible. As one graduate student at the lab told me:

And I thought of the idea, you know, all these people with different backgrounds, would be amazing. But actually in reality, what happens, is that people work on their own quite a lot (doing demos). They are too busy trying to get their research done. They like the idea but a lot of times it doesn't happen. [SH 2003]

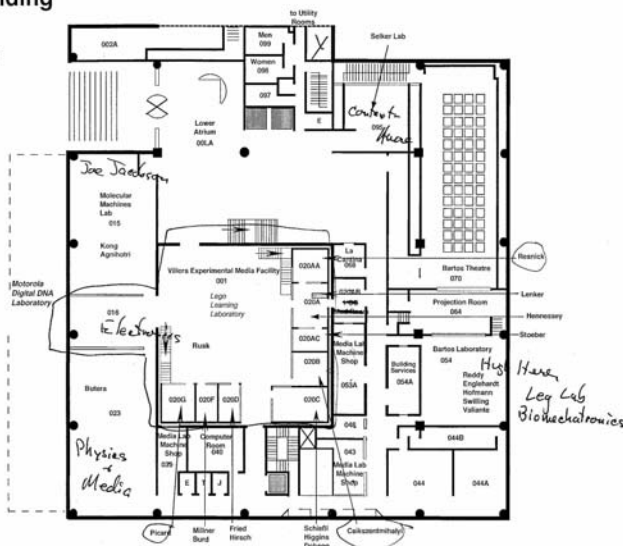
It is hard to really mix disciplines and become truly interdisciplinary. “Most people say they do interdisciplinary work, but they don't”, says Moggridge. At the Media Lab they have certainly tried with the craft of a program such as Media Arts and Sciences and with the “glass philosophy” in architecture.

Transparency at 3<sup>rd</sup> Floor of Wiesner Building



But there are also boundaries in practice (that might make knowledge sticky and constraint collaboration) that create spatial barriers due to the different -hazardous- nature of their work. One example are the researchers working in the Center for Bits and Atoms (CBA)<sup>42</sup> directed by Neil Gershenfeld, prominent figure in the field, author of *The Physics of Information Technology*, the best seller *When Things Start to Think*, director of TTT consortium, and an advocate of “personal fabrication” as the next big thing in information technology.

Wiesner Building  
E15  
Lower Level  
02/09/04



Physics and Media Lab



Besides Gershenfeld’s physics and media group, there is Joe Jacobson’s molecular machines lab that seems even more full of stuff. As well as Ted Selker, Gershenfeld and Jacobson are separated from their offices, which are on the fourth floor of the Wiesner building.

<sup>42</sup> MIT’s Center for Bits and Atoms is an ambitious interdisciplinary initiative that is looking beyond the end of the Digital Revolution to ask how a functional description of a system can be embodied in, and abstracted from, a physical form. These simple, profound questions date back to the beginning of modern manufacturing, and before that to the origins of natural science, but they have revolutionary new implications that follow from the recognition of the computational universality of physical systems. We can no longer afford to ignore nature’s capabilities that have been neglected by conventional digital logic; it is at this boundary between the content of information and its physical representation that many of science’s greatest technological, economic, and social obstacles and opportunities lie (NSF CCR-0122419).



Greg Tucker, ML's facilities manager, explains the situation of the "hard sciences" at the laboratory in the following terms:

The Hard Sciences (Center for Bits and Atoms) consumes much more space than other typical PIs. Just because the physical sciences consume more space. It is a difficult thing for many other PIs to accept, some just don't believe. But it is really true that someone who uses fuel bots and electron microscopes are going to consume a lot of space. They tend to have a higher than average square footage per PI, but it comes with the territory. The reason that Gershenfeld and Jacobson are not closer to their offices is because there is not enough space [and probably some hazardous activities] If you take a look they have students crowded everywhere. They have students who don't have offices, working in the laboratories. They are really, really tight of space. [GT 2004]

Therefore, it seems there is a lack of space for the co-evolution between work and workplace. Even though workplace making is about a "productive enquiry" in a messy situation that it is not only doable when you have enough square feet (SF), in this case seems, to be an important factor for achieving agility.

Both hard sciences' group are just contiguous to the art/media space (The Cube, described in the Users Space, chapter 4) where researchers in learning, affecting computing and art are. These groups are in somewhat playful environment, but architecturally and epistemically separated from the hard sciences (though a "place" for serendipity to occur and knowledge to be shared is the "machine shop" -behind the cube and physics and media group- where in fact I observed some technical exchanges about 3D scanning and a first time meeting between designers and "hard scientists" at the laboratory).

The Cube: Behind that Guernica-like painting, it is *Physics and Media*



### 3.4.6 Power and Territorialities in the Workplace Game

As we mentioned earlier, workplace making is a sort of game of interests, freedoms and powers. This is also the case of some ML's spaces such as the same Cube and the so-called Telmex laboratory in the third floor that hardly has too many power/knowledge issues going on because it has a low rate of space-in-use. The cube, though one of the most playful environments, has issues of power and territorialities subtly going on, as one inhabitant of this space notes:

There is also a lot of territorial stuff going on here as well. It's quite funny. It appears to me that like "that's our area there" [in one corner of the cube] If I, for example, decide to shift this and build a big installation, there will be a lot of trouble (laughs). I think it is matter of politics that I am not quite sure about, but definitely I can feel it. [SH 2003]

Another factor that constrain the co-evolution, in the case of the lab towards working with materials with embedded technologies (smart things) that actually require more physical space, is a sort of heritage from the times of the "old terminals' garden", a physical feeling about these objects called the "computer machinery". That machinery is felt for some members:

It is OK to have spaces that haven't got a computer stuff on it. I feel claustrophobic here, totally claustrophobic in that office. Just three of us, but it is not the people, it is actually the equipment all over the place [SH 2003]

This is a photo that speaks for itself that we might called the transparency of the machinery ...



At the third floor of the Wiesner building, specifically at the Telmex Laboratory for Telecommunications, there is a lack of space-in use. Again, computer machinery is all over the place. However, people work inside their offices with transparent walls and doors.



#### Meaning from the inside: observations in the third floor of the Wiesner building

1. I came here after a class with Ted and sit down there for a while. The sofas spaces were empty and nobody were using that workstations or the computers. There were some questions on this plastic cards hanging from the ceiling. In the Photo you can see a question that says, *What was I thinking?* Referring to a research aimed to build intelligent agents that can retrieve your memory. Again, all the offices have glass walls that connect to this central space, which is name the Telmex Laboratory for Telecommunications and Development due to a sponsor.
2. Most of the time there are not too much physical interaction in this area. People are quietly in their offices. Sometimes they are not there. I once saw Patti Maes and his group/class sitting on this area of couches. Henry Lieberman was also talking to somebody else. It is also a space for crossing (non-place) and going to the coffee and kitchen area.
3. The last time I went (March 2<sup>nd</sup>) I saw again the question *What was I thinking?* (Henry Lieberman's project), but also a hanging poster about Patti Maes' project on handhelds and location and agent-based user services. Also I see something related to technology, change, the center of reflective practice ... again almost no body in that common area. I saw a friend passing by. She didn't see me when crossing through the non-place towards the kitchen area (coffee: see photo below)
4. I am again in this place. Today there are five people on the couches I used to sit, watching a sort of video game where you are supposed to play with colors. Patti Maes is sitting with the group. I guess it is her research group -Software Agents. They are browsing the web, now looking at a database y talking about it. There is also a guy working in one of the "public computers" and a Mexican girl -there are some Mexicans in Bender's group (information:organized) and in this place called the Telmex lab ... It seems a more active place today. [CG 2003-2004]

Greg Tucker, ML's facilities manager, also recognizes the problematic situation of this space, its history and possible solutions:

It is one of the weakest spaces in the building. People hate the lighting for good reasons, it is an awful experiment. We are trying to fix that. As soon as we can get enough money to change the lighting. This used to be part of the cube. We cut the top of the cube off in 1995. We floored over. The cube used to be four stories high. Now, it is only three stories high. We cut the top off and put this in. [GT 2004]

He also comments a somewhat interesting -and problematic- use of this space, namely the sponsors' place. As I described in the Cases details, there are various levels of membership on the consortia according to the amount of money that it is given to the lab:

If they give us a lot of money, they get the right to send someone here, observe, participate, whatever, just be part of the lab community. They get an office and typically these are scattered all over the building. So, they are mixing within the research.

But Tucker also reflects in the powers and visions at play in the workplace making, i.e., design game. He mentions that now the sponsors instead of being put scattered throughout the building randomly have consciously allocated in certain places. This change is very recently as Tucker discourse's acknowledge:

Only in the last few years we started to do it this way. Walter [Bender] likes it that way and I am not sure why. Frankly, I cant explain. I think this is a piece of the model that it is not working well. We've get tight enough space-wise that the assignment of an office to a corporate affiliate couldn't always be based on "this would be the perfect group for them to be with, so we will put them there. There wasn't necessarily room there. We have room somewhere else. We didn't necessarily make sense, but we will put them there anywhere. [GT 2004]

Tucker is also aware of this "controlled" viewpoint -with effects on practice- of space design and the consequences of (lack of) serendipity in communication:

There have been a few cases where corporate affiliates went that happy, because they walk around and can see if there is someone interested as opposed when they are expected. So, Walter is gathering them all in here, so he is able to stay in close touch with them and facilitates them interacting with people that he wanted to interact with, rather than sticking them somewhere in the building and they got forgotten. This started to happen in the late nineties. [GT 2004]

I think there is a key element laying in the fact of the sponsor getting “forgotten” or being ready-to-hand, not deliberately as a center of attention as the “sponsor” (there will be always a sense of identity categorization) by being located in the sponsor room in a specific area. To a certain degree the sponsor is there to become a member. They are in the legitimate periphery and the office space has to support their growing involvement. By allocating them in a specific area like the Telmex lab, you fix their position and thus you constraint some experiences (of learning, collaboration, language flow) to happen.

A flexible office place such an evolving *activity setting* (Luchetti and Stone, 1985) where the sponsors, other research groups and maybe users can move across boundaries, participate in research and prototype development and, thus, engage in some unexpected creative process. In other words, a continuing and evolving *open house* with wide windows at work and at play not only sponsors, but for surrounding designers and users. Activity settings such as the ones proposed by Luchetti and Stone can improve and enhance the lab’s creativity.

#### **3.4.8 Fostering informal and serendipitous face-to-face encounters**

Up to now, influential studies (Allen 1977, 1997; Leonard and Swap 1999) as well as experiences have shown the power and almost (not replacing) characteristic of face to face interactions, even acknowledged by some infoenthusiasts because “face-to-face communication is the richest, multi-channel medium because it enables use of all the senses, is interactive and immediate.” (Leonard and Swap, 1999)

In a quantitative unpublished study done at the lab under the guidance of professors Tom Allen and the architect Gunter Henn, a group of MIT graduates students found that there are few places for informal gathering and communication. This is an experience largely perceived by the lab community of communities, including students and faculty. There is not even a cafeteria.

The new building is supposed “to solve” these problems. As for now, the study found that such “Bas”, always critical in the organizations -such as the kitchen in IDEO SF- are the following, two inside the building and two outside: (1) the Coffee area (the kitchen) at the third floor (see photo), (2) the Basement lobby, a sort of non-place for crossing to Barthos Theater, Hugh Herr lab (formerly 054 room) and the shops (the cantina), (3) the Bike Rack in both sides of the building and the *Au Bon Pain* in Kendall Square on Main Street, Cambridge. (Kee, Shujimori, Morshead, Tsakonas *et al*, 2002)<sup>43</sup>

Coffee Area, 3<sup>rd</sup> Floor

Photos of People in Kitchen Area



Finally, I want to refer to the vision about the new building since it also speak to us about media lab’s spatial practice that, as we have shown, it conditions their learning and innovation. It also unfolds a sort of controlled view of innovation and a deterministic architectural idea. The Architecture Machine group is still at play ...

---

<sup>43</sup> This study was conducted when five groups where located in 1 Cambridge Center, known as “1CC” on Main Street, almost in front of the referred *Au Bon Pain*. That was “a temporary solution, not a permanent one.” (Bender 2003) The movement back to the Wiesner building was due because “proximity does matter” and they feel that being in another building, 400 meters or so away, was constraining the lab’s work. Probably *Au Bon Pan* was also a temporary solution created to cope with that situation. Probably there are still members and related people that come over *Au Bon Pan*.



The new building embraces the ideas of openness and transparency that would prompt interaction and creativity in a special research building:

We have really succeeded at getting these about transparency and openness into the new building. It is not a typical academic research building in that there's so much glass and somewhat double-high space. It is a little harder to explain perhaps why that's a good idea. [GT 2004]



The design process of the new building yet to come because of financial problems<sup>44</sup> was not a co-design process but rather a top-down vision carried out by a selection of faculty and their points of view. The design process and the formation of a client team to deal with the architecture firm (Fumihiko Maki & Maki and Associates) is described by Tucker:

There was a client team and it was made of Nick [Negroponte], Bill Mitchell, myself [Greg Tucker] and a group of PIs from the ML. There were Mitch [Resnick], Judith [Donath], Tod [Machover]. About 4 faculty members and every once in a while there was an extra faculty member. There were 4 or 5 faculty members.

The client team dissolve after the schematics, and design development were done on the new building. Once the design was set, we haven't too much to do. We met pretty regularly in the fall of 1998 through 1999. It was an open forum: What do we want to do?

What do we need? Everyone on the room was a fan of the open space model. I didn't chose the members of the room. I think Nick and Bill Mitchell chose the PIs for the "client team". There was also a representative from MIT, a project (facilities) manager that was at the table most of the time. For a while the MIT planning office was involved. [GT 2004]

<sup>44</sup> After Nasdaq went down, the incentives of two donors to give \$30 M also went away. As Tucker remembers "We invested an enormous amount of time in two donors who were talking about giving us lots, lots of money only to get very closely to sign it. The person who was supposed to sign in July 2000/01, whenever was that the Nasdaq went down. Then, they didn't have a incentive to sign anymore."

### 3.4.8 Places for “Inspiration” or the quest for innovation funding

As I commented above, the faculty and direction are aware of the lab’s lack of social places where there are less territorialities at play and more general sense of membership, as opposed to membership to specific groups. Social places like a café for getting not the users (the topic of next chapter) but the sponsors inspired:

The group was also very hard on proposing more spaces where can actively gather. This is a problem with this building. We don’t have a big lounge or cafeteria where everyone can go. In the new building there is a café on the fifth floor and the top of the new building is a fundraising space. The top of that building [looking at Boston skyline] is basically for the large consortium meetings that we have, 3, 4, 5 times a year we get anywhere from a 100 to 500 people and sometimes if we have a symposium for 1000 we get Kresge [Hall] . We typically managed those now by having the events in Kresge [an MIT auditorium located in Mass Ave] and then bringing everyone back here and doing something in the atrium and opening up the building for demos ...the open houses [GT 2004]

As well as in the case of the design firms that indeed care about their clients, the media lab also take care of their sponsors. They are the source of capital, which is still one of the most important factors of innovation.

Architecturally, they are conscious about creating an special place (a sort of “Ba” using the vocabulary introduced in chapter 1) for the sponsors and for getting them “inspired” and ready for the fundraising sessions by inviting them to attend the consortia meetings at the top of the new building, while watching the Boston skyline.

There is also a “vision” that consciously think of the sponsors as being stimulated in that special place about the work being conducted at the lab. I am not claiming that not worth pursuing or achieving. It is certainly strategic to have the actual and potential sponsors engaged in research and development. But by looking only at the sponsors, they can lose sight in important resources to foster innovation. One of these resources are the sponsors’ customers, i.e.,



the future users of products and prototypes developed by the lab or co-developed by the lab and the sponsors.

The users' space seems overlooked in the current plans for the new building. There are not conscious or formal plans about a users space for experimentation or users testing. The emphasis is on the sponsors' experience, which is certainly important (capital, research engagement). However, it is almost equally important, as I shall argue in the next chapter, to understand, explore, get inspired and co-construct the users' experience.

#### 4. Users in Design Organizations

The fourth material dimension of space for the analysis exploration of innovation and creativity is what I call the *users' experience*. By users' experience, I mean the communities and networks of users of existing and future products and technologies. Design organizations produce prototypes, products and environments for current and future users. Users are the final consumers and customers of products and technologies. They carry the context of successful design, i.e., of product-in-use. For that reason, users are a key resource for design and other types of organizations. To understand users means to understand and construct social practice, that is, the values, tools, the activities and expectations of people. However, that understanding and construction is not easy. It requires expertise and tools.

In this research users are customers of the customers, that is, customers of IDEO's and Continuum's clients and customers of Media Lab's sponsors. Users may or may not be a space for organizational embodiment. That will depend on the choices, needs and techniques of a particular organization

Therefore, the *user space*, both literal (location) and metaphorical (experience), is another key dimension of innovation and creativity that needs to be analyzed. With the location we return to my entry point of analysis, the urban ecologies and the communities and networks of users of products and technologies. The location of the design organizations is also related to the values, shared meanings and experience of users.

The space or, rather certain places around the organizational location may enable the productive interaction between communities of designers and users. Both the organizational *position* in the space of flows and the *experience* in the space of places affect the ways users are introduced into the innovation process and might have impact in competitive advantage.

Learning continually about users and their shared meanings is certainly a competitive advantage for design organizations. If design organizations want to

make a difference in the market and in the life of people, they need not only to understand users (do market research) but also to co-design with them.

The geographical location and building space are crucial to finding out, following and designing user experiences in the case there is a need to literally invite them as IDEO, Continuum and Media Lab do. Organizational places such as playful cafes areas, messy living and conference rooms, cafeteria and group memory spaces can become critical for tapping into users' tacit knowledge, and unarticulated latent needs.

Besides the location of users, there are some relevant related issues that I want to discuss here.

#### **4.1 From User-centered to Community and Network-centered Design**

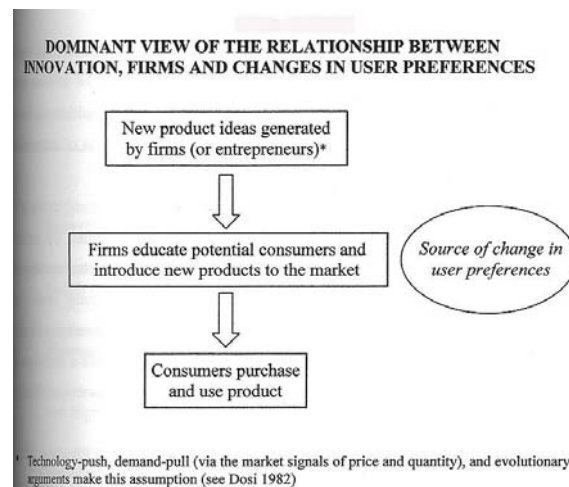
One is the beginning of a shift in user studies, and thus in usability and so-called functional design. That shift is moving away from focusing on an individualized ideal user to a community and network of practice approach that conceives users as members in shared meanings and participants in a learning process. Again, in this context of users' experience research, learning and innovation go hand in hand.

In order to understand this recent and ongoing shift in user research, let me say a few words about the trajectory of user conceptualization and research. This reaches back to and intersects with some of the accounts concerning the critiques of rational, canonical and rationalistic views of innovation, action and learning (Schön 1967, Winograd and Flores 1986, Suchman 1987, Brown and Duguid 1991) that I used and discussed in chapter 1.

As Ilkka Tuomi (2003) notes, "In the 19<sup>th</sup> century and early 20<sup>th</sup> century, consumer durables were not yet invented and the user was a user of tools. Functional products were mainly tools for work. In this view, the user was conceptualized as a sequence of tasks that were chained into a work process. The outputs of specific tasks created the components of manufactured products" (Tuomi, 2003: 9). This is in part due to a firm-based model of

innovation that considered users as passive recipients of goods, i.e., that figures the user as a consumer who buys products already manufactured by firms.

The firm-based innovation model (see Dosi 1982), though it does acknowledge “entrepreneurship,” usually sees innovation as the function of one department or area (product development, for instance). In the network economy where we assist to phenomena like open source software and massive participatory cultures in the era of media convergence, another picture is emerging and we need new lens to look at and make sense of it. We need to move away from the technical-rational view (Tayloristic) to appreciate emergent sources of innovation.



This technical view of the user, which stresses problem-solving and functional operation, conceptualizes the user as an isolated agent that solves problems instead of as a user that lives in communities or networks of shared meanings. In other words, users who enjoy, feel, create personal meaning around artifacts and who want to succeed in the operation with tools.

Good design made the tools part of the equipment and coping mode with things, but also disclosing an emotional relationship with artifacts. In other words, users want meaning and not too many breakdowns. Designers have to anticipate both meaning and breakdowns.

Moreover, such technical (Tayloristic) view of design overlooks the *space of possibilities* for particular designs, their “interpretative flexibility”<sup>45</sup> (Bijker and Pinch, 1987), as well as the meaningful uses and possible breakdowns within particular contexts of technology-in-use and physical situations. On the one hand, the technical view of the user fails to see the individuality and, thus, the experience of communities and networks of users as a factor of the innovation process. On the other hand, as a consequence of the latter, such a linear perspective fails to take advantage of the user's position and location.

Since the 1960s, several scholars have noted that this linear (functional) model is too simplified, because innovations tend to emerge in a complex iterative process in which communication, learning and social interaction play important roles. Allen (1977) and Allen and Cohen (1969) have observed that communication and flow of knowledge is critical in the innovation process.

Rogers (1995) applied Lazarsfeld's two-step flow of communication to explain the role of users in the diffusion of innovations. Von Hippel (1988) and Von Hippel and Henckel (2003) have emphasized that users often play an important role in the process of innovation, and even in the general social welfare, by modifying and improving products. Cohen and Levinthal (1990) argued that the adoption of new innovations requires learning and the development of competences by the potential adopters, while Nonaka (1994), Dougherty (1992), Brown and Eisenhardt (1995) argued that the internalization of customer and market knowledge is critical for successful product creation.<sup>46</sup>

In a more radical way, Tuomi argues that innovation is a social phenomenon, i.e., innovation happens when social practice—the complex network of tools, linguistic uses, everyday actions, and expectations—changes.

---

<sup>45</sup> By interpretative flexibility, Bijker and Pinch mean not only “that there is flexibility in how people think of or interpret [or use] artifacts but also that there is flexibility in how artifacts are designed. There is not just one possible way or one best way of designing an artifact.” (Bijker and Pinch, 1987)

<sup>46</sup> In media and communication studies, there has been also a shift from the model of passive consumers to that of active readers and viewers who co-construct messages and symbols. See, for example, Jenkins, H. (1992), who has shown how zine writers continually appropriate television and magazine texts for their own purposes. Garcia (2003) has also explored how audiences of satirical news media (e.g., The Daily Show) co-construct political messages in related blogs and message boards.

Moreover, Tuomi continues, "If new technology is not used by anyone, it may be a promising idea but, strictly speaking, it is not technology. Similarly, if new knowledge has no impact on anyone's way of doing things, it is not knowledge. Only when the way things are done changes, an innovation emerges." (Tuomi, 2002:10). Certainly, this is a critical and radical view on innovation mostly concerned with the distribution and activation of meaning among communities due to changes in social practice.

However, it is useful for my exploration of design organizations and users, since it highlights the relevance for the innovation process of understanding communities and networks of users.

Tuomi's framework aims to challenge the traditional view of innovation, which assumed that invention happens when a new concrete artifact or mental insight is created. Instead of a heroic inventor, Tuomi proposes a user, or more precisely, *heroic communities of users*. Thus, innovation is generated in "complex interactions between several communities, each with their own stocks of knowledge and meaning. Technological designs and social practice co-evolve. Therefore all innovation is fundamentally social innovation." (Tuomi, 2002: 23) In other words, technologies and products are actively interpreted and appropriated by existing actors, in the context of their existing practices and shared meanings.

The Social Construction Of Technology research program (SCOT) has convincingly argued that users define the development of technologies by the appropriation of possible trajectories, and has presented empirical evidence to support the idea. In other words, the way users culturally appropriate the content of technological artifacts is a process in "which the different interpretations by social groups of the content of artifacts lead by means of different chains of problems and solutions to different further developments." (Bijker and Pinch, 1987:42)

The consequences are quite radical in terms of both the understanding and the use of such meaningful artifacts by different social groups, and their

non-symmetrical interpretations. As Trevor Pinch and Nelly Oudshoorn (2003) put it,

There is no one correct use for a technology. "What is an alarm clock for?" we might ask. "To wake us up in the morning," we might answer. But just begin to list all the uses to which an alarm clock can be put and you see the problem. An alarm clock can be worn as a political statement by a rapper; it can be used to make a sound on a Pink Floyd recording; it can be used to evoke laughter, as Mr. Bean does in one of his comic sketches as he tries to drown his alarm clock in his bedside water pitcher; it can be used to trigger a bomb; and yes, it can be used to wake up. No doubt there are many more uses. No one essential use can be deduced from the artifact itself.<sup>47</sup>

Different user groups and stakeholders impute different meanings to a given technology. Instead of being a well-defined 'objective' artifact, the artifact has many, and possibly incompatible, articulations. As Tuomi comments on this co-construction of technology, "These meaningful products may develop independently of each other, and one technological artifact can embed several meaningful products simultaneously." (Tuomi, 2002:10)

Therefore, users appear as co-designers of technologies, by disclosing different spaces for meaning appropriation. If we adopt this user- and practice-centered model of innovation, Tuomi argues again, "it is easy to see that innovation has many agents and that the process of innovation is distributed in time, space, and across groups that use technology for different purposes" (Tuomi, Idem:10)

Having presented a frame for understanding the relevance of users in the evolution of design and products, I will now turn to describe how *users' experience* is constructed and unleashed by IDEO and MIT Media Lab. Since Continuum is in between the both above in terms of addressing the users, I

---

<sup>47</sup> A similar description of interpretative flexibility is developed by Winograd and Flores (1986) who develop a hermeneutic understanding not only of technological artifacts but also of our very existence.

concentrate in the two extremes of the cases in order to produce a fruitful contrast.

We will see again different ways of addressing the users' context and thus, of co-constructing prototypes, products and technologies and, ultimately, modes of pursuing innovation. Implications for, and lessons from, each firm will be discussed.

## 4.2 IDEO and the construction of users

IDEO has a sophisticated and useful way to incorporate users in the product development and innovation process. Such firm practice with users has been a key competitive advantage of a user-centered design firm like IDEO, whose core characteristic is about doing *empathic design* to help companies (customers) innovate by understanding the real users of their products.

Why does a design and engineering firm need anthropologists, sociologists, linguistics, cognitive scientists and human factors researchers to bring about knowledge of social practices and users' experiences? Because understanding and constructing social practice (what your customers want yet do not know explicitly) is rather difficult. According to Bill Moggridge, co-founder and principal of IDEO, "The main problem for designers is that they tend to be selfish. The engineers and industrial designers always think about themselves" (Moggridge, 2004). Since IDEO is designing objects and products<sup>48</sup> that would become meaningful and even evocative (Turkle, 2002) in people's lives, they have a real business need to understand user cultures. In this area of design consulting firms, "you better make sure that somebody else—besides the designer or engineer—is the relevant one." (Moggridge, Idem)

Since users needs and demands are changing constantly, IDEO has interestingly evolved and expanded its techniques for tracking user

---

<sup>48</sup> IDEO has contributed to the development of over 3,000 products, featuring the Apple Computer mouse, AT&T telephones, Oral-B toothbrushes, Crest toothpaste tubes, Sega game controllers, Hewlett-Packard printers, laptop computers for Apple, Dell and NEC, and the Palm Pilot, among many others.



experiences. In the early days, the user research of IDEO was based on observational techniques mostly drawn from classical anthropology studies.

A decade ago, observational techniques were good at bringing somebody's else context into the design process. As Moggridge recalls of IDEO's early days of users research:

In the early years I used to ... I was designing a piece of surgical equipment and I was going to the operating theater and watched the surgeons at work. If I was designing a marine radio for a ship, I would go on a trip in the ship. Simple observational techniques. [BM 2004]

However, as new needs for design arose and IDEO itself evolved, it started to employ full time specialists: the so-called Human Factors people, mainly psychologists and anthropologists who are trained in understanding the meaning of human behavior. These experts are absent, as I discussed below, in the case of the Media Lab.

This type of research culture have enabled IDEO to develop more sophisticated techniques than the average design firm. In fact, IDEO has now developed more than 50 methods for understanding and getting "inspiration" from users' tacit and latent knowledge (needs and desires). IDEO has published those methods in what is called the "methods deck." IDEO has also made a deck of cards—see below—so researchers and designers can select specifically for certain projects, products and communities.

IDEO researchers use these methods periodically and consistently in very different kinds of projects. Some offices such as IDEO San Francisco has more expertise and know how on that type of work practice. Through the recurrent use of these methods, they have developed a process to deal with the complexities of human behavior, design social practice.

## Human Factors methods



Ask Watch Try

IDEO's user research is not only about engaging customers (i.e., the companies assisted by IDEO and their co-designed products), but rather the end-users of such companies and products. It is about engaging these users (a subsection of communities and networks of practice) in creative and inspirational design. IDEO's human factors research is about a fundamental triad, namely, "Ask", "Watch," and "Try." That is, researchers try to systematize values, desires and tools of people for creating new and better ones.

IDEO has different ways to ask users about their practice, depending on the project's characteristics, timeline, and scope. For instance, sometimes IDEO's researchers "ask in context", i.e., they take into account the *periphery* where the product is going to be used (the workplace, the house, the restaurant, the car, etc.).

If the project requires fast fieldwork, IDEO researchers use quick methods such as "the man on the street," "expert interviews," "photo journals," "mood-o-meter", "drawing exercises", or "draw your money", among others.

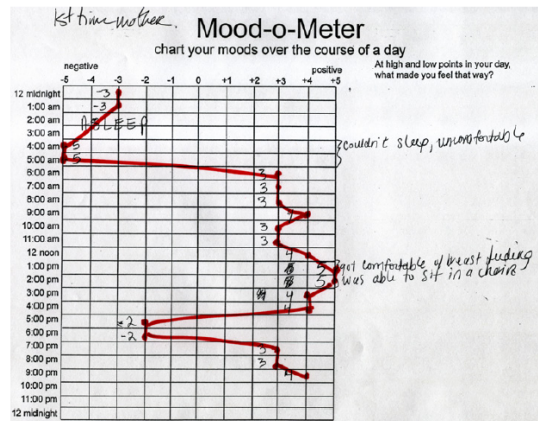
Ask | quick method - expert interviews



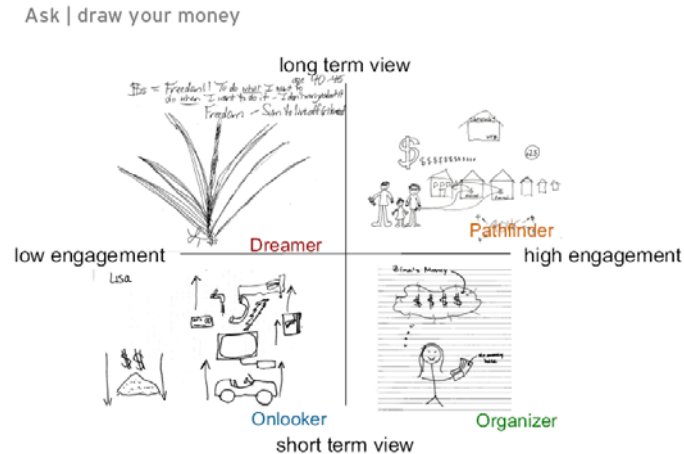
Ask | photo journals



Ask | mood-o-meter



IDEO Human Factors Methods



Since IDEO's work is not in mass products (commodities) but rather in innovative products. In Porter's terms (1980), IDEO's work is about differentiation rather than volume. Therefore, products that tend to make a difference in the first place, drive social trends, and even produce disruptions (like the mouse or the Palm pilot, in the case of IDEO products. Since IDEO is concerned with cutting-edge products, it also require cutting-edge social contexts to scaffold the creative process. So, a resource usually tapped by IDEO is the so-called "extreme users," sometimes refer to as "lead-users" in the innovation literature (Von Hippel 1988).

These users are sometimes explored in their private contexts, but sometimes they are invited as guests to the office where the office atmosphere works as an emerging, strategic and spiritual place (Ba) for inspiring both users and designers in the prototype development. On these occasions, users are given materials to build prototypes, sketches and concepts that articulate users' tacit knowledge and, sparking the design process.

The photo below shows "shoe prototypes" made by extreme users of shoes invited to a creative session. Users are actively constructed through this process of participatory design.

Shoe Prototypes made by extreme users



These creative exercises—called "unfocus groups" in IDEO's jargon—are arranged in collective places, usually at IDEO's evolving and messy offices, and have to do with situated learning of both designers and users because the meaning creation session (unfocus groups) depends in essential ways upon its material and social circumstances. Here and now, in an engaging and cool "place," users playfully interact along with objects, materials, peers, and prototypes. Since usually what people say is different from what they do, traditional "focus groups" would not be so useful for sparking creativity and enacting products, experiences and concepts.

Watch | unfocus group



In the last chapter, I described the co-evolution of IDEO's workplaces and the use of "group memory" to support increasing strategic and conceptual work. Part of that work is not only to understand which of the following pair shows would you like to have but rather to understand deeply the experience of comfort, luxury, pleasure, globalization, beauty, clothing, computing and the like. It's not about a particular object or design. It is about the experience, the values and the cultural practice carried out on objects, environments and places.<sup>49</sup>

"Experience is the gateway to understanding", says one of the current IDEO's projects called "extra-spatial" that precisely is about space design, specifically, about the relationship between people, technology and three-dimensional space. Understanding users experience and values enable successful design, that is, design that can co-evolve with users experience.

The day before to one of my research visits to IDEO San Francisco, they held a meeting with users to disclose the meaning and "places" of "globalization" These are projects for clients that are not mainstream. These are projects involving workshops that touch on high level trends and important issues in business and culture such as mass luxury and localizing globalization. As the reader may guess, this is only one of the multiple ongoing projects.

In our public discourse we usually talk or read about globalization as an experience common to our historic times. But, what does it mean for a firm or a person to be global? What is the meaning of globalization and How can be translated (transformed) into a brand, a concept or a product?

IDEO's people invited people and "construct" globalization users that can bring tacit meaning and personal knowledge about such formal representations. In this case both the location and the office space play critical roles for enhancing understanding and sparking creativity.<sup>50</sup>

---

<sup>49</sup> Recent disputes about the value and level of understanding of experience and common-sense reasoning includes biologists (Varela), philosophers (Dreyfus and Thompson), cognitive scientists (Clark), AI scientists (Minsky), management theorists (Senge, Scharmer), among others.

<sup>50</sup> The location has also to allow a wide range of contact with user cultures. If you are trying to understand the global experience for "cool people," San Francisco might be certainly a good spot. But, what about if you are designing for middle-brow people and you need to be immerse in such values? Well, the designers

In fact, IDEO took the users around differences places in San Francisco related to the experience of being global. Later, they were invited to the office at Pier 28, sit in the common flexible area next to the window near the Bay water and started creative exercises using magazines, materials and prototypes. In other words, putting down the formal and conceptual, that is, the representations and pictures into experiences and places.



Magazines, pens and papers for localizing globalization

Understanding the experience of users is a collective enterprise. Even though IDEO might invite and pick individually extreme users, they are, in turn, members of broader communities and networks. Besides that usually overlooked factor of social cognition, it is not coincidence that these creative exercises are held in collaborative spaces scaffolded by IDEO's teams. Therefore, what IDEO is doing in these users meetings is *meaning creation* that can be translated (and transformed) into prototypes and products. And meaning is fundamentally shared and social. Knowledge that comes out of Ba. Out of the situational productive enquiry.

---

at San Francisco told me that they usually cross the mountains over to Walnut Creek and ... to explore such experiences. There is always a trade-off involved between the location and the related users.



Another interesting “users place” at IDEO that deserves attention is the Toy practice at one of the Palo Alto offices. As is well known, the toy industry is a fast-pace and changing one that requires ongoing learning.

So, the very nature of their work needs continuous agility to adapt to uncertain and changing environments. The work places support and enable such co-evolution.

In the photos below, it is possible to see the working area without any separation to allow verbal and physical communication among designers and researchers with the prototyping area on the back, which in turn, allows a rapid “bringing forth” of ideas, concepts and experiences. On the other side of the room (at the entrance in fact), there is a users testing area where they bring weekly kids to play with prototypes. Both the location -in the calm center of Palo Alto- and the building with this playfully room spark creative languages and fruitful knowledge exchanges between designers and users.

IDEO *Toys practice* space is devoted to 1) user testing with kids, 2) to prototyping and 3) continuous collaboration.





### 4.3 MIT Media Lab and the “lead-users” inside the lab

The MIT Media Lab has an ambivalent relationship with users. We commented above that the ML does not have as a clear process as IDEO or Design Continuum does. Therefore, there is no one process or set of techniques for understanding users' experience with prototypes/products. There are different ways and levels of introducing the user experience according to the type of research group. There is not any sophisticated technique or trained people to do human factors research. At Media Lab what usually is done in this regard is narrow usability testing with the prototypes developed inside the laboratory.

The ways and periodicity of such usability studies vary a lot, depending on the type of research practice and the different approximations to design. I am not trying to generalize here, but to describe phenomenologically how the projects I've seen or I've been involved with have dealt with users' experience. I also draw on discourses by ML's faculty about the way they see and interpret the role of users in the innovation process.

My assumption is that these discourses reveal organizational practices in working out the relationship with users that, ultimately, impact (affect) the innovation process. My other assumption (and a sort of hypothesis) is that the users of actual and future technology -at least in design orgs- play a crucial role in the process. An *ad hoc* hypothesis is that the users' space is also fundamental regarding the participation of organizations' environments not only in terms of the location and the immediate surroundings but also in the building spaces designed and actually used to attract and receive users' practices.

### 4.3.1 Users at the Cube, a playful environment at the ML

The Cube located at the lower level of the Wiesner building is one the most playful environments at the Media Lab. It used to be a theater for performances and theater representations, but currently hosts the three research groups, namely Lifelong Kindergarten led by Mitch Resnick, Computing Culture led by Christopher Csikszentmihalyi and Affective Computing led by Rosalind Picard.

The Cube is usually visited during Open Houses (large meetings with industry at the Laboratory at large) by sponsors and other visitors. During Summer and IAP the Cube is also visited by kids (users) that come here to play and to program in this open environment. This is the place where several ethnographies took place for this research. During the academic term, with exception of the sponsors' week, I didn't observe many kids or users playing around.



MIT Media Laboratory Cube

#### 4.3.4 Discourses on and about Users

As I said before, there is not only one discourse nor a unique work practice related to the introduction of users (sponsors' customers) in the creation of new information and media technologies. But it is possible to glimpse a common stance by analyzing some ML's faculty discourses on the subject. Since the Media Lab is not a top-down organization, it doesn't matter if we start the analysis either from the ground or from the top.

Walter Bender, an insider for more than 20 years at the lab, notes that even though the ML's usability studies are different from those conducted at the product development firms for their actual products, "we do a lot of user studies, I sit on the MIT's Committee Use of Experimental Subjects and I see protocols coming from the Media Lab all the time. We look at how people use and are meshed with that ideas." (Bender, 2003)

#### 4.3.5 The missing context(s)

Users are important because they bring the context (home environment, workplace, educational setting, office, transportation mean) where technology is going to fit in. The success of technology historically has to do with the specific contexts, institutions and social systems that prepare and condition the reception and, thus the success of a particular technology (Kranzberg and Pursell, 1967; Bijker and Pinch; Pinch and Oudshoorn (2003); Castells 1996/2000).

The fact that the ML is missing some contexts is due, in part, to the nature of their work. The *ambivalence* with their contexts is described below in words of a member of the executive direction:

A lot of things we are doing are based on prototypes so we don't have the full context that you have over your product. We never have that complete context here at the laboratory. I shouldn't say never because *sometimes* we do. Some things actually do come out of the lab and just go out into the world. [WB 2003]

But it is not only due to a deterministic nature of their "type" of work. It is also because of an attitude to their work practice and tools:

On the one hand, certainly you want to be observant and to look at context. On the other hand, I don't think for the kind of things we do here that things like focus studies and all that are useful.

It also reveals a naïveté on the knowledge about *user innovation* tools such as toolkits (Von Hippel and Katz, 2002), deck of cards, ethnographies of workplace, unfocus groups, etc. At this point in time, ethnographies methods and interventions in social practice are well developed and sophisticated as shown by the industrial state-of-the-art of design research (IDEO, Cheskin, Fitch, Chiat/Day, TWBA).

This also due to a process of "labeling" of users practice, behavior and social learning. "They", i.e., users have trouble to think about tomorrow and to see beyond the present. Is it like this at all? Are users that limited? That what some ML's discourses think, at least:

And the reason being that's [users studies] generally concentrated in what people think about today, not what people think about tomorrow. I am not sure that people have the ... I think to predict and predict the future is really hard. I think you ask too much when you ask people to predict the future. I think you have to invent the future.

Such limitedness is enforced by Ted Selker, a designer currently at the ML formerly at IBM Research:

Users have a hard time seeing how to use something they haven't used. They tend to think that the way they are doing things is the best way because they are enchanted by their ability to use the tools. It is very dangerous to pretend that the current users have the best insight into the future. [TS 2003]

But to invent the future without social practice is rather tricky. There is a necessity to anticipate the social systems, linguistic networks, spatial conditions and possible breakdowns of the interaction between people and

their future technologies. If that contexts are not taken into account, there are more risks to develop technologies that are not meaningful and, thus irrelevant for the marketplace.

As I said, there is no one response to such missing context. There are different levels of articulation between users discourse and practice at the ML. However, the relevance attributed to the users is not decisive.

The solution to this missing context is a sort of extrapolation (extension) or the role of the designer. In other words, it is the claim that the designer, in laboratory conditions, can be the user:

At the Lab, we are people in the world too. We have to interact with people all the time. We are not doing this over in an ivory tower on a hill, saying, "Here is a new idea." The probability of coming up with good ideas is very high that way. [WB 2003]

Ted Selker, aware of the design world including ethnographies and users studies, has still a view of the innovator<sup>51</sup>, though in dialogue with social practice, as the radical engine for innovation:

The typical statement is you ask your users what they want. I think that this only works if you ask them through the eyes of the future. So, if I go and I spend enough time acting as a user that I understand the things they are saying and why they are saying them and I keep myself in the frame of mind of a innovator, then I can do a better job of innovating. But if ask them what they want I will end up with something very different. And the people that have done that sometimes they think they have succeeded, but actually what they do is incremental or is even complex. And an example is the cameras that were designed by professional photographers [lead users]. I am thinking in one that I saw that had seven different user interfaces areas on the camera with four or five different displays for the user to look at, all at one kit. That's a very complicated user interface. Was it necessary? Well, the users thought so, but in fact the marketplace did not. [TS 2003]

Though aware of the "working" of users, this account label them and misses the opportunity to actually see their "learning" and "innovating" that, as several researchers have pointed out (Von Hippel 1988, 1998; Von Hippel

---

<sup>51</sup> Selker understand the innovator as someone who is always looking for the problems as opposed to a user, who is always looking for how to succeed. An innovator, he argues, is always looking for the problems and what is keeping the things for working perfectly. (Selker, 2003)

Thomke and Sonnack 1999; Dougherty 1992, Tuomi, 2002), can become a competitive advantage for an organization, an industry or even the economy as a whole (Von Hippel and Hanckel, 2003).

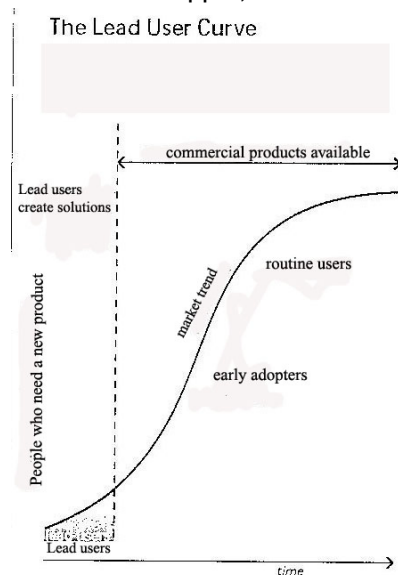
Such labeling also includes pre-conceptions about routine users, early adopters and lead users, if acknowledgement of a differentiation at all.

The early adopters use the technologies for different reasons than the mainstream. They use it to show up, to show they are smart, to show they have the special thing. That's a different reason than productivity. And to the extent of the stylishness persists, then maybe it isn't. So, the cell-phone or the pager are examples where the luster of the product was a big reason for having it and still is. [TS 2003]

That is not always the case in this lab. Nor the only users' context to be found or to be constructed. Since the lab is involved with many different firms in different industries, there are not only one type of users practice but rather different users communities and networks to be aware of.

There is more out there than a distinction between early adopters and mainstream users. As Von Hippel, Thomke and Sonnack (1999) have showed in several industries, there is a differentiation among routine users (mainstream), early adopters and lead users. The scope, depth and amount of these communities will vary according to different products.

Curve from Von Hippel, Thomke and Sonnack (1999)



The labeling and attribution (what Argyris coined as the “ladder of inference”) of certain behaviors and blindness about product-technology-experience design from current users may deviate the attention to the fact that “many commercially important products are initially thought of and even prototyped by users rather than manufacturers” (Von Hippel, Thomke and Sonnack, 1999:4) These users are the so-called “lead-users”, i.e., “companies, organizations, or individuals that are well ahead of market trends and have needs that go far beyond those of the average user” (Idem). Therefore, identifying such experts and communities turn out to be a critical endeavor for fostering and cultivating innovation.

Organizations' position in different electronic and physical (location) networks will enable the identification of lead-users. The building space will also be critical in getting enough inspiration and fruitful ideas in the workshops to be held among designers, sponsors and lead-users.

Even organizations like the Media Lab might benefit from lead-users communities if follow and invited (taken into account) appropriately.

Despite this overlooking on users practices and sometimes naïve knowledge on *users toolkits* to transfer innovation from designers to users, there are some ML's faculty members that do care about users participation. Such important exceptions need to be mentioned and briefly analyzed here in order to have a fair picture of the role of users in the lab, at least from the perspective, timing and constraints of this thesis.

The ML research that is significantly related to users communities are faculty and research groups dealing with issues around learning, that is, Bakhtiar Mikhak from The Grassroots Invention group, David Cavallo and Seymour Papert in the Future of Learning group, to a certain extent Hiroshi's Tangible Media group (see case highlighted below) and Judith Donath's Sociable Media group.

In the case of Resnick's group, the users are kids from ages ranging 10 to 18 years old. The very inspiration for this work comes from the perspective of

using communication technologies in creative ways to foster new ways of thinking and, thus, of learning.

The influential Papert's *Mindstorms* (1980) has been a building block for "from the concrete to the abstract" philosophy (similar to the account on situated learning we have discussed and used) and its implementation into socio-educational practice through software such as Logo, Starlogo, LEGO/LogoBlocks to foster de-centralized thinking and hands-on learning. Kids are users that program and create their own learning material becoming aware of their own knowledge production (knowing). Mitch Resnick explains in the following terms his take on users and their role on research:

We want to develop new generations of technologies that are worthy the next generations of kids. And to make them worthy for them, we have to really understand them and understand their needs. *It doesn't mean that they can tell us exactly what to design.* That's the job of the students here: to learn how to do it. But you need a deep understanding of the users in order to do a good job of designing for them and with them. So, we try to work with users to get a better understanding of them and including them into the design process. But certainly to have a deep understanding of them is critical. [MR 2003]

Here we encountered a much more proactive discourse about users. Understanding kids' needs and desires are critical for the design of successful technologies. There is a recognition of the critical importance of understanding. But at the same time there is a recognition of a design limit on the users' side: "*they can't tell us exactly what to design.*"

There is certainly a difference with the design firms such as IDEO and Design Continuum that precisely used sophisticated techniques to articulate "consumers' unexpressed needs and desires, then envisioning and testing new ways to meet them." (Lojacono and Zaccari, 2004:75) At the Media Lab they lack the expertise as well as the techniques to construct users or rather to co-construct the experiences with technologies.

The justification of that is framed by them saying things like "That's not what we do" (that is certainly true for researchers working in physics media,



nano and quantum computing), “We are users too” (which is true), “users cannot think or predict the future” (who can?).

In the more user-oriented front of the lab with active researchers in the CHI and ACM community such as Resnick, Selker, Ishii, Donath, Maeda and Pentland, among others<sup>52</sup>, there is not one voice or one clear process to introduce users and customers into the developing process. I am not claiming that having users and customers insights is the best way to pursue innovation, create ideas and pull new technologies into society and the marketplace. But it has certain abilities to pull ideas and technologies that fit societal contexts. It is strategic to bring or construct contexts inside the lab.

Therefore, it would be interesting from knowledge creation and innovation standpoint to bring users experiences to the lab as similar organizations do. That doesn't mean to lose the freedom (experimentation, risk) of an organization that is not a firm in the proper sense and doesn't report to stakeholders. But it does mean to connect with social practice (how people work, learn, live) in a meaningful way, which in turn, will specify the successful of prototypes and innovations in the long term.

In times of “experience economy” (Pine and Gilmore,1999) and experience innovation (Prahalad and Ramaswamy, 2003) it seems wise and reasonable to open the senses and “ask, watch and try” what the users are doing within their different contexts of technology-in-use.

Since this chapter is called users space and this research is about the spatial dimensions of innovation, lets review some physical spaces where a group of the Media Lab is actually constructing and empowering users.

---

<sup>52</sup> In fact the Digital Nations consortium (<http://dn.media.mit.edu/>) is aimed to bring information technologies and cheap design to developing countries.

**Box 1****Users Space at the intersection between the school and the street:****The case of the Computer Clubhouse**

Out of the research and development of Mitchell Resnick's group, a project of outreach has been developed at the intersection of media technologies, creative learning and social change. The computer clubhouses are literally "users spaces" outside the lab, usually supported by pre-existing organizations and institutions. The Computer Clubhouse provides a creative and safe after-school learning environment where young people from under-served communities work with adult mentors to explore their own ideas, develop skills, and build confidence in themselves through the use of technology. Established in 1993 by The Computer Museum (now part of the Museum of Science, Boston) in collaboration with the MIT Media Laboratory, the Computer Clubhouse helps youth acquire the tools necessary for personal and professional success.



The justification of the creation of these *Bas* for learning goes as follows:

Most of our best thinking doesn't happen sitting there and just contemplating. It happens in interaction with materials, media, tools, technology and with other people. In all of these activities, the interaction whether with the material world or the human world plays an important role in the (creative) process. One reason that we want to design spaces like this - and the Computer Clubhouses- is because we are committed to having people come together to be able to learn from each other's creative experiences and to build on each other's creative experiences whereas at the same place the Computer Clubhouses we have created or on-line spaces like the new intranet we are creating to connect them, both conserve important roles for people do share ideas and build from each others' ideas. (Resnick, 2003)

**Box 2****Topobo at the Tangible Media Lab at the Media Laboratory**

Topobo has been developed by Hayes Raffle and Amanda Parkes. Topobo is a 3D constructive assembly system embedded with kinetic memory and with the ability to record and playback physical motion. Unique among modeling systems is Topobo's coincident physical input and output behaviors. By snapping together a combination of Passive (static) and Active (motorized) components, users can quickly assemble dynamic biomorphic forms like animals and skeletons with Topobo, animate those forms by pushing, pulling, and twisting them, and observe the system repeatedly play back those motions. For example, a dog can be constructed and then taught to gesture and walk by twisting its body and legs. The dog will then repeat those movements and walk repeatedly.

In the first place, topobo was developed without a substantial concern about the users or about *topobo-in-use*. However, there were a pre-existing experience on playful interactions (Zoob) and a question about sculpture in motion on the design side. Topobo was designed "with a focus on social interactions and socially constructed meaning" (Raffle, 2004). On the one hand, the design was not oriented to fit a gap in social or educational practices. On the other hand, the user experience appeared between the first (made of wood pieces) and second (synthetic pieces) topobo. Then the system continued its development, adding new features and improving its functionality. Both the user and the designer experience contribute to the ongoing development.



In the context of the tangible media group, topobo's concern with users is an exception. In general, Iroshi Ishii's vision is not shaped by users' contexts and experience nor marketplace demands. The vision of the group is intended to disclose "new" directions for tangible media design. As Phil Frei, the designer of *curlybot* and a former student at Ishii's group, once told me, the vision and practice of Ishii is that of 'radical novelty' in the sense of presenting something that nobody has come up with. Paradoxically, such vision can enable creativity but at the same time constraint the successful design-in-use of an artifact. If social practice is overlooked at the different stages of design, there is a risk of failure due to missing dimensions of meaning, emotion and learning. If not users are brought about, there is the risk of constraining the design and its co-evolution and of becoming a 'pile of stuff' in the long run.

Compared to IDEO and Design Continuum, MIT Media Lab offers an interesting contrast to the way of practicing user innovation. With some exceptions of the research groups working in learning, the computing culture group<sup>53</sup>, and the efforts of the Digital Nations Consortium, users and customers are not taken into account substantially (neither from the beginning or during the process). Users are imagined as an *ideal practice* without paying attention to their context, desires, needs and ideas. Sometimes end-users are incorporated in the process of testing some “cool” technologies that come out of the lab. There are also “lead-users” and “extremes” inside the lab. But usually several contexts of design are missing. Overall, much of the innovation happen inside the lab. Is this really *innovation*?

One could argue that the Lab is set up in a way to be freed from market constraints and customers demands. But at the same time, the lab' sponsors expect that some of the technological innovation carried out can make a difference in the world and in their markets. And this means a difference in social practice. Even the most “envisioning lab” has to be able not only to portray future technology, but rather future “technology-in-use.” I will come back to this issues in the implications/conclusions chapter.

---

<sup>53</sup> The work of Tad Hirsch at the Computing Culture group is also concerned with uses of technology that foster awareness and social change in the communities of end-users. See for example, *Sensible Cities*, a project aimed to develop low-cost and distributed sensor networks for grassroots environmental monitoring and *Tele-Guides*, a community-based telephone service to connect multilingual volunteers, non-English speaking immigrants, and social service agencies. More information at <http://www.3-way.org/>

## 5. Summary, Implications and Conclusions

The objective of this thesis was to disclose the intimate relationship between space and innovation, that is, that space does matter for innovation, learning and creativity. Since space (along with time) is a fundamental material dimension of social and organizational life, I came up with four material dimensions (or types) of space for assessing innovation in design organizations. My analysis showed why these different spaces should be considered and studied. Moreover, space and its material dimensions such as the urban space, building, workplace and users' experience (space) can be very helpful for thinking, nurturing and taking action in the innovation process. These spaces constitute what I refer to as organizational embodiment, that is, spaces of possibilities for organizational practice to emerge and to be structured (Giddens, 1985 Orlikowski 2002). In other words, space is a "continuum embodiment" of the organization in all the layers of cognition and structure because space mediates the interaction between the "knowing" capacities and the environment.

As such, an urban space with its infrastructure, soil uses and people moving in and out is a space for work practices and innovation to emerge. New ways of doing things happen in a place that is within a location in the space of flows. That space and its surrounding places give a context to the building and to the workplace. The urban space shapes both the building and the work practices. The urban ecology is the environment for the organizational embodiment, which includes other layers such as the building and the workplace. The users' experience may or may not be a space of organizational embodiment. That would depend on different factors, including the users' location, the type of design done at the organization and the organizational choices regarding social practice.

The analysis of spaces as well as of practices is not a study of representations or espoused architectural discourses but rather an exploration of "situated spaces-in-use" within organizations. That is, to explore the

*situated* space (urban life, functionality of building, agility of workplace and proximity of users' experience) and its relationship to the way organizations enact creativity and innovation.<sup>54</sup>

I examined these matters looking at three very interesting case studies that certainly are in advanced levels of creativity, knowledge generation and innovation. By looking at their spaces and places, I have learned about some of their constraints and resources for innovation and knowledge creation.

I started this research with this blank grid relating the case studies with the four spaces of organizational embodiment. It is time to fill it up.

	<b>IDEO</b>	<b>Continuum</b>	<b>Media Lab</b>
<b>Urban</b>	Cluster	City	University
<b>Building</b>	Opportunistic	Random	Conscious Work of Art
<b>Workplace</b>	Agile, playful Evolving Present	Open, territorialities Past & present	Glass, "stuff" Future vision
<b>Users</b>	Construction Central Sophistication	Important	Labeling opportunity missing context

---

<sup>54</sup> I have learned, both epistemologically and methodologically, about the difference between plans, spatial representations or PR discourses and situated actions, spatial textures and actual work practice. That separation between espoused practice and actual practice or the significance of the organization's position on the space of flows or in the space of places is something that appeared in the experience of work and space. That learning guided me to start thinking about my research endeavor as an exploration of "situated space-in-use."

The building is a boundary object, located within a territorial contiguity, that encloses different places. On the one hand, the performance of the building or, rather, the learning of the people in it, is affected by the larger urban ecology. On the other, the building marks the space of flows and encloses work places, separating them from the surroundings and peripheries. Some buildings and their workplaces are more separated than others from their respective surroundings.

When it comes to innovation and urban space throughout the world, the so-called “milieux of innovation”<sup>55</sup> are phenomena, primarily, metropolitan: “major metropolitan centers around the world continue to cumulate innovation-inducing factors and to generate synergy, in manufacturing as in advanced services.” (Castells, 1996/2000: 421) Even in the case of what Castells refer to as “secondary” (often new or renovated) milieux of innovation constituted sometimes as decentralized systems that spin off from primary metropolitan centers, they often “find their niches in competition with their original urban matrices.” (Castells, Idem:423). The urban space matters and can make a difference in the organizations’ innovation and creativity, i.e., what happens inside can become leveraged or constrained by such urban surroundings and places.

So, the urban space has, then, an intimate connection with innovation. But such account is rather general. Researchers and managers need to look closely at the specifics of the situated urban place to assess its impact on design organizations’ performance to take action on the matter.

As I discuss later there are different levels of intervention and action “on the space.” The workplace and the users’ experience is certainly more actionable than the urban space. The workplace is usually in a process of co-

---

<sup>55</sup> By milieu of innovation, Castells understand a “specific set of relationships of production and management, based on a social organization that by and large shares a work culture and instrumental goals aimed at generating new knowledge, new processes, and new products.” (Castells, 1996/2000)



evolution with latent possibilities for enaction and change. The building is also learning but sometimes slower dealing with several constraints due to its original overdesigned inception (Brand 1994), as the Media Lab building. The urban space is a field with many more stakeholders, interests and perspectives that constrain the possibilities of “urban place making” to a certain degree. It is rather difficult to coordinate the social action for urban place making. One action to be taken though, in the case of a hostile ecological space, is to move from one location to another that, in certain circumstances, may enable both urban and workplace making.

### 5.1 Urban Places as the larger context for design innovation

The ecological and urban space matter, in different ways, to IDEO, Media Lab and Design Continuum. My analysis of the situated urban spaces showed the differences in the type of cluster, in the type of university and research environments and in the urban stimuli of cities.

The position of IDEO in both Silicon Valley and Route 128, seen from the vantage of the milieu of innovation, seems similar. Both are in important high-technology centers, nearby important cities and financial services, and connected through highways and airports along the space of flows. If we take the representations and images as they come from IDEO’s discourse, that is a reasonable account.

However, if we explore the *situated buildings* and their surroundings as well as the designers’ experience, another picture emerges. IDEO Lexington is in the midst of an industrial park where highways converge, firms are vertically integrated and where “places” (restaurants, people, cultural venues) for meaning (knowledge) creation are rather scarce in the environment.

From the point of view of emphatic design (the core business of IDEO), the office is positioned in a hostile environment (space of places) where there is not too much going on to the eyes and senses of a designer looking at how

her prototype/product will fit into lifestyles and human behavior. The location negatively impacts IDEO's Boston office performance.

Further, if we take into account scholarly research on regional advantage such as Saxenian (1994), the ethnography and experience research is corroborated. Route 128 has evolved in a different way than Silicon Valley has: the former is dominated by autarkic corporations that internalize a wide range of productive activities, whereas the latter is a network-based system that promotes learning and mutual adjustment.

The larger space for organizational embodiment, even a so-called "cluster," can negatively impact the experiences of designers and the organizational performance. The communities and networks of practice that populated IDEO have constraints to interact, collide, produce and share knowledge, in part, due to this ecological space. If we look closely at such situated-space-in-use, the cluster can no longer be a cluster for a particular organization such as IDEO Boston.

In the case of the Media Lab, most of its strength as a research organization is due to its location within the territorial boundaries of MIT in Cambridge. The willingness for going global, the funding (in the case of the Media Lab Asia) and the powerful idea of "media arts and sciences" have had somewhat troublesome outcomes in the project of extending the strength of its local place to foreign space such as Germany, India or New Zealand.

There are some limits to achieving that goal of global influence. Even the powerful digital technologies have constraints to move knowledge across geographic boundaries. There is something that cannot be translated. The specifics of the research worlds that unfold in MIT cannot be translated. In order to have success in the global expansion and leadership, there is a need of knowing the territory rather than the map, i.e., the local resources of the organizational media lab world have to be honored.

The Media Lab that is running in Dublin seems quite different. The immediate surroundings of MIT Media Lab are, certainly MIT and all the research and ideas that come out of MIT labs, from engineering and computer science to artificial intelligence, physics and biology. Such a context of research and work is missing in Dublin. The members of Media Lab Europe participate in different kind of activities. So, different knowledge is produced. Different knowing in practice is achieved with consequences in innovation and learning.

These examples show us that innovation, in the context of design organizations, is related to “places” and their urban contexts. The urban contexts and their situated textures can be decisive in enabling “re-embedding conditions” for organizational knowledge to be shared and used across locations.

I am not claiming that such sharing is not possible (in fact it is possible), but rather suggesting that we look at carefully these subtle aspects of organizational practice and their relationship with the ecological space. Overlooking constraints and opportunities of the urban space can seriously damage the organization’s capacity to change, learn and innovate.

## 5.2 Workplace Making Styles

I concentrated much more on the exploration and analysis of the *workplace space* of the three design organizations. This is the research area where knowledge management and architecture intersects, becoming a field for actionable intervention.

Though connected to the urban space (with boundaries and separations), the workplace and office design are immediately related to the ongoing work activities. It is the organizational embodiment in the making. It contains different resources and materials at hand to foster agility, learning and the so-called co-evolution between work and workplace.

The co-evolution is far from being an autonomous or automatic process, but rather an ongoing design game that can be nurtured by materials, social life of the office, transparent messiness and situated boundary objects.

I explored three different styles of workplace making and I think we can compare their styles and bring about some conclusions. Each organization can learn from the other about the way workplaces are constructed. When I say “each” I am also referring to each location (office) of the same organization.

The literature about design firms usually describes IDEO’s innovation practices and processes as very similar to Design Continuum’s (Hargadon 2003). Such accounts usually describe their *similar* process as user-centered design firms with *similar* aspects on their organizational learning such as a flat structure, a sharing culture and a process of rapid prototyping.<sup>56</sup>

However, if we look at their *situated* spaces-in-use, as I did, a different description is required because the supposed similarity is replaced by a different attitude to the space and to workplace evolution with consequences in learning and innovation. Such a different spatial attitude has allowed IDEO to be more agile in pursuing new directions of work practice and business development, creating a competitive advantage. Even having a similar process and similar clients, IDEO’s attitude to space make a difference in its work practice and in the knowledge produced. IDEO’s workplace allows more flexibility, agility and readiness for new projects or new strategic directions as well as for uncertain environments.

Design Continuum has a lower level of co-evolution (back position in the continuum of agility) because, as I described, it has a more random attitude to its urban location, building and workplace. Continuum is positioned strategically on the space of flows, namely, in Boston (literally) and Milan. Its buildings are rather generic and without embodying identity. In terms of workplace making, Continuum has also been active in producing new spaces, especially open spaces with wide hallways but still slight partitions demarking territorialities. Continuum has evolved out of a partitioning heritage. Changes

---

<sup>56</sup> A similar description is also suitable for the MIT Media Lab.

towards open space have been recently. Continuum has triggered new changes because with an open space “change comes more quickly.” There are important differences between the first floor and the basement: not only is their layout very different but also they are not well connected.

There is not a consistent workplace co-evolution since there seem to be different evolutive patterns within an office that, due to the nature of its work, require a coherent physical background to support team and community dynamics. Across Continuum locations, such inconsistency is even greater, creating different embedding conditions that might have effects on how knowledge is created and shared.

That particular way of spacing Continuum’s learning and enacting its space-in-use have consequences in the type of design it does, which is still product development design, particularly, for medical products. With the exception of certain areas of the first floor, Continuum seems not well equipped to handle a new direction of design. The co-evolution, so to speak, has important physical constraints.

If we take the argument of physically situated boundary objects or evocative objects as members of the workplace that might foster prototype development (Schrage, 2000), IDEO (and Media lab) are again in a phase of evolution beyond Continuum. I am not saying that Continuum is going in the same evolving direction, but probably in one similar to IDEO’s.

If we take seriously that argument of playful environment and a meaningful and intelligible mess, maybe Continuum is losing some opportunities of learning, knowledge creation and sharing with its smooth spaces. With a meaningful messy environment full of prototypes, I think, it is still possible to make choices, if there is a robust process. And Continuum has a robust process, which is used in both Boston and Milan.

Therefore, fostering a more playful environment where the products done so far are not only up on the hallway walls (where they are hardly perceived in the *coping mode* of doing things) or on one side of the reception area (for visitors and clients) but rather scattered throughout the working

places to actually remind the collective intelligence and spark the creative dialogue with such products' genealogy. Organizational cognition is done against a physical shared background of practical heritage, i.e., of the way of doing things.

In fact, recent changes at Continuum, especially the partial elimination of cubes since two years ago has been well received because, as I found out, it triggered more shared ownership (knowledge creation) and much less territoriality (decrease of power issues).

So, without being behaviorist, spatial changes led to a change in social practice, that is, in the way designers produce and share knowledge and in the way they relate to each other as members of a mutual and shared intelligible world.

In terms of practical implications, one might suggest, "Why not add more situated boundary objects and evocative objects that carry the shared and received meanings, which might further spark the product/prototype creation?" It might also help to make good choices. It might have a similar beneficial impact on knowledge creation, shared practices (less territorialities), growing involvement and membership, and thus, a creative co-evolution of the workplace.

At least for design organizations and creative industries, open and playful spaces that support situated practices with ad hoc materials facing the unexpected and changing environments, seem key for achieving ongoing agility and learning.

MIT Media Lab also presents an interesting and, sometimes, contradictory relationship between space-in-use and innovation analysis.

As I described earlier, at the lab there is, on the one hand, a discourse of being a bottom-up organization and, on the other, a practice of top-down architecture or, architectural determinism. I summarize this discourse and

practice because we can obtain some concluding remarks about the lab's workplace making.<sup>57</sup>

The lab is certainly not a traditional or hierarchical organization. The official discourse of being a bottom-up organization describes, to a certain degree, many practices at the lab. The faculty have freedom to do their research work. They are hardly "managed" by anyone but they direct the work of graduate students, for whom they are, sometimes, the reason for coming to the lab and for getting their research "inspiration."

The graduate students do, as I said, the bulk of the work. But they live under the umbrella of a faculty member who directs the research group, which adds issues of power/knowledge as well. The experience is varied here, so it is difficult to make a final statement about the experience and practice of graduate students. But there is a great deal of room to do the research, experiment and figure out what to do. That wide open room, which is certainly a privilege, is also a problem in terms of thinking too broadly without direction, which may sometimes lead to "getting stuck and not moving," as one former graduate student told me. I described some of these issues when referring to the lack of a clear and robust innovation process.

An interesting finding in this research was the top-down architectural practice, especially in its embodiment as the glass practice and the transparency philosophy: "Every time we have a reason to renovate the space we will convert the walls into glass" (GT 2004)

Probably other organizations—hierarchical or not—also follow a top-down design approach because it is easier and takes less time. Probably that is the case when someone is planning to design a new building (as the case of the design of the media lab' new building).

But when it comes to workplace making or process architecture, that is, the ongoing process of structuration and change of people who are willing to

---

<sup>57</sup> In describing the Media Lab, as Paul Duguid suggest me, there might be power/knowledge issues since I am near to the practices under study. I have a different type of access than at Continuum or IDEO. Doing a critical exploration of how the lab really works might produce some suspicious feelings.

challenge assumptions about work, employees, workplaces and the ideal state of organizations, top-down approaches are rather useless because they can separate the learners from their sources of awareness and change, that is, from the physical *bricolage* that is created and recreated in an ongoing process of interaction of the embodied communities with their environment.

A material like the glass between offices can decrease both the degree of co-participation in the daily design of spaces and the frequency of messy situations by fostering a vision without resistances (in the sense that all have to be transparent). It may constrain some layers of the co-evolutive process, especially the one related to the role of human agency in the design of the workplace.

The critique that I am pursuing here requires an analysis of the glass as a material and the transparency as a value.

Briefly, the glass allows members to see what people are doing (where are they sitting, what are they doing or not doing), and gives a sense of vision and light. The glass is for seeing through. But it also has constraints: since it is a glass for transparency, it is not usually common (nor expected) to stick photos, post-its and ideas on the glass. It is possible to see prototypes, project announcements and objects (computer machinery mostly) around, but it is difficult to do something with them. The glass can be rigid. In other words, it can become difficult to appropriate it, to use it and re-use it as an evolving material.

As I have tried to show, the organizational (human) relationship with space is circular: we design the space and the space designs us in an ongoing relationship that I have called, following Porter, Schön, Joroff and Horgen (1999), workplace making. Overlooking the constraints of a material like the glass for fostering interaction and creativity may also damage workplace evolution and, thus, its agility to move to new and unexpected directions.

The idea of transparency, i.e., that everyone can look at everyone else's work, can also have unexpected negative consequences in innovation. Researches on Ba have shown that innovation not only happens in places (Kao



2000), but also that such places require some kind of care: “Boundaries must be set within which a meaningful shared context can emerge. This is sometimes called ‘cocooning,’ the practice of building a unique world or context (de Monthoux, 1996). Leaders should set boundaries and protect ba when it is necessary.” (Nonaka, Toyama and Scharmer 2001) Therefore, too much emphasis on transparency as both an organizational and architectural goal may have negative consequences on, precisely, the achievement of the goal itself.

In other words, while transparent walls might be a good solution for a room, a specific context or a project, they could be the worst for emerging and peripheral practices of innovation such as a new group, or newcomers who are doing something different or, apparently, worthless.

It is interesting to contrast the Media Lab’s transparency to IDEO’s. While in the Media Lab the transparency is mainly for members (visitors and sponsors) to look at themselves and the “stuff” around (see below), in IDEO the transparency is for designers to be aware not only of what they are doing, but also what others have done (shelves with objects, designs, products done by other firms) and what users feel and want (as in the case of the group memory spaces).

So, whereas in IDEO the transparency is physically enacted to look through to clients’ demands and users’ needs, in the Media Lab transparent glass is for looking at themselves, at the designers and lead-users inside the building, which is anything but transparent to ecologies beyond the Wiesner building.

Another feature that, I think, complicate the lab’s co-evolution towards “Things That Think” is the computer equipment all over the place. As more work is oriented to things with embedded technology in the environment and as technology itself evolves to ubiquitous computing and scalable networks, the computers have started to feel a bit old fashioned (The Terminal’s garden). But, at the same time, computers and related equipment are objects that

speak about the lab identity, i.e., they carry some of the lab's cultural practice. They tell us what the lab is, so it is not easy to get rid of them.

As some of my ethnographies showed (such as the one in the Telmex lab, 3<sup>rd</sup> floor), these common areas with computers at the center are routinely not spaces-in-use. People work in their offices, most of the time, connected by eyesight and through the glass with those not-in-use common areas. Here lies both a constraint and an opportunity for change, an opportunity to foster workplace making.

Since this research is concerned with practice, enaction and change, I want to offer a recommendation regarding workplace making at the lab.

That recommendation has to do with the transition from a fixed workplace to an activity setting. This is also an opportunity for the kind of work, research and innovation done at the lab. Since much collaboration is within the research groups and the lab is really concerned about mixing disciplines—and, as we saw, there are boundaries in practice due to crucial differences, for example, between the physics and design/art activities—, it might be useful to change places and positions twice a year, once a semester for one week or two weeks or even more often and more flexible. Converting these not-in-use common areas in “activity settings” with some degree of flexible appropriateness could allow people (students, visitors, users, sponsors) to do their work in new ways by exposing them to slightly different environments, to think differently due to new projects, code and new conversations.<sup>58</sup>

These are situational activities that might improve serendipity, unexpected conversations as well as agility and learning by challenging assumptions about work and stable states. They can also foster the creation and sharing of knowledge between complementary or even oppositional groups.

---

<sup>58</sup> This idea about switching with someone in another research group was around the lab, but it has been not put into real practice. It is latent there.

Such activities can be directed towards specific goals of cross-fertilization among groups and research areas or it can be left open for serendipitous or unexpected events related to prototypes, conversations and collaborations.

### 5.3 Spacing and Making Users

Design organizations and other types of organizations are related, in one way or another, to customers. There are different types of customers and network positions in the value-chain of design organizations. I concentrated my analysis on the end-customer, that is, the customer of the customers of IDEO and Design Continuum and the customers of the sponsors of the Media Lab. In other words, the users or rather, communities of users that are using products today and will be using prototypes and new products tomorrow.

Users have been equated to social practice (Tuomi 2002) and to the organizations' environment. Users embody a fundamental context for successful innovation, that is, the context of technology-in-use.

As I showed, they can also be constructed or even become members of an organization. They can also be left aside, idealized or labeled. They are members of that fuzzy construct called "society" or moreover, they are social practice to be structured by future technology. Carrying out the context of successful design, they are and can become important sources for organizational learning and innovation.

Users may or may not be part of the spatial embodiment of the organization. Users, *stricto sensu*, are not a space or a place. They are social practice that might be activated and constructed by an organization or a technology (like Open Source Software), depending on its needs and choices. Users are related to a space in both a literal and metaphorical sense.

Literally, users are in a location (may or may not be the same as the organization) or they can be invited to the office, as IDEO does with their users or as the Media Lab does inviting some youth to program and to play with

technologies over the summer or IAP. Metaphorically, users are a space of experience that the organizations are trying to understand and design for.

Users can become a competitive resource for organizations in times of a network economy. As Michael Schrage (2003) notes, lead-users can help save huge costs as exemplified by Microsoft Windows 95 that was effectively subsidized to the tune of \$900 million by sending out 400.000 beta version copies to thousands of beta sites worldwide, to individuals and organizations willing to help track bugs and suggest improvements in exchange for receiving the software in advance.

I showed that IDEO has sophisticated techniques of user-centered research by which they actively construct the users and their contexts and, more importantly, they try to articulate their unarticulated background of needs, tastes and desires.

Another finding was a particular way of media lab's users labeling, a sort of ladder of inference, about the role of users in the innovation and creative process. In media lab discourse/discourse users are and are not taken into account. I also found out a lack of (tacit) knowledge and related techniques for following, constructing users and taking advantage from them. I showed a few exceptions though.

But generally speaking, there is a discourse and practice that tend to see the users as actors unable of thinking about tomorrow's world and needs or as co-designers of technologies. The Media Lab is missing users' contexts and, to a certain extent, it is not seeing their relevance. But the lab may actively construct some of these contexts of technology-in-use. It can construct them both literally and metaphorically. It has the potential to be as radical and creative as it is in pursuing the design of new technologies, in the area of co-invention of the future and maximization of ideas by integrating (lead) users that are in its legitimate periphery.

#### 5.4 The Bottom Line: Tacit Knowledge Creation and Sharing

Most of the knowledge creation in design organizations occurs within offices, in the interaction of people with materials, projects and places. Although there are a common process beyond the geographical barriers of a design organization, I found differences in the work styles and cultures across locations. A great deal of knowledge sticks and remain in the local offices (in a spatial context) and, sometimes, it is not easy shared.

Most of this knowledge is produced by a “tacit and situated knowing” in a place within a particular urban ecology. The ecology or the building, as I did describe, might constrain or enable, depending on the circumstances and choices, such tacit knowledge production and situated knowing capacity.

As Polanyi (1966) put it, such tacit knowing is part of every act of knowing. The explicit knowledge only makes sense and can become a real competitive advantage with the tacit knowing capacity at play. In this sense, what it is at issue is not explicit-tacit knowledge conversion, but rather the disclosing (and working) of tacit knowledge to make explicit knowledge valuable, tradable and mobile (Brown and Duguid 2001).

Our body is “the ultimate instrument of all our external [explicit] knowledge, whether intellectual or practical.” (Polanyi 1966: 15) The urban location, the building, the workplace and even the users, as we saw, are critical to foster learning and awareness in our body-based relationship with the creation and sharing of knowledge.

For this reason, workplace making is such an important activity and factor of innovation because incorporate the body and its tacit knowing capacity in the design and learning of the work space. The design of spaces that overlook the resources of the body (of the communities and teams of practice) for “place making” can damage one of the sources of organizational innovation.

What can we do, when as Moggridge says, “If you want to get effective tacit knowledge sharing, you need something you can experience like a physical browsing.” The body is a fundamental source of knowledge in design organizations (and probably in other types), but if we think of an experience of physical browsing across locations, or even floors in a building, we may encounter important limits for knowledge sharing.

On the one hand, the body cognition supported by urban ecologies, agile and evolving workplaces is crucial, and on the other hand, there is a limit on the scalability and extension of that cognition across physical boundaries.

How can organizations and leaders manage such body-based resources and capacities and overcome the related limits of tacit knowledge sharing?

By enabling workplace making and by spreading the practice of tacit knowing and the relation to which the explicit knowledge makes sense because “knowledge, in short, runs on rails laid by practice” (Brown and Duguid 2001: 204). Both the enabling of workplace making and the spreading of work practice are intimately related to space design and space-in-use.

On the one hand, the design of spaces has to avoid “overdesign,” anticipate breakdowns on work situations, and allow agility by flexible materials, activity settings and furniture. On the other, attending at specific and productive *spaces-in-use* in one location such as a room, a project space, a particular way to work in a open space that may trigger, as we saw, less territorialities and more shared ownership (knowledge). Also attending at features of a building-in-use might open directions and know-how for spreading practice across locations and thus, enable the conditions for tacit knowledge sharing.

One of my objectives in this thesis has been to highlight the relevance of different types of space on a certain type of organizational innovation. The life and evolution of an organization, so to speak, has to do with its embodiment.

The “making” of organizational places in the case studies and, probably in other cases, is something that deserves attention, care and action not of only one department or level (such as real estate people or managers) but rather require the participation of a great deal of members. To enable such “making” and co-evolution is to enable organizational agility and collective leadership to deal with changing environments and increasing uncertainty. That is to say that not only the mind but also the body and its surrounding spaces have to be ready to learn.

## 6. REFERENCES

- Adler, Paul and Winograd, Terry. (1992), *Usability: Turning Technologies into tools*. New York, Oxford. Oxford University Press.
- Ackerman. Mark, Pipek. Volkmar and Wulf, Volker (eds) (2003) *Sharing Expertise: Beyond Knowledge management*. The MIT Press. Cambridge, Mass. London, England.
- Allen, Thomas (1977). *Managing the Flow of Technology*, Cambridge (MA): MIT Press, reprinted 1993.
- Allen, Thomas (1997), *Architecture and Communication Among Product Development*, Sept 1997, Sloan School of Management WP # 3983, MIT.
- Allen and Cohen, S. (1969) Information flow in research and development laboratories. *Administrative Science Quarterly*, 14: 12-19.
- Argyris, C. and Schön, D. (1978) *Organizational Learning: A Theory of Action Perspective*. Addison-Wesley. Reading, MA.
- Argyris, C. and Schön, D. (1996) *Organizational Learning II: Theory, Method and Practice*. . Addison-Wesley. Reading, MA.
- Avgerou, C. and Walsham, G. (eds) (2000) *Information Technology in Context*, Ashgate, Aldershot, UK.
- Barlow, John Perry (1999) Declaration of the Independence of Cyberspace. <http://www.eff.org/barlow>
- Basalla, George (1988) *The Evolution of Technology*. New York: Cambridge University Press.
- Bateson, Gregory (1972) *Steps to an Ecology of Mind*. NYC: Ballantine Books.
- Becker, Howard (1982), *Art Worlds* (Berkeley: University of California Press).
- Becker, H. (1972) A school is a lousy place to learn anything in. *American Behavioral Scientist* 16: 85-105.
- BEYOND PRODUCTIVITY: Information Technology, Innovation and Creativity (2003). National Research Council of the National Academies.
- Bijker, W. and Pinch, T. (1987) "The Social Construction of Facts and Artifacts: Or how the Sociology of Science and the Sociology of Technology Might Benefit Each Other" in Bijker, W. E., T. P. Hughes and T. Pinch (eds.) *The Social Construction of Technological Systems*, Cambridge: MIT Press.
- Bijker, Wiebe E., Hughes, Thomas P. and Pinch, Trevor (eds.) (1987). *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology*. Cambridge Massachusetts and London: The MIT Press.
- Bijker, Wiebe E. and Law, John (1994). *Shaping Technology/Building Society. Studies in Socio-technical Change*. Cambridge Massachusetts and London: The MIT Press.
- Boland, RJ and Tenkasi, RV (1995) Perspective making and perspective taking in Communities of Knowing, *Organization Science*, (6:4), p.350-372.
- Booth, Wayne, Colomb, Gregory and Williams, Joseph (1995) *The Craft of Research*. Chicago: The University of Chicago Press.
- Bourdieu, Pierre (1977) *Outline of a theory of Practice* . Cambridge, UK. Cambridge University Press.



- Brand, Steward (1987) *The Media Lab, Inventing the future at MIT*. New York, Harvard Business Review, January/February.
- Brand, Steward (1994) *How Buildings Learn: What happens after they're built*. New York, Viking. Published by the Penguin Group.
- Brown, JS (1999), "Introduction," p.xi in *Art and Innovation: The Xerox PARC Artist-in-Residence Program*, Craig Harris (ed), Cambridge: The MIT Press
- Brown, JS (2003) "Innovating Innovation" Foreword to Chesbrough, H. (2003) *Open Innovation The New Imperative for Creating and Profiting from Technology*. Boston: Harvard Business School Press.
- Brown, JS and Cook, Scott D. N. (1999) *Bridging Epistemologies: The Generative Dance Between Organizational Knowledge and Organizational Knowing*. *Organizational Science/ Vol. 10, No. 4, July- August 1999* pp. 381-400.
- Brown, John and Duguid, Paul (2000/2002) *The Social Life of Information*. Boston: Harvard Business School Press.
- Brown, John and Duguid, Paul (1991) *Organizational Learning and Communities of Practice: Toward a Unified View of Working, Learning and Innovation*, *Organization Science*, (2:1), p.40-57.
- Brown, J. and Duguid, P. (2000) *Knowledge and Organization: A Social-Practice Perspective*. *Organizational Science*, 2001 *INFORMS Vol. 12, No. 2, March-April 2001*, pp. 198-213.
- Brown, S.L. and Eisenhardt K.M. (1995) *Product development: past research, present findings, and future directions*. *Academy of Management Review*, 20 (2): 343-78.
- Burt, Ronald (1992) *Structural Holes: The Social Structure of Competition*. Cambridge, MA: Harvard University Press.
- Burton-Jones, Alan (1999) *Knowledge Capitalism: Business, Work, and Learning in the New Economy*. Oxford: Oxford University Press.
- Cairncross, Frances (2001) *The Death of the Distance: How the Communications Revolution will change our Lives*. Boston: Harvard Business School Press.
- Callon, Michel (1980) *The state and technical innovation: A case study of the electric vehicle in France*. *Research Policy*, 9:358-376
- Carr, N. (2003) "IT doesn't Matter." Boston: Harvard Business Review, May.
- Castells, Manuel (1996/2000) *The Information Age: Economy, Society, and Culture Vol 1: The Rise of Network Society*. Oxford: Blackwell.
- Castells, Manuel (1997) *The Information Age: Economy, Society, and Culture Volume 2: The Power of Identity*. Oxford: Blackwell Publishers.
- Castells, Manuel (2001) *The Internet Galaxy: Reflections on the Internet, Business, and Society*. Oxford: Oxford University Press.
- Castells, Manuel "Grassrooting the Space of Flows" in (2000) *Cities in the Telecommunication Age: The fracturing of geographies*. Wheeler, Aoyama and Wharf (eds). Routledge, NY and London.
- Carlile, Paul and Osterlund, Carsten (2003) "How Practice Matters: A Relational View of Knowledge Sharing" in Marleen Huysman, Etienne Wenger and Volker Wulf (eds.) *Communities and Technologies*. The Netherlands : Kluwer Academic Publishers.

- Carlile, Paul R. (2002) "Transferring, Translating and Transforming: An Integrative Framework for Managing Knowledge across Boundaries". Sloan School of management. Cambridge, Ma. Unpublished.
- Chandler, A. (ed)(1990) *Scale and Scope: The Dynamics of Industrial Capitalism*. Cambridge, MA: Belknap Press, 1990.
- Chesbrough H. W. (2003) *Open Innovation: The New Imperative for Creating and Profiting from Technology*. Boston: Harvard Business School Press.
- Clark, Andy (1997) *Being There: putting Brian, Body and World Together Again*. A Bradford Book. MIT Press. Cambridge, Mass. London, England.
- Clark, Herbert (1992). *Arenas of language use*. University of Chicago Press.
- Cohen , W.M. and Levinthal, D.A (1990) Absorptive capacity: a new perspective on learning and innovation. *Administrative Science Quarterly*, 35: 128-52.
- Daft, Richard L. and Weick, Karl E. (1984) *Toward a Model of Organizations as Interpretation Systems*. *Academic of Management Review*, 1984, Vol. 9, No. 2, 284-295.
- Davenport, Thomas and Prusak, Laurence (1998) *Working Knowledge: How Organizations Manage What They Know*. Boston: HBS Press
- de Monthoux, P.G (1996). "Conversation Kills Ideas." In C. O. Scharmer, ed., "Crafting Thought Architectures. 21 Dialogue-Interviews on Organization Studies, Strategy, Leadership & Controlling in the 21st Century." Unpublished project report, Vol. II: 409–438, Cambridge, MA
- De Sola Pool, Ithiel (1981). *The Social Impact of the Telephone*. Cambridge, Massachusetts: MIT Press, 1981
- DEGW (2004) "Office Design and its impact on busines performance" CABE, 29<sup>th</sup> March 2004.
- DEGW (2003) "Measuring Success". Material from 4.181 workshop
- Dosi, G. (1984) *Technological Paradigms and technological trajectories: A suggested interpretation of the determinants and directions of technical change* *Research Policy*. 11: 147-162.
- Dougherty, D. (1992) *A practice-centered model of organization renewal through product innovation*. *Strategic Management Journal*, (Summer):1377-92.
- Dreyfus, Hubert (1979) *What Computers Can't Do*. Revised edition. New York: Harper and Row.
- Dreyfus, Hubert (2001) *On Internet: thinking in action*. New York: Routledge.
- Dreyfus, Hubert and Harrison Hall [eds.] (1992) *Heidegger: A Critical Reader*. Cambridge, MA: Blackwell
- Duffy, Francis (1997) *The New Office*. London: Conrad Octopuss.
- Duffy, Francis (1999) *Architectural Knowledge*. London: Routledge.
- Ehn, Pelle (1992) "Scandinavian Design: On Participation and Skill" in Paul Adler and Terry Winograd (eds.) *Usability: Turning Technologies into Tools*. NY: Oxford University Press.
- Engeström, Y. (1987) *Learning by expanding*. Helsinki: Orienta-Konsultit Oy.
- Flores, Fernando and Winograd, Terry (1986) *Understanding Computers and Cognition: A New Foundation for Design*. Norwood, N.J.: Ablex Publishing.

- Florida, Richard (2002) *The Rise of the Creative Class: And How It's Transforming Work, Leisure, Community and Everyday Life*. NY, Basic Books.
- Fodor, J. *RePresentations: Philosophical Essays on the Foundations of Cognitive Science*. Cambridge, Massachusetts: The MIT Press, A Bradford Book.
- Frey, William and DeVol, Ross (2000) "America's Demographic in the New Century: Aging baby Boomers and New Immigrants as Mayor Players." Milken Institute.
- Fulk, Janet (1993) Social construction of communication technology, *Academy of Management Journal*, 36:921-950
- Fulk, Janet and Steinfield, Charles (eds.) (1990) *Organizations and Communication Technology*. Newbury Park, CA: Sage.
- Garcia, C. (2003). A Framework for Political Edutainment: the case of the Daily Show in MIT Media in Transition Conference, Cambridge, May 2-4, 2003.
- Geertz, Clifford (1973/2000) *The Interpretation of Cultures*. NY: Basic Books.
- Giddens, Anthony (1990) *The Consequences of Modernity*. London: Blackwell.
- Giddens, Anthony (1984) *The Constitution of Society*. Berkeley and Los Angeles: University of California Press.
- Glaeser, Edward (1998) "Are Cities Dying?" *Journal of Economic Perspectives*, 12, 1998, pp. 139-160.
- Glaeser, Edward, Scheinkman and Shliefer Andrei, "Economic Growth in a Cross Section of Cities" *Journal of Monetary Economics*, 36, 1995, pp.117-143
- Granovetter, Mark (1973) The Strength of Weak Ties. *American Journal of Sociology* 78 (6): 1360- 80
- Greenbaum, Joan and Kyng, Morten (1991). *Design at Work: Cooperative Design of Computer Systems*. Hillsdale, New Jersey. Lawrence Erlbaum Associates, Publishers.
- Hagedoorn, John (1989) *The Dynamic Analysis of Innovation and Diffusion: A Study in process Control*. London: Pinter Publishers.
- Hargadon, A. (2003) *How Breakthroughs Happen: The Surprising Truth about How Companies Innovate*. Boston: Harvard Business School Press.
- Hargadon, A. and Sutton, R. (1997) Technology Brokering and Innovation in a Product Development Firm, *Administrative Science Quarterly*, (42), p.716-749.
- Haythornthwaite, Caroline (2002) Strong, Weak and Latent Ties and the impact of New Media. *The Information Society* 18 (5): 385-401.
- Heidegger, Martin (1950) "The Question concerning Technology" in *Question concerning Technology*. New York: Routledge.
- Heidegger, Martin (1927/1997) *Ser y Tiempo*. Santiago: Editorial Universitaria.
- Henkel, Joachim and Eric von Hippel (2003). Welfare implications of User Innovation. MIT Sloan School of Management, Working Paper 4327-03, June 2003.
- Henn, Gunter and Meyhofer, Dirk (2002) *Architecture of Knowledge*. A conversation between Gunter Henn and Dirk Meyhofer on 7<sup>th</sup> June 2003 in Munich. Junius.

- Horgen, Joroff, Porter and Schön (1999) *Excellence by Design: Transforming workplace and work practice*. New York: John Wiley and sons, Inc.
- Hughes, Thomas (1989) *American Genesis: A Century of Invention and Technological Enthusiasm*. New York: Penguin Books.
- IDEO (2003) "Designs on Behavior" Human factors proprietary materials.
- Jacobs, Jane (1961-1993). *The Death and Life of Great American Cities*. New York: The Modern Library.
- Jenkins, H. "Quentin Tarantino's Star Wars? Digital Cinema, Media Convergence and Participatory Culture" (2003) in *Rethinking Media Change*, edited by Jenkins, H. and Thorburn, D. Cambridge: MIT Press.
- Jenkins, H. (1992) *Textual Poachers: Television Fans & Participatory Culture (Studies in Culture and Communication)* Routledge.
- Joroff, Porter, Feinberg and Kukla (2001) *The Agile Workplace: Supporting people and their work*. Gartner and Massachusetts Institute of Technology.
- Kee, Shujimori, Morshead, Tsakonas, Kohlert, Allen and Henn (2002) MIT Media Lab Workplace Performance: Architecting the Knowledge Driven Organization. Final Presentation, December 9, 2002, E51-372.
- Kelley, David (1996). *The designer's stance in Winograd et al. Bridging Design to Software*. Addison-Wesley. 1996
- Kelley, Kevin (1998) *New Rules for the New Economy: Ten Radical Strategies for a Connected world*. New York: Penguin Books. Pp. 94-95.
- Kelley, Tom (2001) *The Art of Innovation: Lessons in Creativity from IDEO, America's Leading Design Firm*. Currency Books.
- Kranzberg M. and Pursell, Carroll (eds.) (1967) *Technology in Western Civilization*, 2 vol., New York: Oxford University Press.
- Krugman, P. (1991). *Geography and Trade*. Cambridge, MA: MIT Press.
- Lakoff, George and Johnson, Mark (1999) *Philosophy in the Flesh: The Embodied Mind and Its Challenge to Western Thought*.
- Latour, Bruno (1986) "Visualization and Cognition: Thinking with Eyes and Hands" *Knowledge and Society* 6 (1): 1-40
- Latour, Bruno (1987). *Science in Action*. Cambridge, MA: Harvard University Press.
- Lave, Jane and Wenger, Etienne (1993). *Situated Learning: Legitimate Peripheral Participation*. New York: Cambridge University Press.
- Lea, M., O'Shea, T., and Fung, P. (1999) *Constructing the Networked Organization: Content and context in the development of electronic communication*. In *shaping organization form: Communication, connection, and community*, eds. G. Desanctis and J. Fulk, pp.295-324. Newbury Park, CA: Sage.
- Leonard, Dorothy and Swap, Walter (1999) *When Sparks Fly: Igniting Creativity in groups*. Boston: Harvard Business School Press.
- Leonard-Barton, Dorothy (1995). *Wellsprings of Knowledge: Building and Sustaining the Sources of Innovation*. Boston: Harvard Business School Press.

- Lester, R and Piore, M (2004) *Innovation: The missing Dimension*. Cambridge: Harvard University Press.
- Levitt, B. and March, J. (1988) Organizational Learning, *Annual Review of Sociology*, 14, p.319-340.
- Lévy, Pierre (1997) *Collective Intelligence: mankind's emerging world in cyberspace*. Cambridge MA: Perseus Books.
- Lojacono, Gabriella and Zaccai, Gianfranco (2003) *MIT Sloan Management Review*. Vol. 45 No. 3.
- Lucas, Robert Jr. (1988) "On the Mechanics of Economic Development" *Journal of Monetary Economics*, 22, pp.38-38.
- Luhmann, N. (1995). *Social systems*. Stanford, CA: Stanford University Press.
- Luhmann, N. (1990). *Die Wissenschaft der Gesellschaft*. Frankfurt am Main: Suhrkamp
- Mahnke, Frank H (1996) *Color, Environment and Human Response: An Interdisciplinary understanding of Color and Its Use as a Beneficial Element in the Design of the Architecture Environment*. New York: Van Nostrand Reinhold.
- March, JG. (1991) Exploration and exploitation in organizational learning, *Organization Science*, 2(2), p.71-87.
- March, JG and Simon, HA (1958) *Organizations*. Wiley, New York.
- Marshall, A. (1920). *Industry and Trade*. London: Macmillan.
- Marx, K. (1859) *A Contribution to the Critique of Political Economy*.
- Marx, K. and Engels, F. (1845-46) *The German Ideology*, ch. 1 'Feuerbach', in *Marx and Engels: Collected Works* vol. 5.
- Maturana, H. and Varela, F (1982). *El árbol del Conocimiento: Las Raíces Biológicas del Entendimiento Humano*. Santiago: Editorial Universitaria.
- McLuhan, Marshall (1962) *The Gutenberg Galaxy: The Making of Typographic Man*. Toronto: The University of Toronto Press.
- McLuhan, Marshall (1964) *Understanding Media: The Extensions of Man*. New York: McGraw-Hill. Inc.
- Merleau-Ponty, Maurice (1962) *Phenomenology of Perception*. London: Routledge & Kegan Paul.
- Milgram, Stanley (1967) The small world experiment. *Psychology Today*.
- Miller, Carolyn (1984) Genre as social action. *Quarterly Journal of Speech*, 70:151-167.
- Mitchell, William J. (2003) *ME++*. The Cyborg Self and the Networked City, Cambridge, MA; MIT Press.
- Mitchell, William (1995) *City of Bits: Space, Place and the Infobahn*. Cambridge: MIT Press.
- Minsky, Marvin (1985, 1986) *The Society of Mind*. A Touchstone Book. Published by Simon and Schuster, Inc.
- Nardi, Bonnie (1996) *Studying Context: A comparison of Activity Theory, Situated Action Models, and Distributed Cognition in Context and Consciousness: Activity Theory and Human-Computer Interaction*, Bonnie Nardi (ed). Cambridge, MA: MIT press.

- Nardi, Bonny and Vicki O'Day (1999) *Information Ecologies: Using Technology with Heart*. Cambridge: MIT Press.
- Negroponete, N. (2003) "Session One: Extreme Globalization" Key Note in *Extreme Communications A Radical Rethinking of Business, Technology and Regulatory Strategies*, Cambridge, MIT.
- Negroponete, N. (1995) *Being Digital*. Cambridge, MA. MIT press.
- Nelson, R. and Winter, S. (1982) *An Evolutionary Theory of Economic Change*. Cambridge, MA .Harvard University Press.
- Nishida, Kitaro (1920) *The Standpoint of religion*.  
<http://www.aloha.net/~albloom/sdn/nishida1.html>.
- Nonaka, I. (1994) A dynamic theory of organizational knowledge creation, *Organization Science*. (5), p.14-37.
- Nonaka and Nagata, A. (2000). A firm as a knowledge- creating entity: a new perspective on the theory of firm. *Industrial and Corporate Change*, 9 (1): 1-20.
- Nonaka, I. And Takeuchi, H. (1995) *The knowledge creating company: How Japanese Create the Dynamics of Innovation*. Oxford University Press, N.Y.
- Nonaka, Toyama, R and Konno, N. (2000). SECI, ba, and leadership: a unified model of dynamic knowledge creation. *Long Range Planning*, 33: 5-34.
- Nonaka, Toyama and Scharmer (2001). Building Ba to Enhance Knowledge Creation and innovation at large firms, In *Dialogue on Leadership*.
- Orlikowski, W. (2002) Knowledge in Practice: Enacting a Collective Capability in Distributed Organizing, *Organization Science*, (13:3), p.249-273.
- Orlikowski W. and Yates, J. (1992) Genres of organizational Communication: A structurational approach to studying communication and media. *Academy of Management Review*, 17: 299-326.
- Orr, J. (1990) Narratives at work: Story telling as cooperative diagnostic activity. *Proceedings of the Conference on Computer Supported Cooperative Work*, Austin, Texas.
- Orr, J. (1996) *Talking about Machines: An Ethnography of a Modern Job*. Ithaca, NY:IRL Press.
- Oudshoorn Nelly and Pinch, Trevor (eds.) (2003) "How Users and Non-Users Matter" in *How Users Matter The Co-Construction of Users and Technology*. Cambridge: MIT Press.
- Papert, Seymour (1980) *Mindstorms: Children, Computer and Powerful Ideas*. Cambridge, Massachusetts: Perseus Publishing.
- Pine II, Joseph and Gilmore, James (1999) *The experience Economy: Work and Theatre & every business a stage*. Boston: Harvard Business School Press.
- Polanyi, Michael. (1958) *Personal Knowledge: Towards a Post-Critical Philosophy*. The University of Chicago Press, Chicago 60637.
- Polanyi, Michael. (1966) *The tacit dimension*. Gloucester, Mass. Peter Smith.
- Porter, Michael, "Clusters and The New Economics of Competition." *Harvard Business Review*, November-December 1998.

- Prahalad, C.K. and Ramaswamy, Venkatram (2003) "The new Frontier of Experience Innovation". Cambridge, MA. MIT Sloan Management Review. Vol. 45 No. 3.
- Raffle, Hayes (2004) "Topobo: A 3-D Constructive Assembly System with Kinetic Memory". Master of Science Thesis in Media Arts and Science. MIT. Cambridge, Mass.
- Rheingold, H. (1994) *The Virtual Community: Homesteading on the Electronic Frontier*. New York: Harper Collins Publishers.
- Rodríguez, D. (1995) *Gestión Organizacional*. Ediciones PUC, Santiago: 1995.
- Sassen, Saskia (2000). *Cities in a World Economy*. Pine Forge Press.
- Saxenian, Anna Lee (1994) "The Limits of Autarky: Regional Networks and Industrial Adaptation in Silicon Valley and Route 128". Prepared for HUD Roundtable on Regionalism sponsored by the Social Science Research Council, Dec 8-9, 1994.
- Scharmer, C. O., Arthur, B., Day, J., Jaworski, J., Jung, M., Nonaka, I and Senge, P (1999-2000) *Illuminating the Blind Spot: Leadership in the Context of Emerging Worlds*. In *Leader to Leader* (Spring 2002), p. 11-14. McKinsey-Society for Organizational Learning (SoL) Leadership Project.
- Schön, Donald (1967) *Technology and Change The New Heraclitus*. New York: A Seymour Lawrence Book / Delacorte Press.
- Schön, Donald (1983) *The Reflective Practitioner : How Professionals Think in Action*. New York: Basic Books.
- Schrage, Michael (2004). *The Innovation Subsidy*. MIT Sloan Management Review. Vol. 45 No. 3.
- Schrage, Michael (2000) *Serious Play: How the World's Best Companies Simulate to Innovate*. Boston, Mass. Harvard Business School Press.
- Schumpeter, Joseph A. (1934) *The Theory of Economic Development: An Enquiry into Profits, Capital, Credit, Interest and the Business Cycle* (Cambridge, MA: Harvard University Press). [See p. 63.] [\*0]
- Schumpeter, Joseph A. (1943) *Capitalism, Socialism and Democracy* (London: Allen and Unwin). [See pp. 82-83.]
- Scott, A. (1988a). *Metropolis: From the division of labor to urban form*. Berkeley, CA: University of California Press.
- Searle, J. (1980) *Minds, brains, and programs*. *Behavioral and Brain Science* 3:417-457. Reprinted 1981 in *Mind Design: Philosophy Psychology, Artificial Intelligence*, ed. J. Haugeland. Cambridge, MA: The MIT Press, A Bradford Book.
- Seiler, John A (1984) "Buildings and Behavior" from "Architecture at Work". Cambridge, MA. Harvard Business Review p. 120.
- Senge, Peter (1990) *The Fifth Discipline: The Art and Practice of the Learning Organization*. Doubleday, New York.
- Shah, Sonali K. (2003) *Community-Based Innovation & Product Development: Findings from Open Source Software and Consumer Supporting Goods*. PhD. Unpublished Thesis. Sloan School of Management, MIT. Cambridge, Mass.

- Shannon, C and Weaver, W. (1949) *The Mathematical Theory of Communication*, Urbana, Illinois: University of Illinois Press.
- Sproull, L. and S. Kiesler (1991) *Connections: New Ways of Working in the Networked Organization*, Cambridge: MIT Press.
- Stone, Philip J. And Luchetti, Robert (1985) Your office is where you are. Cambridge, Mass. Harvard Business Review.
- Storper, M. (1989). The transition to flexible specialization in the U.S. film industry: External economies, the division of labor, and the crossing of industrial divides. *Cambridge Journal of Economics*. 13, 273-305.
- Suchman, Lucy (1987) *Plans and Situated Actions*. Cambridge: Cambridge University Press.
- Suchman, Lucy and Randall Trigg (1991) "Understanding practice: Video as a medium for reflection and design" in J. Greebaum and M. Kyng [eds.] *Design at Work*: 65-89. Hillsdale, NJ: Erlbaum.
- Toffler, Alvin (1980) *The Third Wave*. New York: William Morrow.
- Tsoukas, H. (1996) The firm as a distributed knowledge system: A constructionist approach, *Academy of Management Journal* (41) p.464-476.
- Tuomi, Ilkka (2002) *Networks of Innovation: Change and Meaning in the Age of The Internet*. Oxford: Oxford University Press.
- Tuomi, Ilkka (2002) *The Future of Knowledge Management*. Lifelong Learning in Europe (LLinE), vol VII, issue 2/2002, pp. 69-79
- Tuomi, Ilkka, (2003) *Beyond User-Centric Models of Product Creation*. Paper submitted for the COST Action 269 "User Aspects of ICT" conference: The Good, The Bad and The Irrelevant, 3-5 September 2003.
- Turkle, Sherry (1995) *Life on the Screen: Identity on the Age of the Internet*.
- Turkle, Sherry (2004) *Evocative Objects: Things We Think With*. MIT Technology and The Self Initiative. (Forthcoming)
- Tushman, Michael L. and Anderson, Philip (1997) *Managing Strategic Innovation and Change*. A collection of readings. Oxford, NY. Oxford University Press Inc.
- Tyre, M. and Von Hippel, E. (1997) *The Situated Nature of Adaptive Learning in Organizations*. *Organization Science/ Vol.8 No1*, January-February.
- Van der Veer, R., and Valsiner, J. (Eds.) (1994). *The Vygotsky Reader*. Oxford: Blackwell.
- Varela, F., Thompson, E. and Rosch E. (1991/2000) *The Embodied Mind: Cognitive Science and Human Experience*. Cambridge: MIT Press.
- Vernon, R. (1960). *Metropolis 1985*. Cambridge, MA: Harvard University Press
- Vigotsky, L. (1978). *Mind in Society: The development of Higher Psychological Processes*. Cambridge, Mass: Harvard University Press.
- Virilio, Paul (1995) *The Art of the Motor* (Minneapolis: University of Minnesota Press, 1995)
- Von Krogh, G., Ichijo, K., and Nonaka, I. (2000). *Enabling Knowledge Creation: How to Unlock the Mystery of Tacit Knowledge and Release the Power of Innovation*. Oxford: Oxford University Press.



- Von Hippel, Eric (1988). *The Sources of Innovation*. New York: Oxford University Press.
- Von Hippel, Eric ((1998) *Economics of Product Development by Users: The impact of "Sticky" Local Information*. *Management Science*/Vol 44, No 5, May 1998.
- Von Hippel, Katz (2002). Shifting Innovation to Users via Toolkits. *Management Science*, 2002 Informs, Vol.48, No. 7, July 2002 pp. 821-833.
- Von Hippel, Thomke and Sonnack (1990). *Creating Breakthroughs at 3M*. Harvard Business Review, Reprint 99510.
- Wheeler, James O., Aoyama, Yuko and Wark, Barney (2000) *Cities in the Telecommunications Age, the fracturing of geographies*. New York Routledge.
- Weber, Max (1914) *Economia y Sociedad*. Ciudad de México: FCE
- Weick, Karl (1987) "Theorizing about organizational communication" in Jablin, Putnam and Porter [eds.] *Handbook of Organizational Communication*: 97- 122 Newbury Park, CA: Sage.
- Weick, K. and Roberts, K. (1993) *Collective Mind in Organizations: Heedful Interrelating on Flights Decks*. *Administrative Science Quarterly*, 38 (1993): 357-381.
- Wertsch J.V. (1981). *The concept of Activity in Soviet Psychology*. Armonk, NY: Sharpe.
- Wellman, Barry (2001) *Physical Place and Cyber Place: The Rise of Personalized Networking*. *International Journal of Urban and Regional Research* 25 (2).
- Wenger, Etienne (1998) *Communities of Practice: Learning, Meaning and Identity*. Cambridge, UK. Cambridge University Press.
- Whyte, William F. (1997) *Creative Problem Solving in the Field: reflections on a Career*. London: AltaMira Press.
- Wiener, N. (1964) *Cybernetics, Second Edition: or the Control and Communication in the Animal and the Machine*. Cambridge: MIT Press.
- Williams, Raymond (1972) *Television: Technology and Cultural Form*. Hanover, N.H.: Wesleyan University Press.