ARCHITECTURAL SPACES OF INNOVATION
THE CASE:
METU TECHNOPOLIS

A THESIS SUBMITTED TO
THE GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES
OF
MIDDLE EAST TECHNICAL UNIVERSITY

BY

ÖZLEM BALKAN

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR
THE DEGREE OF MASTER OF SCIENCE
IN URBAN DESIGN
IN
CITY AND REGIONAL PLANNING

DECEMBER 2006

Approval of the Graduate School of Natural and Applied Sciences

Prof. Dr. Canan ÖZGEN
Director

I certify that this thesis satisfies all the requirements as a thesis for the degree of Master of Science

Prof. Dr. Melih ERSOY
Head of Department

This is to certify that we have read this thesis and that in our opinion it is fully adequate, in scope and quality, as a thesis for the degree of Master of Science

Inst. Sevin OSMAY
Supervisor

Examining Committee Members

Assoc. Prof. Dr. Baykan GÜNAY (METU, CRP) _____

Inst. Sevin OSMAY (METU, CRP) _____

Assoc. Prof. Dr. Çağatay KESKİNOK (METU, CRP) _____

Prof. Dr. Sevgi AKTÜRE (METU, CRP) _____

Assist. Prof. Dr. Abdi GÜZER (METU, ARCH) _____

I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

Name, Last Name: ÖZLEM BALKAN

Signature:

ABSTRACT

ARCHITECTURAL SPACES OF INNOVATION
THE CASE:
METU TECHNOPOLIS

BALKAN, Özlem
M. Sc., Department of City and Regional Planning
Supervisor : Inst. Sevin OSMAY
December 2006, 131 pages

Since the second half of twentieth century, the economic value of scientific work produced in academic settings has been increased, the terms of 'Science Park', 'Technopark', 'Technopole' and 'Technoburb' are appeared. And these settlements attempt to stimulate and promote further use of the knowledge on a certain part of studies that can be put in commercial use. Consequently, the need for concerning the relations in between these technopark settings -within the university settings- and the social network they constitute occurred. This need brought new aspects in 'architecture of knowledge' into consideration and found its reflection in the physical setting such as; the *architectural spaces for innovation*, and the *social quality* of spaces for the spatial performance issues. This spatial point of view is the issue that the study considers through the methodology of spatial data analysis based over social sciences.

The study consigns the initial proposition of the analysis on the relationship between the spatial organization of the Technopark and its communal networks

in spatial, communal and virtual mediums. The second proposition is the relationships whether in the consequence this relationship form spatial typologies or not. The focus of the study is a socio-spatial analysis of the interior public spaces of communal interaction within the technology producing factories, named as “Technoparks”. The study is basically circumscribed within the borders of the case; METU Technopolis’s public or common spaces.

Key words: Socio-spatial analysis, Technoparks, Collaborative networks, Environmental psychology, Behavioural science.

ÖZ

BULUŞÇULUĞUN MİMARİ MEKANLARI
ÖRNEK:
ODTÜ TEKNOPARK

BALKAN, Özlem
Yüksek Lisans, Şehir ve Bölge Planlama Bölümü
Tez Yöneticisi: Inst. Sevin OSMAY
Aralık 2006, 131 sayfa

Yirminci yüzyılın ikinci yarısından itibaren, akademik ortamlarda üretilen bilimsel çalışmanın ekonomik değeri artmış; ve 'bilim parkı', 'teknopark', 'teknopol' ve 'teknokent' kavramları ortaya çıkmıştır. Bu yerleşkeler, bilginin ilgili alandaki çalışma kapsamında ticari kullanıma dönüşmesi ve daha geniş kullanım alanlarına ulaşması açısından önemli bulunmaktadır. Dolayısıyla, özellikle üniversite bağlantılı teknopark yerleşkelerine olan gereksinim ve bunların sosyal-ilişkisel ağları üzerine eğilimler gelişmektedir. Bu gereksinim, 'bilginin mimarisi' açısından da yeni yaklaşımlar ortaya çıkarmakta; ve fiziksel dizge bağlamında yansımalarını *buluşçuluğun mimari mekanı* ve mekansal performans için mekanın *sosyal kalitesi* konularında yansımalar bulmuştur. Bu mekansal bakış açısı, çalışmanın metodolojisini mekansal veri çözümlemesini ve sosyal bilimler zemini üzerinde kurar.

Bu çalışma, teknopark yerleşkesini ve mekansal örgütlenmesinin sosyal örüntüsü ile ilişkilerini, sosyal, mekansal ve sanal ortamlarda inceleme önerisini

geliştirmektedir. Ayrıca çalışmanın bir diğer önerisi de, bu ilişkilerin mekansal bağlamda herhangi bir tipolojik sonuca varıp varmadığını sınamaktadır. Çalışmanın örneklemi ODTÜ Teknopark Yerleşkesinin mekansal ve sosyal ilişkileri çerçevesinde belirlenmiştir.

Anahtar Kelimeler: Sosyo-mekansal analiz, Teknoparklar, Ortak çalışma örgüsü, Çevresel psikoloji, Davranış bilimi.

To My Beloved Family …

ACKNOWLEDGEMENTS

First and foremost, I would like to express my deepest gratitude to my supervisor Inst. Sevin OSMAY for her guidance, advice, criticism, encouragements and insight throughout the research. She has been a spiritual motivator who expanded my horizons and gave strength to carry on. I could never be such persevering without her caring support.

I am deeply indebted to my wise proffessors; Prof. Dr. Baykan GÜNAY for his warm guidance, Assoc. Prof. Dr. Çağatay KESKİNOK for his mindful criticism and valuable suggestions, Assist. Prof. Dr. Adnan BARLAS for his sensitive approach and supportive friendship, Assist. Prof. Dr. Anlı ATAÖV for her in-depth insights and Assist. Prof. Dr. Abdi GÜZER for his experienced and wise criticism. Their endless scope of vision, advice and criticism gave me the opportunity of constructing a better structure for the study.

I am also grateful to my friends, Burçak DEMİROK and Koray ÜRKMEN for their never ending support since the first day of my endeavour. Also I am sincerely thankful to Yasemin UZAKGÖREN for her suggestions, comments and helps. My special thanks to Mehmet ATIL, for his faithful support that gave strength to carry on. I would like to thank all of my friends who respected and understood me throughout the writing process of this thesis.

The limitless mainstay of my family, Deniz, Erdinç and Eylem BALKAN, gave me the energy to persist upon this study. Their support has always been the most meaningful certainty throughout my life. That is why I feel the keenly gratitude for them.

TABLE OF CONTENTS

PLAGIARISM iii
ABSTRACT iv
ÖZ vi
ACKNOWLEDGEMENTS ix
TABLE OF CONTENTS x
LIST OF TABLES xiii
LIST OF FIGURES xiv

CHAPTERS

1. **INTRODUCTION**
1.1. Setting the Research Problem 1
1.2. Scope and Objective 4
1.3. Limitations 5
1.4. Organization of the Study 6

2. SCOPE OF THE STUDY
2.1. Scope 8
2.2. Innovation 9
2.3. Research Settings as Innovation Hubs 11
2.4. Spaces of Knowledge-Processing within University Settings: Technoparks 13
2.5. The Networking of Space as a Setting for Its Community 18
2.6. Common Spaces for Knowledge Productivity 21
2.6.1. Common Space Affecting the Potentials of Innovation 25

3. METHODOLOGICAL APPROACH

3.1. Research Question and Methodology 29

3.2. Spatial Data Analysis Based on Sociological Research 31

3.3. Research Techniques Selected 33

4. THE CASE STUDY

4.1. The Overview of the Concept of Technopark in Turkiye 35

4.1.1. Case Study Selection: METU Technopolis 38

4.1.2. Technopark Setting in METU:

The Functional Formulation of METU Technopolis 39

4.1.3. The Central Architectural Themes of the Selected Buildings 40

4.1.3.1. METU Twins 42

4.1.3.2. METU Halıcı Software House 44

4.1.3.3. METU Silicon Block 47

4.2. 'Measuring' Spatial Performance 49

4.2.1 Material Space within Boundaries, Connections and Networks 49

4.2.1.1. Social Space 52

4.2.1.2. Spatial Experience 55

4.2.1.3. Common Spaces and Innovation Community 59

5. CONCLUSION: FINDINGS OF ANALYSIS

5.1. Findings of the Sociological Analysis 64

5.2. Data Visualization an Analysis 66

5.2.1. Behaviour Mapping of METU Twins 68

5.2.2. Behaviour Mapping of METU Silicon Block 70

5.2.3. Behaviour Mapping of METU Halıcı Software House 76

5.3. The Significance of Developing an Architectural Approach to "Spaces of Innovation" 80

REFERENCES 82
ONLINE REFERENCES ……..……. 86

APPENDICES
APPENDIX A. 88
APPENDIX B. 90
APPENDIX C. 107

LIST OF TABLES

TABLES

Table 4.1 : A time chronological chart of the development of theTechnopark issue 37-38

Table 4.2: Differentiating communities from networks …….. 62

Table C.1 : Number of years spent in the METU Technopolis …...…… 112

Table C.2 : Daily Space Activity Type ……..…….……...…… 113

Table C.3 : Perception and Definition of *common* spaces by the respondents …….. 113-114

Table C.4 : Distribution of Individual Usage of Defined Spaces within a Workday ……..…… 115

Table C.5 : Ratings of the Common Spaces in terms of Individuals' Satisfaction ……..…..……..… 116-118

Table C.6 : List of User-Needs in each Building ……..…….……...… 119

Table C.7 : Activity – Space Relationship ……...…….…… 121

Table C.8 : Face-to-face communication during a work day ……..…123-124

Table C.9 : Evaluation of the Environmental Qualities of Common Spaces ……...…… 126-128

Table C.10 : Frequency distribution of different means of communication used ……..…….……..…..……...… 129

LIST OF FIGURES

FIGURES

Figure 4.1 : Establishment dates …….…….……...….. 35
Figure 4.2 : Sectors ……..…… 35
Figures 4.3-4 : Locations referred to university ……...……...36
Figures 4.5-6 : Locations referred to city nodes, and university settings ...….36
Figure 4.7 : Locations referred to city.....……31
Figure 4.8 : Study fields ……...…….……...…….36
Figure 4.9 : An aereal photo of METU Technopolis area …….. 39
Figure 4.10 : Site plan analysis of METU Technopolis area with the studied buildings highlighted 41
Figure 4.11 : Adopted basement floor plan of METU Twins 43
Figure 4.12 : Adopted ground floor plan of METU Twins 43
Figure 4.13 : Adopted first floor plan of METU Twins 44
Figure 4.14 : Adopted basement floor plan of METU Halıcı Software House.... 45
Figure 4.15 : Adopted ground floor plan of METU Halıcı Software House ...46
Figure 4.16 : Adopted first floor plan of METU Halıcı Software House 46
Figure 4.17 : Adopted basement floor plan of METU Silicon Block 47
Figure 4.18 : Adopted ground floor plan of METU Silicon Block 48
Figure 4.19 : Adopted first floor plan of METU Silicon Block 48
Figure 4.20 : An analysis on the aerial photo of METU Twins 50
Figure 4.21 : An analysis on the aerial photo of Silicon Block 51
Figure 4.22 : An analysis on the aerial photo of Silicon Block 52

Figures 4.23 : The percentage of major activity fields within total number of firms analyzed in each three observed buildings ……. 53
Figures 4.24-25 : Images from METU Twins 54
Figures 4.26-27 : Images from Halıcı Software House 54
Figures 4.28-29 : Images from Silicon Block 55
Figure 4.30 : An "inviting" image from the lobby (METU Twins)..... 56
Figure 4.31 : A "relaxing" view from inner courtyard (METU Twins) 56
Figure 4.32 : The view from the niches of the first floor corridor (METU Twins) 56
Figure 4.33 : An image of common use of the corridor (METU Twins) 56
Figure 4.34 : A view of "potential interactions" in front of the main entrance gate (METU Silicon Block) 57
Figure 4.35 : Another frontal entrance that serves as a "relaxing balcony" (METU Silicon Block)..... 57
Figure 4.36 : An image of the cafeteria (METU Silicon Block) 57
Figure 4.37 : The corridor space, poorly lit (METU Silicon Block) 57
Figure 4.38 : A perspective from the ground floor corridor space (Halıcı Software House) 58
Figure 4.39 : The first floor corridor space (Halıcı Software House) 58
Figure 4.40 : An image of the first floor corridor furniture (Halıcı Software House) 59
Figure 4.41 : The entrance lobby (Halıcı Software House) 59
Figure 5.1 : Behaviour map of METU Twins ground floor 67
Figure 5.2-3 : Figures depicting the interaction types within METU Twins office interiors ……..68
Figure 5.4 : Types of interaction within the ground floor of METU Twins 69-70
Figure 5.5 : Behaviour map of the basement floor of the METU Silicon Block 71
Figure 5.6-7-8-9 : Figures showing the exterior space use in METU Silicon

Block 72
Figure 5.10 : Types of interaction within the basement floor of Silicon Block 73
Figure 5.11 : Behaviour map of the ground floor of the METU Silicon Block 74
Figure 5.12 : Types of interaction within the ground floor of METU Silicon Block 75
Figures 5.13-14 : Images of office spaces from METU Silicon Block 75
Figure 5.15 : Behaviour map of the basement floor of the Halıcı Software House 76
Figures 5.16-17 : Images fom the independent two gates of Halıcı Software House.....77
Figures 5.18-19 : Images from the meeting rooms of Halıcı Software House (ground level) 78
Figure 5.20 : Types of interaction within the ground floor level of Halıcı Software House 78-79
Figure C.1 : Justification of the questions used in questionnaires ……....109
Figure C.2 : Research techniques used ....…….....110
Figure C.3 : Activity types spread over the spaces used ..…….... 111

CHAPTER 1

INTRODUCTION

"Architecture may well be `frozen music' like a phonograph record; but man is the pickup whose movement realizes the experience"
_ Thiel[1]

1.1. Setting the Research Problem

The challenge of improving the worker performance is faced no matter where it's looked, from small organizations of industry to the largest conglomerates. The study deals with the technology producing worker profile, on the basis of *technopark* structure. As taking act in workplaces, and serving the generated *innovation* outcomes to the market, a researcher and his/her working environment are the focal points to enhance in order to achieve the performance. The question of the study is clear: How can a researcher's performance be improved through the architectural design?

The study offers an architectural perspective in order to answer this question. The basic issue is "the effects of the architectural space that generates or hinders the act of innovation" within technopark settings. The goal of the study is to find out the spatial criteria that improves the knowledge workers'

1 Thiel, P., *"A Sequence-Experience Notation"*, Town Planning Review, Vol. 32, No. 1 (April, 1961).

productivity of innovative ideas. This process, will lead to end up with a broad analysis through the case analysis of the *spaces of innovation*.

To define the relationship between the spatial organization of the information generating settlements, *technoparks*, and their communal networks that develop mediums with the relations constituted in spatial, virtual, and communal forms; an architect has the role of being the generator and designer of these settings within the physical dimension of the technopark that has the essential importance to the study. Forasmuch as the architecture is a tool for creating physical containers for the housed networks, then the accordance of these networks and the related spaces takes great importance for technopark's purpose of existence. So; what impact does the physical layout of the workplace have on collaboration and innovation? Does this spatial organization affect the production of the knowledge process within these settings? What are the spatial and social needs of the community of the white-collar workers in between the university campus area and Technopark borders? And what is the duty of an architect in order to give those needs to the user?

Developing a high-performance and "change adept" workforce requires *creating the space of innovation* and putting in place the tools, practices and procedures that improve knowledge workers' thinking productivity. This study describes how to improve this productivity through the development of the *spaces of innovation*. Assuming that the architectural milieu deliver the right thinking space and networks needed to fully unlock the potential and productivity of human thought, this study has a role of putting an architectural approach to achieve this goal.

Hence, the field of architecture steps in first –within the three important factors- with its role of establishing the *spatial* form. Since the design procedure, within the process of ensuring the functional and social needs, is the main phase

throughout the building and re-building processes; then the relation of the spatial impact of the designed space and user is obvious.

Second role is dealt with another form of space, the *virtual* one that is formed by communication tools, which is another medium that connects the users within an abstract form of networking. That is quite a space, defined by the elements of relations and connections.

The last role is related to the *community* itself which is an essential set that involves the relationships in-between the spaces of both virtual and architectural. This role is fairly important because the relations that are occurred in the designed physical and virtual mediums are the generators of social interaction. This interaction creates the essential potentiality for productivity. The increasing frequency of e*ncountering* between the users affects the idea creation process positively [2].

The basis for this interaction is the *common space* that is the intersection point of social networking of the related community. The discussion of the study is whether these relationships form, in consequence, spatial typologies of interior public spaces of the Technoparks or not.

Since Turkey is a fairly new ground to synchronize to the global context of informational evolution, it has the chance to bring social and spatial health to the informational production spaces in the earlier stages of development and improvement. Finding architectural solutions to this is the spine of the study. The case of this analysis will be Middle East Technical University Technopolis.

[2] Toker, Umut, 2003. *Space for Innovation: Effects of Space on Innovation Processes in Basic Science and Research Settings*. UMI Number: 3128797.

1.2. Scope and Objective

Why care these relations? Seeing that there have been huge sums of investment spent on these settings of knowledge processing, technoparks, and the act of innovation suggests architectural design matters. Thus, the architectural configuration of the *spaces of innovation* counts.

The scope of the study is a socio-spatial data analysis of the architectural spaces of communal interaction in technology producing working places, named "Technoparks".

And these architectural spaces are studied in specific to METU Technopolis in terms of three levels as the tools of analysis: first, *Spatial* (as forming a base for communal interaction: public, semi-public, private, or introverted-extroverted,…), second, *Virtual* (formed by the technological communication media), and third, *Motivational* (including the modes of interaction as motivation generators: face-to-face, virtual, distant, campus wide,…); Dimensions of the Communal Space[3] within the Technopark setting. These three levels of spaces created through their modes of interaction constitute the communal space.

Thereby, by embracing the issues of *architectural configuration* and *socio-spatial concordance* within the METU Technopolis, the study finds its place in-between the fields of architecture and social sciences.

The study makes an effort to put the *situation* and *spatial needs* of the user communities of METU Technopolis.

3 *Communal Space:* the spatial pattern that occurred within the said motivational, spatial, and virtual spaces.

1.3. Limitations

Boundaries of the study are drawn by setting the theoretical fields of Innovation, Technoparks, Behavioral Science, and Spatial analysis. Analysis on the architectural circumstances of METU Technopolis and theories based on the interrelations between the circumstances and the communal network are the issues that are considered. Thoroughout the study, spaces and their communities are interconnected by the common space analysis of thechnopark settings that are related to a communal network identification.

Also, the said technology producing settings, technoparks, are assumed to exist in developed and developing countries. Thus, the examples of the selected literature are related to the studies of 1950 and after (excluding Turkey). Considering Turkey, the limits of the examples and theory dates back to 1980's.

The limitations of the case study are *spatially* determined by the boundaries of the METU Technopolis setting and its environment attached to its surrounding campus area. A set of three characteristic buildings are selected and the *social* limits are determined by the user networks within the METU Technopolis structure.

The dimensions of the study are set as; the *user* and the *space*. The *user* is the individual worker and the study deals with their behaviour within the working medium and self evaluation of their productivity. The space is the architectural one and the interactional mediums that are created by social, virtual and face-to-face communication.

1.4. Organization of the Study

Preliminary part, *Chapter 1*, deals with setting the research problem, scope, and objective of the study. Here, the limits of the study are also stated, with a brief definition of analyzed fields and issues. In order to depict the whole image of the study, here, the organization of the study is given as a guide.

The review of the related literature constituted within the *Chapter 2*, in order to put the needed informational groundwork. This chapter includes the issues of: *innovation*, *research settings* as innovation hubs, *technoparks* as spaces of knowledge production within university settings, *the networking of space* as a setting for its community, *spaces of innovation* as generators of innovation.

The research methodology is defined within the *Chapter 3*, under the illumination of literature survey about the issue. The case probing techniques are identified both in sociological and architectural grounds.

After constructing the background for the analysis chapter of the study, the spatial geography of an innovation setting, Middle East Technical University (METU) Technopolis is analyzed within the *Chapter 4*. The functional formulation of this setting is defined by using the sources of METU Technopolis' web site, user interviews, visual data acquired by several visits to the site. The study particularly considers the *architectural expressions* of the three buildings of METU technopolis structure in terms of their "spaces of innovation". These three sample units are the buildings of: METU Twins, METU Halıcı Software, and METU Silicon Block. The "socio-spatial analysis" of these mediums is also made by using in-depth inventories, and gathered visual data. The case area selection process is mentioned in *Chapter 4.1.1*, and the gathered spatial data are analyzed basically on sociological research procedures. The spatial and communal network analysis is made in order to

reach out the parameters for the measurement of the *spaces of innovation* within the three selected buildings of METU Technopolis.

And finally, the synthesis of collected data is placed in *Chapter 5*. The findings provided by sociological research process are given with the subjective innovation outcomes depending on the data gathered from the user and space. Then the conclusion of the previous chapters is stated. In this chapter, the effects of the common spaces on innovation procedure observed within METU Technopolis' working mediums. By relating to these effects in terms of subjective data gathered, the significance of developing an architectural approach to "spaces of innovation" is mentioned. Finally, the study closes up with a discussion part: *Space for Technology? Or Space for the Knowledge Pocessing Community?*

CHAPTER 2

SCOPE OF THE STUDY

"What exactly is the mode of existence of social relationships? ...The study of space offers an answer according to which the social relations of production have a social existence to the extent that they have a spatial existence; they project themselves into a space, becoming inscribed there, and in the process producing that space itself. "

_ Lefebvre[4]

2.1. Scope

The research framework is based on the effort to achieve a better understanding of the functioning of the technopark organizations and, in spesific, to trace the spatial characteristics supporting the act of *innovation*. Since the social and economic importance of the technoparks are accepted by many authorities (dipnotta belirt), the effort of enhancing the architectural quality of these settings becomes a significant issue to consider. In order to enhance the architectural quality, the study attempts to identify the attributes of the spatial environment and the user needs and satisfaction within METU Technopolis.

The literature of the study is organized around the theoretical background of the concept of *Innovation, Behavioural Science,* and the social aspect of

4 Lefebvre, Henri. 1974. A complete index of Lefebvre's major works is available in Shields' *"Lefebvre Love and Struggle"*, (1999) with annotations regarding reprints and editions collecting separate parts of previous publications.

Architecture with *Spatial Analysis* methodologies. These theoretical groundwork leads to a socio-spatial analysis study on the issue of Technoparks.

2.2. Innovation

The word *innovation* has a wide meaning rooting from Latin 'innovare' that means 'to make new or alter' and in its context; 'bringing in new methods' (The Concise Oxford English Dictionary[5]). With its wide scope generated with the scientific developments, the term *innovation* has a variety of definitions. Since, "*innovation* is to commercialize new ideas successfully"[6], then the relationship between *innovation* and management strategies are significant. As *management* is deciding on the goals and then planning the provision of resources —human, physical, and informational— to reach those goals, the human (social), physical (architectural), and informational (virtual and concrete communication) needs to be considered carefully.

A better theoretical understanding of the way organizations function and configure spatially, in particular, how they support *innovation* is the basic issue to consider throughout this literature survey. To do that, in this part of the study, the recent history of approaches to innovation which are including suggestions of possible spatial design that might facilitate innovation are selected.

The significance of the concept of *innovation* developed during the immediate post-war period, as economists tried to rationalize the massive growth of the German and Japanese economies and the relative stagnation of other nations.

[5] *http://www.askoxford.com/concise_oed/innovation?view=uk* (last access: 18th October, 2006)

[6] *Innovation* defined by: DTI- Department of Trade and Industry-England.

(*http://www.dti.gov.uk*. Last access date: 21th November, 2006).

After S. Beer's publication of the text in operational research (Beer, 1966), a thirty years of maturation in theory took place. In 1960s and 1970s 'softer' strategies grew up within Research and Design (R&D) and the creative or knowledge-based industries[7]. These strategies included 'brainstorming' and formal 'networking'. By the year, 1977, Tom Allen made an investigation on defense-related engineering, put doubt on minds. Allen, put forward that 'successful innovations seldom come from brainstorming or from larger scale networking'. Allen mentioned that:

"The inner team cannot sustain itself without constantly importing new information from the outside world … such information is best obtained from colleagues within the organization[8]".

Prof. Porter[9], well-known with his economical studies on competitive advantages, has also defended that in order to increase a society's prosperity of a country, its ability in rivalry plays an important role, and that rivalry ability depends on science, technology and *innovation*.

Since the day (1942) Schumpeter[10] defined the term *innovation* as: "new commodities, new technologies, and new sources of supply and new types of organization"; the description of this issue has moved to the heart of economic policy-making (Simmie, 2001).

---

[7] Penn, A., Desyllas J., Vaughan L., *"The space of innovation: interaction and communication in the work environment"*, Environment and Planning B: Planning and Design, 1999, vol. 26, p.194.

[8] Allen, T., 1977, p. 123.

[9] Porter, Michael E., "*The competitive advantage of nations*". The Free Press, New York, 1990.

[10] Schumpeter, Joseph Alois, (1883-1950) an Austrian economist (though not an 'Austrian economist' in the sense of being a member of the Austrian School of economics) and a significant figure in the history of economic thought.

http://en.wikipedia.org/wiki/Joseph_Schumpeter (Last access date: 16th November, 2006)

After setting these definitions, it is important to assess that the *innovation* with its functional medium: is a *designed action*. Then the questions of: What kinds of spaces do the act of innovation need? What qualities should these spaces have? are need to be answered.

2.3. Research Settings as Innovation Hubs

Beginning from the second half of twentieth century, the economic value of scientific work -produced in academic settings- is increased, and there occurred several concerns of the possible linkages with the business community. Thus, the numbers of university research settings and the working areas provided for this aim are accrued. Throughout this spread, one approach that had an increased interest during the last few years is the conept of the regional industrial complexes, commonly known as *technopoles*[11]. Several universities engaged in activities with these complexes targeting regional and national development. The terms of 'technology or science park', 'technopark', 'technopole' and *technoburb* –the critical term that Robert Fishman[12] created– appeared.

As seen from the definitions of *innovation*, the projects of technology development and innovation start the transformation of the ideas to marketable products. The very basic idea lies underneath the technological products is making them presentable to the market. Thus, the engagement of the industry and technology producing settlements (technoparks) –with their academic support for innovation– makes sense.

[11] Gibson and Smilor, 1988.

[12] In his work "Bourgeois Utopias: The Rise and Fall of Suburbia", Robert Fishman (1989) argued that the development of a new kind of city, the *technoburb*.

Another term in literature relating to research parks include the French word 'technopole,' which is translated in English as 'science' or 'technology park'[13]. The terms such as 'technopole' or 'science park' cover a wide concept relating not only to the physical buildings for high-tech activities but also to the many relationships established in these environments with universities, research, and industry. All of these various terms can be used to describe such parks: research parks, science parks, technology parks, technopoles, technoparks, science centers, business innovation centers, centers for advanced technology and similar versions of the same concept. The terms 'science park' and 'technopole' are used most commonly in Europe, while the term 'research park' is preferred in the United States and Canada. The AURRP (1997) argues that, in actuality, the term technopark is more accurate, given that the central concept is development, transfer, or commercialization of technologies rather than the conduct of basic science research."[14]

The importance of the University-industry cooperation is mentioned by Feller, in 1994 as:

> *"University-industry cooperative R&D programs have become the dominant form of industry support of academic R&D. Both industrial and university participants report a broad set of benefits for these centers, including patents and licenses, but extending well beyond these markers of technology transfer*." (p. 54)

These settings that are established in order to generate innovation created significant hubs of technology producing and transferring factories. Thus, the

[13] Malecki, 1991.

[14] *http://www.planning.unc.edu/courses/261/drescher/litrev.htm* (Last access date: 18th October, 2006)

spatial and social needs of the users of these physical milieus require a deeper consideration, especially in the fairly new developed cases of Turkey.

2.4. Spaces of Knowledge Industry within University Settings: Technoparks

The innovation hubs are forms of enterprise zones, described by Manuel Castells and Peter Hall to be the mine and foundry of the informational economy. Some of these zones are pure private sector real-estate efforts, but most are the products of cooperation between the public and private sectors. These hubs are characterized by the partnership of research institutions and companies with the common goal of generating the basic materials of the informational economy. Thus, the importance of university settings strategically within these hubs is quite considerable offer with their academic knowledge. In this way, in the case of Turkey, the example of METU Technopolis is a quite mature example that is worth studying on. Because in Turkey, innovation takes its roots basically from METU's University setting.

The Association of University Related Research Parks[15] clearly relates the *university* and the *technopark* by giving the characteristics of these settings:

> "(1) Existing or prospective land and buildings intended primarily for private and public research and development facilities, high-technology and science-based companies, and support services; (2) a contractual and/or formal ownership or *operational relationship with one or more universities or other institutions of higher education*, and science research; (3) a role in promoting research and *development by the university* in

[15] AURRP, 1997, p. 6.

> partnership with industry, assisting in the growth of new ventures, and promoting economic development; and (4) a role in aiding the transfer of technology and *business skills between the university* and industry tenants".

As the nests of innovation, the *technoparks* as knowledge-processing nodes for innovative technologies strongly related with the term 'innovation'. As the study deals with the questions of: Does their (technopark) spatial organization affect the knowledge production process within those research settings? What are the spatial and social needs of the community of white-collar workers' in between campus area and within technopark borders? This new frontier of 'knowledge industry[16]' has potentials and disadvantages that are worth paying more attention. With the new "technopoles" of the global context, the vision of a new social approach to the design of these settings both physically (architectural) and socially (communal) is needed.

It's hard to reach a satisfying explanation on how the variables and relations mentioned work in space, although many studies have investigated this issue[17]. On the other hand, the stated definitions of the terms above include a potential of answering the question of: 'How does the spatial organization of the *spaces of innovation* affect the act of innovation?'

Another broad definition of Technopark is: the *planned* centres for the promotion of high-technology industry whose main aim is to generate the basic

[16] Romer (1990), Grossman and Helpman (1991) developed models describing a knowledge-producing industry which generates economic growth by producing new ideas. Each new idea requires a fixed amount of intangible investment (such as Research & Development). The size of the knowledge industry, its skill intensity and its efficiency determine the price of new ideas. Cheaper new ideas raise macroeconomic productivity and consumer welfare due to greater choice and better quality.

[17] Lambooy 1984, 1986; Knight 1992; Malecki 1991; Florax 1993; Castells and Hall 1994.

materials of the informational economy[18]. The term *planned* here, referes to a designing activities, in the perspective of both organizational and physical. If the the physical dimension is taken in hand, then the fields of architectural and urban scaled design efforts are to be considered.

Thus, new aspects in creating the spaces for the activities of innovation appeared. The 'architecture of knowledge' brought into consideration and found its reflection in the physical setting such as; setting the *motivational* space for innovation, the *social quality* of spaces for the spatial performance. This spatial point of view forms a base with the socio-spatial analysis in the methodology of this study. With this perspective, the purpose is to get the findings of the needed spatial quality for the act of innovation.

From the aspect of economy, the main goal of these settings, named technoparks, is selling knowledge as a new trend that have brought new concepts of organizational structure. This structure basically requires huge funds and the establishment of strong teams of experts. The initial target of these teams is to put the findings into commercially applicable format.

On behalf of this economical point of view an architectural perspective may well be constituted. Within these settings, the questions about their spatial configurations should come into mind. Can the space within the building be a setting for the social use and potential interaction in order to create the productivity? Does the architectural realization have an effect on how the spaces function with respect to how people use them? What is the relationship between the individual and his or her designed environment or social setting? What is the relationship between a user network and the architectural artefact in where it dwells?

[18] Castells and Hall, 1994.

Toker, in his study at North Carolina State University for the Degree of Doctor of Philosophy (2003), analyzed how the spatial organization of workspaces in university research centers influence encounters among researchers and therefore innovation process outcomes. And he has created an inquiry about the effects of spatial organization on innovation process outcomes.

He claims that:

> "*… Among various information resources used for information consumption, face-to-face technical consultations are the most important information resources. Research in design disciplines has shown that spatial organization of workspaces can affect human encounters. …*"[19]

As Toker mentions, the configurational properties of the space play a central role in our working, home, social and cultural lives. The social aspect of architecture engages people with their environment and each other, contributing to the quality of communities, organizations and individuals. This contribution is based on the networks that are related to those of whom are the users that are housed in architectural settings. This issue of architecture is essentially grounded on design by imitation through a social network which serves to realize the ideas of social qualities contained by the space.

While dealing with designing spaces for society, it becomes obvious that the social aspect of architecture within technopark settings is directly affected by the social order that is derived partly by the use of computer-based production systems. The recent revolution of information, that the study is essentially inspires on, has a great influence on the architectural forming of technoparks as technology producing spaces. The context of physical space organization of

[19] Toker, U., 2003, p.1.

these settings is also organized under the influence of global networking transformations according to the technological improvements.

As mentioned above, this information based revolution has changed the organization of space deeply. Morgan[20] (2004) states that: "Globalization and digitalization have been presented as ineluctable forces which signal the 'death of geography'…". "The argument that 'geography matters' is pursued in three ways: first, by questioning the 'distance-destroying' capacity of information and communication technologies where social depth is conflated with spatial reach; second, by arguing that physical proximity may be essential for some forms of knowledge exchange; and third, by charting the growth of territorial innovation systems"[21]. Current accounts of economic globalization[22], and particularly of large globally operating corporations as its principal actors, are still preoccupied with two propositions: one of them is the idea that these "global players" are able to assume much of the power and sources of power traditionally ascribed to the nation-state; the other, connected one is the idea that their transnationalised structures and practices are able to turn the world into one unified, global space, making them fully independent of place, location, and space[23]. This proposition gives clues to define the virtual space configuration of innovation producing settlements.

---

[20] Morgan, K., 2004.

[21] Morgan, K., 2004.

[22] Wikipedia defines the term *globalization* in two perspectives:

Economically and socially positive: As an engine of commerce; one which brings an increased standard of living—prosperity to developing countries and further wealth to First World and Third World countries. This view claims that economic prosperity brings about social prosperity.

Economically, socially and ecologically negative: As an engine of "corporate imperialism"; one which tramples over the human rights of developing societies, claims to bring prosperity, yet often simply amounts to plundering and profiteering. Negative effects include cultural assimilation via cultural imperialism, the export of artificial wants, and the destruction or inhibition of authentic local and global community, ecology and cultures.

(*http://en.wikipedia.org/wiki/Globalization.* Last access date: 9th September, 2006)

[23] cf. Pries 2001; Sassen 2001; Ohmae 1995.

Given the variety and wide scope of definitions in relation to the term *innovation*, the study attempts to apply this definition to the circumstances of METU Technopolis within certain limits. Assuming METU Technopolis offers a *space of innovation* and an environment for productive processes. The question posed in the study is how the innovation-productive processes are related to architectural spaces. The objective of the study is to discover the relationship between social interaction and architectural space leading to innovative processes from the perspective of the users working at METU Technopolis.

2.5. The Networking of *Space* as a Setting for Its Community

According to the Merriam-Webster dictionary, *space* is defined as "a limited extent in one, two, or three dimensions: distance, area, volume" and "a boundless three-dimensional extent in which objects and events occur and have relative position and direction". This physical definition of the space gives a clue of its social extent with the word *event* that can be related to the *user*, since the configuration of space is strongly bounded with its context of the "user community".

The crux issue of perceiveing the space around, for navigation/way finding or to grasping the objects for instance, bounds the user to a functional context of the space . However, beside the functional necessities of space, there are also some social aspects due to the way people are comfortable in collaborating with each other. The literature on this topic is vast and multidisciplinary from cognitive psychology[24] to architecture.

---

[24] Nova, Nicholas. "*CRAFT Research Report_1: Socio-cognitive functions of space in collaborative settings: a literature review about Space, Cognition and Collaboration*", September 2003.

Since the prevailing concept, namely *globalization*, exposed a new concept of working environment, a flexible work arrangement, the spatial configurations for some categories of knowledge workers has gained a momentum within 'virtual mediums' of new communication tools. Adopting to a knowledge-based perspective, that has a great influence on knowledge creation and transfer, this change in spatial configuration is defined with the term *despatialization*. More specifically, despatialization –consequential to working with improved communication tools, such as internet, intranet, videophone, etc.– modifies the elements of the relations of "person-person, person-artifact, person-place, space-place-activity, space-artifacts"[25] within spaces of knowledge processing spaces.

The change in space is generated mainly by the global networking organization especially driven by technological developments. And as looked from the other side of the medallion, the architecture that drives this spatial transformation is the essential generative force. Into what kinds of architecture do the social networks of these individuals ultimately evolve, and what are the socio-spatial consequences of the interactions among such adaptive processes at the knowledge-processing level? What is the role of architecture in promoting a prescribed social cohesion and the awareness needed to fulfill the users' missions in its fullest spectrum?

After stating the overall coexistence of the information producing space and the social network as it's basis, we should ask the questions of: Is architecture loosing its importance as the generating force of producing physical and social spaces? Or does Richard Sennet have right on persisting on the term *power of*

---

[25] Nicolas Nova, expresses these five interrelations in his study of Socio-cognitive functions of space in collaborative settings : a literature review about Space, Cognition and Collaboration, 2004.

place[26]? Does the design of the infromation producing space need to be considered with its social network underlying?

This new concept of the knowledge production with the improvements of communication tools within a global network structure brought new architectural design basis for technology producing settings. These changes in architectural design approaches are the leading issues to consider in order understanding the spatial norms of knowledge industry workers' medium. Because technology purports to be "scientific" it may be regarded as autonomous, not requiring reference to or validation by local cultures. The workplaces today, like isolated working cubicles of today's informational era, may be elegant, but couldn't these structures be placed anywhere on the globe? Are there any other contextual solutions to find in order to promote a better working milieu?

The standardization of the designed space[27] mostly affects the technology producing nodes, technoparks. The information era we are living in today, made the space sublimated into a more abstract form then it was used to. Thus, it is relevant in point to say that a new space needs to be emerged related to the spatial and social needs that are transformed according to the user needs within their contextual conditions. The power of place[28] is essential and significant in order to provide a generating force for knowledge production.

[26] Sennett, R., *The Fall of the Public Man*. W.W. Norton and Company, 1974.

[27] Roudometof, V., *Preparing for the 21st Century*, Sociological Forum, Vol.12, No. 4, 1997.

Thrift, N., *On the Determination of Social Action in space and time*, Environment and Planning D, p. 23-57, 1983.

[28] Sennett, Richard. *The Fall of the Public Man*. W.W. Norton and Company, 1974.

2.6. Common Spaces for Knowledge Productivity

In the 1920s, architecture had liberated itself from the narrow borders of functions associated with the restrictions of space[29]. And the design of common space started within the building. The issue of security on knowledge protection based on an introverted communal space brought the need for *interior publicity* in order to interact. It's seen that Sigfried Gideon sensing the potential of physical elements forming the space affect far beyond their limits of measurable dimensions. And this is the radiation of the architectural space that interacts with its environment. That is similar to the elements affecting architectural space qualities. It's alike within the social context. Social networks interrelate and interact, thus, radiate their social space that they form. The physical borders are fine if they do not compress these relations within functional norms. However, these spaces within borders may create positive, relaxing and motivational spaces when the public interaction is enhanced.

The main purpose becomes to build solid buildings with interior common spaces that pass over the borders and through the walls. This constitutes the social network penetrating within the interior and/or exterior knowledge-processing *community* which is also highlighted by Toker's study[30].

So what is the community referring for? "A *community* is an amalgamation of living things that share an environment. The individual living beings can be plant or animal; any species; any size. What characterizes a community is sharing interaction in many ways. In human communities, intent, belief, resources, preferences, needs and a multitude of other conditions may be present and common, affecting the degree of adhesion within the mixture, but

[29] Sierek, K., 2001.

[30] Toker, U., 2003.

the definitive driver of community is that all individual subjects in the mix have something in common. This is even true in biological communities"[31].

After putting forward the community concept, the theoretical groundwork of society related spatial analysis should be set. The first time that socio-spatial analysis set formally is in 1991 by Hillier and Penn. Based on the theoretical background and *space syntax* methodology put forward in Hillier and Hanson (1984), and building on Allen (1977) and Granovetter's (1982) observations, they investigated the morphogenetic potential of certain types of spatial structure over the user behaviour data. The statistical spatial model proposed by Hillier and Hanson conceives social and spatial rules as restrictions on a random generative process. Hillier (1985) suggests that the interaction between rules and randomness allows for the production not only of known solutions, but also of new solutions or morphogenesis[32].

"In later studies, Hillier and Penn (1991) propose that morphogenesis tends to occur when the rules that restrict the random process are few or have a relatively local reach. They distinguish between "long models" and "short models", the first would be those which have many rules that determine the spatial relations (the activities, type of people, visual connections, etc.) and the second, where a minimum of rules is specified. The authors propose that long model buildings will tend to produce reflections or projections of the social rules, and so will tend to be conservative, while short models on the contrary will tend to be generative of new relations or knowledge.

---

[31] *http://encyclopedia.thefreedictionary.com/community*
(Last access date: 26th September, 2006)

[32]*Morphogenesis*: from the Greek *morphê* (shape) and *genesis* (creation).
(*http://en.wikipedia.org/wiki/Morphogenesis*. Last access date: 19th September, 2006).

Hillier and Penn (1991) also make the distinction between two types of knowledge, suggesting that knowing can refer either to the set of abstract rules that allow us to act socially and in general terms form the ideas “we think with”, or that they refer to a particular more concrete set of rules on a specific subject, which in general terms are “ideas we think of”. They call the first, Type A, and can be loosely be defined as *social knowledge*, and the second Type B, which they suggest could be defined as *scientific knowledge*. In the study, within the technopark settings these two types of knowledge are juxtaposed. A technopark worker uses a concrete set of rules (architectural space) through innovation process under the effect of the set of abstract rules (communal space) that allos him/her act socially.

Hillier and Penn (1991) combine these concepts and propose that the production of Type B knowledge will tend to happen as long as Type A knowledge is absent in spatial terms, that is in a short model building, whose spatial conditions will essentially be generative. On the contrary, the reproduction of knowledge, lies in the conservative, type B, mode.

As Hillier and Penn emphasize, network communities are especially interesting and useful settings in which to look closely at the evolution of technology and social practice. The interactions between social practice and technical mechanisms, since boundaries between designers and users are blurred and evolution here is responsive to user experience. The examples show how designers can rely on social practice to simplify a technical implementation, how they can design technical mechanisms to work toward a desirable social goal, how similar technical implementations can have different social effects, and how social and technical mechanisms evolve. Complexities of the design

process and the contributions of mediators in addressing communication breakdowns among a diverse group of designers are quite obvious[33]".

Tom Allen (1977), in studying communication and innovation in engineering, refers to the production of new knowledge and states that problem solving and significant advances in knowledge depend much more on interaction between people that are not part of the same research group, profession or field, than on communication within work groups. This statement is supported by detailed empirical studies that have demonstrated that the most significant advances in engineering knowledge appear to have a random component, which often depends on *chance meetings* between people that work in *different* fields and who are not the members of the same team, but work in the same building; supporting Toker's findings[34]. The technopark setting is to be considered under the studies of Allen. Thus, the creation of common or social speces within technopark settings is important.

Consequently, the physical setting of the organizational space takes its designed morphology related to its human environment. Since this environment is strongly interrelated to social improvements, here the technological developments, the space housing this human environment is accordingly changes. Then, the study asks the questions of: Is the space itself being physically sublimated to a virtual dimension? So how the white-collar worker of the information industry affected? Do they need more of this? Or less?

[33] Margarita Greene, Alan Penn. *Socio-Spatial Analysis of Four University Campuses*: *the implications of spatial configuration on creation and transmission of knowledge.* Space Syntax First International Sympsium, London, 1997.

[34] Toker, Umut, 2003. *Space for Innovation: Effects of Space on Innovation Processes in Basic Science and Research Settings*. p.306-319. UMI Number: 3128797.

2.6.1. Common Space Affecting the Potentials of Innovation

What exactly is the mode of fertility in knowledge-producing communities? How the space affects this mode of productivity? The study of space offers an answer according to which the social relations of production have a social existence to the extent that they have a spatial existence; they project themselves into a space, becoming inscribed there, and in the process.

It is Georg Simmel who emerged the concepts of space dynamics in both *spatial* and *occasional use of spatial metaphors* categories[35] that imports sociology into a relational, as well as pointedly synchronic and a historical, mode of analysis.

As getting into mid-twentieth-century sociology, it's witnessed that both an accentuated attention to the spatial dimensions of social life and a general enrichment and diversification of sociology's spatial vocabulary and imagery-rarely amounting. A first important landmark for our purposes is Sorokin's idea of 'socio-cultural space', where he strongly displays the kind of relational understanding that had started to burgeon with Simmel, using concepts such as 'relational field', 'relational position of meanings', 'points of reference', 'positional relationship', or 'referential fields of meanings'[36]. Sorokin's attention to the spatial aspects of social experience was also marked, significantly, by the intent to 'liberate sociology and the social sciences from voluntary servitude to the natural sciences' and from the "sterility of the positivistic 'natural-science' sociology" and by the consequent rejection of

[35] Gross, Matthias, *Perspectives on Global Development and Technology, Volume 4, issue 1,* 2005.

[36] Sorokin, 1964, pp. 97-158.

"prevalent sociological conceptions of the causal relationships of socio-cultural phenomena, of time, and of space"[37].

Since "the architect's primary work is to map the social system in place, he or she then listens carefully and assembles the most empowering new solutions drawn from the user community itself, finally seeing that they are powerfully heralded to the whole group"[38], then an architect should design the artifact within the conditions of the social context.

By accepting this importance; the fact that the theory of sociology has a great importance on the design process comes into existence. It's Georg Simmel[39], who is a starting point to consider sociology in the architectural design process. Because his constitutions of theoretical foundations that have become the ground for sociological theorists and still continue to challenge the mainstream social theory, and the individual as the starting point of Simmel, so the human interrelations or socialization is the basic issue of his theories of sociology.

In summary, it may be stated that sociology analyses the geometry of society. The "behaviors of individuals" are the points to departure. The individual is determined and socialized within the society. However, the tension between the individual and society invariably exists. Because the individual is in a strong relationship with the society, he or she does exist not only for him/herself but also for his or her society. Consequently, he or she is neither social nor individual. For Simmel, the individual and the society are the integrated unities.

---

[37] Sorokin, 1964, p. vii.

[38] *http://arcturus.org/sa/adventures_in_soc_arch.html* (Last access date: 25th May, 2006)

[39] "Georg Simmel (1858-1918): Born in Berlin … studied at the University of Berlin and received his doctorate in 1881. His knowledge spanned the fields of history, philosophy, psychology and the social sciences. In 1885 he became an unpaid lecturer at the University of Berlin, teaching courses on logic and the history of philosophy, ethics, social psychology, and sociology …" (*http://socsci.colorado.edu/SOC/SI/si-simmel-bio.htm*, Last access date: 12th June, 2006)

The individual with his/her subjective consciousness wants to pass beyond the social consciousness. In this context the conflict is inevitable and that is the core of life. If one is not existent, the other is either. The consciousness of ego constituted by the individuals interacts with external objects that affects them and satisfy themselves.[40]

Using "sociology in architecture"[41] is a new concept, and has a noticeable account "even if architectural sociology[42] is an emerging subfield, it draws on the existing fields of environmental psychology, ecological sociology, organizational ecology, organizational sociology, and community sociology. In practice, architectural sociology builds upon *social design theory*[43] and uses research methods such as survey research, internet research, interviewing, field observation, secondary data sources, and unobtrusive measures" says Jean Beaman (2003). Also Bugni[44] explains how to observe people in their environments that "can provide clues for the architect on how social interaction occurs in various settings such as classrooms, meeting rooms, office spaces, and pedestrian walkways."

Smith[45] says;

---

[40] *http://www2.pfeiffer.edu/~lridener/DSS/Simmel/SIMMELW4.HTML*
(Last access date: 17th April, 2006)

[41] *http://strata.unlv.edu/smith_bugni/studentsoc.pdf*
(Last access date: 13th March, 2006)

[42] Smith and Bugni define *architectural sociology* as the application of social theory and methods to the architectural design process. It provides quantitative and qualitative research tools to anticipate how designs impact people on a variety of levels. (*Symbolic Interaction Theory and Architecture*, Vol. 29, No. 2, Pages 123-155, 2006).

[43] Morris, L., *Permanent Innovation*, 2006.

[44] Valerie Bugni, an organizational and social researcher for Lucchesi, Galati Architects, Inc., in Las Vegas. (*http://www.asanet.org/footnotes/dec02/fn17.html*, Last access date: 8th June, 2006)

[45] Ronald Smith, Chair of the Sociology Department at The University of Nevada, Las Vegas.

> "*I am convinced that sociology has a huge contribution to make to a new way of thinking in architecture and that sociology will also further expand upon some of its theories as a result of this work. As with all new paradigms, architecture will not change easily. Nevertheless, architectural sociology has a promising future.*"

To conclude, the space that is widely affected by the people, who experience it, needs to be formulated in a way that the users mean to function itself. The social use is the marker of the potential of interaction within the space. Thus, the spatial quality of the social space is strongly related with the user profile and the morphological features of the architecture. The study probes the architecture of the *spaces of innovation* under this theoretical framework.

CHAPTER 3

METHODOLOGICAL APPROACH

3.1. Research Question and Methodology

Human being and his/her behavior patterns lead the efficient design of the spaces related and vice versa. Thus, the study follows the theories within Behavioral Science literature. On the other hand, it departs from the Community Design concept in analyzing the spatial performance for further studies.

From the perspective of design, architectural design criteria intersecting the social pattern that gives the performance of the space configuration, visual analysis of spaces with users' opinions considered as given data (interviews, audio-visual records of spaces used/unused …). This guides the study to a quantative resulting. The study aims to achieve quantative results through the methods of qualitative behavioural analysis.

The case of METU Technopolis, with its wide variety of usage areas both interior and exterior that set a basis for its communal networking, evokes the mining need of its common space analysis within the selected buildings. In order to find the answer to the questions of: What impact does the physical layout of a Research Setting have on innovation? Does this spatial organization affect the innovation process within these settings? What are the spatial and social needs of the community of research workers *in-between* the university campus area and Technopark borders? What makes these buildings concordant

for their communal network structure? And what does not? Are there any spatial typologies that are juxtaposed on these structures? If so, how to analyze and categorize them?

The context for the study is the *common spaces* (where the innovation is inhibited with "useful interaction"[46]) of the technoparks include is conducted with the main objective of getting a better understanding of the technopark spaces and how they support *innovation*.

This study utilizes a multiple-case study research design with the unit of METU Technopolis case analysis with an "empirical inquiry that (i) investigate a contemporary phenomenon within its real-life context; when (ii) the boundaries between phenomenon and context are not clearly evident, and in which (iii) multiple sources of evidence are used"[47].

Thus, the case of METU Technopolis in this study receives consideration in terms of these three levels that Yin expresses. After the real-life context of the technopark settlement is set, then the boundaries between the settlement and its context will be cleared out by analyzing multiple sources of evidence observed in order to put the conclusions of the study.

The three buildings selected from the settlement of METU Technopolis, which differ substantially in their architecture, size and the programmatic nature of the disciplines they house, their spatial configurations are analysed using *sociological* and *spatial data* analysis methods. Observations of patterns of space use and movement were carried out and a questionnaire survey of the employers was used to elicit perceptual interaction or network strengths.

---

[46] Hillier et al, 1990; Hilier and Penn, 1991; Penn and Hillier, 1992.

[47] Yin, 1984.

The methodological approach includes the *field observation* based on both visual and vocal data. An other branch that consists the methodology is *survey research* and is applied by the combination of standardized and open-ended questionnaires. These data are examined within the behavior science and architectural basis. The discussion here is to discuss whether the act of *innovation* affected by the architectural mediums related to the context of the existing network within METU Technopark setting. If so, identifying the spaces of innovation is the goal of the study.

3.2. Spatial Data Analysis Based on Sociological Research

Spatial data analysis a method of analysing spatially referenced spatial data where quantative observations are associated with fixed points or areas on a field. The spatial data set is obtained constituting of a collection of measurements or observations on one or more attributes taken at specified locations.

This analysis is a kind of methodology for research areas that deal with data in their spatial context. The fact that there are important links between social and environmental systems so that the study of one may draw in theory and data from the other, there are two other reasons for a methodological approach that takes in both areas of research. First, both deal with *observational* rather than *experimental* data. Because the values of variables cannot be controlled. Second, social and environmental analyses are often directed at similar scales and data structures (the spatial arrangements of the sites or areas are often highly regular) so that many of the types of data analytical methods relevant in one for describing spatial variation may be applicable in the other[48].

Thereby, the spatial data is gathered with respect to the social use of space within the case of METU Technopolis. The character of the common spaces

[48] Haining, Robert, "*Spatial Data Analysis in the Social and Environmental Sciences*",1990.

that are housed in METU Technopolis is held by the observation of the rates of entry, locations and types of activities and patterns of behaviour. The focus here is to address the 'role of spatiality' in collective situations. By collective, the communal situations are mentioned. These situations take place within the public spaces of the referred technopark settings.

The research method include questionnaires and in-depth interviews supported by participatory observations that are used in order to obtain subjective evaluation of the spaces analyzed. The spatial analysis depicts the preliminary responds of definitive, quantitative, qualitative, and relational questions used within the sociological research.

Definitive questions are asked in order to gather the identification data of the user profile, perception of the space by the user, adequacy of the space defined by the user, and the behavioural maps. Quantative questions seeks for the responds of the amounts for the usage types and frequencies. Also the qualitative questions are the tools of gathering the subjective ideas of the respondent that widens the quality scale of the space used. The responds to the relational questions brings the data of interaction between person-person, person-artifact, person-place, space, place and activity, and space-artifacts. The outcomes of the data analyzed are given in the appendix part of the study.

The variables of *space* and *user*, within a sociological research on *architectural spaces of innovation* structures the content of the study within the case. The sociological perspective is limited by the subjective point of view about the common spaces of the workers of METU Technopolis. The data gathered on innovation and space relationship from the workers of METU Technopolis, excludes the designers' intention and objective outcomes of productivity. In other words, the architects of the three buildings and their opinions on spaces of innovation are not included in the analysis. The designers' approach and space

preferences can be dealt with an other dimension of this issue. Further studies may be done by including a correlation analysis on objective outcomes related to space and user relationship for elaborating the concept of innovative spaces.

3.3. Research Techniques Selected

The research techniques selected include questionnaires, rating scales, digital and free-hand behaviour pattern drawings. The questionnaire, used as a tool in the study includes *definitive, qualitative, relational* questions. Including 15 questions in total, with the scope of probing 'space defintions' and 'user behaviour' within the selected three buildings of METU Technopolis.

The definitive questions are tracing the definitions of the 'user profile', 'perception of space and the use of space' and the 'types of communication'. The questions 1 to 4, and the question 7 and 9, asks the definition, usage properties and characteristics of the common spaces. These spaces are defined as *office space, meeting halls* or *rooms, entrance lobby, corridor space, cafeteria or canteen, tea-coffee-drinking-water spots, cigarette rooms, stairs, courtyards*, and *fire exits*. Question 10 attempts to identify the means of communication used. Question 14 seeks an answer to the rates of satisfaction in the spaces mentioned. In order to obtain a visible pattern of space use, a more detailed definition of 'a daily behaviour pattern' is inquired through drawing in question 15.

The qualitative questions, questions 5 and 6, are probing the 'adequacy' of these spaces in terms of their functions and the user 'needs' within these mediums. Also the question 11 inquires the needs of the means of communication used or required. The last part of the questionnaire includes open-ended questions to obtain the views of the users on equipments and technical features of the working space.

The relational questions 12 and 13 are tracing the ‘space-user’, ‘space-activity’, ‘activity-productivity’, and ‘communication-motivation’ relations. The preference for working alone or with others is inquired in order to clarify the working process defined by the user. Also the ways of including themselves into the group of their colleagues are asked to identify the relations of the users in between.

In addition, in-depth interviews (recorded audio format), participatory experiences, and visual surveys (pictures of the analysed spaces throughout the workdays) gave the opportunity to perceive the spaces in the perspective of the users. Thereby, a more detailed evaluation is obtained on spatial perception, usage, needs, satisfaction rates of the common spaces.

Since research on innovative spaces encompasses a wide domain of research techniques this study is limited to the above stated techniques only. The emphasis is mainly on the user’s perspective.

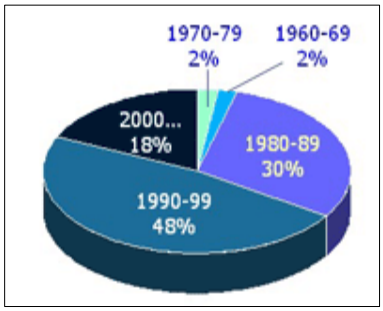
CHAPTER 4

THE CASE STUDY

4.1. The Overview of The Concept of *Technopark* in Turkey

Turkey has the huge amount of the potential of bright minds that can be put into a process of marketable product output. In the new millenium, with the accelarating force of entreprenuership, Turkey had its chance to be placed within the global economic rivalry. Knowledge-processing is the key issue to achieve this goal, so the mediums of knowledge-processing are named as *technoparks*, have emerged and still being emerging in the country.

The issue of *technopark* appeared in Turkey in the 1980's. And their distribution over the parameters of establishment dates, sectors, locations, sizes, numbers of personnel, etc. are visualized below. (*Source*: AISP, 2002):



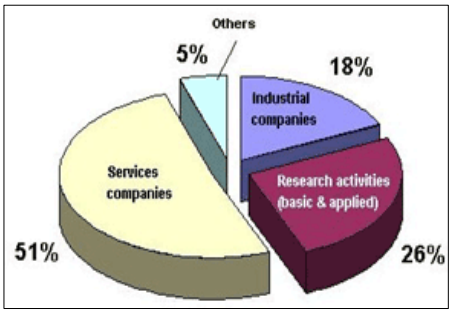


Figure 4.1 : Establishment dates.

Figure 4.2 : Sectors.

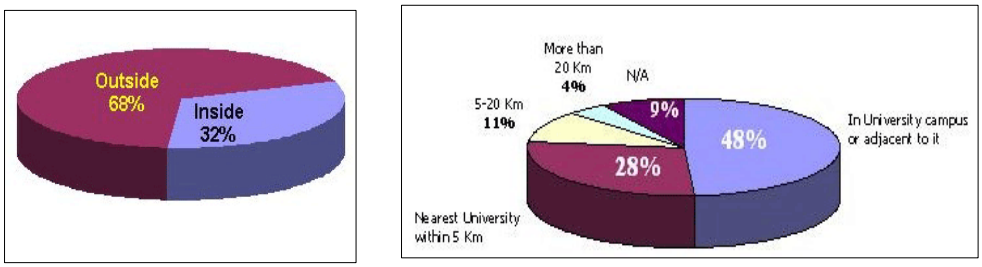


Figure 4.3-4 : Locations referred to university.

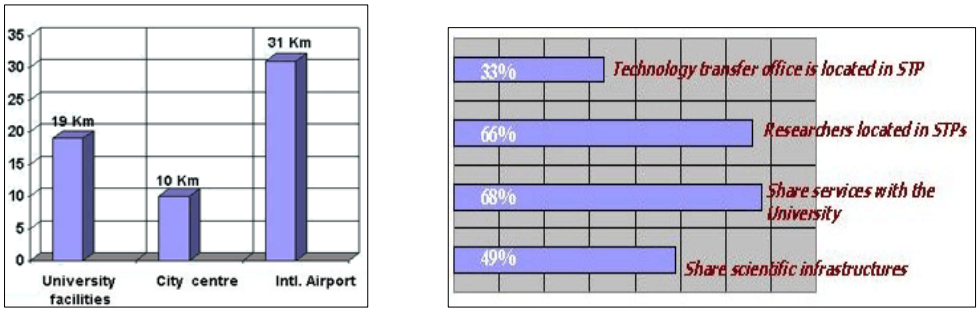


Figure 4.5-6 : Locations referred to city nodes, and university settings.

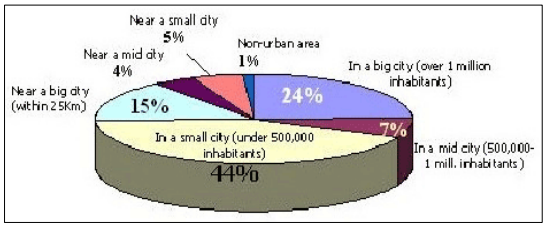


Figure 4.7 : Locations referred to city.

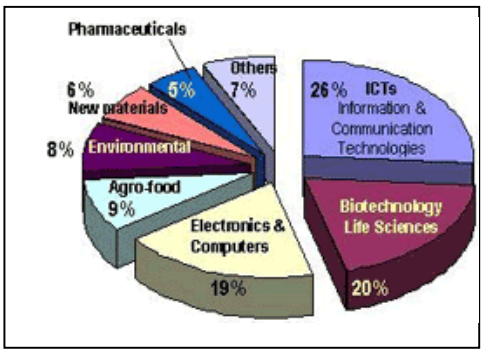


Figure 4.8 : Study fields.

A chronological approach to the issue of Technoparks in Turkey is indicated on Table 4.1 below.

Table 4.1 : A time chronological chart of the development of theTechnopark issue[49].

1980: First studies began with M ETU Technopolis.
1991: KOSGEB began to establish Technology Development Centers.
1996: Ministry of Industry and Trade set 'The Technoparks Regulation'.
1998: METU Technopolis and MAM (Marmara Research Center) accepted as the first Technoparks in Turkey.
2001: The Regulation of Technology Development Regions (Regulation no. 4691) took effect.
2005: By June, The Cabinet Council certified 18 TDCs. (METU Technopolis TDC, Hacettepe TDC, Ankara TDC, Eskisehir TDC, TUBITAK-MAM TDC, ITU Ari Technopark TDC, Kocaeli University TDC, Yildiz Technical University TDC, Selcuk University TDC, Istanbul University TDC, West Mediterranean Technopark TDC, Trabzon TDC, Cukurova TDC, Erciyes University TDC, ATA Technopark TDC, and Mersin TDC).

[49] *http://www.metutech.metu.edu.tr/* (Last access date: 17th September, 2006)

Table 4.1 Continued.

By the year 2005: The active technoparks are METU Technopolis, GOSB, Ankara TDC, TUBITAK-MAM, Hacettepe TDC, ITU TDC, Izmir TDC, Eskisehir TDC, Selcuk University TDC, and West Mediterranean Technopark TDC.

There are several types of Technoparks defined over the world. These types are stated by the METU-CP Studio Study (1996-97) as: Science Park (1), Research Park (2), Innovation Center (3), Incubator (4), Technology Park (5), Technology Development Center (6), Technopolis/Technopole (7).

METU Technopolis is the type 7, *technopolis*. Since the *technopolis* is an organization which produces economical activities that is equipped by the universities, research establishments, and industry units including the whole spectrum of urban service; METU Technopolis is a concordant example of this type located in Turkey.

4.1.1. Case Study Selection: METU Technopolis

The study, by synthesizing the overall information about the technology producing centers, technoparks, gives a comprehensive vision within the country. Since METU Technopolis is the earliest example of these settings throughout the country, its operating system is in a more stabilized and improved condition then the later examples. Also the architectural effort taken throughout the time period on the design of the buildings and the overall setting gives the potential of a deeper perspective on the analysis process. Newly generated technoparks are more or less in a process of creating their spatial

character in fewer examples of spaces. In order to get the richest example set, the best case is selected as METU Technopolis.

4.1.2. Technopark Setting in METU:
The Functional Formulation of METU Technopolis

METU Technopolis, within the campus settlement of Middle East Technical Univesity (METU), located on the basic development axis (west corridor) of the city of Ankara. This facility has a dynamic interaction with surrounding universities and national research centers on account of its strategical location. The expansion area provided for METU Technopolis covers 110 hectares that is quite appropriate for its development. All these features makes the facility an attractive organization to its shareholders[50].

Figure 4.9 : An aerial photo of METU Technopolis area (date: 06.08.2004). *Source*: METU Technopolis Coordination Office.

[50] *http://www.metutech.metu.edu.tr/* (Last access date: 2th October, 2006)

The physical proximity to the university campus center, also an advantage for creating an interaction between the working population of METU Technopolis, academics, and students.

The functional formulation of METU-Technopolis is stated as "the settings that are oriented to increase the university-industry cooperation with its modern infrastructure and superstructure offered to the firms, researchers, and academics that produce technology for empowering the country within the international arena and contributes to a synergy between the actors"[51]. This formula is supported with the goals of: "contribution to Turkey's R&D (research and development) potentials and technology producing skills, to create skillful labor force and employment opportunities, to play a role in orienting Turkey's technology production and accumulation issues with its priorities of sectors, to perform the continuity of university-industry collaboration, to inhibit the process of the transformation of university's research infrastructure and knowledge accumulation into an economical value, to support the high-technology product and service constitution for the global market, to create the appropriate medium for technology transfer, and to be one of the essential component of regional development sustainability"[52].

4.1.3. The Central Architectural Themes of the Selected Buildings

Throughout the study, the METU Technopolis area is analyzed within three examples of buildings: METU Twins, Halıcı Software, and METU Silicon. These three are selected with respect to their building dates, closed areas, and study fields. METU Twins is the first building established, so, in order to see the difference between the others built later on, this building is a significant

[51] *http://www.metutech.metu.edu.tr/* (Last access date: 5th October, 2006)

[52] *http://www.metutech.metu.edu.tr/* (Last access date: 5th October, 2006)

reference study area to consider. The METU Silicon Block has the utmost floor area (total: 11.000 m^2, office: 7134 m^2), a flaring amount to compare with the others. Halıcı Software Building is the first example of build-operate-transfer model that has an important figure worth studying on.

As the study deals, in particular, with METU Technopolis' spatial quality that is supposed to meet the needs of the users, the analysis will have an architectural perspective, beginning from an urban scale. To do this, the overall structure of the setting and its components are observed. Then, the data are gathered from the selected components (selected buildings). Step by step, the a whole picture is depicted from physical perspective to a social dimension on the individual level.

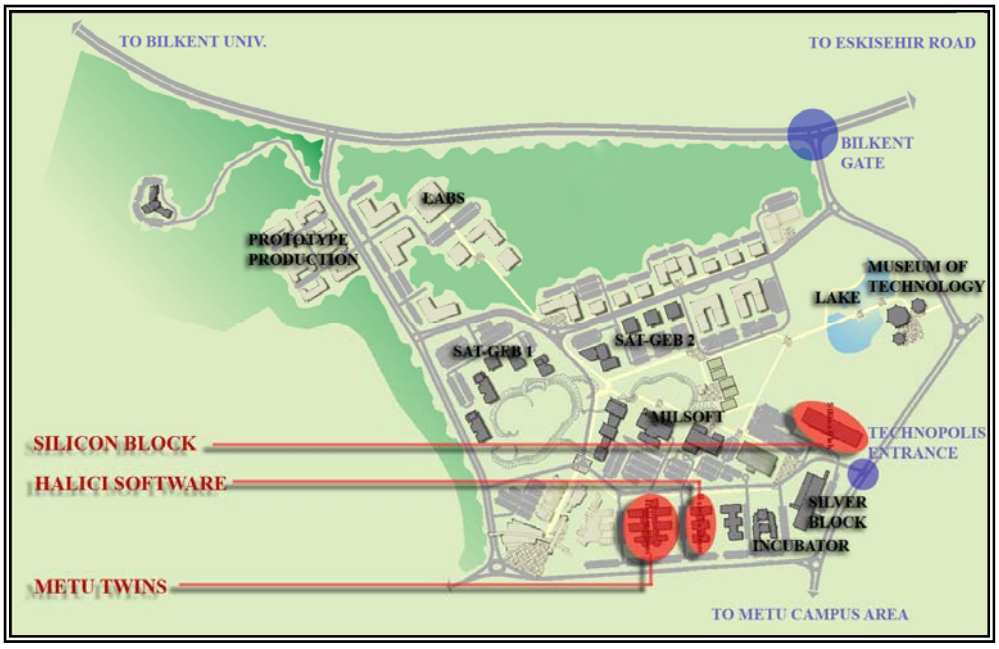


Figure 4.10 : Site plan analysis of METU Technopolis area with the studied buildings highlighted (in red). *Source*: METU Technopolis official web site[53].

[53] *http://www.metutech.metu.edu.tr/* (Last access date: 15th October, 2006)

As seen from the site review, it's clear that the three buildings selected as the sampling frame are the initial silhouettes to meet the people approaching from the campus area. Below, with a chronological order, the architectural themes of the samples are analysed.

4.1.3.1. METU Twins

The first established service building of METU Technopolis, METU Twins, put in commission in January 2001. The building covers a total floor area of 7000 m^2 (closed) with an area of 4740 m^2 for office use. An area of 445 m2 integrated office spaces (open office), served by independent service areas. A 25% of the office area is designed modularly in order to achieve flexible spaces. The good use of day light is accomplished with its solid-void distribution on its site plan. The cafeteria is provided for the working people that can serve for 200 people. The conference room is located right near entrance lobby, with a capacity of 100 people. The building has a central heating and cooling system and a parking lot for 80 vehicles. The building layout is enhanced with an inner courtyard with a longitudinal pool as a decorative element[54].

The architectural theme of the building is; the spaces set around a circulation axis, which is the wide, well-lit, double-floor high, corridor space. The U shaped solid structure has a mirror effect with the symmetry axis of the inner courtyard line. Building has three floors: basement for technical service areas; ground consists of the entrance, open office areas, cafeteria, information center and meeting hall, service and vertical circulation spaces, and the access to inner courtyard; first floor including the similar configuration as the ground floor has, differently this floor has an access to terrace (open).

[54] *http://www.metutech.metu.edu.tr/* (Last access date: 7th September, 2006)

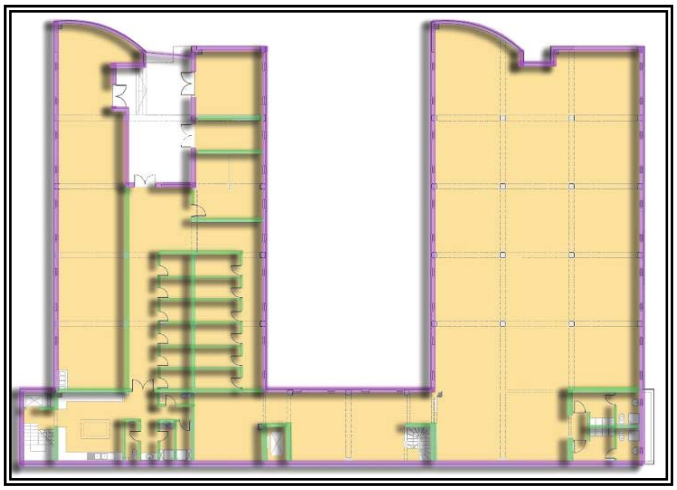


Figure 4.11 : Adopted basement floor plan of METU Twins. *Source*: METU Technopolis Coordination Office.

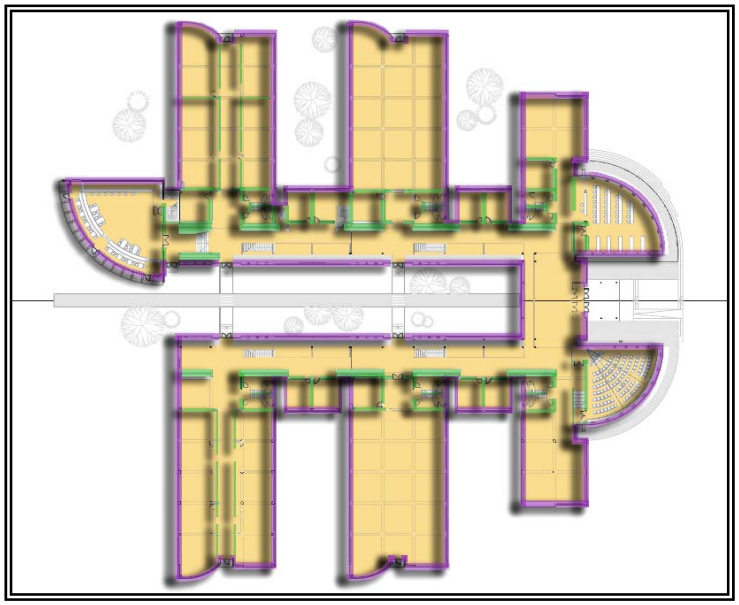


Figure 4.12 : Adopted ground floor plan of METU Twins. *Source*: METU Technopolis Coordination Office.

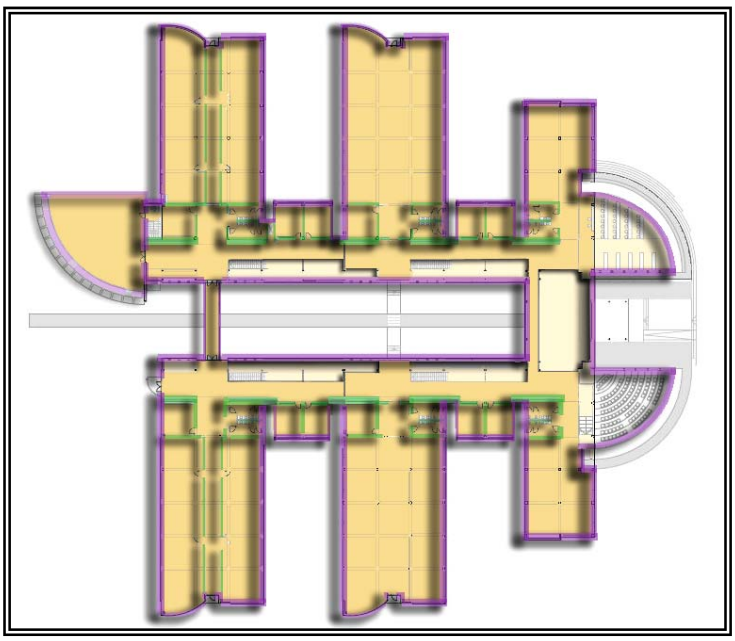


Figure 4.13 : Adopted first floor plan of METU Twins. *Source*: METU Technopolis Coordination Office.

4.1.3.2. METU Halıcı Sofware House

The second building that put in commission, in the year 2000, is METU Halıcı Software House. This establishment is the first example of build-operate-transfer model within the METU Technopolis settlement. The building has an office area of 3857 m^2 out of the gross area of 4840m^2 . The mass of the total area is divided to independent office areas up to 900 m^2. Inside the building layout, there are modular office areas that can be divided to 33 m^2 of sections. Other than the office spaces, the entrance lobby and the corridor space forms the common spaces. This building also has a central heating and ventilation system. The parking lot is for 40 vehicles[55].

[55] *http://www.metutech.metu.edu.tr/* (Last access date: 11th September, 2006)

The architectural theme is set by three main rectangles of office spaces combining with a circulation space. The tabs of rectangles forming two more independent entrances beginning from the main entrance.

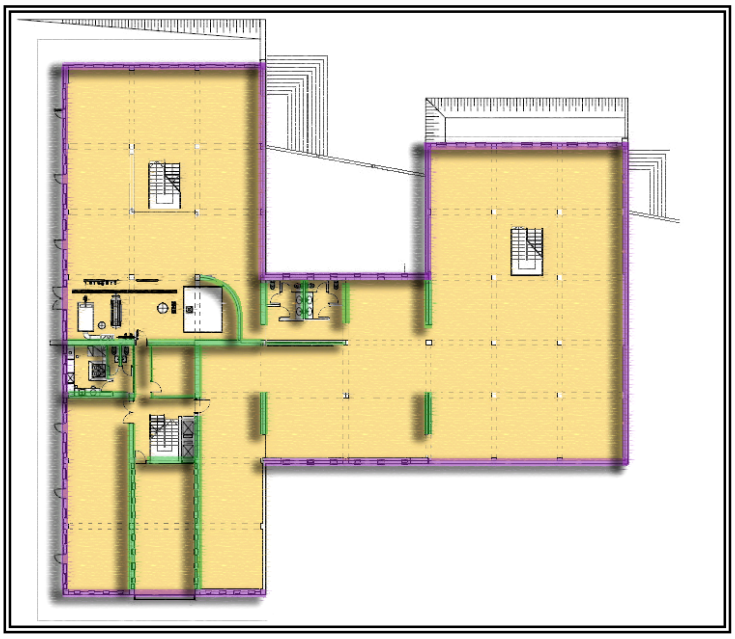


Figure 4.14 : Adopted basement floor plan of METU Halıcı Software House.
Source: METU Technopolis Coordination Office.

With its preliminary designed function of cafeteria area on the basement floor of METU Halıcı Software House, it is seen that this purpose is not applicable recently. The space entitled as a ‘cafeteria’ within the basement floor layout is transformed into a ‘depot’ space. In consequence, the whole areas of this floor are used for technical and service pruposes only.

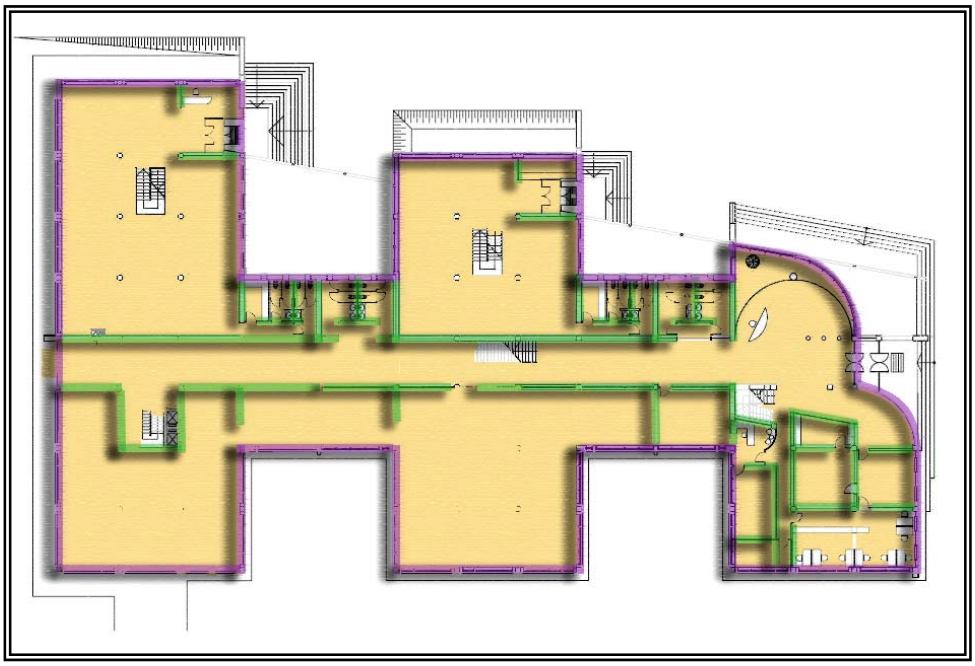


Figure 4.15 : Adopted ground floor plan of METU Halıcı Software House.

Source: METU Technopolis Coordination Office.

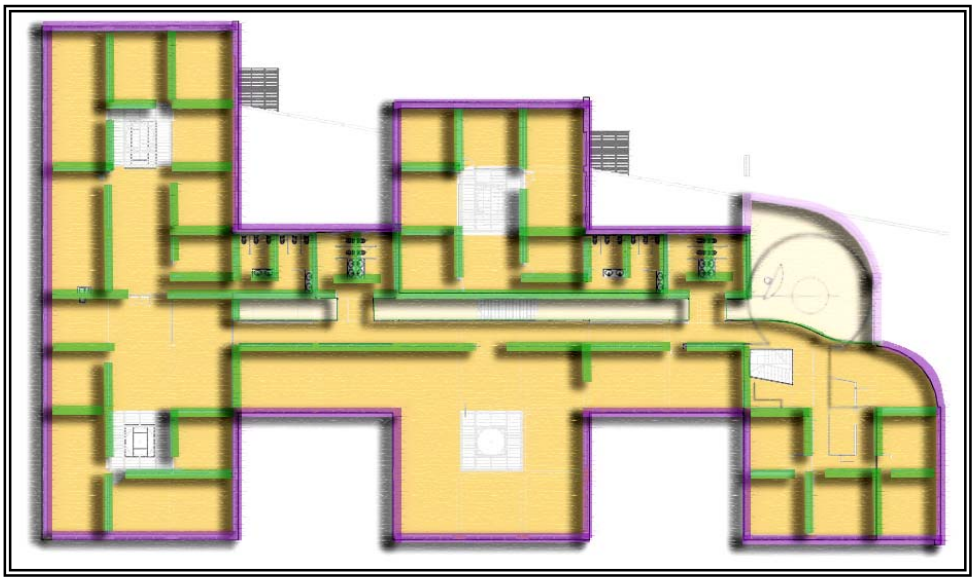


Figure 4.16 : Adopted first floor plan of METU Halıcı Software House.

Source: METU Technopolis Coordination Office.

4.1.3.3. METU Silicon Block

By the year 2004, METU Silicon Block is put in commission within the first term scope of the Development Plan. with an extinguished design language, the building is constituted of a floor area (closed) of 11000 m^2 including a 7134 m^2 of office space. These office spaces inside has a variety of flexible spaces that range in size from 72 m^2 to 600 m^2. Two of these offices have independent entrances. And an intelligent climatization[56] system is provided. Inside the building, there are 3 meeting rooms, a continuously serving cafe-bar, a restaurant with the serving capacity of 300 people.

The building itself is a plain rectangle. The circulation axis is situated in between the offices. A huge façade meeting the users from the main gate, that has a *screen* effect with its both transparent and reflective surface, completes this modernistic appearance.

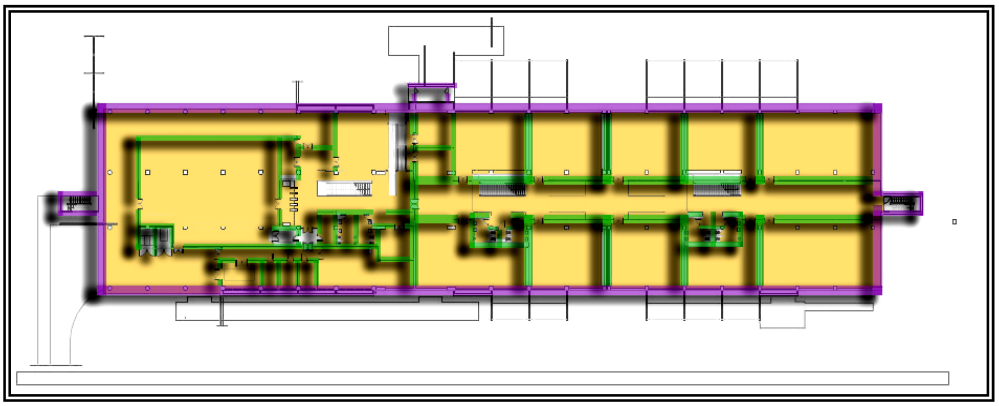


Figure 4.17 : Adopted basement floor plan of METU Silicon Block. *Source*: METU Technopolis Coordination Office.

56 Using smart devices with sensors to control the climate of the building spaces. (*http://www.messe-duesseldorf.de/shk/de/SHK-Catalogue_2006.pdf.* Last access date: 18th September, 2006).

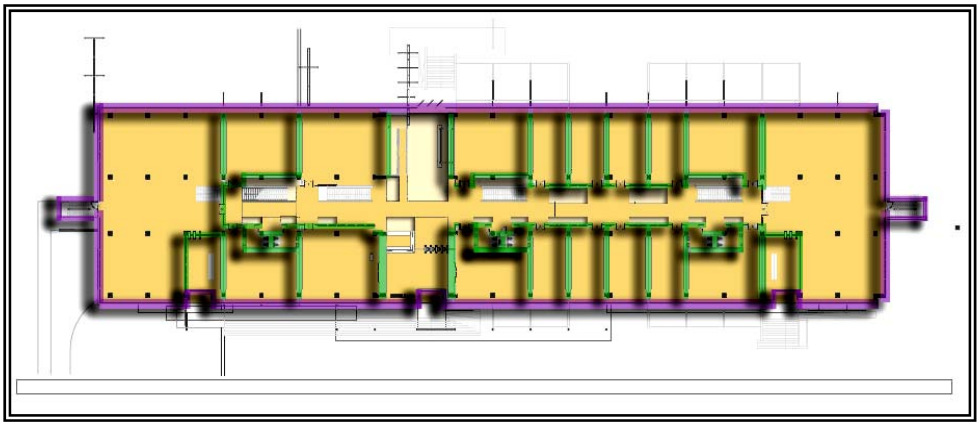


Figure 4.18 : Adopted ground floor plan of METU Silicon Block.

Source: METU Technopolis Coordination Office.

Figure 4.19 : Adopted first floor plan of METU Silicon Block.

Source: METU Technopolis Coordination Office.

4.2. 'Measuring' Spatial Performance

In the process of *measuring* spatial performance, the elements that form the structural basic tool kit[57] for the study area are the *material space (a)* that concerns the physical properties of space and dealt in a more analytetic analysis in terms of *boundaries, connections and networks* is possible. Since the material 'spacing' of objects follows the necessary logic of social 'spacing', the initial ordering of objects in space can always be connected with principles of social ordering. Every kind of building erected for the needs of a community, implies the construction of a 'context' for human interaction and human activities. The spaces that are associated with specific communal group, consequenlty, with the creation of *social space (b).*

In the case of METU Technopark, the *material space* is constituted by the three selected buildings: METU Twins, SiliconBlock, and Halıcı Software House. Their physical properties are mentioned within an architectural context beforehand; and a more analytetic approach to their boundaries, connections and networks are going to be stated in this part of the study.

The *social space* issue is going to be treated after setting the specific communal characters of the three buildings selected.

4.2.1. Material Space within Boundaries, Connections and Networks

The METU Twins is set basically behind the boundary of its entrance façade. The frontal space, excluding most of the activities of the office users, absorbs them to a more attractive spatial order of the inside and the attached open spaces

57 "Chairgroup Socio-Spatial Analysis Thesis research subjects and approaches", Wageningen University, Chairgroup Socio-Spatial Analysis.

http://www.dow.wur.nl/webdocs/Internet/Landschap/lsg_SRA/socio-patial%20analysis%20thesis.pdf. (Last access date:12th June, 2006)

behind itself (See Figure 4.20). METU Twins is connected to the METU Campus with both on foot and vehicle road. Other nearby users of the Technopark spend time in its cafeteria. Its networking is set on a considerable range of social groups. Such as: the campus, technopark, and industrial communities.

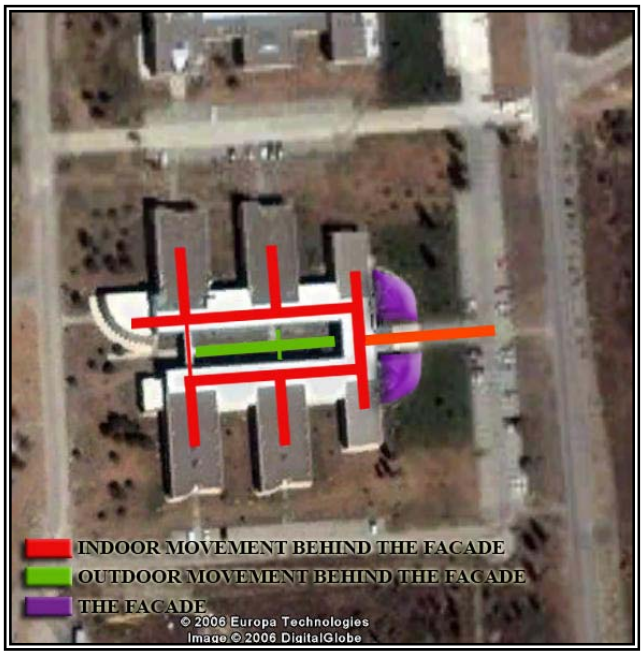


Figure 4.20 : An analysis on the aerial photo of METU Twins.
Source: Google Earth (2005).

This is quite dissimilar to the Silicon Block, that offers a frontyard with a long façade carrying the user activity as an entrance screen. This screen acts as a double-sided vertical element which has two different characteristics; outside it is more casual and informal, inside more operative and formal (See Figure 4.21).

building users connect to the campus and nearby technopark buildings. Its networking mostly involves with industrial people addressed.

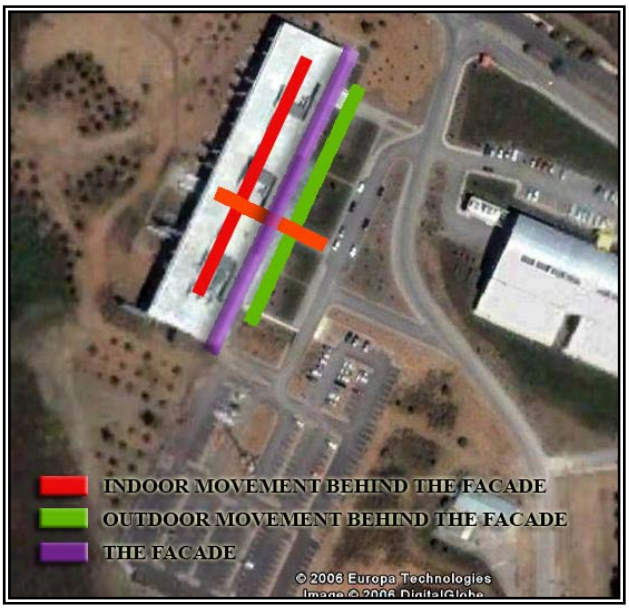


Figure 4.21 : An analysis on the aerial photo of Silicon Block. *Source*: Google Earth (2005).

Halıcı Software House has either of these characters. This building directs the users inside and lets them out just for their long breaks of the work day. Neither front space to use –except parking lot– nor attached open or semi-open spaces to be found (See Figure 4.22). The scant entrances of the independent two firms as lessees that have their gates as the only open spaces to take fresh air. The main entrance gate placed on the welcoming façade is too formal to spend for refreshment purposes.

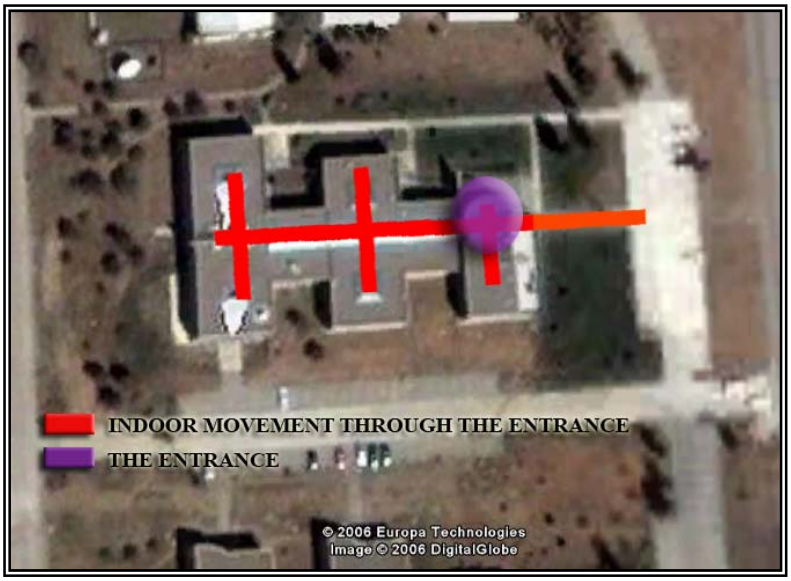


Figure 4.22 : An analysis on the aerial photo of METU Halıcı Software House. *Source*: Google Earth (2005).

4.2.1.1. Social Space

As the ensemble of social objects (user), the material spaces are constructed in order to serve human interests: they have context. Thus, it is not enough to define a material space only in terms of physical characteristics. The essential feature of these physical environments is having a social logic. Human activities interconnects the initial ordering of physical objects and spaces. The community housed, is the associated preliminary element that characterizes the boundaries of social space.

The social context of the three buildings is more or less similar to each other. METU Twins Building houses a 55 percent of software firms, Halıcı Software House 50, and Silicon Block 65. These values depict the striking likeness of the communal structures housed.

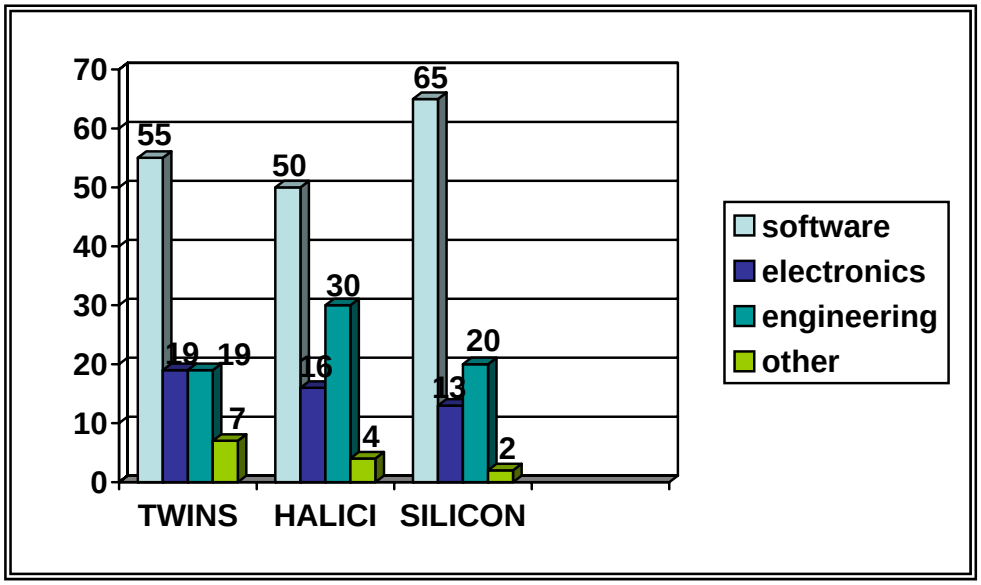


Figure 4.23 : The percentage of major activity fields within total number of firms analyzed in each three observed buildings.

Since the social context overlaps within each of the three cases, the behavoural patterns are assumed to be similar. The difference is the three differnet physical layouts that offer different encountering spaces. These, constitute different connections and networks within the three buildings observed.

In the METU Twins, a wide layout of common corridor space providing a well-lit and visible space as the perimeter of the open courtyard, creates a satisfying encountering space for the user. This phenomenon binds the *spatial practice*[58] together with its spatial trajectory. This space influences people's behaviour and interaction with its character of being open, well-lit and wide design. In Halıcı Software House, the encountering happens within each firm's divided spatial

[58] "Chairgroup Socio-Spatial Analysis Thesis research subjects and approaches", Wageningen University, Chairgroup Socio-Spatial Analysis.

http://www.dow.wur.nl/webdocs/Internet/Landschap/lsg_SRA/socio-spatial%20analysis%20thesis.pdf (Last access date: 16th August, 2006)

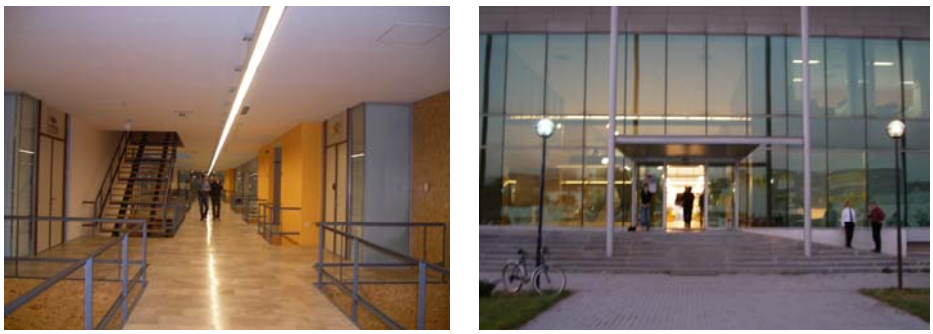
layout, hence, the interaction rate is poor compared to METU Twins within the closed building area. METU Silicon Block offers this encountering space mostly with its open entrance yard, which is quite clear that did not designed for this purpose. Inside the building, the narrow and artificially-lit corridor space limits the interaction time interval. Also, the cafeteria, although located central to the overall plan layout, seems rarely used according to the inventory outcomes.

Figures 4.24-25 : Images from METU Twins.

Source: Personal Archive (2006).

Figures 4.26-27 : Images from Halıcı Software House.

Source: Personal Archive (2006).



Figures 4.28-29 : Images from Silicon Block.

Source: Personal Archive (2006).

4.2.1.2. Spatial Experience

The study analyses the spatial experiences[59] of the given three example buildings with the acceptance of: the interaction between people and the surrounding space have an important *subjective* dimension. Hence, the phase of probing the perspective of the *subject* grounds on the tools of survey analysis, inventories, behaviour pattern observations; and architectural analysis.

Thus, the outcomes of the conducted questionnaires, in-depth interviews, observational data analysis, and the spatial conclusions brought by the outcomes of behavioural data are reflected within the "measurement of spatial performance" issue.

The subjective reflection of the user within the METU Twins over his/her spatial experience is fairly positive compared to the other two buildings. A 62% of the users define the space as "inviting", also with the given the reasons of being wide

[59] "Chairgroup Socio-Spatial Analysis Thesis research subjects and approaches", Wageningen University, Chairgroup Socio-Spatial Analysis.

http://www.dow.wur.nl/webdocs/Internet/Landschap/lsg_SRA/socio-spatial%20analysis%20thesis.pdf (Last access date: 2th June, 2006)

and well-lit, the spaces for common use are providing a quite “relaxing”, “discharging” qualities for a 51% of the users. In METU Twins building, the value rentability is minimized by the high ratio of the common use spaces to the whole area, compared to the other observed buildings of the METU Technopolis.

Figure 4.30 : An “inviting” image from the lobby.

Figure 4.31 : A “relaxing” view from inner courtyard.

(METU Twins) *Source*: Personal Archive (2006).

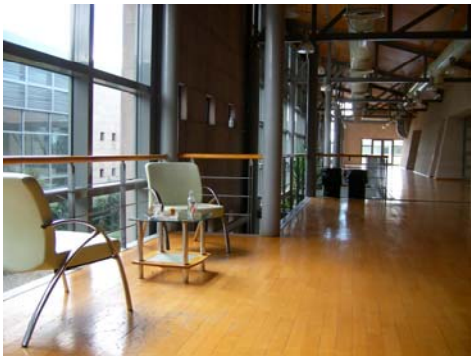


Figure 4.32 : The view from the niches of the first floor corridor.

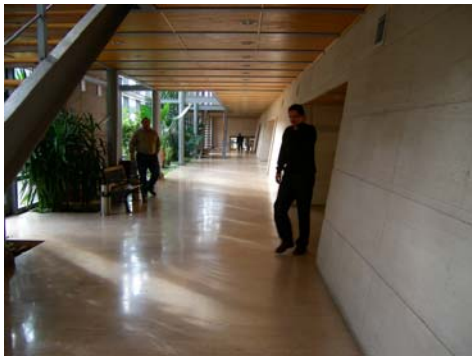


Figure 4.33 : An image of common use of the corridor in short breaks.

(METU Twins) *Source*: Personal Archive (2006).

METU Silicone Block, with the spatial experience scene it offers, has the features of “an avarage interior common space”, “a potential exterior space to improve”, and “lacking a good distribution of natural light”. The interaction possibilities are created mostly within the physical borders of the office and, especially in good wheather, the entrance patio. The basic issue that is mentioned by the 47% of the respondents is the lack of exterior furnishings and open/semi-open building extensions. (See figures below).

Figure 4.34 : A view of “potential interactions” in front of the main entrance gate.

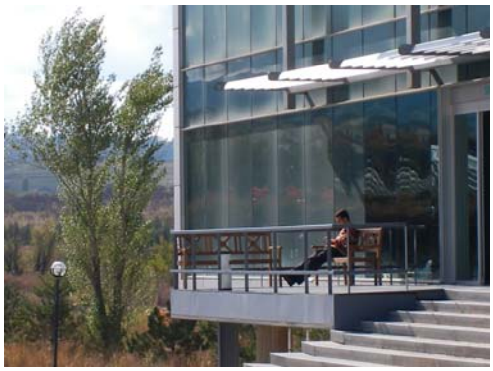


Figure 4.35 : Another frontal entrance that serves as a “relaxing balcony”

Figure 4.36 : An image of the cafeteria. **Figure 4.37 :** The corridor space, poorly lit. (METU Silicon Block). *Source*: Personal Archive (2006).

On the other hand, a 57 % of METU Halıcı Software House user defines the building as a “working container”, “workibator”, which indicates that the user has the need of spending time in calming common spaces in order to reduce the working stress. Moreover, the 31% of the users mention that; the rare social encountering opportunities are achieved in the short (coffee-tea-smoking) breaks, on foot, in the “desolate and unfurnished corridor space”.

The offered spatial qualities served for the common use are located lopsided with respect to the whole layout, 33% of the respondents highlight that “the niches and the furniture of the corridor space is located only near to the entrance façade” that causes the users to feel a sense of hierarchy.

Figure 4.38 : A perspective from the ground floor corridor space.

Figure 4.39 : The first floor corridor space. *Source*: Personal Archive (2006).

Consequently, METU Halıcı Software House is defined to be having a lack of offering informal common spaces. This enforces the users to leave the building in order to meet the need of interaction within nearby buildings, such as METU Twins, or campus and nearby campus alternatives. That is because the building does not even provide an informal outdoor space for the common interaction.

Figure 4.40 : An image of the first floor corridor furniture. (Halıcı Software House)

Figure 4.41 : The entrance lobby. *Source*: Personal Archive (2006).

To sum up, the knowledge about how people react to environmental qualities has importance for environmental planning and design. Thus, the given subjective data gathered from the sociological research tools, set the perceptional data and the needs of the users of the related buildings. The information collected, reflects the appropriate working space qualities in a subjective manner. It's seen that, most of the needs are related to the improvement of the general qualities of the *common* spaces. This is to be reminiscent of the concept of "interaction" in the way; patterns of space affects the patterns of 'useful' interactions between the research groups[60].

4.2.1.3. Common Spaces and Innovation Community

Since the structure of space has much to offer in random encounter and copresence, it is possible to read an implicit strong spatial component in Allen's observations[61]. While interaction between members of the same discipline or area

[60] Hillier et al, 1990; Hillier and Penn, 1991; Penn and Hillier, 1992.

[61] Allen, Tom, 1977, p. 123.

of study arises naturally, either because of space (they will often work near each other) or in spite of space (programmed meetings tend to bring together those one would expect to have common interests); interaction between people from different areas of study does not arise naturally and has no real reason to occur (they work in different places, attend different seminars and conferences and do not have any special reason to need to meet).

The type of interaction Allen describes as fundamental to innovation will tend not to be programmed, and as such will depend strongly on casual encounter. This suggests that the patterns of encounter generated by the movement of people through the public space network that links programmatic spaces within buildings may be a key factor in the generation of innovation.

In the process of tracing the *spaces of innovation*, within the example set from the METU Technopolis, the common use of spaces are considered carefully because of their high casual encountering potentials. According to the questionnaire and in-depth interview respondents, the highest satisfaction rate[62] of the common spaces belongs to the METU Twins. After that the METU Silicon building and the lastly Halıcı Software House follows.

The character of common space can perhaps be shaped by the way visitors make use of it and may change at different times of the day, depending on copresence, space use, diversity, interface with other visitors or members of staff. Are these variables affected by the spatial layout? Is there a relation between spatial configuration and patterns of visitors' movement and public space use? How does space and the location of functions affect the perceived character of buildings of technology production? Is there a method of analysing

[62] Common space satisfaction rates: METU Twins: 64%, METU Silicon: 43%, Halıcı Software House: 12%. (See Appendix C).

the networking structure of workplace and its auxilary spaces of social interaction?

In order to address these issues, a computational model of the process is developed by which ideas are generated and diffused through dynamic social networks[63].

After a long time passed over the day Le Corbusier claimed: "A house is a machine for living in…" (1923); Hiller refined this definition as in the title of his book: "Space Is the Machine" (1996). Hence, there can be stated a conclusion such as: the space configuration of a certain function will affect the operation mechanism and its communal or social networking or vice versa. As highlighted in the 2nd International Conference on Communities and Technologies (13-16 June 2005 Milan, Italy), in the workshop brochure by Filippo Dal Fiore and Guido Martinotti[64].

> *"Continuously evolving ecologies of communities and networks populate the world, both directly-experienced and Internet-mediated, contributing to originate different opportunities in which a special social dimension (i.e. socio-cognitive space), also called 'ba's'[65] is shaped, and in which meaningful social innovations take place … The organizational community versus the occupational community ("a sort of operating adhocracy"), A. Lam (2000, 2002) argues that a community of practice takes a governance form situated in a middle position in the continuum between hierarchy and network. But, as for the concept of*

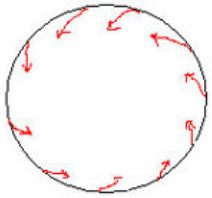
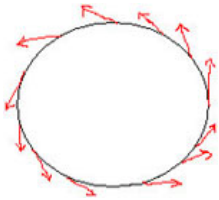
[63] Chang and Harrington, 2005.

[64] Both are from: School of Sociology, University of Milan Bicocca.

[65] Nonoka, I., and Konno, N., 1998.

community, N. Postman (1993) emphasizes the idea that a common obligation (cum: together+ munis: obligation) is central to application of the concept. … Ending by postulating: communities and networks represent the two extremes of an epistemic continuum of the different possible relationships between an individual/organization/system/agent (i.e. its individuality) and the environment in which these actors operate (i.e. its sociality)"

Table 4.1 : Differentiating communities from networks.

		
Communities		Networks
Tension towards homogenization/conservation	Vs	Tension towards differentiation/generation
Confirming/explicative communication		Creative communication, new paths of sense
Space of belonging		Space of comparing

The terms community and network are both strongly interrelated. Whether the controlling/organizing mechanism is the virtual or spatial one (within the network hierarchy), the tension in between strongly occurs. Combining the

network to the communal structure is a way to maximize the fertility of production process. This aim finds its base in the physical intersection set: *common spaces*. Therefore the design of these spaces in technology production nodes (named as *technoparks*) becomes extremely important.

The social network structure of the METU Technopolis setting is developing phase by phase. The communities flourishing within this setting are the key issues to integrate. While giving the effort of finding the *spaces of innovation*, one should sense the necessity of communal structure integrated to its overall network. The appropriate mediums for generating the needed interaction level for creative ideas are behind this fact.

CHAPTER 5

CONCLUSION:
FINDINGS OF ANALYSIS

5.1. Findings of the Sociological Analysis

The findings on the question “How can researcher performance be improved through the architectural design?” put on a framework by the guideance of Nicolas Nova, and his study *Socio-cognitive functions of space in collaborative settings* (2004):

“When dealing with the concept of space in collective situations, it should be considered that the three dimensions: *persons, space/place and artifacts*, and a corollary feature which is *activity*. From the relation between each of those components, affordances of space emerges among the group”.

The answering process that is based on the interrelations that Nova focuses on are: person-person, person-artifact, person-place, space, place and activity, and space-artifacts on which this analysis is mainly based on.

The findings of the sociological analysis (using the methods of observation, questionnaire, in-depth interview, participation) and architectural data analysis (architectural configuration analysis, behaviour mapping) are juxtaposed and a visual presentation is obtained.

The findings of person-person interaction analysis in the three buildings selected, METU Twins, METU Silicon Block, Halıcı Software House, gives

information on the levels of interaction. In comparison to Halıcı Software House, METU Twins building (indoor) and Silicon Block (outdoor) have a higher level of interaction in the common spaces[66].

The person-artefact interaction is depicted with the *behaviour maps*[67] and *types of interaction analyses*. The density of usage within the common spaces and their furnishings of the three selected buildings, with relation to their design purpose[68], show that METU Twins have the highest, METU Silicon Block the avarage, and Halıcı Software House the lowest values.

The best interaction of person-place is found in the architectural layout of the METU Twins Building. In METU Twins, the definition of 'interaction space' accords with its designated plan. Silicon Block has unexpected uses of interaction spaces by the definition of the user. The user creates his/her socializing nodes independent within the unforeseen spaces (e.g. fire exits used for short term socialization) of the building. On the other hand, Halıcı Software House does not even provide enough physical space for socialization of users.

---

[66] See APPENDIX A.

[67] Ward Thompson., C., Findlay, C., Southwell, K. and Aspinal, P., *Lost in the Countryside: Techniques to Address Wayfinding Problems*, 2004.

*Spatial behaviour mapping**: Taking as a starting point the 'impression objectives' for the building, the analysis of the extent to which these objectives are met within the existing 'spatial experience'. This involves the application of a visual spatial cognition framework to understand the overall assumptions different kinds of visitors that will make about the space, as well as the objects, colours and people that inhabit it. This trace* consists of perception and visual spatial cognition, verbal and non-verbal rituals, behavioural science and environmental psychology.

*Also based on the scientific research work of Ronald Rensink, Mary Potter, Knill & Richards, Irvin Biederman, V.S. Ramachandran and Semir Zeki. In addition a body of philosophical work around the relationship with the 'space', from thinkers such as Gaston Bachelard, James Elkins, Lev Manovich and Henri Lefebvre.

[68] In Silicon Block, users define unforeseen interaction spaces, like fire exit stairs and outdoor architectural extension elements. Here, the offered common spaces within the architectural configuration are mentioned. (See Appendix C).

Users of Halıcı Software House prefer to leave the building in order to have a space for social interaction.

Th question related to the intersection of *space*, *place* and *activity* is answered in the findings related to spaces of work and socialization. The activity best accords its space within the layout of METU Twins building. The sense of place is supported by the designer's offered architectural configuration, however, needs to be enhanced[69].

The working areas (office spaces) of the three buildings are evaluated by the users as appropriate for their purpose and satisfying the needs of the users. Also the space and its artifacts (elements placed within the space; either fixed or semi-fixed or non-fixed) are evaluated to accord with the working spaces (open office spaces).

The findings of the sociological analysis in relation to the architectural spaces indicate a strong relationship between *space-place-artifact-person* in the three selected buildings of METU Technopolis: METU Twins, Silicon Block, and Halıcı Software House.

5.2. Data Vizualization and Analysis

Based on the observational data, a graphic representation is produced using the *behaviour mapping method*. This depiction is gained by juxtaposing the sociological research data over architectural layout. With this type of presentation; the patterns of movement and space use are identified simultaneously.

[69] A significant amount of interviewed users mention the lack of furnishing and shading elements on terrace, inner courtyard, and circulation paths. (*See* APPENDIX A).

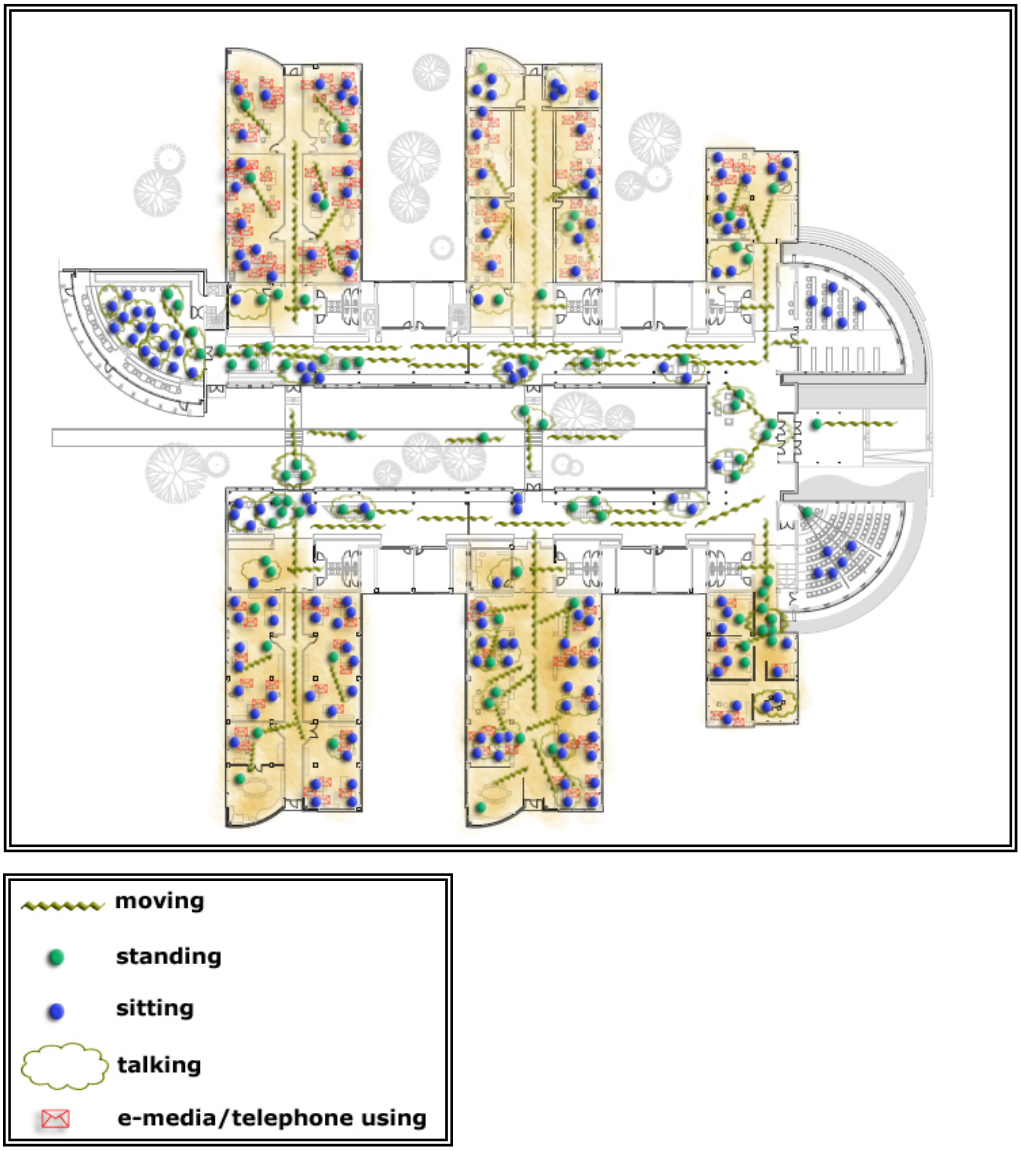


Figure 5.1 : Behaviour map of METU Twins ground floor.

Source: Personal Archive.

Figure 5.1 shows that the interaction (circles around talking people) can be seen to take place in a number of different kinds of location and can be divided into

‘formal planned meetings’ and ‘informal unplanned interactions’ according to pilot interview outcomes. These types of interaction broadens itself after an in-depth interview study to scheduled/unscheduled group or office meetings, coincidental consultations, and e-media/telephone originated meetings.

5.2.1. Behaviour Mapping of Metu Twins

It’s conformable to say that inside the METU Twins building, in the cellular formal meeting rooms there is interaction where all participants are seated and mostly a formal meeting is taking place. Some areas of the open-plan also contain meeting tables with several seated people that indicates similar patterns of use. In te open plan work areas, single seated workers do not tend to interact with each other. However, there is interaction between seated and standing people, reflecting the visitiors to desks in order to solve the problems.


Figures 5.2-3 : Figures depicting the interaction types within METU Twins office interiors.

In the corridor space, there is a quite interaction taking place compared to the other two buildings observed. This is apperently unplanned interaction between

passing people and the seated or standing people on their breaks. The good use of natural light makes the users visible and gives the opportunity to encounter with each other.

A further kind of interaction can be detected in the connection through the stairs. Here, both participants are probably ‘movers’ and interaction is taking place either whilst changing the floor for giving breaks or work based reasons.

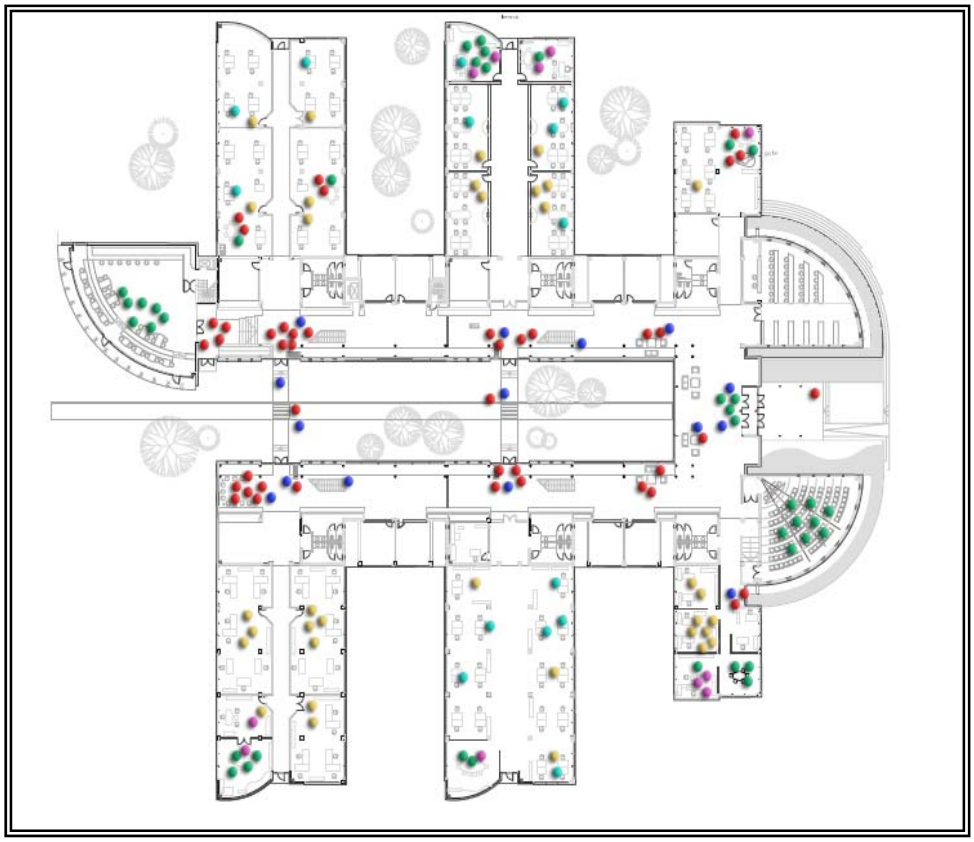


Figure 5.4 : Types of interaction within the ground floor of METU Twins.
Source: Personal Archive.

Figure 5.4 Continued.

These findings suggests that the interaction level is the highest with a 47% of rate compared to METU Silicon Block (37%) and Halıcı Software House (16%). It is seen that especially Halıcı Software House needs to be far more generative in the way it fuctions socially.

5.2.2. Behaviour Mapping of Metu Silicon Block

It is seen that the possible interactions occur within the office spaces in the METU Silicon Block are mostly planned or unplanned meeting activities within the meeting areas. Most of the users are seated and possible desk visits are limited compared to METU Twins building. The common wide space of restaurant offers the highest ratio to interact within long breaks (See Figure 5.5).

Corridor space is defined as “too narrow to spend time on consultations”, then a possibility to interact on fire escape spots are created by the user independent from the designer’s intention (See Figure 5.6). Also the exterior entrance patio suggests the need to interact within any kind of breaks. The user mentions the lacking of outside extensions and furnishings.

Figure 5.5 : Behaviour map of the basement floor of the METU Silicon Block. *Source*: Personal Archive.

METU Silicon Block, with its functional approach in design, offers the required areas for the assigned purposes of the spaces. However, the 'shrinked', 'lacking of good natural lighting[70]' features of the indoor common spaces enfroces the users to spend time within the outdoor extensions of the building. The use of fire exits for refreshment purposes indicates this need for indoor common space. The architectural layout meets the requirements of assigned spaces, however, the questionnaire results indicate the lacking of a more spatial need for indoor interaction.

[70] See Appendix C for more detaild information.

Figures 5.6-7-8-9 : Figures showing the exterior space use in METU Silicon Block.

Source: Personal Archive.

Although the poor interior space for common use features, the entrance space and its exterior extension is used with a high level of interaction compared to the other two examples. The exterior interaction rate is highest in Silicon Block (66% of the whole interaction amount of the three buildings), METU Twins is the second (22%), and the Halıcı Software House is the last (12%).

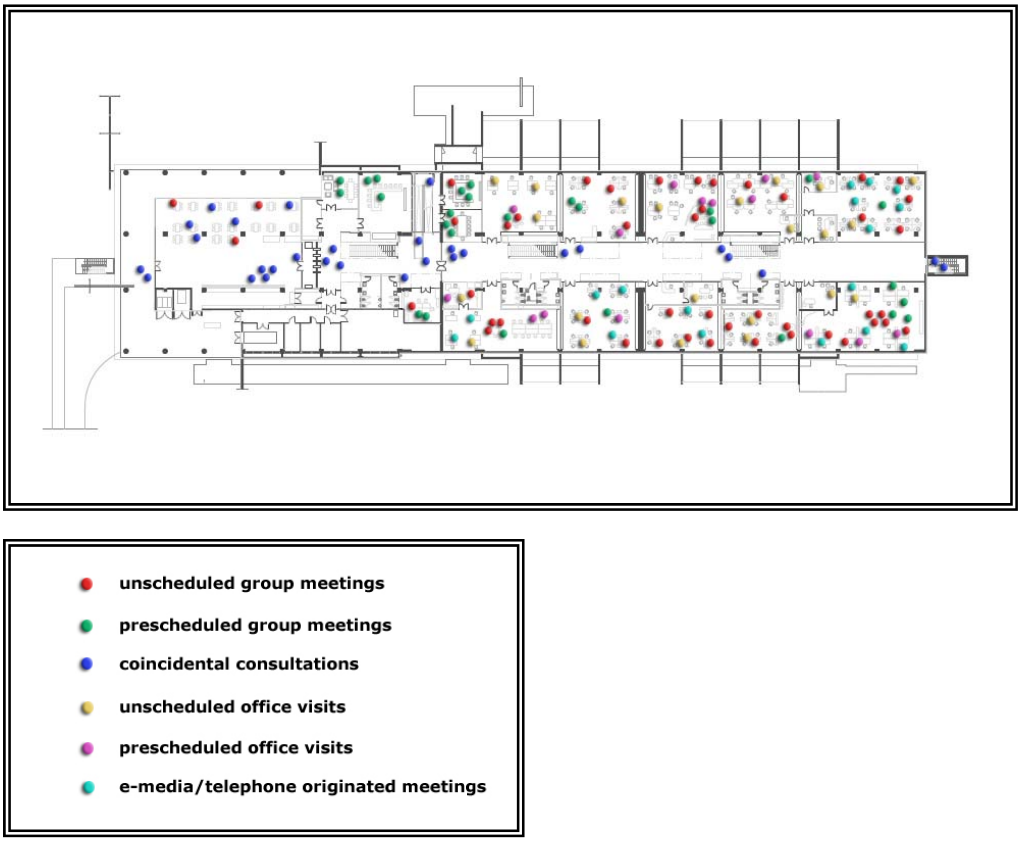


Figure 5.10 : Types of interaction within the basement floor of METU Silicon Block.

Source: Personal Archive.

The ground floor level has the higher level of interaction within the whole body of the building. The entrance gate with it extensions and the cafeteria space located just opposite to it suggests a wide niche combination that provides the encountering opportunities.

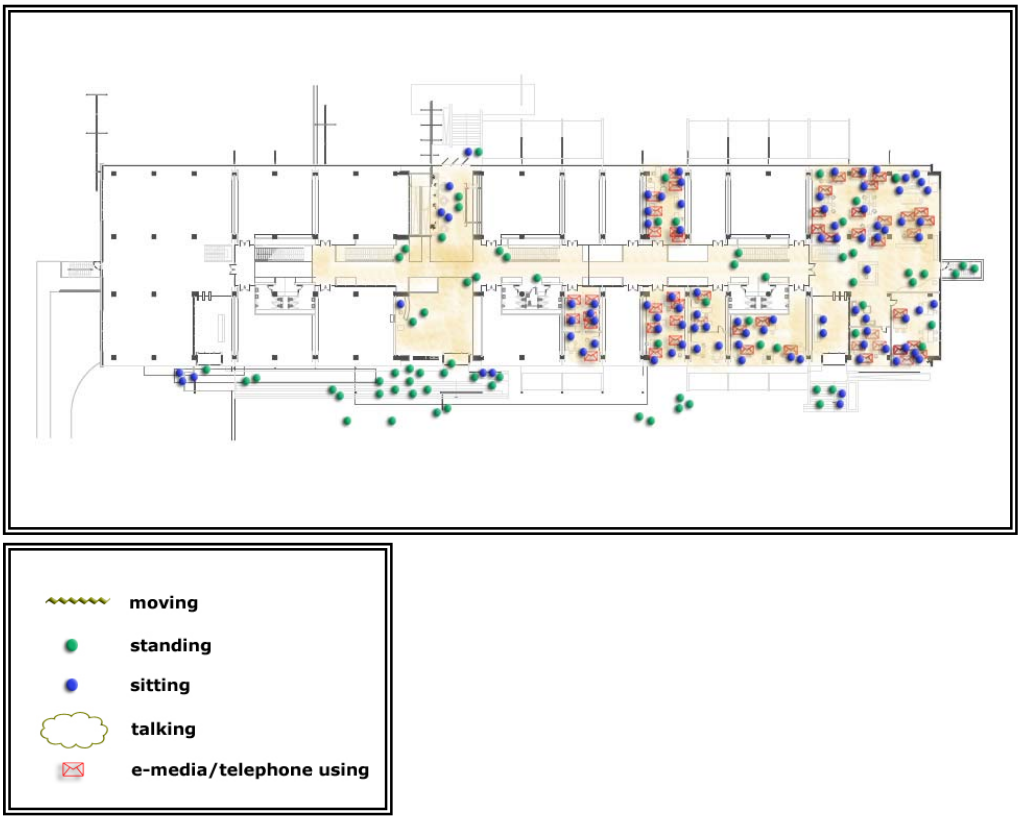


Figure 5.11 : Behaviour map of the ground floor of the METU Silicon Block.
Source: Personal Archive.

The METU Silicon Block reveals itself as a office-centric working medium layout. The interaction inside the office settings are configured independently, and the only chance of achieving face-to-face consultations with the other office users is the common spaces. As a common space, circulation paths, defined as inappropriate for this prupose by the user interviews. The baest practice occurs within the meeting rooms, cafeteria space, and fire escapes.

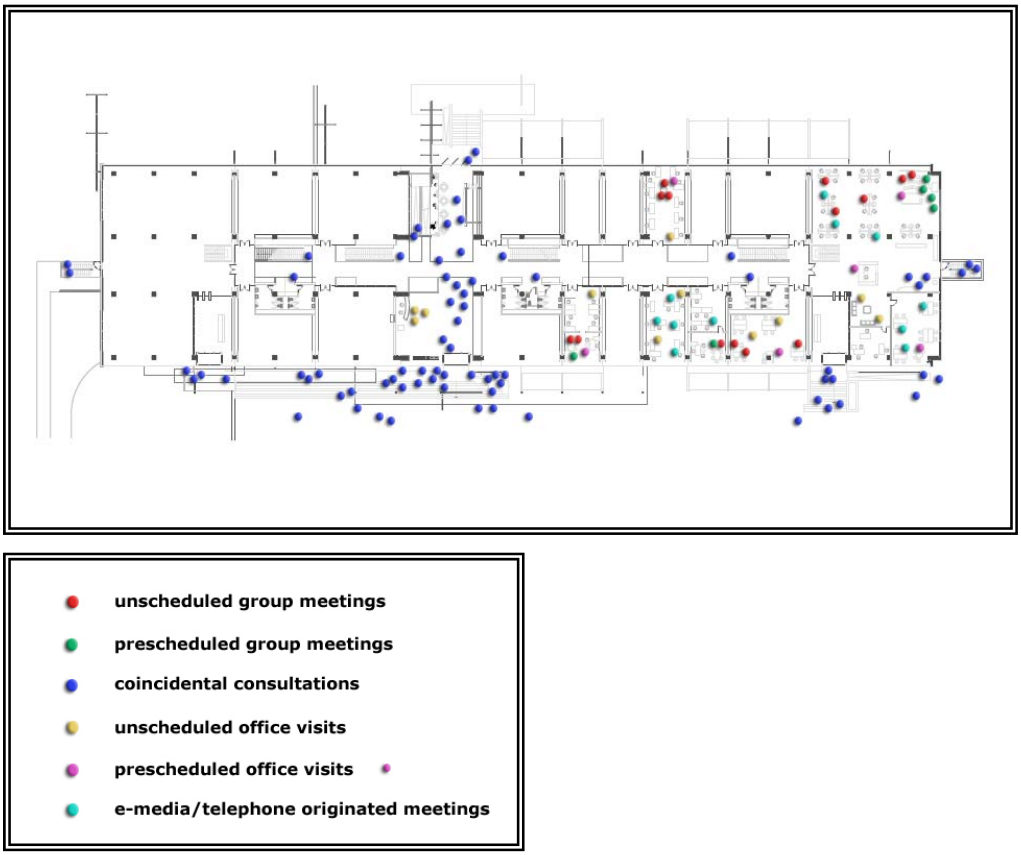


Figure 5.12 : Types of interaction within the ground floor of METU Silicon Block.

Source: Personal Archive.

Figures 5.13-14 : Images of office spaces from METU Silicon Block.

Source: Personal Archive.

5.2.3. Behaviour Mapping of METU Halıcı Software House

Figure 5.15 : Behaviour map of Halıcı Software House on ground floor level.
Source: Personal Archive.

The sociological research on Halıcı Software House indicates that the interaction level, resulting also from the visible patterns of space use, is lower compared to the other two buildings observed. The e-media use ratio is highest (67%) within the all interaction types (planned and unplanned face-to-face, and e-media/telephone interactions). It is lowest in METU Twins (47%), and avarage in METU Silicon Block (58%).

The use of common spaces within Halıcı Software House, causes a low rate of interaction. Because of the layout design limited to functional criteria, circulation paths suffer to include social interaction. The entrance gate and its interior and exterior extensions seems to be the potential spaces to unscheduled encounters.

Figures 5.16-17 : Images fom the independent two gates of Halıcı Software House. *Source*: Personal Archive.

The gate locations are obvious with the coincedental encountering groups marked in blue in the figure 4.44. The interior of the Halıcı Software House building does not offer much to face-to-face technical consultations. That reduces the amount of the spaces of innovation, and mentioned frequently on the questionnaire and interview outcomes .

The meeting rooms and halls used mostly for scheduled meetings are potential interaction nodes other than office space meeting spots. The user highlights the lack of a wide refreshment area such as a cafeteria, and needs to go out in thier mid-day breaks to near buildings (56%), campus area (29%), or outside the campus facilities (15%).


Figures 5.18-19 : Images from the meeting rooms of Halıcı Software House (ground level). *Source*: Personal Archive.

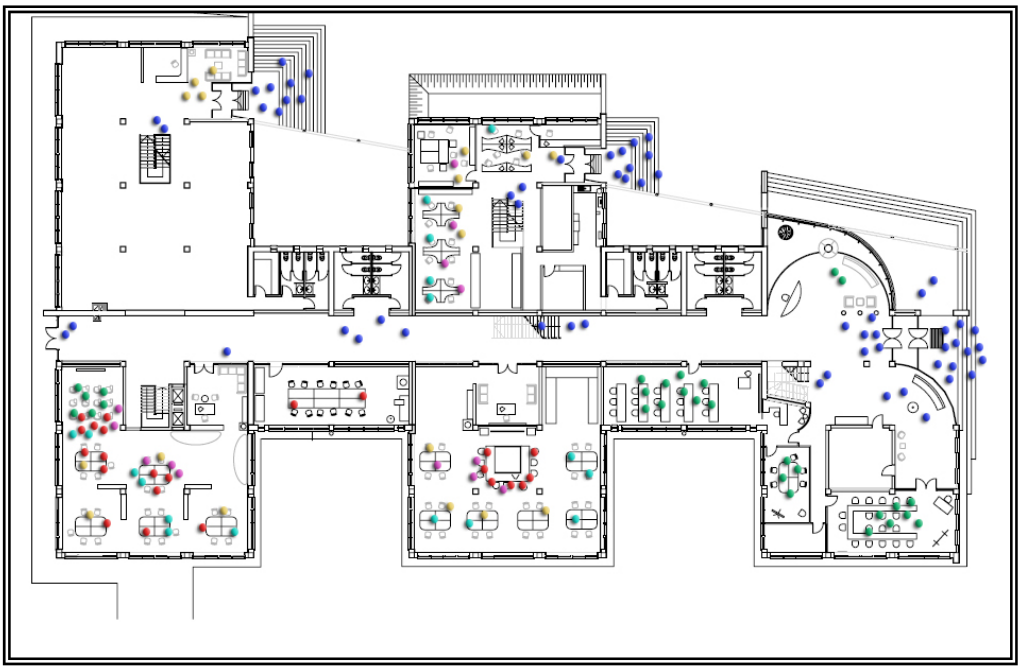


Figure 5.20 : Types of interaction within the ground floor level of Halıcı Software House. *Source*: Personal Archive.

Figure 5.20 Continued.

To sum up, the interrelations of person-person, person-artifact, person-place, space, place and activity, and space-artifacts are observed with a sociological research perspective. Consequently, the audio-visual data gathered by the observations and participations, the questionnaires responds on hard copy and e-mail based mediums, the in-depth interviews with the workers and the organizers, and lastly the architectural space data superimposed yielded the results of these interrelations. The scatters depicted in behaviour maps and types of ineraction figures give the clue to trace the *spaces of innovation*.

The highest interrelation of person-person is achieved in METU Twins building. The interrelation of person-artifact (that is the building and its components) is well undertaken in METU Twins again. Halıcı Software House is relatively poor in this interaction level. The predominance and variety of the activities are indicating the potentiality of creating encountering nodes. These nodes are suggesting useful face-to-face technical consultations and accepted as possible *spaces of innovation*.

The Socio-Spatial Analysis focuses on interactions that occur between people and environments. This is accomplished via an examination of social interactions that influence characteristics of the physical and social environment and the usage, experiences, images, preferences, values, and interests cherished

amongst the ‘life-world’s’ of people. Spatial concepts used to fit are that of the perceived, imagined and lived space. These are mainly the spatial, communal or virtual mediums that are considered by the study.

5.3. The Significance of Developing an Architectural Approach to “Spaces of Innovation”

Technoparks happened to be entrusted establishments with the production and transmission of knowledge. Their vital task for development, the university settings especially the ones with their technology production nodes -which are technoparks- have a great influence on region’s industrial and economical progress. Thus the design of appropriate curricular structures for technoparks should be in a systematic effort in order to accord with their technology producing community. To obtain appropriate structures an architectural effort should be taken to define communal nodes of interaction.

The construction of an atmosphere conducive to innovative activities takes place largely through programmed activities, at a certain time and place such as lectures, seminars and workshops, or unplanned social connections like coincedental encounters[71]. On the other hand, an important prerequisite for the purpose of creating spaces of innovation is the spatial quality of physical medium. The architectual millieu that encapsulates these activities of the user happen to meet the functional needs. To achieve this, the enhancements of the architectural spaces in accordance with the social interactional spaces should be considered.

It is apparent that ‘emancipating’ the access to spatial differentiation for all categories of workers will entail a reciprocal ‘limiting’ code of behaviour,

[71] Toker, U., 2003.

especially to those predominating space use. This paradoxical phenomenon is constituted between the concepts of ‘necessity of security’ taking root from the nature of the work and the ‘need of interaction’ in order to generate the act of innovation within the technopark indoor layout. Thus, a balance of common and private use of working space is needed. The free patterns of common use will empower the innovative process and cause a fertile ground for production. Spaces of innovation are then can be identified in the intersection nodes of both common and private patterns of behaviour.

The outcomes gathered throughout the study, indicate that the common spaces of the selected buildings of METU Technopolis provide the ground for creating social interaction in-between the workers. Since this interaction is the generating force leading to the act of innovation, the architectural accordance to this purpose is essential. Most of the workers highlight the ‘refreshing’ effect of the mentioned common spaces in questionnaires, interviews, and space-behaviour observations.

It is important to specify the fact that these common spaces are the ‘spaces of interaction’, however, in this case of METU Technopolis, they are not especially designed for this purpose. The common spaces are the refreshment areas that provide opportunities of interaction, but are not designed for the purpose of creating innovative spaces.

It is a fact that this generative quality of space, interaction, is strongly needed within the building of the Technopark. On the other hand, it is important that these common spaces of interaction acquire a character of their own. That is the further discussion in the field of architecture towards creating ‘spaces of innovation’ from the designers’ point of view.

REFERENCES

Allen, T. J., 1984, *Managing the Flow of Technology: Technology Transfer and the Dissemination of Technological Information within R&D Organization.* Cambridge, MA: M.I.T. Press.

Backhouse, A. and Drew, P., 1992, *The Design Implications of Social Interaction in a Workplace Setting.* Environment and Planning B: Planning and Design, 19, 573 – 584.

Becker, F. D. and Steele, F., 1995, *Workplace by Design: Mapping the High-Performance Workscape.* San Francisco, CA: Josey-Bass Publishers.

Blaut, J. M., 1991, *Natural Mapping*, Transactions of the Institute of British Geographers, New Series, Vol. 16, No. 1, pp. 55-74

Bugni and Smith., 2006, *Symbolic Interaction and Theory of Architecture*, Symbolic Interaction, Vol. 29, No. 2, p. 123-155.

Blyton, P., Turnbull, P., 1998, *The Dynamics of Employee Relations.* (2nd Ed.) MacMillan Press Ltd.

Castells, M. and Hall, P. G., 1994, *Technopoles of the World: The Making of Twenty-first-century Industrial Complexes.* London, New York: Routledge.

Chavis, D.M., & Pretty, G., 1999, *Sense of community: Advances in measurement and application.* Journal of Community Psychology, 27(6), 635-642.

Davis, K., 1967, *Human Behaviour at Work: Human Relations and Organizational Behaviour.* 4th Edition. Mc Graw-Hill, Inc.

Dougherty, D., 1996, Organizing for Innovation. In S. R. Clegg, C. Hardy, W. Nord (Eds.), *Handbook of Organization Studies* (pp. 424 – 439). London: Sage.

Ferguson, G. S. and Weisman, G. D., 1986, *Alternative Approaches to the Assessment of Employee Satisfaction with the Office Environment.* In J. D. Wineman (Ed.), Behavioral Issues in Office Design (pp. 85 – 108). New York, NY: Van Nostrand Reinhold.

Giddens, A., 1996, *Introduction to Sociology*-2nd Ed.. New York, London: W W Norton & Co, Inc.

Grant, J., Mittelsteadt L., 2004, *Types of Gated Communities*. Planning and Design, vol.31: 913-930.

Golledge, R. G., 1993, *Geographical perspectives on spatial cognition*. In T. Ga¨ rling & R. G. Golledge (Eds.), Behavior and environment (pp. 16–46). Amsterdam: North-Holland.

Greinacher, U., 1995, *The New Reality; Media Technology and Urban Fortress.* Journal of Architectural Education. Vol.18 (3): 178-184.

Hillier, B., Hanson J., 1984, *The Social Logic of Space*. Cambridge University Press.

Hillier, B., 1985, *The Nature of the Artificial: the Contingent and the Necessary in Spatial Form in Architecture.* Geoforum, *16*(2), 163 – 178.

Hillier, B., Burdett R, Peponis J, Penn, A., 1987, *Creating life: or, does architecture determine anything?* Architecture & Behaviour Vol. 3 No: 3 pp 233-250.

Hillier, B., 1996, *Space is the Machine*. Cambridge University Press.

Hillier, B., 2003, *The knowledge that shapes the city: the human city beneath the social city.* In: 4th International Space Syntax Symposium, p. 17-19, London, UK.

Hillier, B., 2005, *Between social physics and phenomenology.* In: Fifth Space Syntax Symposium, 13-17 June 2005, Delft, The Netherlands.

Massey, D., Quintas P., and Wield, D., 1992, *High Tech Fantasies: Science Parks in Society, Science, and Space.* London: Routledge.

Melbin, M., 1972, *Alone and with Others: A Grammar of Interpersonal Behaviour*. New York: Harper & Row.

Newman, O., 1995, *Defensible Space: a New Physical Planning Tool for Urban Revitalization.* Journal of the American Planning Association. (61): 149-155.

Nisbet, R. & Perrin, R.G., 1977, *The Social Bond*. New York: Knopf. (Out of print. See The Quest for Community.)

Pellow, D. N., Park, L. S., 2002, *The Silicon Valley of Dreams: Environmental Justice, Immigrant Workers, and the High-Tech Global Economy*. New York, London: The New York University Press.

Penn, A. and Desyllas, J. and Vaughan, L., 1999, *The space of innovation: interaction and communication in the work environment.* Environment and Planning B: Planning and Design, 26 (2). pp. 193-218. ISSN 02658135.

Rappaport, J., 1977, *Community Psychology: Values, research, and action*. New York: Rhinehart and Winston.

Rapoport, A., 2000, Science, Explanatory Theory and Environment-Behavior Studies. In S. Wapner, J. Demick, T. Yamamoto, and H. Minami (Eds.), *Theoretical Perspectives in Environment – Behavior Research: Underlying Assumptions, Research Problems and Methodologies* (pp. 107 – 140). New York: Kluwer Academic / Plenum Publishers.

Roiser, M., 1987, *Commonsense, science and public opinion*, Journal for the Theory of Social Behaviour, 17(4): 411–32.

Saarinen, T. F., 1976, *Environmental planning: Perception and behavior*. Boston: Houghton Mifflin.

Sarason, S.B., 1974, *The psychological sense of community: Prospects for a community psychology*. San Francisco: Jossey-Bass.
Schumpeter, Joseph, 1942, *Capitalism, Socialism, and Democracy*. New York: Harper & Row.

Scott, J., 1991, *Social Network Analysis*. London, Newbury Park, New Delhi.

Sommer, R., 1969, *Personal Space: the Behavioral Basis of Design.* Englewood Cliffs, NJ: Prentice-Hall.

Steadman, P., 1983, *Architectural Morphology*. Cambridge University Press.

Turner, A., Doxa, M., O'Sullivan, D., & Penn, A., 2001, *From isovists to visibility graphs: a methodology for the analysis of architectural space*. Environment and Planning B, 28(1), 103–121.

Vedovello, C., 1997, *Science Park and University-Industry Interaction: Geographical Proximity Between the Agents As a Driving Force*. Technovation 17: 491-502.

Ward Thompson., C., Findlay, C., Southwell, K. and Aspinal, P., *Lost in the Countryside: Techniques to Address Wayfinding Problems*, 2004.

Wasserman, S., Faust, C., 1994, *Social Network Analysis: Methods and Applications*. Cambridge: Cambridge University Press.

Westhead, Paul, 1997, *R & D 'Inputs' and 'Outputs' of Technology-Based Firms Located On and Off Science Parks*. R & D Management 27(1): 45-62.
Whyte, A., 1977, *Guidelines for field studies in environmental perception*. (MAB Technical Notes 5). Paris: UNESCO.

Wicker, A. W., 1979, *An Introduction to Ecological Psychology*. Monterey, CA: Brooks / Cole.

Yin, R. K., 1984, *Case Study Research: Design and Methods.* London: Sage.

Zimring, C. and Peatross, D., 1997, *Cultural Aspects of Workplace Organization and Space*. In G. T. Moore and R. W. Marans (Eds.) Advances in Environment, Behavior, and Design: Toward the Integration of Theory, Methods, Research, and Utilization (Vol. 4) (pp. 195 – 221). New York: Plenum Press.

Zuboff, S. (1986). *New Worlds of Computer-Mediated Work.* In J. T. Black, K. S. Roark, L. S. Schwartz (Eds.), The Changing Office Workplace (pp. 21 – 36). Washington, DC: The Urban Land Institute.

ONLINE REFERENCES
(in order of appeareance)

- *http://www.askoxford.com/concise_oed/innovation?view=uk* (Last access date: 18th October, 2006)
- *Innovation* defined by: DTI- Department of Trade and Industry-England. *http://www.dti.gov.uk.* (Last access date: 21th November, 2006)
- *Schumpeter, J. http://en.wikipedia.org/wiki/Joseph_Schumpeter* (Last access date: 16th November, 2006)
- *http://www.planning.unc.edu/courses/261/drescher/litrev.htm* (Last access date: 18th October, 2006)
- *http://en.wikipedia.org/wiki/Globalization*. (Last access date: 9th September, 2006)
- *http://encyclopedia.thefreedictionary.com/community* (Last access date: 14th August, 2006)
- *http://en.wikipedia.org/wiki/Morphogenesis*. (Last access date: 19th September, 2006)
- *http://arcturus.org/sa/adventures_in_soc_arch.html* (Last access date: 25th May, 2006)
- *http://socsci.colorado.edu/SOC/SI/si-simmel-bio.htm,* (Last access date: 12th June, 2006)
- *http://www2.pfeiffer.edu/~lridener/DSS/Simmel/SIMMELW4.HTML*(Last access date: 17th April, 2006)
- *http://strata.unlv.edu/smith_bugni/studentsoc.pdf* (Last access date: 13th March, 2006)
- (*http://www.asanet.org/footnotes/dec02/fn17.html,* (Last access date: 8th June, 2006)
- *http://www.metutech.metu.edu.tr/* (Last access date: 17th September-oct, 2006)

- (*http://www.messe-duesseldorf.de/shk/de/SHK-Catalogue_2006.pdf* .(Last access date: 18th September, 2006).

- *http://www.dow.wur.nl/webdocs/Internet/Landschap/lsg_SRA/socio-spatial%20analysis%20thesis.pdf.* (Last access date:12th June, 2006)

APPENDIX A

KEY DEFINITIONS OF *INNOVATION*

a) "Innovation is a tool that gives the opportunity of a different work field or service to the entrepreneurs."[72]

b) "The commercially successful exploitation of new technologies, ideas or methods through the introduction of new products or processes, or through the improvement of existing ones. Innovation is a result of an interactive learning process that involves often several actors from inside and outside the companies."[73]

c) "Innovation expresses technological development and making works in more good methods and ways. The firms catch the advantages of competition and with innovation and see the innovation as a wide concept including both new technologies and new ways of doing works." [74]

d) "Innovation, regardless of its complexity level, is the application of bright ideas that will cause to reach the market success and is certainly not an 'invention'. For example, phone is an invention but cellular

[72] Drucker, Peter F., *Innovative and Entrepreneurship, Practice and Principles.* Harper & Row, Publishers, Inc. 1985.

[73] European Commission DG XIII and XVI, 1996, p.54.

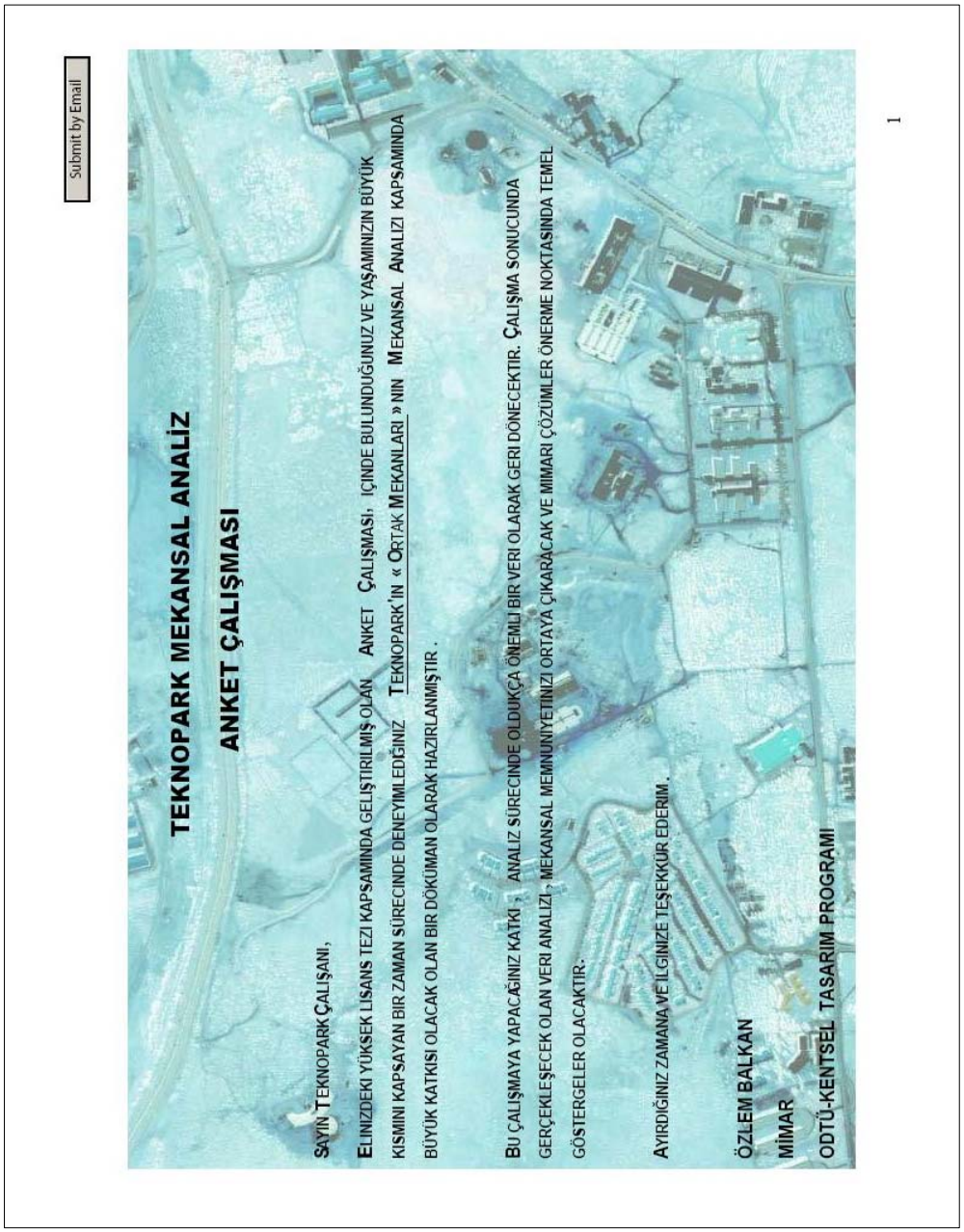
[74] Michael Porter and Scott Stern, *Innovation: Location Matters*, 2001.

phone is an innovation. Next step is such an innovation, cellular phone with WAP. All these innovations are nested together with technology development and the more their technology dimension is well grounded, the more they are successful. Innovation does not stay at this point, such as there are cellular phones with changeable covers. As seen here, there are continues change and renewal in this product. These changes and renewals are so effective that they help to increase the number of users with their features and also bring the firms in profitability and competitive power."[75]

[75] *http://www.tusiad.org/haberler/konusma/duyuruno457.pdf.* (Last access date: 17th September, 2006).

APPENDIX B

COPY OF THE CONDUCTED DIGITAL QUESTIONNAIRE



ANKET 01

1. Ne kadar zamandır ODTÜ Teknopark'ın bir üyesisiniz? Hangi bağlamda/çalışma alanında?

2. ODTÜ Teknopark'ın hangi alanlarını/mekanlarını kullanmaktasınız? Hiç bulunmamış olduğunuz mekan var mıdır?

Ofis alanı (açık) ☐ *Ofis alanı (kapalı)* ☐ *koridor* ☐ *toplantı salon/odaları* ☐ *giriş holü bekleme/dinlenme kısmı* ☐ *kafeterya/kantin/çay ocağı* ☐

merdiven ☐ *sigara odası* ☐ *çay/kahve makineleri* ☐ *avlu (açık/yarı açık)* ☐ *yangın merdiveni* ☐ *balkon/teras* ☐ *otopark* ☐

eklemek istedikleriniz :

3. Yukarıda yazdığınız alanlar bina içinde veya binaya ait, içinde çalışanların veya ziyaretçilerin ortak kullanıma açık olanları belirtiniz. (tüm çalışanlara ve/veya iş ile ilgili görüşmelere dışarıdan katılanlara açk mekan ya da alanlar: toplantı mekanları, koridor/hol mekanları, kafeler, yemekhaneler, sigara odalan, balkon/teraslar)

Ofis alanı (açık) ☐ *Ofis alanı (kapalı)* ☐ *koridor* ☐ *toplantı salon/odaları* ☐ *giriş holü bekleme/dinlenme kısmı* ☐ *kafeterya/kantin/çay ocağı* ☐

merdiven ☐ *sigara odası* ☐ *çay/kahve makineleri* ☐ *avlu (açık/yarı açık)* ☐ *yangın merdiveni* ☐ *balkon/teras* ☐ *otopark* ☐

eklemek istedikleriniz :

4. Yukarıda yazdığınız ortak kullanıma açık olan mekanlarda, normal bir iş gününde harcadığınız zamanın oranını belirtiniz.

%	20	40	60	80	100	YORUMLAR
Ofis alanı (açık)	☐	☐	☐	☐	☐	
Ofis alanı (kapalı)	☐	☐	☐	☐	☐	
koridor	☐	☐	☐	☐	☐	
toplantı salon/odaları	☐	☐	☐	☐	☐	
giriş holü bekleme/ dinlenme kısmı	☐	☐	☐	☐	☐	
kafeterya/kantin/çay ocağı	☐	☐	☐	☐	☐	
merdiven	☐	☐	☐	☐	☐	
sigara/mola odası	☐	☐	☐	☐	☐	
çay/kahve makineleri	☐	☐	☐	☐	☐	
avlu (açık/yarı açık)	☐	☐	☐	☐	☐	
yangın merdiveni	☐	☐	☐	☐	☐	

3

5. Genel anlamda, yukarıda belirttiğiniz ortak mekanlar sizce ne kadar yeterli*dir? Örnekleriniz üzerinde memnuniyet aralığınızı belirtiniz.

	Çok İyi	Yeterli	Vasat	Yetersiz
	☐	☐	☐	☐
	☐	☐	☐	☐
	☐	☐	☐	☐
	☐	☐	☐	☐
	☐	☐	☐	☐
	☐	☐	☐	☐

[* *yeterli*: mekanların tasarlanmış olduğu fonksiyona (amaca) uygunluğu, üretkenliğe olan katkısı, düzeyi.]

6. Bu ortak mekanlarda eksikliğini hissettiğiniz mekansal ve kullanıma dayalı ihtiyaçlarınız* var mıdır? Varsa, lütfen belirtiniz.

[* *ihtiyaçlar*: kendinize özel alan, sessizlik, müzik, görsel zenginlik, gezinti, ...]

7. Belirtilen ortak mekanlarda ne tür ilişkilere dahil olmaktasınız? ***(yüz yüze: gündelik/iş dışı sohbet, iş ile ilgili planlanmamış sohbet, planlanmış toplantılar, yalnız kalarak dinlenme/mola, ... mekansal: komşuluk ile; geçerken dahil olma, sosyalleşme,... sanal: internet, intranet, telefon/videofon, audio- konferans, ...)***

		AKTİVİTELER
MEKAN ADI		

8. Yukarıda belirtilen iletişim/ilişkilerden üretkenliğinize katkısı olduğunu düşündükleriniz hangileridir? Bunlara katılımınız nedir?

İLETİŞİM/İLİŞKİ ADI			BİR İŞ GÜNÜ İÇİNDEKİ KATILIM YÜZDESİ (ZAMAN ORANI)
	Formal (resmi)	Yüz yüze iletişim (planlı)	%
	Formal (resmi)	Yüz yüze iletişim (plansız)	%
	Informal (gündelik)	Yüz yüze iletişim (planlı)	%
	Informal (gündelik)	Yüz yüze iletişim (plansız)	%

9. Lütfen aşağıdaki tabloyu dikkate alarak, söz konusu ortak kullanım mekanlarının genel karakterlerini tanımlayınız.
(P: Olumlu,N: Olumsuz,X: Fikir Yok)

MEKAN KARAKTERİ		Konumda ve kullanımda ulaşılabilirlik/ kolaylık	Gün ışığının etkin/yetersiz kullanımı	Yapay ışıklandırmanın etkin/yetersiz kullanımı (aydınlık/ yarı aydınlık/ diğer)	Tavan yüksekliği (alçak/yüksek/ diğer)	tefriş (kullanışlı/ yeterli/ kullanışsız/ diğer)	iklimlendirme (iyi/kötü/diğer)	**Sonuç olarak:** mekansal konfor (geniş/dar/ kullanışlı/diğer)
MEKAN ADI	OFİS ALANI							
	TOPLANTI MEKANLARI							
	DİNLENME MEKANLARI (KAPALI)							
	DİNLENME MEKANLARI (AÇIK/YARI AÇIK)							
	KORİDORLAR							
	MERDİVENLER							

7

Eklemek istediğiniz diğer mekanlar:

10. İşyerinizde kullandığınız iletişim yollarının kullanım sıklığını (oranlarını) işaretleyiniz. (kutucuklardaki rakamlar, gün, hafta ya da aydaki "defa" kullanım sayısıdır.)

İletişim Yolları	Yüz yüze (planlı toplantılar, plansız karşılaşmalar / ziyaretler)	İnternet/İntranet	Memoranda	Telefon/Videofon	Audio-konferans
Gün içinde					
Haftada					
Ayda					

11. Hangi tür iletişim yolunun eksikliğini hissediyorsunuz? Uygulanmasını önerebileceğiniz iletişim yolları nelerdir?

12. Fiziksel ve zihinsel bağlamlarda sizce hangi iletişim şekli/şekilleri sizi daha çok motive etmekte? Üretiminizde/çalışmanızda hız kazandırmakta? Lütfen nedenlerini size ait bakış açınızla sıralayınız.

13. Çalışma sürecinizde, verim/üretkenliğinizi olumlu ya da olumsuz etkileyen mekan özelliklerini/nedenlerinizi belirtiniz.

Sizi en çok motive eden?

Size monotonluk hissi veren?

En hızlı çalışma sürecini yaratan?

Yalnız ya da toplu halde çalışma tercihi?

Belirtmek istediğiniz diğer düşünceleriniz?

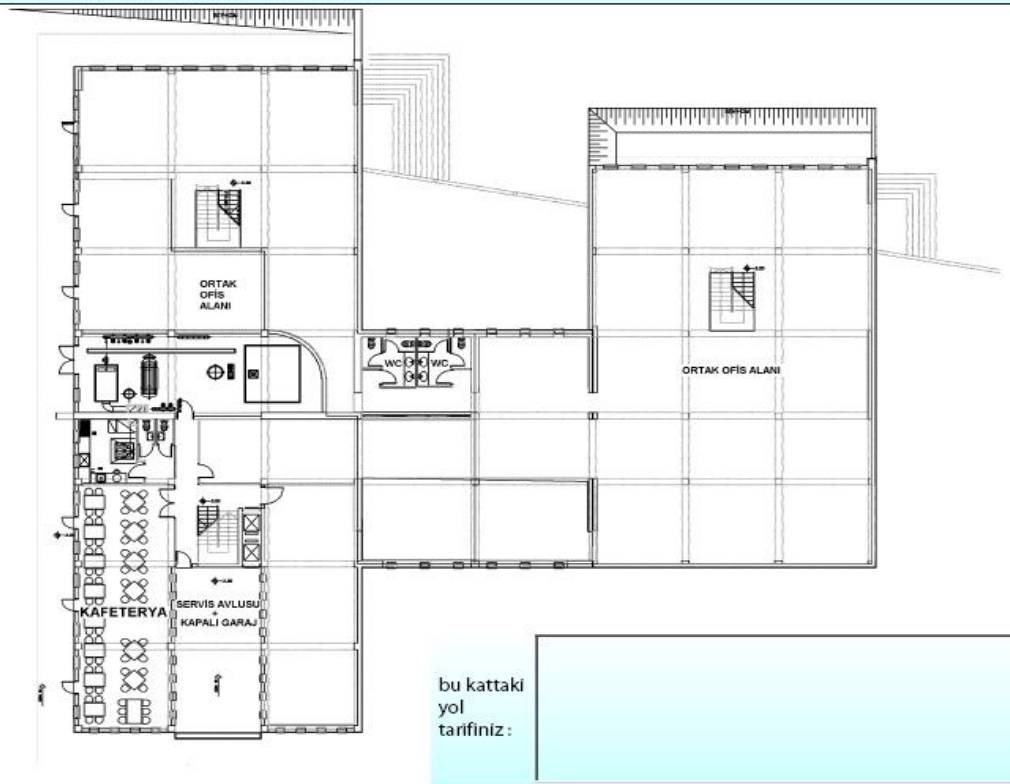
14. ODTÜ Teknopark yapılarından ve mekanlarından memnun musunuz? Sizce bu binaların hangi özellikleri size konfor sağlamakta/ sağlamamakta?

Binalar		Konfor Özellikleri
ARGE İKİZLERİ		Mekansal Teknik Aydınlatma/ Havalandırma ... Konum Ulaşılabilirlik Ses Konforu Mahremiyet
HALICI YAZILIMEVİ		
ODTÜ GÜMÜŞ BLOKLAR		
ODTÜ SİLİKON BLOK		
SATGEB-1 ORTAK BİNASI		
MİLSOFT ARGE BİNASI		

15. ODTÜ Teknopark'ın bulunduğunuz yapısı içinde gün içinde kullandığınız en uzun kullanım nereleri kapsar? (en uzun "günlük yol tarifi"nin tanımını yapınız)

HALICI

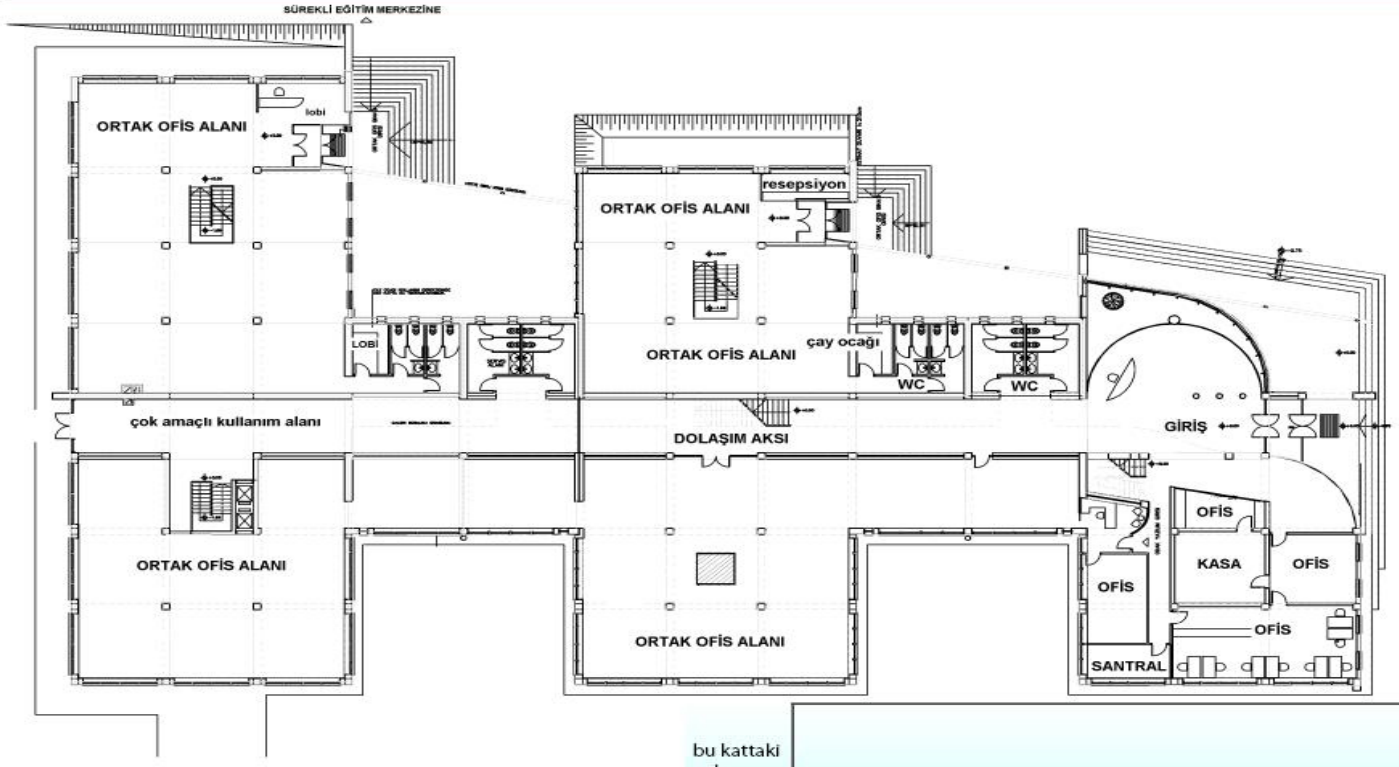
BODRUM KAT



bu kattaki yol tarifiniz :

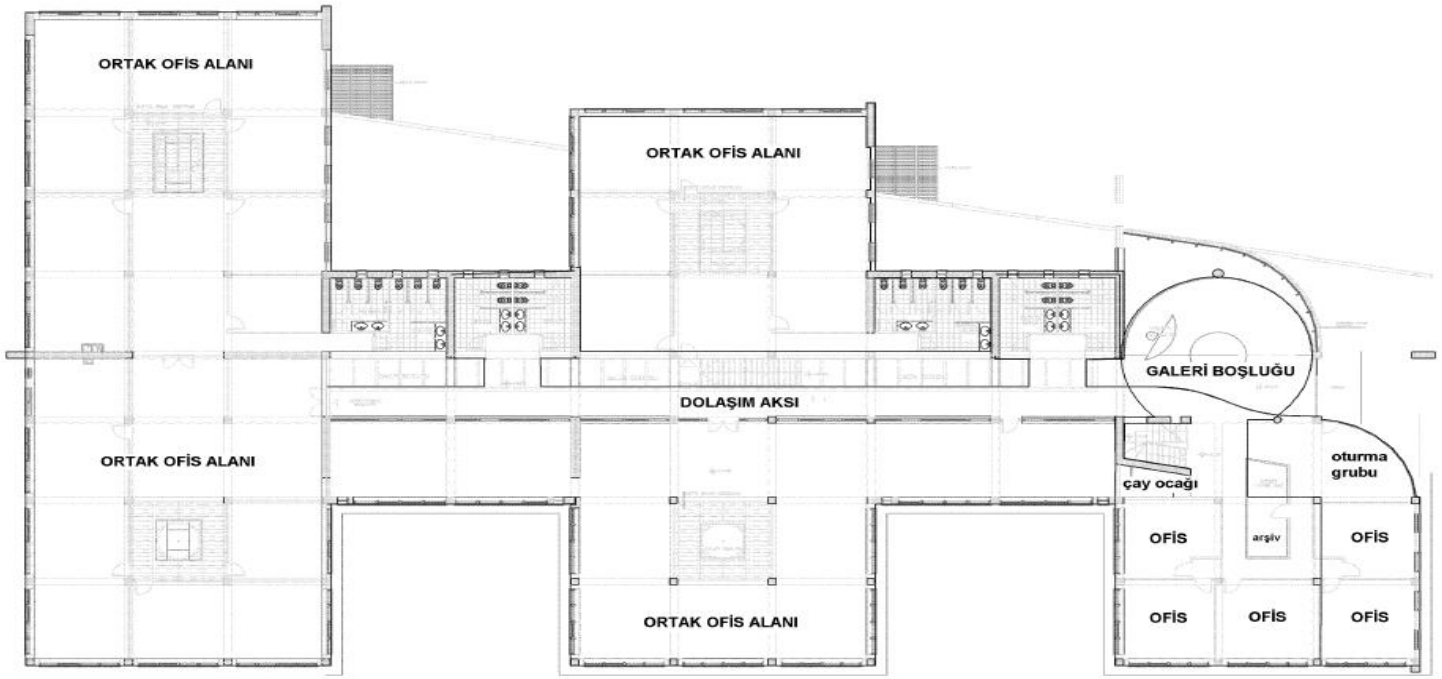
11

HALICI **ZEMİN KAT**



bu kattaki yol tarifiniz :

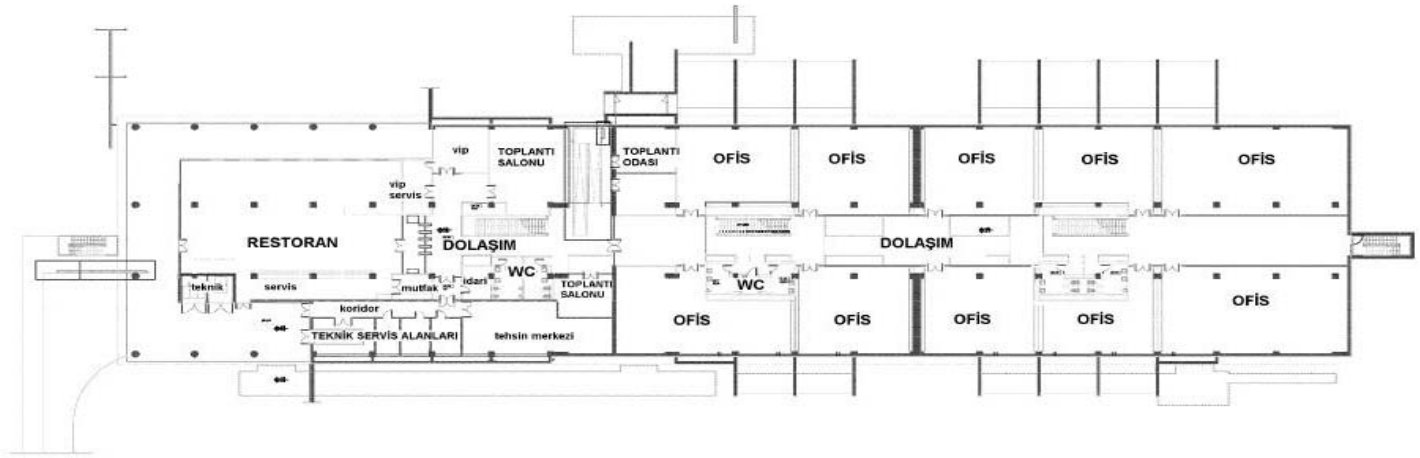
HALICI **1. KAT**



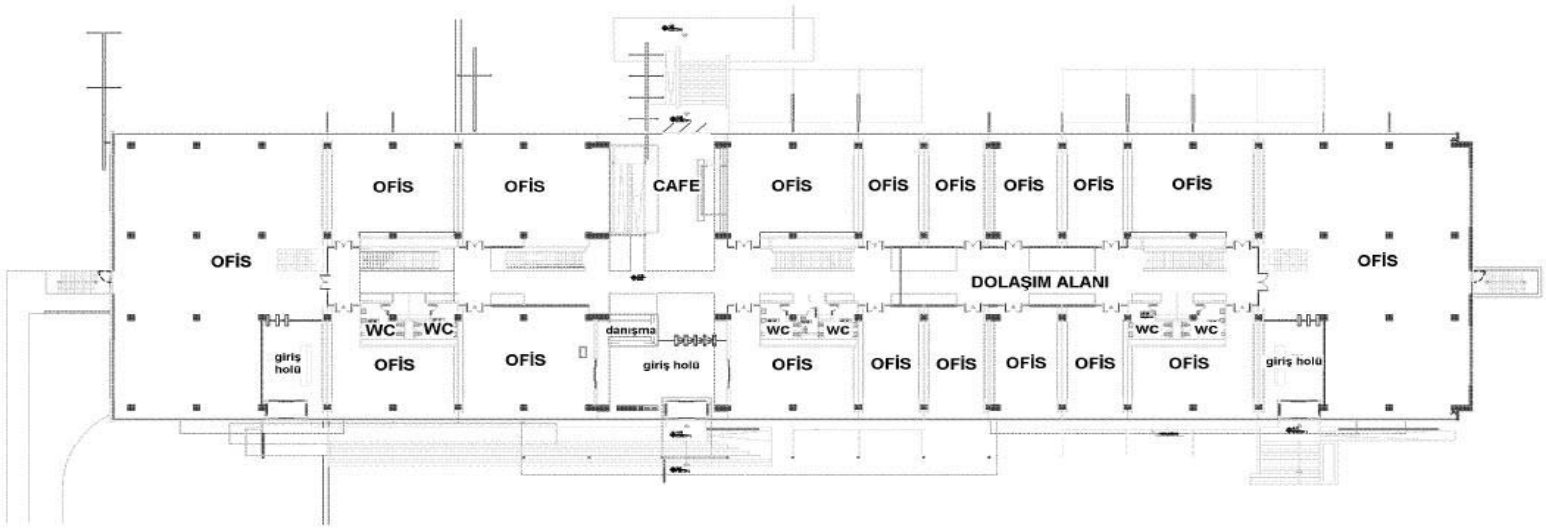
bu kattaki yol tarifiniz :

13

SİLİKON BLOK **BODRUM KAT**



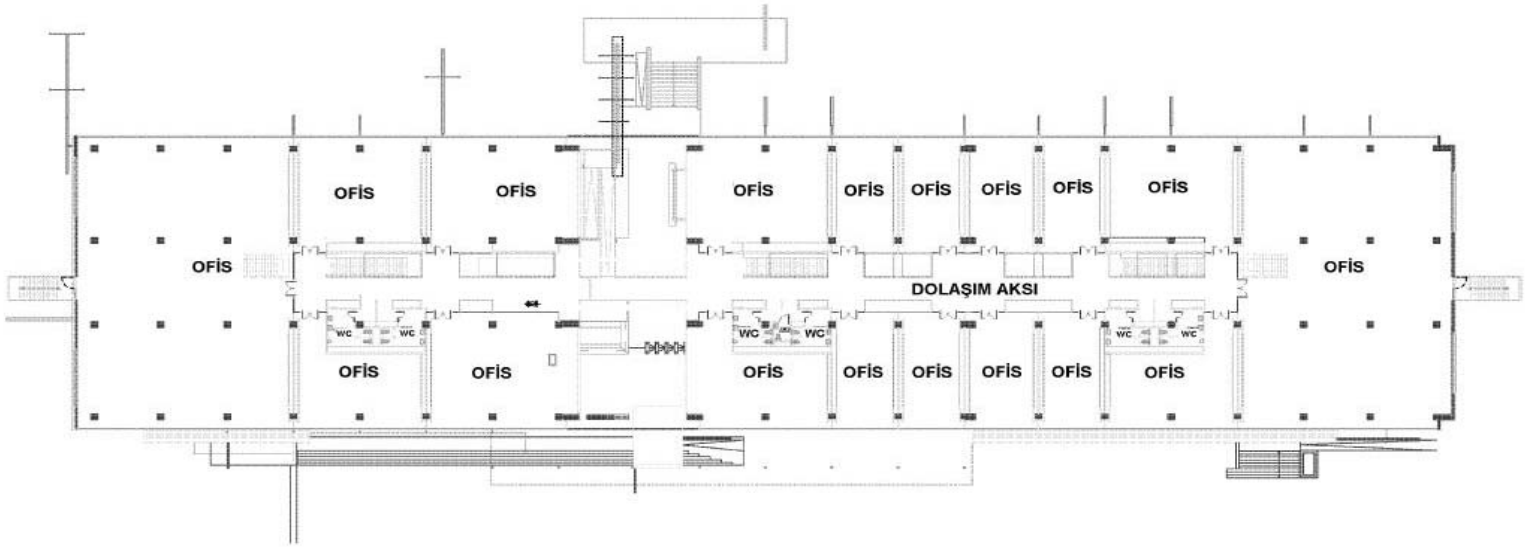
SİLİKON BLOK **ZEMİN KAT**



bu kattaki yol tarifiniz:

15

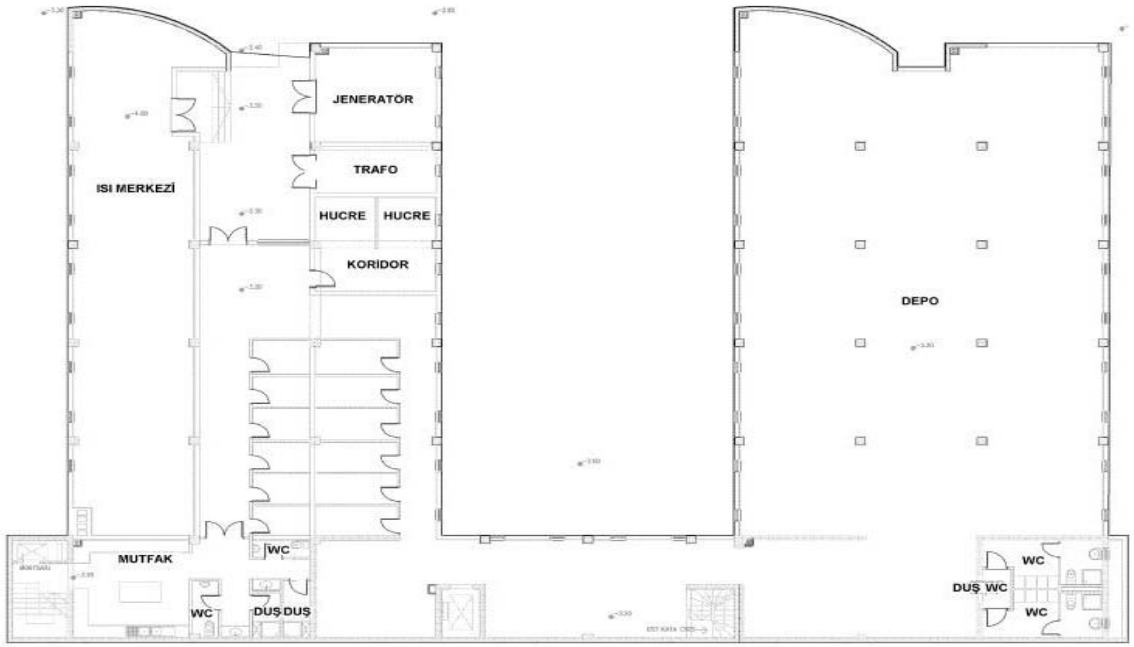
SİLİKON BLOK **1. KAT**



bu kattaki yol tarifiniz :

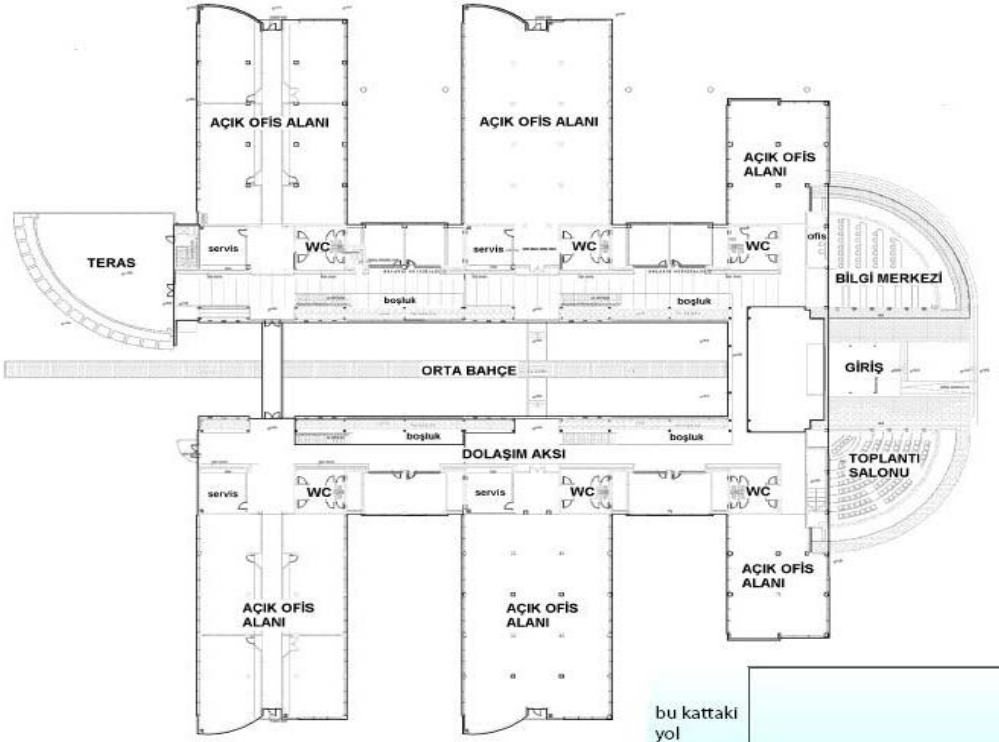
16

ODTÜ İKİZLERİ **BODRUM KAT**



bu kattaki yol tarifiniz :

ODTÜ İKİZLERİ **1. KAT**



bu kattaki yol tarifiniz :

19

Bazı anahtar ifadeler :

- Ekipman/tefriş yeterliliği konusunda fikirler
- Havalandırmanın uygunluğu konusundaki fikirler
- konusu ile ilgili sıkıntı / memnuniyet
- Duygusal stresin etkileri
- Görsel stresin etkileri
- Diğer

20

APPENDIX C

EVALUATION OF THE QUESTIONNAIRE AND INTERVIEW OUTCOMES

The techniques of questionnaires and in-depth interviews supported by participatory observations are used in order to get the subjective data of the spaces analyzed. The spatial analysis gives the preliminary response of definitive, quantitative, qualitative, and relational questions used within the sociological research techniques.

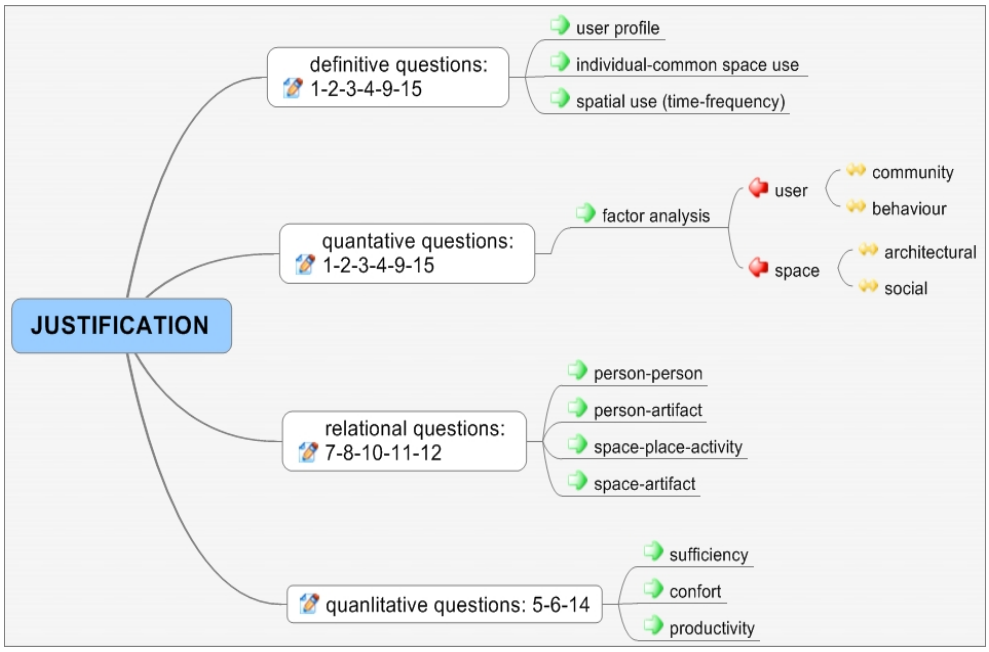


Figure C.1 : Justification of the questions used in questionnaires.

The sociological research conducted within the three buildings of METU Technopolis is made in three types of questionnaires. First, the hard-copy of the

questionnaire to be filled out by hand; second, digital copy sent and received by e-mail; third, the in-depth interviews recorded. The size of the sample group is 102 people. The distribution of the conducted research techniques over the respondent numbers is depicted below:

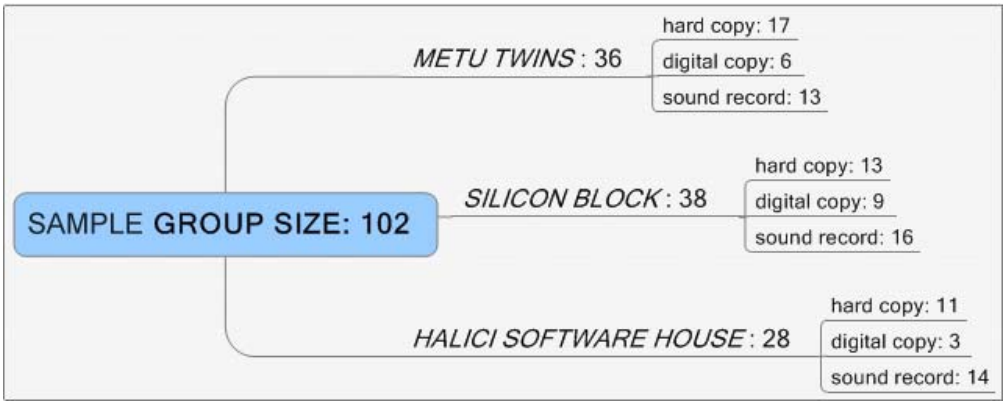


Figure C.2 : Research techniques used.

The two types of spatial activities (static, dynamic) within the building and its extensions are identified under three types of spaces referring to the three buildings. Each space is classified according to its usage, working or refreshing, thus three types of spaces are determined: common space (refreshing), open-office space (working), and office as room (working). The term dynamic refers to the behaviours that are mobile (e.g. passing through), and the term static refers to the behaviours that do not include movement (e.g. standing and talking, sitting during a formal or informal meeting). The image below shows the percentage distribution of these spaces and activities.

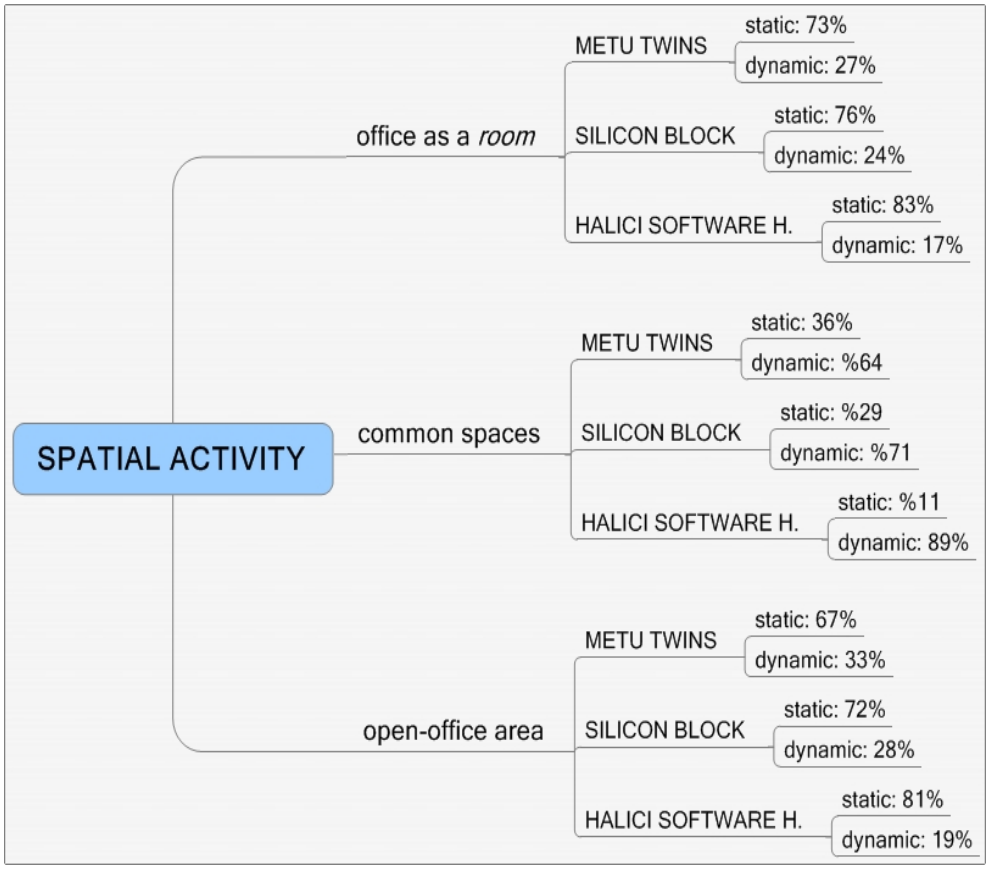


Figure C.3 : Activity types spread over the spaces used.

After depicting the overall structure of the questionnaire survey, the collected data is summarized in the tables below. The percentile distribution of answers are given for each of the buildings; METU Twins, METU Silicon Block, and Halıcı Software House. An evaluation of the analyzed data is given under the tables.

Findings on *question 1* give the spatial experience rates over the time spent within the three buildings analyzed. This is a total data giving the experience of the whole amount of the users responded during the analysis process. Table C.1 below, indicates the number of years that the users spent in the selected three buildings of METU Technopolis.

Table C.1 : Number of years spent in METU Technopolis.

Time spent (year)	Number of respondents (Total: 102)	Percentage
0-1	21	21 %
1-2	26	26 %
2-3	17	17 %
3-4	19	19 %
4-5	11	10 %
Over 5	8	7 %

Answers on *question 2* give the daily activity spaces within the selected three buildings. There are three types of activity spaces dominating the study areas: ‘open office space’, ‘office space as a room’ and ‘outside the office’. A great amount of the users stay in the open-office space (82 %), mostly administrative workers stay in their offices as rooms, a considerable amount is mobilized (9 %). Table C.2 below, categorizes the users by the activity spaces they use daily.

Table C.2 : Daily Activity Spaces (%).

Type of Space used	Number of people responded (Total: 102)	Percentile
Open office space	78	77 % (18% mobilized within the office space)
Office as a room	15	16 %
Outside the office (Mobilized)	9	9 %

Table C.3 : Perception and Definition of *common* spaces by the respondents (%).

Spaces Defined as *common* spaces	Number of the respondents	Percentile of the respondents
Open office space	85	84 %
Meeting rooms/halls	77	76 %
Cafeteria/Restaurant/tea-coffee spots	98	97 %

Table C.3 Continued.

Corridor space	102	100 %
Stairs	100	100 %
Courtyard	25	24 %
Terrace	19	18 %
Fire escape spots/stairs	27	26 %
Parking lot	33	32 %
Lobby/entrance	102	100 %

The perception and definiton of the “common space” is obtained within given and suggested common space names both in standardized and open-ended answers. The open-office space is a common use area for the workers of the companies located in separate offices. Visitors especially from the related businesses also use the common spaces. The suggested common spaces have a multi-function whereas they are designed as places for different purposes. The “fire escapes” for example, are preferred for short breaks within the Silicon Block. Also, for some, the “parking lot” is a space for common interaction.

Another common use of space in the METU Twins is the courtyard and terrace use.

Table C.4 : Distribution of individual usage of defined spaces within a work day (%).

Name of the space	Number of the respondents	Percentage of the respondents	Percentage of usage during a work day
Lobby/entrance	76	77 %	0-20 % (5 %)*
Stairs	89	90 %	0-20 % (5 %)*
Courtyard	26	27 %	0-20 % (5 %)*
Restaurant /cafeteria	63	64 %	20-40 %
Terrace	11	12 %	0-20% (5 % depending on weather)*
Fire escape spots/stairs	23	24 %	0-20 % (5 %)*
Parking lot	31	31 %	0-20% (5 %)* (depending on weather)

The answers to *question 4*, construct a picture of the space use distributed on a normal work day (See Table C.4 above). Office areas are the most used spaces. For meetings (planned or unplanned) some of the users use the meeting areas. Others stay in their offices during meetings. Long refreshment breaks are spent in cafeteria or restaurant spaces (Halıcı Software House does not have any). This consists 20 to 40 percent of the work day. The values marked with a "*" indicates to the spaces where the user spends least time of his work day.

Table C.5 : Ratings of the common spaces in terms of individuals' satisfaction (%).

NAME OF THE SPACE		SATISFACTION RATE			
		Very good	Satisfying	average	dissatisfying
METU TWINS	Office space	8 %	**67 %**	11 %	4 %
	Meeting rooms/halls	33 %	**55 %**	7 %	5 %
	Cafeteria/Restaurant/ tea-coffee spots	9 %	27 %	**52 %**	12 %
	Lobby/entrance	21 %	**51 %**	28 %	- %
	Corridor space	16 %	**58 %**	19 %	7 %
	Stairs	8 %	**61 %**	29 %	2 %
	Courtyard	24 %	**63 %**	9 %	4 %
	Terrace	- %	21 %	**47 %**	32 %
	Fire escape spots/stairs	- %	- %	- %	- %
	Parking lot	- %	**59 %**	39 %	2 %

Table C.5 Continued.

SILICON BLOCK	**Meeting rooms/halls**	8 %	53 %	**33 %**	6 %
	Cafeteria/Restaurant/tea-coffee spots	7 %	62 %	**18 %**	13 %
	Lobby/entrance	2 %	23 %	**57 %**	18 %
	Corridor space	4 %	51 %	**34 %**	11 %
	Stairs	- %	31 %	**46 %**	23 %
	Courtyard	- %	18 %	**66 %**	16 %
	Terrace/extension	2 %	32 %	**40 %**	26 %
	Fire escape spots/stairs	- %	13 %	**51 %**	34 %
	Parking lot	- %	17 %	**47 %**	36 %
	Office space	21 %	48 %	**23 %**	7 %
HALICI SOFTWARE HOUSE	**Meeting rooms/halls**	19 %	49 %	**32 %**	9 %
	Cafeteria/Restaurant* tea-coffee spots	27 %	58 %	**13 %**	2 %
	Lobby/entrance	6 %	37 %	**48 %**	9 %
	Corridor space	11 %	51 %	**31 %**	7 %
	Stairs	- %	21 %	**57 %**	22 %
	Courtyard	15 %	57 %	**28 %**	- %
	Terrace	- %	- %	**- %**	- %
	Fire escape spots/stairs	- %	- %	**- %**	-%

Table C.5 Continued.

Parking lot	- %	-%	**- %**	- %
Office space	11 %	61 %	**26 %**	2 %

* Not applicable in Halıcı Software House, because the building does not have a cafeteria/restaurant. However, the tea-coffee spots that are available are taken into consideration.

Rating scale results gathered from the respondents show that METU Twins have a higher satisfying ratio compared to the other two buildings. That is because the interaction frequency is mentioned to be more within the suggested common spaces. Hence, the conclusion of a better quality of interaction occurs. This fact is also highlighted in in-depth interviews as a criterion of productivity. Silicon Block is the second rated in terms of satisfaction because of its limited indoor common space. Building extensions and fire exits are used beyond the aim of the design purposes. Fire exits, for example, are used during breaks and this indicates a transformation of functional use of space through spatial behaviour. Lastly, in addition to the lack of common spaces offered, Halıcı Software House demonstrates a fairly poor quality of common spaces (See Table C.5 above).

The results gathered from the responds of *Questions 6, 13* and *14* indicate a list of user needs (See Table C.6 below). The respondent sample group belonging to METU Twins building has a positive opinion about the offered common spaces. However, the need for enhancing the common spaces with increasing the number of seating elements both indoor and outdoor is mentioned frequently. Also the terrace space is said to be improved its spatial quality with a shading element.

Table C.6 : List of user-needs in each building.

METU TWINS	-Terrace on the first floor, needs furnishing and shading elements. In good weather conditions, mostly first floor users spend time in there. -The cushion in the courtyard is empty. An effect of water - view is needed. -The corridor space is appropriate but the junction nodes need more furniture. -Entrance and parking lot (entrance patio) has a potential to use in breaks. Needs some furniture. -Restaurant's air conditioning needs to be improved.
SILICON BLOCK	-The exterior extension spaces of the building are used frequently because of the poor quality of the corridor space and the café space with a lowly favored and needs to be extended and furnished. -The corridor space is artificially-lit and needs more light. -The two meeting rooms are placed on the basement floor, which is not easy to reach, and the entrance doors are located behind the stairs.
HALICI SOFTWARE HOUSE	-A cafeteria or snack bar is needed. There's no place for spending long or even the short breaks. Users have to go to nearby buildings, campus area, or outside the campus facility. -Corridor space is sufficient for circulation but needs to be enhanced for interaction. -There's no room for having a break outside the medium of office space, so the office workers mostly use the space in front of the fire exit. -A common space for social interaction is needed. -The offered common spaces such as the lobby and corridor seatings are found too formal.

METU Twins building have the need of ‘improving’ requirements mentioned by the user. On the other hand, METU Silicon Block has the need for a more expanded indoor space. The need for good natural lightening is also considered besides the need for exterior common space extensions. The METU Halıcı Software House has the highest amount of needs that are asked to be fulfilled for the satisfaction of the user. ‘Lack of indoor common-informal use of space’ is stated by a great amount of the respondents (almost 100 %). Because of this reason, long refreshments are spent within nearby buildings or campus and nearby campus facilities.

In conclusion, the user-responses to these *questions (6, 13 and 14)* indicate that in the first building, METU Twins, except few additional demands for furnishings the users are satisfied with the existing common spaces offered. In the second building, METU Silicon Building, the need for common spaces are expressed overtly. Users are aware of lacking indoor common spaces. In order to meet this need they transform the usage of other spaces not planned as common places. In the third building, METU Halıcı Software House, the users list down a number of common spaces required for different usages lacking.

The results gathered from the answers of the open-ended *question 7* indicate that the variety of common space activities is highest within the METU Twins building. The other two buildings’ suggested interior common spaces are fairly poor compared to METU Twins building. On the other hand, Silicon Block meets the need for interaction in common spaces by its exterior extension spaces. Even the fire escapes functions as encountering spaces. In the Halıcı Software House, the user finds (forces) interaction space within scarce corridor space and entrance gate fronts. The entrance stairs of the three independent gates of Halıcı Software House gives the potential area in order to encounter with each other (See Table C.7 below).

Table C.7 : Activity – Space relationship.

	Name of the Space	*Activity*
METU TWINS	Office Space	private desk study, unscheduled group meetings, planned meetings, small celebrations
	Meeting Room/Hall	planned meetings, audio-conferences
	Restaurant	eating and chatting during long mid-day breaks
	Corridor	group discussions, tea-coffee-smoking breaks, walking by, passing through, telephone calls
	Terrace	walking by, group chats and discussions, telephone calls
	Courtyard	walking by, chatting, telephone calls

In METU Twins, the use of private activities, such as preference of working alone, telephone calls, etc., are quite considerable within the office and corridor space. Some also use courtyard and terrace spaces for this kind of situations. Besides this fact, public activities take place within the mentioned spaces in addition to a wider range of alternatives of spaces, such as meeting rooms, restaurant, entrance lobby, parking lot, etc. Most of the transitional activities

take place within the common spaces of corridor, stairs, courtyard and terrace. Questionnaire results show that office, meeting rooms, parts of restaurant spaces are more static compared to the others mentioned in the table (See Table C.7 above).

METU Silicon has a more use of privacy within the indoor spaces compared to the other two buildings. Since the results of the questionnaire indicate the lack of indoor common space improvements, it is expected to highlight the fact that the density of public use expands to outdoor spaces. Because of the fact that the questionnaire results indicate the need for a more amount of furnishing, the observational data gives the conclusion that the users of METU Silicon Block seem to be more dynamic within outdoor spaces, especially in the front yard. This transitional activity appears to be faster within the corridor space, probably because of the narrow circulation area provided.

The answers to the open-ended question in the last part of the questionnaire reveal the inclination of the preference of ‘working alone’ or ‘working with others’. This leads to the conclusion of the private use existing within METU Halıcı Software House is limited by the ‘desk studies’ and ‘private phone calls’ of the workers. According to the observational data obtained, METU Halıcı Software House displays a fairly static set of activities compared to the other two buildings. The outdoor space is also a desolated space except the parking lot use in the beginning and ending of the work day.

The nodal activities take place within the spaces such as tea-coffee-water spots, seatings of indoor and outdoor. The same types of activities are seen in the three buildings analyzed.

Table C.8 : Face-to-face communication during a work day.

SILICON BLOCK	Office Space	private desk study, unscheduled group meetings, planned meetings
	Meeting Room/Hall	planned meetings
	Corridor	Passing through, short time encounters
	Restaurant	eating and chatting during long mid-day breaks
	Café	eating and chatting during short breaks, the small exterior extension for taking fresh air
	Entrance patio	walking by, group discussions, telephone calls, group chats
	Fire escape	telephone calls, smoking breaks, group chats
HALICI SOFTWARE HOUSE	Office Space	private desk study, unscheduled group meetings, planned meetings, small celebrations
	Meeting Room/Hall	planned meetings, audio-conferences, mostly seminars
	Corridor	Passing through, short time encounters
	Entrance gates (interior-exterior)	group discussions, telephone calls, group chats

Table C.8 Continued.

METU TWINS	Formal	Planned	**62 %**
		Unplanned	38 %
	Informal	Planned	17 %
		Unplanned	**83 %**
SILICON BLOCK	Formal	Planned	**61 %**
		Unplanned	39 %
	Informal	Planned	26 %
		Unplanned	**74 %**
HALICI SOFTWARE HOUSE	Formal	Planned	76 %
		Unplanned	34 %
	Informal	Planned	64 %
		Unplanned	46 %

It is accepted that face-to-face communication is a generative tool of innovative activities. Above, with the Table C.8, the characteristics of face-to-face communication types are highlighted within a percentage scale. The unplanned

encounters seem to be higher in number within the buildings of METU Twins and Silicon Block. It is stated in the answers to the open-ended questions that the frequency of unplanned/unscheduled encounters are higher in number than the planned ones. So, the potential of useful[76] interactions is more within the unplanned encounters. On the other hand, since Halıcı Software House covers more scheduled encounters than the previously stated buildings, the potential of useful interaction value is the lowest.

The outcomes of the questionnaire indicate that the more enhanced the common spaces provided the more interaction occurs. The accordance of the designed common spaces with their functional usage is seen best within METU Twins building. METU Silicon is in the middle and METU Halıcı Software House is the poorest on the range.

This evaluation gives the preliminary inputs for the further studies on the tracing process of the spaces of innovation within METU Technopolis. Since this study includes solely the perspective of the user and the observer as an architect, it has the feature of constituting a starting point throughout the elaboration process of future study's scope and analysis range.

[76] *Useful* for the acts of innovation.

Table C.9 : Evaluation of the environmental qualities of common spaces. (Positive :P, Negative: N, No Idea: X, Not Applicable: NA, F: Final Comment)

	Name of the space	access-ibility	use of day light	use of artificial light	ceiling height	Furnish-ing	clima-tization	F
METU TWINS	Office	**P: 78 %** N: 22 %	**P: 74 %** N: 26 %	**P: 83 %** N: 17%	**P: 88 %** N: 12 %	**P: 76 %** N: 24 %	**P: 86 %** N: 14 %	**P**
	Meeting spaces	**P: 92 %** N: 8 %	**P: 76 %** N: 24 %	**P: 87 %** N: 13%	**P: 91 %** N: 9 %	**P: 89 %** N: 11 %	**P: 83 %** N: 17 %	**P**
	Refresh-ment areas (interior)	**P: 88 %** N: 12 %	**P: 92 %** N: 8 %	**P: 94 %** X: 6 %	**P: 98 %** N: 2 %	**P: 66 %** N: 34 %	**P: 89 %** N: 11 %	**P**
	Refresh-ment areas (exterior)	**P: 79 %** N: 21 %	**P: 97 %** X: 3 %	**NA**	**NA**	P: 37 % **N: 53%**	**NA**	**P**
	Corridor	**P: 94 %** N: 6 %	**P: 89 %** N: 11 %	**P: 87 %** N: 13%	**P: 92 %** X: 8 %	**P: 52 %** N: 48 %	**P: 79 %** N: 21 %	**P**
	Stairs	**P: 81 %** N: 19 %	**P: 96 %** X: 4 %	**P: 82 %** X: 18%	**NA**	**NA**	**P: 78 %** N: 22 %	**P**

Table C.9 Continued.

SILICON BLOCK	Office	**P: 67 %** N: 33 %	P: 42 % **N: 48 %**	**P: 54 %** N: 46%	**P: 59 %** N: 41 %	**P: 71 %** N: 29 %	**P: 76 %** N: 24 %	**P**
	Meeting spaces	**P: 83 %** N: 17 %	**P: 63 %** N: 37 %	**P: 87 %** N: 13%	**P: 89 %** N: 11 %	**P: 91 %** N: 9 %	**P: 92 %** N: 8 %	**P**
	Refresh-ment areas (interior)	**P: 63 %** N: 47 %	**P: 82 %** N: 18 %	**P: 89 %** N: 11 %	**P: 97 %** X: 3 %	**P: 68 %** N: 32 %	**P: 74 %** N: 26 %	**P**
	Refresh-ment areas (exterior)	**P: 69 %** N: 31 %	**P: 98 %** X: 2 %	**NA**	**NA**	P: 49 % **N: 51%**	**NA**	**P**
	Corridor	**P: 91 %** N: 9 %	P: 32 % **N: 68 %**	**P: 57 %** N: 43%	**P: 54 %** X: 46 %	P: 23 % **N: 77 %**	**P: 69 %** N: 31 %	**N**
	Stairs	**P: 71 %** N: 29 %	P: 44 % **N: 56 %**	**P: 62 %** X: 38%	**NA**	**NA**	**P: 64 %** N: 36 %	**N**

The definitions of the general characteristics to the given common spaces above (See Table C.9) conclude the satisfaction levels within the three buildings. The evaluation of the environmental qualities according with the given fetaures of *accessibility*, *use of artificial and day light*, *ceiling height*, *furnishing*, *climatization* and lastly an *overall comment* is done with the answers to the *question 9*.

Table C.9 Continued.

HALICI SOFTWARE H.	Office	**P: 68 %** N: 32 %	**P: 64 %** N: 36 %	**P: 86 %** N: 14%	**P: 68 %** N: 32 %	**P: 77 %** N: 23 %	**P: 87 %** N: 13 %	**P**
	Meeting spaces	**P: 93 %** X: 7 %	**P: 86 %** N: 14 %	**P: 88 %** N: 12%	**P: 67 %** N: 33 %	**P: 73 %** N: 27 %	**P: 84 %** N: 16 %	**P**
	Refresh-ment areas (interior)	P: 47 % **N: 53 %**	**P: 61 %** N: 39 %	**P: 88 %** X: 12 %	**P: 98 %** N: 2 %	**P: 56 %** N: 44 %	**P: 87 %** N: 13 %	**N ***
	Refresh-ment areas (exterior)	**P: 69 %** N: 31 %	**P: 97 %** X: 3 %	**NA**	**NA**	P: 17 % **N: 83%**	**NA**	**N**
	Corridor	**P: 84 %** N: 16 %	**P: 79 %** N: 21 %	**P: 88 %** N: 12 %	**P: 68 %** X: 32 %	P: 42 % **N: 58 %**	**P: 76 %** N: 24 %	**P**
	Stairs	**P: 83 %** N: 17 %	**P: 76 %** X: 24 %	**P: 88 %** X: 12%	**NA**	**NA**	**P: 89 %** N: 11 %	**P**

** The general comments on interior refreshment areas of Halıcı Software House are negative because of the low satisfaction rate about the building layout.*

In METU Twins, the satisfaction values are higher and the general comment is positive under the all of the space fetaures given compared to the other two buildings analyzed. METU Silicon Block is also evaluated with a positive attribute. However, it is considerable that the decreasing value in the

satisfaction rate is obvious within both indoor and outdoor refreshment areas. METU Halıcı Software House is evaluated to have the lowest rate of satisfaction especially within the interior refreshment areas.

Table C.10 Frequency distribution of different means of communication used.

		face-to-face (planned and unplanned)	internet-intranet	memoranda	Telephone	audio-conf.
METU TWINS	In a day	**23**	19	2	6	-
	In a week	36	**53**	3	13	-
	In a month	48	**114**	5	45	1
SILICON BLOCK	In a day	16	**21**	-	3	-
	In a week	27	**57**	1	11	-
	In a month	37	**137**	3	41	1
HALICI SOFTWARE H.	In a day	11	**19**	1	8	-
	In a week	21	**59**	2	16	-
	In a month	33	**141**	4	24	2

Within the three buildings observed, the responds to the *question 10*[77] indicates the fact that 'virtual communication' has a higher frequency than 'face-to-face communication'. On the other hand, METU Twins has the highest of face-to-face interaction within the three examples of buildings. The lower face-to-face interaction gets the often virtual communication tools are used. METU Halıcı Software House seems to have a wider virtual interaction space than the others according to the frequency rates (See Table C.10 above).

Question 11 aims to get information about the lacking communication tools. Almost all of the respondents do not seek for any other type of communication tool then the ones available (See *question 10*). The need for more face-to-face interaction is felt, however internet is stated to hinder face-to-face interaction.

Responds to *Question 12* indicates a preferences of in terms of the types of communication that motivates the user most. Accordingly, 66 % answered that face-to-face communications have a motivational effect on the users' act of innovation. Unplanned group discussions within scheduled meetings are especially mentioned as the generative forces of productivity. 34% responded that communication through internet-intranet provides a more time saving working process.

The spatial features that affect the user in either poistive or negative way throughout a work day are collected by the answers to the *question 13*. The general points that are highlighted by the sample groups are categorized under four titles. First, the 'generators of motivation for working' are grouped including the attributes of *well-lit, good climatization, wide spaces, preference of working in privacy but within a team work.* Second, the attributes that

[77] Collected data of this question is also based on the answers to the in-depth questions.

develop a ‘sense of monotony’ are stated as the environments that are *poorly lit*, *without a scene*, *repetition of work*, *working without breaks*. The third group is under the category of providing the ‘fastest working circumstances’ and has the elements of *virtual communication tools* and *team working*. And lastly, the category under the preference of ‘working in groups’ or ‘alone’ concludes the general intention of the users (belonging to the all of the observed buildings) with the statement of *team working with a personal/private space*.