"FLEXIBILITY" IN MULTI-RESIDENTIAL HOUSING PROJECTS: THREE INNOVATIVE CASES FROM TURKEY

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Approval of the thesis:

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submitted by **DUYGU ALBOSTAN** in partial fulfillment of the requirements for the degree of **Master of Architecture in Architecture Department, Middle East Technical University** by,

Prof. Dr. Canan Özgen Dean, Graduate School of Natural and Applied Sciences
Assoc. Prof. Dr. Güven Arif Sargın
Assoc. Prof. Dr. Emel Aközer
Assist. Prof. Dr. Lale Özgenel
Examining Committee Members
Assoc. Prof. Dr. Selahattin Önür
Assoc. Prof. Dr. Emel Aközer
Assist. Prof. Dr. Lale Özgenel
Prof. Ayşe Müge Bozdayı Dept. of Interior Architecture and Environmental Design, Hacettepe University
Assoc. Prof. Dr. Tansel Korkmaz Gr. Prog. in Architectural Design, İstanbul Bilgi University

Date: 29.07.2009

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: Duygu Albostan

Signature:

ABSTRACT

"FLEXIBILITY" IN MULTI-RESIDENTIAL HOUSING PROJECTS: THREE INNOVATIVE CASES FROM TURKEY

Albostan, Duygu M. Arch., Department of Architecture Supervisor: Assoc. Prof. Dr. Emel Aközer Co-Supervisor: Assist Prof. Dr. Lale Özgenel

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This thesis aims to investigate and discuss the conceptual and operational contexts of innovative approaches in the design of multi residential housing in Turkey over three selected cases. Flexibility, as an inclusive concept that encompasses adaptability and typological variety, is used to structure the framework of the discussion. The inquiry is based on the idea that flexibility and the associated concepts can be used to develop, in N. John Habraken's words, "a new and challenging kind of architecture" in the context of multi residential housing.

The housing blocks designed by Ahmet Gülgönen in Eryaman 3rd Stage, and those designed by Tuncay Çavdar in the same stage, and Levent Loft 1 project designed by Tabanlıoğlu Architects are selected as cases. These projects advocate flexibility and also exemplify an innovative approach to design. The thesis introduces a conceptual framework that allows dealing with flexibility in the housing context, and then evaluates the selected cases by means of this conceptual framework.

Keywords: Flexibility, Adaptability, Typological Variety, Eryaman 3rd Stage Housing, Ahmet Gülgönen, Tuncay Çavdar, Levent Loft 1, Tabanlıoğlu

ÇOK HANELİ KONUT PROJELERİNDE "ESNEKLİK": TÜRKİYE'DEN YENİLİKÇİ ÜÇ ÖRNEK PROJE

Albostan, Duygu Yüksek Lisans, Mimarlık Bölümü Tez Yöneticisi: Doç. Dr. Emel Aközer Ortak Tez Yöneticisi: Yrd. Doç. Dr. Lale Özgenel

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Bu tez, Türkiye'deki çok haneli konut tasarımında "yenilikçi" olan yaklaşımların kavramsal ve operasyonel bağlamlarını, seçilen üç örnek üzerinden incelemeyi ve tartışmayı amaçlamıştır. Kapsayıcı bir kavram olarak, uyarlanabilir olma ve tipolojik çeşitlilik gibi iki ilgili kavramla da ilişkilendirilen "esneklik" ana çerçeveyi oluşturmak için kullanılmıştır. Araştırma, esneklik ve ilgili kavramların, çok haneli konut bağlamında, N, John Habraken'in ifadesiyle, "yeni ve dikkate değer bir mimarlık" geliştirmek için kullanılabileceği fikrine dayanmaktadır.

Eryaman 3. Etap'ta Ahmet Gülgönen tarafından tasarlanan konut blokları, aynı etapta Tuncay Çavdar tarafından tasarlanan bloklar, ve Tabanlıoğlu Mimarlık tarafından tasarlanan Levent Loft 1 projesi, esneklik arayışları ve yenilikçi bir tasarım anlayışını da sergilemeleri nedeniyle bu çalışma için seçilen örneklerdir. Bu tez esneklik kavramını konut bağlamında ele almaya olanak veren bir kavramsal çerçeve sunmakta, seçilen örnekleri bu çerçeve aracılığıyla değerlendirmektedir.

Anahtar Kelimeler: Esneklik, Uyarlanabilir Olma, Tipolojik Çeşitlilik, Eryaman 3. Etap, Ahmet Gülgönen, Tuncay Çavdar, Levent Loft 1, Tabanlıoğlu To My Parents Seval and Erol Albostan

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CHAPTER 1

INTRODUCTION

The concept of flexibility is an important concern in the design of housing. Flexibility refers to the idea of accommodating change over time. Thus, flexible housing corresponds to "housing that can adapt to the changing needs of users" (Till & Schneider, 2005, p. 287). Adaptability and typological variety are the other concepts related to flexibility. This thesis discusses flexibility and the related concepts in the context of housing, by focusing on three innovative multi-residential projects in Turkey: two separate groups of housing blocks in Eryaman 3rd Stage, one designed by Ahmet Gülgönen and the other designed by Tuncay Çavdar, and Levent Loft 1 designed by Tabanlıoğlu Architects.

1.1. Problem Definition

The study claims, through these examples, that a concern for flexibility can inspire, in N. John Habraken's (2008) words, "a new and challenging kind of architecture" (p. 291). From this perspective, the aim of this study is to explore the extents and limitations of flexible design approach in Turkey by analyzing the selected cases. The main purpose is to find out how flexibility grants the opportunity to the architect to produce creative options that will respond to changing demands of the users during occupancy whether or not these options are exercised by the users.

Within this framework, this thesis tries to find answers to the questions mentioned below:

• How does the idea of flexibility inform a design approach?

- What does flexibility offer within the context of housing design?
- What are the extents and limitations of flexible design approach in Turkey?

Mainly four sources are used for constructing the framework of the thesis: the works of Tatjana Schneider and Jeremy Till on "flexibility": their book titled *Flexible Housing* (2007), and two articles titled "Flexible Housing: The Means To The End" (2005a) and "Flexible Housing: Opportunities And Limits" (2005b), and N. John Habraken's review, titled "Design For Flexibility" (2008), of Schneider and Till's work with a focus on their book. These are the latest studies on "flexibility" in the context of housing and represent a comprehensive research on cases in the European context beginning from the early twentieth century. Schneider and Till (2007) define and discuss the term "flexibility". They introduce "flexible housing" by providing a criticism on the current condition of housing in the UK, which they consider as an outcome of a conventional approach. The study of Schneider and Till shows the social, economic and environmental benefits and usefulness of flexible housing.

Habraken in "Design For Flexibility" criticizes Schneider and Till's book by commenting that "[m]ost importantly, for a book about design, one would like to know in what way flexibility might inspire the making of a new architecture." (2008, p. 291). Furthermore, Habraken proposes other examples, which should have been included among the cases discussed by Schneider and Till (Habraken N. J., 2008).

According Schneider and Till (2005a, 2005b, 2007), flexibility as accommodating change in housing, addresses a number of issues related with the current and future needs of the users. Firstly, it offers variety in the architectural layout of the units. Secondly, it includes adjustability and adaptability of housing units over time. And finally, it allows buildings to accommodate new functions. In order to provide flexibility, architects should consider the possible future needs of users during the design process; in other words, "long-term thinking" in the design process is required.

The benefits of "flexibility" in housing are discussed both from the perspective of users and in terms of innovative construction and design under four main themes: "the structural system", "the service spaces", "architectural layout" and "furnishing for flexible use". According to Schneider and Till (2005, p. 287), one of the basic principles of designing flexible is to avoid inflexibility. In other words, the design of the inflexible parts of a building plays a crucial role in achieving flexibility. Structural system and the service spaces are the permanent components. First, through the consideration of the structural system, it is preferred to reduce the load bearing walls. Next, through the consideration of servicing, accessibility and adaptability of technical equipment is crucial to make changes in the future. Over the permanent components, the architectural layout can be investigated in terms of its typological variety and adaptability over time. The research focuses on the structure and plan of residential blocks and their use. It also addresses the issue of social sustainability.

There are two controversial methods in flexible housing design, which are regarded to belong to the "rhetoric of flexibility" (Schneider & Till, 2007): a determinate way of design that refers to movable transformable spaces and an indeterminate way of design that points to endless changes. These two ways indicate a foreground consideration of flexibility in the design process, but as Schneider and Till (2005, p. 159) assert "some of the most successful examples of flexibility tend to operate in the background", which is another way of flexible design. With respect to this, the cases selected in this study, are examples for the latter approach. In other words, flexibility was not the main consideration of the architects among the selected cases from Turkey. Thus, in these examples flexibility operates in the "background".

Three basic approaches can be distinguished in relation to housing: traditional, conventional, and innovative. Traditional approach refers designing in the light of "an accepted system of rules" (Oxford English Dictionary Online, 2009). The

houses in the same location seem to be similar but at the same time, they are unique. This can be observed in traditional residential architecture in Anatolia.¹ Conventional approach², on the other hand, is a more standardized way of design that is based on the repetition of known and accustomed types of housing units. The standard plan types such as "two/three/four rooms and one living room" refer to the size and the number of the bedrooms, and are determined in advance by the architects. The same types of housing units, therefore, are constructed repetitively. In traditional design approach, there is also a repetition, but what is repeated is a pattern. Every house is adapted to the user and the context that it belongs. Therefore, each house is an unfolding of a general scheme. Susceptibility of this kind is not in question in conventional design. It is not dependent on the environment and the user. On the other hand, there are innovative approaches to housing design that concern flexibility. They aim to bring new perspectives to housing design in two ways: by offering typological variety and by offering the possibility to change over time.

1.2. The Structure of the Thesis

The investigation focuses on a literature review in order to present a framework for dealing with flexibility and associated concepts, adaptability and typological variety in the context of housing. The methodology is based on an investigation of selected cases from Turkey by means of the conceptual framework. These selected cases are Eryaman 3rd Stage, two separate groups of housing blocks designed by Ahmet Gülgönen and by Tuncay Çavdar, and Levent Loft 1 designed by Tabanlıoğlu Architects. These cases are investigated in terms of four

¹ For more information, the prominent studies on this subject can be seen: Hakkı Eldem's *Türk Evi Plan Tipleri* (1954), *Türk Mimari Eserleri* (1975) and *Türk Evi Osmanlı Dönemi I* (1984), E. Asım Kömürcüoğlu's *Ankara Evleri* (1950), Celile Berk's *Konya Evleri* (1951), N. Çakıroğlu's *Kayseri Evleri* (1952), Vacit İmamoğlu's *Geleneksel Kayseri Evleri* (1992), Kemal Aran's *Beyond Shelter: Anatolian Indigenous Buildings* (2000), Önder Küçükerman's *Turkish House In search Of Spatial Identity* (1978), Gül Asatekin's *The Role of the Inhabitant in Conservation a Proposal for the Evaluation of Traditional Residential Architecture in Anatolia* (1994).

² The term "conventional" is often used synonymously with the term "traditional" as they both rely on an accepted system of rules. Here conventional approach refers to a design approach that is "in accordance with accepted artificial standards of conduct or taste; not natural, original, or spontaneous" (Oxford English Dictionary Online, 2009).

themes, mentioned above: "structural system", "service spaces", "architectural layout", and "furnishing for flexible use". Furthermore, the approaches of the architects are discussed on the basis of the interviews conducted with them. Three questions that were directed to all interviewee are given below:

- Was the concept of "flexibility" an input when the design phase of the project started? Did you consider the changing demands and wishes of the users?
- How did you integrate these four themes, structural system, service spaces, architectural layout and furnishing into your design?
- Do you have similarly conceived projects? Can you describe your experiences related to these projects?

Additional questions were directed according to their previous architectural experiences. In brief, the investigation is based on both the approaches of architects and their methods of design.³

In the introductory chapter, the necessity of flexibility and the related concepts, adaptability and typological variety in the context of housing and the aim of the thesis are briefly described.

Chapter 2 serves to define the concepts of "flexibility", "adaptability", and "typological variety". Both Habraken (2008), and Schneider and Till (2007) mention that flexibility and adaptability have overlapping meanings. The meaning of the other related concept, typological variety, is more obvious. It points to freedom of choice. To introduce the technical meanings of these concepts in relation to the context of housing, especially the meanings of adaptability and flexibility, it is crucial to refer researchers who point to their changing senses over time. Besides the main references, Schneider and Till (2005a, 2005b, 2007) and Habraken (2008), Andrew Rabeneck, David Sheppard and Peter Town (1973) offer flexibility against "tight-fit functionalism" in the housing context after introducing a historical overview of the twentieth century housing. According to

³ The interviews were conducted via electronic mails with these questions.

Rabeneck, Sheppard and Town (1974), flexibility is related to the construction technique and the position of service spaces in housing design, whereas adaptability points to the architectural layout of the housing. Steven Groák (1992) defines flexibility as capability of "different physical arrangements" and adaptability as capability of adjustments and changes for "different social uses". Moreover, according to Herman Hertzberger (1991), flexibility suggests an open-ended solution, which refers to what is called "rhetorical value" of flexibility, defined by Schneider and Till (2005). He introduces a new concept: "polyvalence". It also has an overlapping meaning with adaptability and flexibility (Habraken N. J., 2008, p. 290). Gerard Maccreanor (1998) has a different view about flexibility. He says that flexibility does not imply "an endless change". He also asserts that the buildings which are not originally designed for flexibility, can be the most adaptable ones (1998, p.40). Adrian Forty (2000), on the other hand, deals with flexibility as an issue that requires long-term thinking in architectural design.

Four main themes to discuss "flexible housing", both from the perspective of users and in terms of innovative construction and design, are introduced: 1) "structural system", 2) "service spaces" including "wet spaces" and "access units", 3) "architectural layout" including "different configurations of units" and "spatial organization", and 4) "furnishing for flexible use". These categories are adopted from the works of Schneider and Till (2005a, 2007). Schneider and Till (2005a, 2007) introduced two analogies to evaluate both the use, and the form (structural system, servicing and construction techniques) of flexible housing: "soft" and "hard" analogies. "Soft' refers to tactics which allow a certain indeterminacy, whereas 'hard' refers to elements that more specifically determine the way that the design may be used" (2005, p. 289). These analogies are discussed in detail in Chapter 2.

Chapter 3 provides a historical context. The three episodes in the evolution of flexible housing in the twentieth century depicted by Schneider and Till (2007) are introduced by selected examples from Europe:

- The first episode, 1920s, "Modernity and The Minimal Dwelling", can be deemed as a reform in housing design after World War I in Europe. The changing notion of dwelling can be regarded as a reflection of the process of transition from tradition to modernity triggered by the changes in the lifestyles and society. Hilde Heynen (Modernity And Domesticity: Tensions And Contradictions, 2005) is referred to discuss briefly the social environment following World War I that had a great impact on reform in the housing design.
- The main concern of the second episode, 1930s-1960s, is an historical overview of "The Industrialisation of Housing". Prominent attempts in terms of technology and techniques in construction are listed as "prefabrication", "modularity", "standardization" "prototype design" and "support and infill system".
- As a consequence of developments in construction techniques and technology, the third episode of flexible housing can be observed in 1970s, which brought forth the issue of "Participation and User Choice".
 "To some individual architects and social searchers the problem is seen as one of permitting personalization of the home." (Rabeneck, Sheppard, & Town, 1974, p. 76). Architects have started to share the control over design of housing with users. In addition to the projects and names that Schneider and Till discuss, Habraken (2008, p. 291) adds more names from Europe: Lucien Kroll in Brussels, and Nabeel Hamdi and Nicholas Wilkinson in the UK, who developed Habraken's "Support and Infill" theory as a new approach called "Primary System Support Housing And Assembly Kit" (PSSHAK).

Chapter 4 is devoted to the case studies. Blocks designed by Ahmet Gülgönen in Eryaman 3rd Stage, blocks designed by Tuncay Çavdar in the same stage and Levent Loft 1 designed by Tabanlıoğlu Architects are chosen for discussion. These cases are different from the "rhetorical examples of flexibility", which are described by Schneider and Till as buildings that "doggedly take the word at face

value to denote elements that move and flex (another standard signal of progressive modernity)" (2005, p. 159). In fact, they can be regarded to be among the "successful examples of flexibility [that] tend to operate [flexibility] in the background" (Schneider & Till, 2005, p. 159).

The housing blocks designed by Gülgönen and Çavdar in Eryaman 3rd stage are projects of social housing, whereas Levent Loft 1 is a residential block of a loft type. The scope of this investigation is to find out different approaches of the architects and their strategies and methods to create flexible housing. The inquiry on these cases aims to find out what in these cases are innovative and challenging and what the contribution of an interest in flexibility can be during the design process.

In the final chapter, the current situation of housing design in Turkey is briefly mentioned in terms of flexibility. Based on the analysis of the cases, extents and limitations of flexible design approach in Turkey are highlighted and discussed. The necessity of further research in flexible housing design, its strategies, methods, and the need to develop them further are pointed out.

CHAPTER 2

AN OVERVIEW OF THE TERMINOLOGY AND THE CONCEPTUAL FRAMEWORK

This chapter aims to clarify the meanings of the terms "flexibility", "adaptability" and "typological variety". As both Habraken (2008), and Schneider and Till (2007) mentioned, "flexibility" and "adaptability" are very similar in meaning and often overlap but the colloquial and the technical meanings can provide a departure point for their clarification and the conceptual framework of the study.

2.1. Flexibility, Adaptability, Typological Variety

The English colloquial usage of the word "flexibility" is:

- 1. Capability of being bent; pliancy.
- Susceptibility of modification or alteration; capacity for ready adaptation to various purposes or conditions; freedom from stiffness or rigidity. (Oxford English Dictionary Online, 2009)

In its ordinary usage, "flexibility" denotes not only a physical change, modification or adaptation, for a variety of purposes or uses, but also freedom, which emerges as one of the key meanings. It as such also refers to "adaptation", as well.⁴

⁴ Habraken mentions briefly about the confusion in the terminology; "flexibility" and "adaptability" "have multiple and often overlapping meanings that make it virtually impossible to come up with a vocabulary accepted to everybody" (2008, p. 290).

The word "adaptability", points to "[t]he quality of being adaptable; capacity of being adapted or of adapting oneself; potential fitness" (Oxford English Dictionary Online, 2009). It accommodates a meaning of fitting or suiting for a variety of purposes.

And finally, the denotations of the word "variety" are:

- 1. Tendency to change; fickleness; change of purpose or plans.
- 2. Difference or discrepancy between things or in the same thing at different times.
- 3. [D]iversity of nature or character; absence of monotony, sameness, or uniformity.
- 4. A different form *of* some thing, quality, or condition; something which differs or varies from others of the same class or kind; a kind or sort. (Oxford English Dictionary Online, 2009)

The meaning of "typological variety" is more obvious comparing to "flexibility" and "adaptability" and in the context of housing, it points to freedom of choice for diverse users.

In architectural discourse, "flexibility" and "adaptability" have been defined in different ways. Some of these definitions are compiled in Table 2.1. In this table, definitions by Schneider and Till (2005a, 2005b, 2007) and N. John Habraken (2008), Andrew Rabeneck, David Sheppard and Peter Town (1973, 1974), Herman Hertzberger (1991), Steven Groák (1992), Gerard Maccreanor (1998) and Adrian Forty (2000) are included.

	ADAPTABILITY			
Andrew Rabeneck, David Sheppard, Peter Town	1973	 "Flexibility" is proposed against "tight-fit functionalism". (p.698) The unsuccessful attempts in flexibility are criticized for they may lead to what they call the "fallacy of freedom through control". (p.701) Flexible housing should be capable of offering "choice" and "personalization". (p.698) 	Adaptability in the housing context refers to housing units that can be "easily altered as circumstances changed". (p.699)	
	1974	The concept of flexibility deals with the "constructional technique and services distribution". (p.86)	Adaptability is related to the "planning and layout" of a building including the sizes of rooms and the relation between rooms. (p.86)	
Herman Hertzberger	1991	In flexible design, "there is no single solution that is preferable to all others; Hertzberger comes up with another concept called "polyvalence". (p.146)	-	
Steven Groák	1992	Flexibility points to "capability of different physical arrangements". (p.15-17)	Adaptability points to "capabil[ity] of different social uses". (p.15-17)	
Gerard Maccreanor	1998		Adaptability is "a different way of viewing flexibility" which refers to "transfunctional[ity] and multifunctional[ity]". (p.40) Maccreanor emphasizes that "most adaptable [buildings] were those not originally planned for flexibility". (p.40)	
Adrian Forty	"The incorporation of 'flexibility' into the design allowed architects the illusion of projecting their control over the building into the future, beyond the period of their actual responsibility for it " (n.143)		-	
Tatjana Schneider, Jeremy Till	2007	Flexibility in the context of housing is "achieved by altering the physical fabric of building" (p.5)	Adaptability in the context of housing is "achieved through designing rooms or units so that they can be used in a variety of ways". (p.5)	

Rabeneck, Sheppard and Town published two articles about flexibility and adaptability entitled "Housing Flexibility?" (1973) and "Housing Flexibility/ Adaptability?" (1974). In the former study, they introduced terms including "tight-fit functionalism". "Tight-fit functionalism" refers to the unhealthy situation of mass housing in the twentieth century Europe, and Rabeneck, Sheppard and Town explain it as miniaturized living areas with cell type rooms, which do not allow any changes (1973, p. 698). In that sense, they see flexibility as a tool to make the minimal housing environments capable of offering opportunity for "choice" and "personalization". On the other hand, they also criticize flexibility especially for it can lead to too technical or complicated housing projects; they call the situation as "the fallacy of 'freedom through control" (1973, p. 701).

The scope of flexibility in the context of housing is defined by Rabeneck, Sheppard and Town as "[t]o provide a private domain that will fulfill each occupants expectations" (1973, p. 709). For them, a house may be considered adaptable when "[it] could be easily altered as circumstances change" (1973, p. 699).

In their second article, Rabeneck, Sheppard and Town (1974) propose a more detailed definition:

The adaptable approach, in contrast to the flexible, emphasizes planning and layout rather than constructional technique and services distribution. It is based on carefully considered variations in room sizes, relationship between rooms, slightly generous openings between spaces and little overt expression of room function. (Rabeneck, Sheppard, & Town, 1974, p. 86)

In this sense, flexibility deals with how the permanent and fixed parts of the buildings are configured: the structural system and the service spaces. The organization of the rooms, their dimensions, the relation between the rooms and their functions are the concern for adaptability. To sum up, Rabeneck, Sheppard and Town claim that while the design decisions about the structure and service spaces are related to flexibility, the consideration about the architectural layouts of the remaining spaces are associated with adaptability.

Groák discussed the difference between flexibility and adaptability in relation to housing from a different perspective in his book, *The Idea of Building: Thought and Action in the Design and Production of Buildings* (1992):

The spatial organization and internal environment may be suitable for only a limited array of uses. Here we should distinguish between 'adaptability', taken to mean 'capable of different social uses', and 'flexibility', taken to mean 'capability of different physical arrangements'. The building's capacity for accommodating changed uses will depend on the extent to which it is adaptable and/or flexible. (Groák, 1992, pp. 15-17)

In this definition, Groák explains "adaptability" as suitability for adjustments and changes related to the internal space configurations in housing units. In short, adaptability is related to the use of space. "Flexibility", on the other hand, is defined as suitability for "different physical arrangements", which is valid not only for interior but also for the exterior adjustments of the unit itself. In this respect, it can be inferred that Groák agrees with the definitions of Rabeneck, Sheppard and Town. Groák's definition is further elaborated by Schneider and Till to clarify these concepts:

[While] [a]daptability is achieved through designing rooms or units so that they can be used in a variety of ways, primarily through the ways that rooms are organized, the circulation patterns and the designation of rooms ... [f]lexibility, is achieved by altering the physical fabric of building: by joining together rooms or units, by extending them, or through sliding or folding walls and furniture. (Schneider & Till, 2007, p. 5)

According to the description above, adaptability seems to deal with the internal organization of housing units in order to accommodate the change in use. Flexibility, on the other hand, is not only related to structural system and the position of service spaces of the building, but also to the physical changes occurring in the remaining spaces such as the adjustments related to both the envelope and the interior space. In that respect, flexibility includes both physical and social continuum in the housing. Thus, it can be asserted as including adaptability, as well. Although Schneider and Till (2007, p. 5) emphasize the nuance in between as "[w]here adaptability is based around issues of use, it [flexibility] involves issues of form and technique", these terms do not have strictly defined territories.

Hertzberger in his book entitled *Lessons for Students in Architecture* (1991) emphasized the importance of the concept of flexibility in architectural design as:

Flexibility signifies – since there is no single solution that is preferable to all others – the absolute denial of a fixed, clearcut standpoint. The flexible plan starts out from the certainty that correct solution does not exist ... Although a flexible set-up admittedly adapts itself to each change as it presents itself, it can never be the best and most suitable solution to any one problem; it can at any given moment provide any solution but most appropriate one. (1991, p. 146)

From Hertzberger's perspective, "flexibility" in the housing context refers to houses that are capable of proposing different solutions for diverse uses with no certain "single solution" but most appropriate solution. He discussed flexibility in a different perspective by introducing the term "polyvalence". Polyvalence refers to a characteristic of a static form; "a form that can be put to different uses without having to undergo changes itself, so that a minimal flexibility can still produce an optimal solution" (1991, p. 147). The concept of "polyvalence" is added by Habraken to a group of terms including "flexibility" and "adaptability" that have multiple and overlapping meanings.

The argument of Hertzberger is supported by Maccreanor who states that:

Flexibility has for a long time been a subject of interest for architects. In the years to follow this resulted in many buildings with open, changeable planning around fixed service cores[.]...One conclusion is that flexibility doesn't simply imply the necessity of endless change and breakdown of accepted formula. On the contrary, the buildings that have proven to be the most adaptable, were those not originally planned for flexibility. (Maccreanor, 1998, p. 40)

Both Hertzberger and Maccreanor point out the unsuccessful housing environments that are designed mostly figuratively as a result of the misunderstanding of the concept of flexibility. The confusion in meaning of flexibility" is based on two contradictory roles: "it has served to extend functionalism and so make it viable" and "it has been employed to resist functionalism" as stated by Forty (2000, p.148). In that sense, flexibility is neither a characteristic of indeterminate space that allows "endless change", nor is it a characteristic of determinate space with too much technical equipments. In other words, if architects leave their buildings open for infinitely different solutions for the users; they lead to "open-endedness" (Schneider & Till, 2005, p. 158) and "uncertainty" (Hertzberger, 1991, p. 117). By the same token, if architects put more emphasis on flexibility through building with movable parts, they will create "false neutrality" as a result of too much technicality or strictly defined spaces (Schneider & Till, Theory, 2005, p. 158). They are the two controversial approaches to flexibility in architectural design that belong rather to "the rhetoric of flexibility" by Schneider and Till (2007, p. 5).

Maccreanor explained the relation between the concepts of flexibility and adaptability by emphasizing that flexibility includes adaptability as well.

Adaptability is a different way of viewing flexibility. The adaptable building is both transfunctional and multifunctional and must allow the possibility of changing use; living into working, working into leisure or as a container of several uses simultaneously. Adaptability is not primarily concerned with a designed idea of flexibility based on the collapse of the traditional layout. An apparent robust identity and enduring presence within an urban context is required that allows the building to cope with future needs and changing conditions. (Maccreanor, 1998, p. 40)

Maccreanor relates adaptability to social sustainability. The need for physical change in housing emerges due to two reasons. The housing units are expected to offer freedom of choice (typological variety) for users having a diversity of lifestyles prior to occupation. Secondly, they should provide opportunity to make adjustments or modifications (adaptability/flexibility) according to the changing wishes and demands over time. The need for change might occur as a result of demographical changes such as an increase or decrease in the number of household members or a possible decrease in the capacity of inhabitants to do certain things especially due to ageing.

Maccreanor also criticizes a particular interpretation of the concept of "flexibility" by stating that:

Buildings that were designed to be flexible in their internal arrangements had minimum floor to ceiling heights, making them difficult to adapt to future uses. It was often more cost efficient to build new accommodation rather than to renovate or rearrange the existing. (Maccreanor, 1998, p. 42)

The above definitions illustrate that the design of housing needs to be "flexible" and "adaptable" in order to provide units with a capacity for "change" to fulfill the changing needs and demands of the users over time. Each residential building, in this sense, can change in time. "Long-term thinking" in design process is required. Additionally, flexible housing should also accommodate "typological variety", in order to make the residential units offer freedom of choice prior to occupation.

To sum up, the concept of flexibility is defined as the capacity of buildings for physical change and adaptation according to changing circumstances. Flexibility as an inclusive concept covers the related concepts of adaptability and typological variety and it is achieved by designing the fixed elements, which are the structural system and the servicing of a residential block in a way to allow change. *Kallebäck* Experimental Housing in Sweden, for example, has been designed in a way that the building provides opportunities to the users to make physical changes and also adaptations in their houses over time (Figure 2.1). Flexibility makes residential spaces adaptable according to the demands of the users with diverse lifestyles. Flexibility and adaptability, in this sense, are closely associated.



Figure 2.1: Flexibility as Capability of Change in Physical Fabric of the Building: *Kallebäck* Experimental Housing (1960) by Erik Friberger in Sweden (Schneider & Till, 2007, p. 72) (Redrawn by the Author of the Thesis)

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Figure 2.2: Adaptability as Capability for Different Usage: Adaptable House (1962), by Development Group of the MHLG in Britain (Schneider & Till, 2007, p. 73) (Redrawn by the Author of the Thesis)

Adaptability, on the other hand, refers to situations that allow users to adjust and modify their houses within determined territories according to their wishes. For example, Adaptable House (1962) designed by Development Group of the MHLG in Britain has the potential of allowing different architectural configurations by replacing the unfixed partitions within determined territories, in the light of the possible variation of users between the years 1986 to 2003 (Figure 2.2). In other words, adaptability in the residential context refers to allowance of variety of architectural configurations in accordance with diversity of usage.



Figure 2.3: Typological Variety as Freedom in Choice, *Überbauung Hellmutstrasse* by ADP, 1991 (Schneider & Till, 2007, p. 148)

Typological variety, on the other hand, refers to freedom of choice, for example, in *Überbauung Hellmutstrasse* (1991) designed by ADP (Figure 2.3). This project allows users to choose the residential units according to their wishes and needs.

2.2. "Flexible Housing"

This part explores how the concept of flexibility and the related concepts, adaptability and typological variety, influenced the approaches to housing design. The first query is about why the concept of flexibility is important in housing design, which is related to flexibility in usage, and the second is about how the concept of flexibility is achieved in housing design, which refers to the methods and the areas of innovation in technology to achieve flexibility. These two questions are discussed in reference to the book entitled *Flexible Housing* by Schneider and Till (2007).⁵ The discussion is based on the "soft" and "hard" analogy that Schneider and Till (2005-a, 2007) have introduced.

2.2.1 Flexibility in Usage

Flexibility is an important concept in the context of housing because of the users' needs and demands for change and modification. The first query; **"why flexible housing"** refers to the capability of offering every user a minimum but adequate and efficient basic quality at the base building level and through infill or built-in level, the ability to respond to individual wishes and demands over time.

Schneider and Till define "flexible housing" as "housing that is designed for 'choice' at the design stage, both in terms of social use and construction, or designed for 'change' over its lifetime" (2005, p. 157). Therefore, flexible housing seems to be appropriate for the users with diverse lifestyles. In that respect, the ability to respond to wishes and demands of the users, starting from the very beginning of occupation, and lasting over time, can be regarded as the main scope of flexibility in the context of domestic architecture. "Long term consideration" in architectural design process comes to scene with the aim of creating flexible housing. For Schneider and Till,

⁵ In addition to works of the already mentioned scholars, Bernard Leupen's (2003) book entitled *Dwelling Architecture And Modernity* was in the readings list of the course called "Lectures Architectural Design" within the Msc1: Architecture & Modernity package program at Delft University of Technology. Within this course in spring 2008, the concept of flexibility was discussed by the visiting scholars and architects.

[F]lexibility is an important consideration in the design of housing if it is to be socially, economically and environmentally viable. The degree of flexibility is determined in two ways. First the in-built opportunity for adaptability, defined as 'capable of different social uses', and second the opportunity for flexibility, defined as 'capable of different physical arrangements'. (Schneider & Till, 2005, p. 157)

From the perspective of user, there are two issues that should be considered in housing design in order to achieve flexibility: firstly, the capacity of the project to offer a variety of "choices" in housing types prior to occupation, and secondly, its capacity to allow "changes" after occupation. Both of these issues require long-term thinking in the design process (Till & Schneider, 2005, p. 287).

The former one, offering a "variety" of choices in housing types, should be considered starting from the design stage. The building should offer "the possibility of choosing different design layouts" "prior to occupancy" (2005, p. 287). In Bernard Leupen's book entitled *Dwelling: Architecture And Modernity*, Gustau Gili Galfetti names this kind of flexibility as "**initial flexibility**" and describes it as changing and modifying possibilities offered to occupants prior to occupancy (2003, p. 90). In brief, presenting a variety of "choice" for different uses in the design stage can be claimed as a prerequisite for flexible housing.

The in-built opportunity in "initial flexibility" is a response to the idea of designing residential blocks appropriate for diverse users. In that sense, "initial flexibility" should be considered as a part of the design problem to achieve flexibility (Figure 2.4). It reflects an innovative way of thinking in design. Schneider and Till distinguish it from a way of thinking that characterizes the conventional approach: "[t]he tendency to design buildings that only correspond to a specific type of household at a specific point in time reflects a way of thinking that is predicated on short term economics" (Schneider & Till, 2005, p. 157).



Figure 2.4: *Njiric+Njiric* Housing, Den Bosch, 1993: The Module (above) and Its Configurations for Diverse Users (below) (Paricio, 2003, p. 76) (Redrawn and Colored by the Author of the Thesis)

The main concern of the second issue in flexible use is stated by Schneider and Till (2005, p. 287) as "the ability to adjust one's housing over time" including "the potential to incorporate new technologies over time, to adjust to changing demographics, or even to completely change the use of the building from housing to something else". It is the flexibility offered by the structural system and the service spaces, in other words, the permanent components of the buildings. The design of these permanent components determine whether a housing project is flexible or not, in the long run. The capability of fulfilling the changing wishes and demands of users over time is called "**permanent flexibility**" by Galfetti (2003, p. 90). The possible future changes in needs and demands can be estimated from demographical changes⁶ such as increase/decrease in the number of household members, practical changes required by an occupant's loss of abilities to do certain things, mostly because of aging, and possible functional transformations of the building from residential to something else.

⁶ Needs and demands can change according to location and time. For instance, in Yüzüncü Yıl, Ankara near Middle Technical University, there is now a major population of students instead of families.


Figure 2.5: The *Flexabilt* Home: A Diagrammatic Scheme of a Cycle of the Change in Architectural Layout in Accordance with the Change in Number of Family Household (Friedman, 2002, p. 79) (Colored by the Author of the Thesis)

Demographical changes can be considered as one of the most important concerns for flexible housing. The number of household members might change over time. As Schneider and Till assert, "[o]ne of the problems of treating housing as a static commodity with fixed design parameters is that it arrives into a world of changing demographics" (2007, p. 37). For instance, Avi Friedman (2002) shows a cycle of change in the number of people in the household and accordingly a change and adaptation in the housing unit (Figure 2.5).



Figure 2.6: *Fleksible Boliger* Housing Project Study by Tegnestuen Volden, 1986, Denmark: A Scenario of Changing Lifestyle of the Household (Schneider & Till, 2007, p. 98)

The practical changes required by situations such as the onset of losing one's ability to do certain things due to ageing are the other crucial considerations of flexible housing. Consequently, the housing unit should be adaptable and adjustable to fulfill the changing needs of the inhabitants. In the light of these considerations, the users should not feel the need to move to another house, due to demographical and practical reasons.⁷

⁷ As an example, the *Südliche Furth* Houses, Neuss, Germany by Ağırbaş & Wienstroer (2008) offer separately designed housing units for elderly people and people with disabilities. This is a competition project that won first prize in the competition organized by federal state of North Rhine-

A third concern is to be able to change the use of a building completely. This is also important for a building to be considered as flexible.

There are different methods to achieve flexibility. These can be examined under four main themes: structural system, service spaces, architectural layout and furnishing for flexible use. The related strategies, however, can be applied in different ways in the design of flexible housing according to "soft" and "hard" analogies proposed by Schneider and Till (2007).

2.2.2. "Soft" And "Hard" Analogy

The "soft" and "hard" analogy that Schneider and Till introduce, refers to two different ways of "flexible housing" design. For Till and Schneider, ""[s]oft' refers to tactics which allow a certain indeterminacy, whereas 'hard' refers to elements that more specifically determine the way that the design may be used" (Till & Schneider, 2005, p. 289). The related techniques can be distinguished by analyzing form (or technology), and use of a housing project. Here, use is related to the architectural layout of housing. The form, on the other hand, comprises the construction techniques, structural system and servicing of the housing projects, and deals with how they affect the degree of flexibility in housing projects (Till & Schneider, 2005, p. 289). These two categories, use and form, can be either "soft" or "hard". These techniques, "soft" and "hard" use, "soft" and "hard" form, are briefly discussed according to Schneider and Till's point of view (2007, 2005b).

The projects, which are examples of "soft" use, allow users to make changes or adaptations according to their needs and wishes in time. Architect works in the background. One of the common features of that kind of projects is stated as "the provision of more space"; this technique is based on a "relaxed" and "indeterminate" approach (Schneider & Till, 2007, p. 7). The others, which are

Westphalia in 2003 (Hasol, 2008). Despite the fact that the project is designed in the light of the concepts of variety and flexibility, and consequently, tries to make the environment appropriate for everybody, it offers a separate solution for practically disabled people at the center of the area.

examples of "hard" use, on the other hand, are more architect based ones where architects work in the foreground and determine the possible changes or adaptation for users over time (Schneider & Till, 2007, p. 7). The common features of that kind of projects can be listed as being preferable to use in the "premium space", the preferable use of the folding/movable elements, and the production of "highly specific nature of the configurations" (Till & Schneider, 2005, p. 293).

Another way to achieve flexibility in housing is through the design of form, whether "hard" or "soft". According to Till and Schneider (2005, p. 293), "hard" form means "those technologies/forms that are developed specifically to achieve flexibility". The structure of the buildings is intentionally designed for flexibility. It is a determinate way of design and flexibility operates in the foreground in terms of the form of a building. In other words, the construction technique becomes important in determining the housing design. On the other hand, "soft" form is "the stuff that enables flexible housing to unfold in a manner not completely controlled by the foreground of construction techniques" (Till & Schneider, 2005, p. 294). Thus, it is a less determinate way of design and flexibility operates in the background.

In this study, the projects are also classified according to their techniques (form and use) as "soft" or "hard". In these two techniques, the way of creating both the "initial flexibility" for "choice" in the design stage and "permanent flexibility" for "change" over time differs.

[T]he importance in the design of flexible housing is to be aware of the tensions between the indeterminate and determinate approaches because it serves as a constant reminder of the tension between the reality and the ideals of spatial occupation. (Schneider & Till, 2007, p. 7)

In "soft" systems, the building is indeterminate in terms of form and the usage of space so that the users have the opportunity to make adjustments according to their needs over time. For instance, apartment blocks, in the *Weissenhofsiedlung* settlement (1927) in Germany, were designed by Mies, and these blocks are

"soft" in both use and form (Figure 2.7).⁸ In other words, the interior space of each unit have been left incomplete and empty to be built and changed later by the users according to their needs. Flexibility also operates in the background.



Figure 2.7: Upper Plan Belongs to the blocks in *Weissenhofsiedlung* Settlement designed by Mies van der Rohe, 1927, Germany as an example of the use of "Soft" techniques (Redrawn by the Author of the thesis) and Below to *Maisons Loucheur* by Le Corbusier, 1928/29, France, as an example of the use of "Hard" techniques (Till, Wigglesworth, & Schneider, 2004-6)

According to Hertzberger (1991, p. 146), the "soft" techniques can be regarded as "the set of all unsuitable solutions to a problem". Hence, he prefers a more determined way of design that is composed of polyvalent rooms. In "polyvalent organization", the dimensions of rooms are appropriate for different functions.⁹ Thus, this kind of design can be assessed as "hard" form as the physical fabric is determined by the architect instead of the user and the aim is to develop form specifically to achieve flexibility. However, as the polyvalent rooms are considered as multifunctional and their functions are determined by the user, that kind of housing design can be evaluated as an example of "soft" use. Besides the architectural layout, the usage of a house might be predetermined by the

⁸ The interior possible different layouts of types in the project have been designed by different architects and designers.

⁹ This will be discussed under the title of structural system.

architect, as in the case of *Maisons Loucher* by Le Corbusier (1928/29) in France (Figure 2.7). This project is evaluated as flexible: "hard" in form and "hard" in use.

In this respect, the projects can be categorized in terms of their constructional and technical way of design: "soft", "hard" form, or through their plan or architectural layout, that affects the usage of housing: "soft" or "hard" use.

In terms of use it may appear a contradiction that flexibility can be achieved through being either very indeterminate in plan form and/or technology or else very determinate, but historically both approaches have developed in parallel throughout the twentieth century. (Till & Schneider, 2005, p. 289)

From this point of view, it seems necessary to emphasize that "hard" systems can be mainly applied in housing design with limited space; whereas, "soft" ones are appropriate when there is plenty of space. Within this framework, the inquiry about the design of flexible housing is based on whether or not, the "initial" and "permanent flexibility" are provided and if this is the case, how they are achieved.

2.2.3. The Areas of Innovation to Achieve "Flexible Housing"

These two stages for flexible use are one of the prominent concerns to explore the different strategies and methods of flexible housing design. For instance, as mentioned before, for "initial flexibility", the layout of the building should offer a variety of choices for users with different lifestyles, and for "permanent flexibility", the residential unit should give the opportunity to make physical arrangements and adaptations over time according to the changing needs and wishes of the users. In short, to create housing that provides flexibility in these two stages, the configuration of permanent parts, the structural system and service spaces, play a major role in the design. The degree of flexibility in the main space depends on the configuration of these permanent parts.

There are a number of ways of achieving flexibility in housing design. This section aims to highlight some basic strategies that suggest alternative methods to create flexible housing through using "soft" and "hard" techniques. They are

explored through four main themes: 1) "the structural system"; the location of load bearing walls and the columns, 2) "the position of service spaces"; the access system and the organization of wet spaces, 3)"the architectural layout" of the residential blocks in terms of the variety of unit types and the spatial organization of types, and 4) "furnishing for flexible use"; the use of furniture to separate different functional spaces or the use of folding furniture to allow different configurations for day and night.

2.2.3.1. Structural System

The structural system, as being one of the fixed and permanent parts of the building, is important in determining whether the architectural layout will be flexible or not. The flexibility of residential buildings is related to their permanent components and the variable ones. Projecting future scenarios during the design process makes buildings to be adaptable and changeable according to ever changing wishes and demands of the users. For instance, correct decisions about the frequency of the structural elements and the usage of load bearing walls, can allow changes to be made in future. In that sense, there are two main structural methods to attain flexibility: "base structures" and "polyvalent organizations". The former refers to a structural system that allows a layout that is not fixed in functional sense, however vague and left as generic space. It is mostly composed of columns and beams. The latter one, "polyvalent organization", is based on designing vague rooms or cells that are appropriate for any function (Schneider & Till, Flexible Housing, 2007) (Table 2.2).

Table 2.2: The Structural Systems for Flexible Housing: Base Structures and Polyvalent Organizations, 1,3,5: (Drawn by the author of the thesis), 2: (Schneider & Till, 2007, p. 125), 4: (Schneider & Till, 2007, p. 95) (Redrawn and Colored by the Author of the Thesis)



"Base structures" also called as "indeterminate buildings" (Schneider & Till, Flexible Housing, 2007), with a provision of open space, is a way of design with a limited number of permanent elements.¹⁰ "[F]aced to the vitality and diversity of potential occupancy, the reaction is to provide a frame and within it empty generic space that can be filled in and adapted over time" (Schneider & Till, 2007, p. 39). The architects may intentionally leave the rest as a generic space for the users to fill in according to their needs and demands, as incomplete and indeterminate. Therefore, this approach can be regarded as generally accommodating "soft" form (Table 2.2).

As opposed to an indeterminate space idea of "base structures", the space in "polyvalent organizations" is generally divided into permanent "modules" with standardized dimensions, appropriate for diverse functions. Hertzberger is one of the pioneers of this kind of approach that is discussed in the next chapter. In this approach, the sizes of the modules are standard and fixed in form, but it is possible to join two or more modules together or to divide a module into smaller modules. Hence, this approach is generally evaluated as accommodating "hard" form.¹¹ Hertzberger asserts that "[t]he only constructive approach to a situation that is subject to change is a form that starts out this changefulness as a permanent – that is, essentially a static – given factor: a form which is polyvalent" (Hertzberger, 1991, p. 147). In that sense, "polyvalent" type of housing design is considered as more determinate than the open space idea of the "base structures". However, the usage of these polyvalent forms is determined by the users, and thus, can be regarded as "soft" in use likewise the former. The benefits of "polyvalent organizations", in comparison to the former one, are stated by Schneider and Till as:

¹⁰ There are some exceptions in "base structures" such as "open buildings" (Habraken N. J., 1972) or "SAR" (Foundation for Architects Research) (Habraken N. J., 2008). If the architect develops the form of the building (structural system, construction technique and servicing) specifically to achieve flexibility, then the project is an example of a "hard" form: *Kallebäck* experimental housing (1960) by Erik Friberger (Chapter 3).

¹¹ There are also some exceptions in "polyvalent organizations", if the form of the building (structural system, construction technique and servicing) is indeterminate, then the project is an example of a "soft" form: *Überbauung Hellmutstrasse, by ADP Architektur und Planung, 1991, Switzerland* (Chapter 3).

Rather than the provision of open space, it starts with a cellular structure. Flexibility over time is provided in two ways. First, the rooms are indeterminate in their function. Secondly, the divisions are laid out and structured so as to allow them to be connected together in a variety of configurations [.] (2007, p. 40)

The structural system, in some cases, can accommodate these two structural techniques together (Table 2.2). In brief, both of the organizations related to the choice of structure are to be among the main concerns of the architects who want to achieve flexibility at a very early stage of the design process.

2.2.3.2. Service Spaces

The position of the service spaces and service cores can be regarded as a determinant for the configuration of the main spaces. Service units can be a part of the structural system, or they are designed separately. They comprise "access units" in the scale of both building and unit, and the infrastructure that determine the location of "wet spaces". Schneider and Till emphasize the importance of the position of service spaces in the design of housing:

1) The strategic placing of service cores to allow kitchen and bathrooms to be placed within specific zones but not to be permanently fixed.

- 2) The ability to access services so that they can be updated at a later date.
- 3) The distribution of services across the floorplate so that they can be accessed for in any plan arrangement. (Till & Schneider, 2005, p. 294)

Access to the service elements is another prominent concern in making the building capable for alterations for a variety of unit types and giving the opportunity to make adaptations and adjustments in the future. One of the practical ways in this sense is to collect all the services in a single zone so that the main space can be undisturbed as generic space, "freedom in internal layout" (Rabeneck, Sheppard, & Town, 1974, p. 76). The service spaces can be placed on areas of the facades or in the middle of the building. On the other hand, they can also be located in two or more locations on the same floor (Figure 2.8).



Figure 2.8: The Possible Configurations of the Service Spaces in Architectural Layout (Drawn by the Author of the Thesis)

The type of access units too determines the layout of a building. Schneider (2003, p. 52) emphasizes the importance of the position and type of access units as: "[a] typology of housing structures can be prepared by classifying them according to the access branches onto which the associated apartment groups are tied in and the position of these branches in the building". She offers a typology of access units as vertical and horizontal, open and closed systems. The main access unit of the building can be external or internal.

The vertical access units are configured as service cores with staircases providing vertical access to the housing units around it. They can be either a freestanding core attached to the building or located within the building itself (Figure 2.9).



Figure 2.9: Vertical Access Unit either as a Freestanding Unit or as Integrated to the Building (Drawn by the Author of the Thesis)

The horizontal access units, on the other hand, serve to connect the vertical access units and the housing units. They are located inside the building as a

closed system or attached as an open gallery type of access system (Figure 2.10).



Figure 2.10: Schematic Drawing of Horizontal Access Units in Multi Storey Buildings (Schneider F. , 2003, pp. 50,52) (Colored by the Author of the Thesis)

In brief, together with the structure, the position of service spaces as being fixed elements, affect the degree of flexibility in housing design. In multi residential housing, besides minor changes such as adding balconies or other open air spaces, the facade is generally "fixed" too. In that respect, the main indeterminate space outside the service zone provides freedom to apply alternative methods of creating flexible housing that allows practically useful alterations in its architectural layout.

2.2.3.3. Architectural Layout

The configuration of the permanent components reflects the degree of flexibility in a housing. Flexibility of architectural layout depends on the configuration of the permanent components of the buildings. This investigation on the architectural layout of flexible housing focuses on two scales: building scale and unit scale. Firstly, in building scale, the alternative configurations of different "types of units" on each floor are investigated. Units are composed of permanent components such as service spaces, wet spaces (kitchen and bathrooms) and structural elements, and besides, the main space is composed of living spaces and rooms. Secondly, in unit scale, "the spatial organization" of different functions in units is explored. The aim is to discuss the limitations and possibilities of the permanent components on the design of architectural layout.

The first controversies over 'flexibility' was whether flexibility was better achieved by making the work of architecture incomplete and unfinished in certain respects, leaving it to the future to decide, or whether the architect should design a building that was complete, though nonetheless flexible. (Forty, 2000, p. 142)

This can be regarded as the main contradiction on flexible housing: either an indeterminate (incomplete) project that architect gives the floor to the users, or a determinate one that the architects determine the architectural layout in a way that the users do not need to make any physical changes: "soft" or "hard" use (Schneider & Till, 2007, p. 7). In this respect, the configuration of main space is also important in creating flexible housing. It is examined under two subtitles: the "types of units", and the "spatial organization" of the units.

Types of Units

As the study investigates also the concepts of typological variety and adaptability, the ability to offer alternative configurations in housing types becomes an important issue in creating flexible housing. The possibility of proposing different arrangements in unit types is related to the two stage of flexible use: initial and permanent flexibility. Before occupation, the residential block should offer a variety of "choices" to users (Figure 2.11) and, second, during the post occupancy period, the housing units should allow users to make "changes" according to their wishes and demands.



Figure 2.11: *Siedlung Hegianwandweg* Multi Storey Apartment House Project by EM2N *Architekten*, 2003, Switzerland (Schneider & Till, Flexible Housing, 2007, p. 146)

From this point of view, it can be stated that one of the major problems of the conventional housing projects is their limitations to allow changes or adaptations over time, or in other words, their inappropriateness for future scenarios. In relation to this issue, Paricio states that:

Diversity of housing supply is one response, but it is not the one which the market has chosen. Developers all underline what is, apparently, the largest segment of the market: the conventional family [,] ... the conventional option.

The other possibility is a house which can accommodate diversity which is capable of adapting to the needs of the user before or after the purchase. (2003, p. 76)

Table 2.3: Architectural Layouts that are Appropriate for Flexible Housing 1: (Drawn by the Author of the Thesis), 2: (Schneider & Till, 2007, pp. 183,184), 3: (Schneider & Till, 2007, p. 72) (Redrawn and Colored by the Author of the Thesis), 4: (Schneider & Till, 2007, p. 188), 5: (Schneider & Till, 2007, p. 189), 6: (Leupen, 2003, p. 132)

			DEFINITION	DIAGRAMMATIC DRAWINGS
		SLACK SPACE	It can be determined as space, which is not intentionally, determined its function or configuration as a dwelling space within the unit. However, it is considered as a free space that can be appropriate to be included to the house itself. It is an overtime opportunity for users. Alcoves, flat roof, courtyards, staircases or later on added mezzanine floor are commonly used slack spaces.	(1)
	A R	VERTICAL/ HORIZONTAL ADDITIONS	The design approach can be regarded as the future extensions of the building both in vertical and horizontal way. In other words, architect should focus on the structural system, the access units and the technical equipment for wet spaces, and also lighting, so as to give opportunity to extend for changing uses, during the design process.	(2)
	с н		It also embraces the incomplete building idea.	BALCONY BALCONY
36	I T E C T U R A L	EXPANDING WITHIN	In order to expand the unit, the building should be designed as a base structure and the external envelope of the unit gives opportunity to be extended. The units can be later on enlarged according to an increase in the number of people in the household or some other external forces. This strategy is not a commonly applied one.	(3) Kallebäck Experimental Multi Housing Project, by Erik Friberger, Sweden 1960
	L Y O U T	JOINING TOGETHER & DIVIDING UP	This strategy gives the users the opportunity to combine two or more units in order to get a larger one, or vice a versa. The main point for applying this is not to put structural elements such as load bearing walls to outer walls of the units. It can be used for both polyvalent structures and base structures.	After 20 years After 40 years
		SHARED (SWITCHED) ROOM	It can be defined as a room that users are able to switch in between two units over time. The same principles stated above are also valid for this strategy.	
		DIVISIBLE/ JOINABLE ROOM	This strategy gives the users the opportunity to combine two or more rooms together in order to get a larger one, or vice a versa. The main point of applying this is not to put structural elements such as load bearing walls within the units. It can be used for both polyvalent structures and base structures.	(6) Schröder House, by Gerrit Rietveld in Utrect, The Netherlands, 1924.

As Forty states, "accommodating diversity of unit types" is one of the important characteristics of flexible housing: "[t]he incorporation of 'flexibility' into the design allowed architects the illusion of projecting their control over the building into the future, beyond the period of their actual responsibility for it [post occupancy phase]" (Forty, 2000, p. 143).

Spatial Organization

The spaces, as mentioned before, can be designed in either a complete, determinate way, or incomplete, indeterminate way. Indeterminate space is called "raw space" by Schneider and Till. This can be used for both the "base structures" and the "polyvalent organizations". Raw spaces are "spaces [that] are not fully formed (cooked) and their eventual spatial form is a shared production of designer and the user" (2007, p. 134). The organization of spaces (living, sleeping, dining and the wet spaces), and the relation between these spaces are investigated in the cases introduced in Chapter 4. In flexible housing, the architectural layout of the units can include "slack spaces" which are described by Schneider and Till as follows: "the designer intentionally provides spaces for appropriation but does not determine their exact use or configuration" (Schneider & Till, 2007, p. 137) (Table 2.3).

The elements used as separators or partitions become important for the spatial organization of the units. These elements determine the relation between the spaces. The relation between the spaces can be provided by sliding/moving/ folding walls, as furnishing elements, which are discussed under the title of "furnishing for flexible use". These separation and partition elements can be considered as an opportunity for users (Table 2.3).

2.2.3.4. Furnishing for Flexible Use¹²

Rabeneck, Sheppard and Town state, "[a]rchitects interested in flexible housing often take it upon themselves to invent systems of furniture or 'detachable units' tailored to their conception of flexibility." (1974, p. 88). Furniture can serve as a separator or a compact unit that accommodates functions as well. For instance, the project (1990) designed for *Habitatge i Ciuttat* competition, by Iňaki Abalos and Juan Herreros in Spain, is based on different configurations that are created by movable furniture. The floors, ceiling, and columns on the periphery are fixed components of the block and the interior configuration of the units is determined by users by moving the furniture that serves as a separator as well (Table 2.4).

Furnishing for flexible use, in other words, can be achieved by using furniture as a surface or as a functional unit. They can be used as a stable or movable/foldable element in the house (Table 2.4). The use of movable/foldable furniture, such as a kitchen or a bed utility, is to transform space during day and night according to the needs and demands of the users. That kind of foldable furniture is preferred in minimal dwellings. On the other hand, furniture can be used as a functional unit that can make rooms appropriate for different functions during night and day.

¹² The issue of furnishing in the context of flexible housing is not limited with movable/folding/sliding walls or foldable furnishing. In the housing scale, a unit itself can be considered as an indeterminate space, which is called "house as furnishing" (Table 2.4). By the same token, in the scale of unit itself, rooms can be considered as indeterminate spaces and they can be treated as furniture: "Room as Furniture" (Table 2.4). However, furnishing within this context was not deeply discussed in this study.



Table 2.4: Furnishing for Flexible Usage, 1: (Galfetti, 2003, p. 99), 2: (Schneider & Till, 2007, p. 191), 3: (Teige, 2002, p. 244), 4: (Teige, 2002, p. 243), 5: (Schneider & Till, 2007, p. 190)

2.3. Conclusion

This chapter introduces a conceptual framework. Three concepts, "flexibility", "adaptability", and "typological variety", are discussed in the context of housing. The characteristics of flexible housing and the methods to achieve it are evaluated with reference to the concepts of "soft" and "hard" use and form. "Soft" refers to an indeterminate way of design that offers endless solutions, while "hard" systems, to a more determinate way of design.

Four themes are determined in order to evaluate and discuss whether a project is flexible or not: "structural system", "service spaces", "architectural layout", and "furnishing for flexible use". In the next chapter, the chronological background of the methods and strategies for flexible housing design in the twentieth century will be explained in the light of these four themes and the "soft" and "hard" analogy mainly on the basis of Till and Schneider's work.

CHAPTER 3

AN HISTORICAL OVERVIEW OF "FLEXIBLE HOUSING" IN THE TWENTIETH CENTURY¹³

Schneider and Till (2007) discuss the issue of flexible housing in the twentieth century under three titles: "Modernity and The Minimal Dwelling", "The Industrialisation of Housing", and "Participation and User Choice". This discussion focuses on the prominent examples that reflect different intentions in design. Thus, this chapter overviews and discusses themes related to flexible housing design such as "standardization", "limited space standards", "minimum dwelling", "base structures", "polyvalent organizations", "convertible space", "prefabrication", "user participation" and "future intended design".

3.1. 1920s: "Modernity and The Minimal Dwelling"¹⁴

The discussion of the concept of flexibility in the context of domestic architecture is introduced under two topics: "the evolving conditions of the vernacular" and the "external pressures that have prompted housing designers and providers to develop alternative design solutions, including flexible housing" (Schneider & Till, 2007, p. 13). Thus, it can be claimed that flexible housing evolves from the continuation of traditional tendencies in housing design or emerges as a new design tendency following the outward forces in the twentieth century. The

¹³ The main sources of this part are Schneider and Till's work (2005a, 2005b, 2007) and Habraken's (2008) review of it. The examples are selected from the case studies of Schneider and Till (2007) and evaluated in the light of Habraken's criticism (2008) and accordingly, some additional examples are introduced.

¹⁴ Schneider and Till (2007, p. 15) call the first episode in flexible housing as the "Modernity and The Minimal Dwelling".

discussion on the first period focuses on new tendencies and the outer constraints that triggered a change in design thinking. Schneider and Till emphasize that: "[a]rchitects, particularly in the 1920s, were questioning existing patterns of living and approached the building as something that could change over time and something that could adapt to the wishes of its inhabitants" (2005, p. 158). In this respect, they explored selected prominent examples built during 1920s and 1930s, which emerged as a result of a radical change in housing, after World War I, from the perspective of "modernity"¹⁵ and the slogan of "minimum dwelling".

"Minimum dwelling", on the other hand, is defined as "dwelling with subsistence minimum" by Karel Teige (2002, p. 234). "Minimum dwelling" differs from other multi residential blocks in terms of achieving an "ideal functional solution" which "would at least satisfy the basic minimal requirements for healthy living" (Teige, 2002, p. 234). The requirement for minimal dwelling, as stated before, is a consequence of not only the housing crisis after World War I, but also the changes in the society as a result of the modernization process.

Exhibitions on new housing projects¹⁶ are the prominent examples that follow the evolution of housing design through new tendencies. The 1927 *Stuttgart*

¹⁵ According to Hilde Heynen (2005, p. 1), "the literature of **modernity**" focuses on "the idea of change and discontinuity, stating that in a modern condition change is paramount and nothing can remain fixed or stable". Heynen also explains the term "modernity" as not only a "change" but also a "discontinuity" with tradition, or a rupture within the process of transformation from tradition. The change and discontinuity with tradition occurred as a result of the outward conditions such as the changes in society, economy and alike. Heynen states that "[*m*]odernity refers to typical features of modern times and to the way that these features are experienced by individual: modernity stands for the attitude toward life that is associated with a continuous process of evolution and transformation, with an orientation towards a future that will be different from past and from present" (1999, p. 10).

¹⁶ A list of exhibitions on new housing schemes can be found in Teige (2002): The 1923 International Exhibition of Architecture by *Bauhaus in Weima*r (Walter Gropius), The 1927 *Stuttgart Werkbund* Exhibition *Die Wohnung: The Weissenhofsiedlung* by *Deutscher Werkbund* (Mies van der Rohe, J.J.P.Oud, Victor Bourgeouis, Le Corbuiser, Gropius, A.G. Schneck, Hans Scharoun, Peter Behrens, Mart Stam, Josef Frank, Adolf Rading, L. Hilbersheimer, Max Taut, Bruno Taut, Richard Döcker, Hans Poelzig), The 1929 Exhibition *Wu Wa Breslau* (*Wohnung und Werkraum*) in Poland by German *Werkbund*, The 1929 Exhibition of *Dammerstock* Settlement in *Karlsruhe* (Walter Gropius and Otto Haesler), *Das Neue Heim* in Zurich 1928 by Swiss *Werkbund*, The 1930 Exhibition *WoBa* (*Wohnen und Bauen*)in Basel, The *Stuttgart Weissenhof Siedlung* by Vienna *Werkbund* in 1932 (Adolf Loos, R. J. Neutra, Andrè Lurcat, Rietveld, Jos. Hofmann, Jos. Frank, Brenner, Grete Schütte-Lihotzky, and others), The 1930 Stockholm and Dresden Exhibition by E.G.

Werkbund Exhibition *Die Wohnung*: The *Weissenhofsiedlung* served as a context of "new" and "minimal" housing, is presented and discussed briefly in the following section.

The main consideration of the new tendencies was to improve the living conditions, particularly of the working class, in social housing after World War I, and the main idea behind the design of "minimum dwelling" was to find out the "limited space standards" of housing that could serve in an adequate and efficient way. The concept of flexibility played a crucial role in the development of "minimum dwelling". From that point of view, Schneider and Till assert that "[i]f there was less space, then that space needed to be used in as efficient and flexible a manner as possible. This led to architects developing new plan types for housing, many of which had elements of flexibility" (2007, p. 16).

There are also some examples of minimal dwellings that have been designed in an inflexible and unhealthy way through "tight-fit functionalism" labeled by Rabeneck, Sheppard and Town (1973):

> "[a] proliferating response by architects to this 'tight-fit functionalism' has been to propose flexibility or multi-use of restricted space as a means of providing opportunities for choice and personalization" (Rabeneck, Sheppard, & Town, 1973, p. 698)

In the light of the "soft" and "hard" analogy, flexibility in the context of "minimum dwelling" can be achieved in three ways (Table 3.1). The first approach in the design of minimum dwelling is to determine the "**base structures**" which are generally designed by using "soft" techniques: "soft" form, and use. The housing unit offers a variety of configurations and allows change and adaptation.

Asplund (Arhèn, Ahlberg, Almquist, Bergsten, Dahl, Erickson, Friberg, Hüorvik, Jonson, Lewerentz, Markelius, Schmalansè, and Ryberg), and The Prague Exhibition of Housing by *Svaz Ceskèho Dila* in 1930.



Figure 3.1: The *Weissenhofsiedlung* housing project by Mies van der Rohe, the permanent and infill components (Redrawn by the Author of the Thesis), the exterior view and interior view (Kirsch, 1989)

The Weissenhofsiedlung experimental housing project (1927), designed by Mies van der Rohe can be regarded as the first successful example of minimum dwelling (Figure 3.1; Table 3.1). Van der Rohe only designed the permanent components of the building in order to provide an indeterminate open space to be arranged by the users; the large spans of column and beam system with perimeter walls, and the infrastructure for the service spaces of the blocks were predetermined and built. Blocks are configured as frame construction, which Mies van der Rohe thought to be "the most appropriate form of construction to balance the fixed needs for efficient forms of construction with the changing needs of its occupants" (Schneider & Till, 2007, p. 20). In this way, he grants freedom to users by allowing them to fill the main open space with light infill partitions whenever they want. Thus, this project, as a base structure, can be regarded as an example of "soft" use.

The second design approach in the design of minimum dwelling, called **"polyvalent organization**", on the other hand, is based on generally "soft" use, but "hard" form. In this system, domestic units offer flexibility in usage within the permanent boundaries of housing unit itself: "the provision of rooms that were indeterminate in use" (Schneider & Till, 2007, p. 18). The *Hufeisensiedlung* multistorey apartment block (1925-1931) designed by Bruno Taut can be regarded as a prominent example (Figure 3.2; Table 3.1).

The *Hufeisensiedlung* multi-storey apartment block provides rooms with no designated use. The architectural layout of the units is composed of rooms that are similar in size. Taut used standard dimensions that can be appropriate for diverse use. In order to accommodate users with diverse lifestyles, the function of space is left indeterminate or "neutral". The structural system of this project is composed of load bearing walls. In that sense, in terms of its form (structural system, construction technique and servicing), this project is more determinate than the van der Rohe's project. Users can decide the use of rooms whenever they want. Thus, it can be assessed as an example of "hard" form and "soft" use.



Figure 3.2: The *Hufeisensiedlung* multi-storey apartment block (1925-1931) by Bruno Taut: Plan (Redrawn by the Author of the Thesis) and Exterior view (Schneider & Till, 2007, p. 58)

Finally, the third technique in the design of minimum dwelling is called as **"convertible space"**, which is "more architect-determined" (Schneider & Till, 2007, p. 18). Since the main consideration is the patterns for different uses, this approach can be regarded as dealing with "flexibility in use" over time. Because of the limitations of the available space, architects control and organize the usage of space by folding furnishing elements and moving/folding/sliding walls as elements of convertible spaces. The cycle diagrams are used in planning the units in this approach (Figure 3.3). In this example, both the form and the use of space can be evaluated as "hard".



Figure 3.3: The Use Cycle Studies in *Montèreau* Project (Rabeneck, Sheppard, & Town, 1973, p. 704)

Maisons Loucheur Housing project (1928-1929) by Le Corbusier can be given as one of the most influential examples (Figure 3.4; Table 3.1). This project is based on the idea of adaptable floor plan with "minimal" (limited) space through the use of moveable and foldable furniture and partitions. Le Corbusier had the idea of using the large living space during the day and dividing that unified space into smaller spaces during the night. In this project, Le Corbusier determined and designed every detail of the unit. Thus, users could adapt and adjust their unit according to Le Corbusier's decisions. It can be regarded as an example of "hard" form and use.

In brief, "minimum dwelling" in relation with "modernity" can be asserted as one of the important developments that reflect a change in the concept of dwelling. It is an outcome of a new attempt in solving "[t]he great problems of to-morrow [in mass housing], dictated by collective necessities, [which] put the question of "plan" in a new form." (Corbusier, 1960, p. 9). In order to produce housing blocks appropriate for all, "standardization" that connotes universal suitability and maximum adaptability became a key issue in the planning of minimum dwelling.



Table 3.1: 1920s Modernity and The Minimal Dwelling; 1: (Till, Wigglesworth, & Schneider, 2004-6), 2: (Kirsch, 1989, p. 52), 4: (Schneider & Till, 2007, p. 58), 5 & 6: (Schneider & Till, 2007, p. 61), 7: (Teige, 2002, p. 210)(All the images are Redrawn and Colored by the Author of the Tthesis)



Figure 3.4: *Maisons Loucheur* Housing project (1928-1929) by Le Corbusier: Plan and exterior view (Till, Wigglesworth, & Schneider, 2004-6)

In 1920s and 1930s, there were two controversial approaches to flexibility in architectural design that belong rather to "the rhetoric of flexibility" (Schneider & Till, 2007, p.5). On one hand, there is a tendency to advocate the necessity of minimal dwellings designed in the form of indeterminate unit plans, and on the other hand, the tendency to support more determinate new modes of housing with technical and mechanical equipments. Starting from 1930s, these tendencies have continued by adopting industrial solutions to construction techniques in housing.

3.2. 1930s - 1960s: "The Industrialisation of Housing"¹⁷

The second period corresponds to the development of innovative ideas in the construction techniques of "minimum dwelling", and its reflections and further developments. While the first episode of the 1920s, "Modernity and The Minimal Dwelling" dealt with the social and cultural aspects, the second part focused on the technical and economic aspects of flexible housing. New construction techniques and technology, served to establish a link between the first episode, starting with the questioning of the existing housing patterns of the first period and the third episode, the "user participation" in design process stage.

After World War I, the discussion on "standardization", "normalization", "rationalization", "constructivism", "functionalism" brought the idea of "prefabrication" in housing construction (Kirsch, 1989, p. 9).¹⁸

According to Le Corbusier, the solution for the problems in housing could be solved by offering standardized solutions. Le Corbusier came up with the idea of "standardization" which was a result of the developments in industry. These developments made possible standardized and comparatively perfect types of production. They also led to a standardized solution that is universally accepted as the proper and appropriate type of housing for all human beings. From this point of view, the neutral skeleton system called "*Maison Dom-ino*" (1919) by Le Corbusier can be regarded as one of the pioneering schemes for mass-produced housing constructions (Figure 3.5; Table 3.2). This scheme is "soft" in use. The frame (support) is separated from the in-fill part of the building, in other words, the permanent/fixed part is detached from the infill/unfixed elements added later. In terms of its technology or form, it is "hard" because flexibility operates in the foreground. It was developed specifically to achieve flexibility.

¹⁷ Schneider and Till (2007, p. 21) call the second episode in flexible housing as "The Industrialisation of Housing".

¹⁸ Schneider and Till (2007, pp. 21-27) base their argument on Le Corbusier's famous slogan "a house is a machine for living", Walter Gropius's prefabrication method in Weissenhofseidlung project and Henry Ford's factory production idea.

Table 3.2: 1930s-1960s "The Industrialization of Housing", 1: (Till, Wigglesworth, & Schneider, 2004-6), 2: (Schneider & Till, 2007, p. 23), 3: (Schneider & Till, 2007, p. 64), 4: (Schneider & Till, 2007, p. 69), 5: (Rabeneck, Sheppard, & Town, 1973, p. 721), 6: (Schneider & Till, 2007, p. 72) (Images 4,5,6 are redrawn and colored by the Author of the Thesis)





Figure 3.5: Maison Dom-ino (1919) by Le Corbusier (Till, Wigglesworth, & Schneider, 2004-6)

The process of "standardization", led to the development of the "modular" design and "prototypes" in housing. These are mostly assessed as examples of "hard" form because the modular system is determinate and designed for flexibility and "soft" usage as the users were given the opportunity to select what they wanted and needed. Growing House (1932) by Otto Bartning is an example for this kind of construction (Table 3.2).

Habraken's "Support and Infill" theory is one of the important theories to design housing blocks, which are examples of "soft" use. Habraken improved mass housing quality by developing the idea of "Support and Infill" with the Foundation for Architects Research (SAR) in 1964. He advocates a built-in opportunity in residential blocks for a variety of types by making the architectural layout independent from the structural system, which improves techniques and technology in mass production. One of the other opportunities offered by his theory is that the users are seen as an indispensable input in the design process, thus buildings allow users to make adjustments in the future.

In brief, the support and infill system in the design of housing units seems to be based on a separation of the structural system and the infill system. Users have no right to interfere to structural system while the infill system refers to configuration of the detachable units according to users' needs and wishes. The housing projects designed according to "Support and Infill" systems can be examples of both "soft" and "hard" form. It depends on the choice of architect: whether designing a determinate or indeterminate project in terms of its form.

Kristalbouw project (1952) by Jan Trapman provides a base to the theory of Habraken (Figure 3.6; Table 3.2). It is a concrete frame structure with an outer layer of balconies, which can be accessed via inner access units or open access galleries. Beside the permanent components, the use and design of the block is left open. Thus, it is an example of "soft" form and use.



Figure 3.6: *Kristalbouw* study project (1952) by Jan Trapman (Redrawn by the Author of the Thesis)

Kallebäck experimental housing (1960) by Erik Friberger, on the other hand, can be regarded as an example of "hard" for and "soft" use (Till, Wigglesworth, & Schneider, 2004-6) and is an illustrative case (Figure 3.7; Table 3.2). A column and slab system is based on an initial idea of shelves to accommodate the units. The form of the project is "hard" because of the specific solutions for construction such as the "demountable partition walls", "wall cupboards" and "doors" that are determined by architect to make the project flexible. Users can extend their units

by moving demountable partition walls. In this way, architect allows user to participate in design process.



Figure 3.7: *Kallebäck* experimental housing (1960) by Erik Friberger: plan (Redrawn by the Author of the Thesis) and exterior view (Till, Wigglesworth, & Schneider, 2004-6)

To sum up, the innovations in design techniques for achieving flexibility allows user involvement in the design stage. According to Schneider and Till:

A flexible housing design opens opportunities to the user in three specific ways. The first is through the ability to customise, which gives the future resident a degree of choice over their future home. The second is the potential to adapt design prior to occupation not so much as a means of customization (which tends towards treating housing as a commodity) but as a means of involving future tenants in a participative capacity, as well as giving housing providers the freedom to change the housing mix. The third way that flexible housing empowers the user is post-completion, when a flexible design

enables users to make adjustments on their own terms. (Schneider & Till, 2007, pp. 46-47)

3.3. 1970s: "Participation and User Choice"¹⁹

Habraken's "Support and Infill" theory led to the "participation and user choice" in housing design, providing an exception to what Rabeneck, Sheppard and Town say about mass produced housing:

The public sector [in mass housing] response to housing design problems has been to research users needs as a means of generalizing the condition of 'invisible' clients of public housing architects [that leads to anthropometric studies]. (Rabeneck, Sheppard, & Town, 1973, p. 698)

The use of standardized components would allow adaptation over time, in terms of replacement or addition, with minimum fuss. However, the analogy about the form cannot be regarded as a totally "soft" one (Schneider & Till, 2007). *Les Marelles* prefabricated housing project (1975) by Bernard Kohn and Georgers Maurios, for instance, offer prefabricated elements from which the users can pick whatever they want to customize their houses. Here, all the possibilities are predetermined by the architects, and the design is an example of "hard" form but "soft" use (Table 3.3). According to Habraken, "[t]he bad reason for keeping flexible housing at arm's length was that, when participation came to the fore, many architects resented the idea that users would make design decisions. And many still do" (2008, p. 292).

Two important housing projects, *Wohnanlage Genter Strasse* by Otto Steidle and Partners (Figure 3.8; Table 3.3) and *Überbauung Hellmutstrasse* by ADP *Architektur und planung* (Figure 3.9; Table 3.3), offer "soft" use and also "soft" form. The structural systems in these projects are totally different from each other: the former one is a "base structure", while the latter has a "polyvalent organization".

¹⁹ Schneider and Till (2007, p. 27) call the third episode in flexible housing as the "Participation and User Choice".

Wohnanlage Genter Strasse was built in three phases in 1970s where Steidle and partners used a structural system called "Elementa", which is composed of reinforced concrete column and beam system with ceiling panels (Schneider & Till, 2007, p. 85). Users are given the opportunity to define the free open space according to their needs and wishes. They can also customize their units by using glazing or solid infill panels (Schneider & Till, 2007, p. 85). Additionally, there are "excess spaces" that users can claim over time as either outdoor space or indoor space. In brief, as a base structure, the fixed part and the infill part are separated from each other. Thus, this project is an example of "soft" form and use (Figure 3.8; Table 3.3).



Figure 3.8: *Wohnanlage Genter Strasse* by Otto Steidle: Plan (Redrawn by the Author of the Thesis) and Exterior view (Till, Wigglesworth, & Schneider, 2004-6)

Überbauung Hellmutstrasse, on the other hand, is designed by ADP *Architektur und planung.* Although there are interior load-bearing partition walls, users are given the opportunity to make changes in the future. Additionally, the block allows multiple arrangements to fulfill the needs of users with diverse lifestyles. Thus, these future changes can include enlargement or reduction in the size of the units. In brief, this project is another example of "soft" form and use. The architects allow user participation in the design process and also give users the opportunity to customize their houses (Figure 3.9; Table 3.3).



Figure 3.9: *Überbauung Hellmutstrasse* by ADP *Architektur und planung*: plan and exterior view (Till, Wigglesworth, & Schneider, 2004-6)

Three European architects, Lucien Kroll in Brussels, and Nabeel Hamdi and Nicholas Wilkinson in UK are also important in this framework (Habraken, 2008, p. 291). N. Hamdi and N. Wilkinson improved Habraken's "Support and Infill" theory and developed an approach called "Primary System Support Housing and Assembly Kit" (PSSHAK) in Britain (Rabeneck, Sheppard, & Town, 1973, p. 727). They tried to separate not only the structure from the infill but also the service spaces of the housing block. The implemented goals of the scheme are listed as:

- 1. To allow tenants to choose plan layout before moving in;
- 2. To allow layout to be adapted to a family's changing needs, and to subsequent tenants;
- 3. To provide longer term adaptation of the basic structure to different mixes of dwelling sizes thus allowing for future increases in space standards and family size. (Rabeneck, Sheppard, & Town, 1973, p. 727)
Table 3.3: 1970s "Participation and User Choice"; 1: (Schneider & Till, 2007, p. 85), 2: (Schneider & Till, 2007, p. 87), 8&11: (Till, Wigglesworth, & Schneider, 2004-6), 3&4: (Schneider & Till, 2007, p. 87), 5: (Till, Wigglesworth, & Schneider, 2004-6), 6: (Habraken, 2008, p. 294), 7&8: (Till, Wigglesworth, & Schneider, 2004-6), 9-12: (Friedman, 2001, pp. 113-126), 10: (Till, Wigglesworth, & Schneider, 2004-6), 13-14: (Rabeneck, Sheppard, & Town, 1973, p. 727) 15: (www.greatbuildings.com), 16: (Politano, 2006), 17&18&19: (Schneider & Till, Flexible Housing, 2007), 20: (Hertzberger, 1991, pp. 157,158) (1,2,4,5 are redrawn and colored by the Author of the Thesis)



		· · · · · · · · · · · · · · · · · · ·			
1 9 9	Multiple Arrangements	The design idea is to divide the space in three distinct horizontal zones. At the top is a line of similarly sized rooms divided by loadbearing partitions, and with the possibility of inserting non- loadbearing partitions to define circulation. These rooms as "polyvalent organization", have no designated use.			"Soft" Form "Soft" Use
	User Participation & Future Intended design				
0 s	Polyvalent Organization				(6)

Table 3.3 (continued)



59

Table 3.3 (continued)



In this context, PSSHAK flats designed by N. Hamdi and Wilkinson and GLC in 1970 are considered as the product of a successful design process. Varieties of house types are provided for users with diverse lifestyles and as a result of the zoning principle of the service spaces, the users were given the opportunity to adapt and adjust their houses according to their demands. In this example, users can implement their individual choices within the soft infill area (Table 3.3).

In brief, the idea of separating the elements of construction, the support and infill systems is not only a technical solution in flexible housing design. It also empowers the user as a participant in the design process.

3.4 Conclusion

The approaches to housing design related to flexibility in the twentieth century are discussed under three episodes. These episodes are labeled by Schneider and Till (2007) according to the social, technical and economic dynamics in the twentieth century.

In the first epoch, the discussion was based on new models of housing schemes with respect to minimal space standards. In the next epoch, the focus was shifted to standardized construction models of houses; Le Corbusier is one of the pioneers with his neutral skeleton system for mass produced housing along with Habraken with "Support and Infill" theory. The last epoch, 1960s, introduced new themes such as "customization", "future intended design" through user participation in the design process. This chapter reflects on the question how flexibility was achieved in the twentieth century. According to Till and Schneider there were mainly two systems: "soft" and "hard". Accordingly, the approaches in flexible housing were based, on one hand, on standardized solutions with an indeterminate way of design called "soft" systems and on the other hand, a more advanced and complicated, determinate way of design called "hard" systems.

This brief presentation of the developments in flexible housing, pointed to the changing demands such as the need for housing and limited space standards, innovations in construction techniques and technology, and user participation in the design stage. This investigation constitutes a broad framework to explore the methods and strategies utilized in design of three case studies from Turkey in Chapter 4.

CHAPTER 4

THREE HOUSING PROJECTS IN TURKEY FROM THE PERSPECTIVE OF "FLEXIBILITY"

This chapter explores how "flexibility" and the related concepts, adaptability and typological variety, have influenced design approaches to housing in Turkey, and illustrates how flexibility can inspire new ways of housing design and enhance the quality of housing projects. Within this perspective, the main purpose of this chapter is to find out how flexibility grants the opportunity to the architect to produce creative options that will respond to changing demands of the users during occupancy whether or not these options are used by the users. It also aims to understand the extents and limitations of flexible design approaches over selected cases. To achieve these goals, three innovative examples are examined: Eryaman 3rd Stage²⁰ housing blocks designed by Ahmet Gülgönen, blocks designed by Tuncay Çavdar in the same stage and Levent Loft 1 housing project designed by Tabanlıoğlu Architects.

The projects are discussed, firstly, in terms of the methods and strategies used to achieve flexibility, secondly, in terms of flexible usage related to ever changing needs and wishes of the users, and finally, in terms of the views from the

²⁰ Eryaman 3rd Stage social housing projects were obtained through a competition. They were studied in the following theses: Kaya Alpan's *The Agency Of The Architect In The Production Process Of Mass Housing The Example Of Eryaman Mass Housing Application*, 1999, Fahriye Oya Tali's *Mass-Produced Housing Project Proposal In Ankara-Eryaman With Reference To The Mass-Produced Housing Site Planning And Housing Design Methods*, 1994, H. Filiz Alkan's *A Study On The Social Environmental Analysis Of The Qualitative Values In Mass Housing Areas In Suburbs : A Case Study In Ankara-Eryaman*, 1999 and Aylin Başçetinçelik's thesis study *An Urban Way Of Life In A Suburban Residence: Ankara - Eryaman*, 2002. In the articles by Cana Bilsel (2000) titled "Three Recent Settlements In Ankara: Batikent, Eryaman And Bilkent,Questions On Quality And Sustainability Of The Built Environment", by Ali Cengizkan (2005) titled "Producing Ankara Through Residential Architecture: Generating And Re-Generating The City After 1975" and by Aydan Balamir (2003) titled "Çağdaş Mimarlık Mimari Kimlik Terimleri II: Türkiye'de Modern Yapı Kültürünün Bir Profili" they were examined in detail. In this thesis these groups of blocks in Eryaman 3rd Stage are approached specifically as examples of flexible housing design.

architects themselves. Three semi-structured interviews were conducted with Ahmet Gülgönen, Tuncay Çavdar, and Tabanlıoğlu Architects. Three questions were directed to them about their design approaches in these selected projects via electronic mail:

- Was the concept of "flexibility" an input when the design phase of the project started? Did you consider the changing demands and wishes of the users throughout time?
- How do you integrate these four themes, structural system, service spaces, architectural layout and furnishing into your design?
- Do you have similarly conceived projects? Can you describe your experiences related to these projects?

Information obtained from these interviews formed a basis for the discussion in this chapter.

These projects are different from the more conventional residential projects in many ways. One of the significant characteristics of the two cases in Eryaman 3rd Stage, for instance, is that they were designed for "an urban design competition" organized by the Housing Development Administration (HDA) for 3195 housing units. HDA divided the region into two areas, one being larger than the other. Within the projects submitted, Ahmet Gülgönen's proposal for the site was found eligible to be constructed on the larger area.²¹ Gülgönen developed both a site plan and a group of residential blocks and units. Another important feature of Eryaman 3rd Stage housing project is that:

[f]or the first time in the planning of a new settlement in Turkey, the planning decisions of Eryaman points out the necessity of developing detailed 'urban design' schemes for each of the neighbourhood units, the neighbourhood centres and the central areas. (Bilsel, 2000, p. 9)

²¹ Ahmet Gülgönen, Tuncay Çavdar and Cengiz Bektaş were invited by the Housing Development Administration. Raci Bademli as a city planner, Oral Vural and Doruk Pamir as architects evaluated the submitted projects (Alpan, 1999, p. 123).



Figure 4.1: Site Plan of Eryaman 3^{rd} Stage (Archive of Housing Development Administration)

Tuncay Çavdar's proposal was found eligible to be constructed on the second region (Figure 4.1). Both of the projects were designed in 1993 and built between 1993 and 1995.

Levent Loft 1, on the other hand, is a prominent example of a transformation project. It is an unfinished office building transformed into a residential block by preserving the existing concrete basic structure. In brief, these selected cases illustrate how flexibility is interpreted in three different contexts.

Flexibility as a design criterion is discussed under four main themes: 1) "the structural system", 2) "the service spaces", ("access units", and residential "wet spaces"), 3) "the architectural layout" ("variety of types" and "the spatial organization" of units) and 4) "furnishing for flexible use". They are explored in the light of the "soft" and "hard" analogy. The design approaches of the architects are also discussed.

4.1. Eryaman 3rd Stage Housing Blocks, Ahmet Gülgönen, 1993

Project Name:	Eryaman Third Stage Housing Project		
Project Type:	A Social Housing Project		
Location:	Eryaman, Ankara ²²		
Architect(s):	ect(s): Ahmet Gülgönen ²³		
Date Designed:	1993		
Construction Completed:	Built in phases from 1993 to 1995		
Number of Housing	2680 Units		
Units: ²⁴	Diversification in between 45 to 100 square meters and one		
	storey to two storey		
Client / Developer:	The Republic of Turkey Housing Development Administration		
	(HDA) by a competition		
Managed By:	Tekser, Eston, Tepe, Yardımcı, İçtaş, Sutek		

Table 4.1: General Information about Project

The prominent characteristics of Gülgönen's project are the "site plan" of the neighbourhood and the "typological variety" in blocks and units. The idea of the site plan was based on "clustering" the blocks around an inner courtyard. Another important characteristic of the project is that it has 25 building types with nearly 250 types of housing units (Cengizkan, 2005, p. 51). These variations are obtained as a result of both the position of blocks on the lot, and the changing

²² Eryaman Third Stage is a social housing project located in Eryaman which is described as "a new settlement situated on the 'Western Corridor', at a distance of 18 km. from the center of Ankara" (Bilsel, 2000, p. 9).

²³ Ahmet Gülgönen graduated from the Department of Architecture at Middle East Technical University. "He obtained a Masters degree from the University of Pennsylvania in 1964. During his stay in US he worked as a designer in the office of Louis Kahn, participating in projects such as the Indian Institute of Management in Ahmedabad and the National Assembly buildings in Dacca, Bangladesh. On returning to Turkey, Gülgönen was chairman of the Department of Architecture at METU in 1968 and 1969. He won prize in a competition for the Gallipoli Memorial Park and Museum (1969) in Turkey shown in this issue, and won second prize in 1972 international competition for the Center Pompidou in Paris, France. Since moving to France, where …he practices as well as teaches at the Ecole des Beaux Arts[.]" (Taylor, 1991, p. 62).

²⁴ "A total of 3.195 residences were produced in the third stage and of these, 2.680 were in Gülgönen's area[.]" (Cengizkan, 2005, p. 45).

number of floors in the blocks. The positions of blocks on the site provides variety; a type of block, for example, stands as a single building on the site, or as attached to other blocks. By the same token, as Bilsel (2000, p. 10) mentions: "[a] variety of housing types of different heights is mixed to provide an architectural diversity". In both ways, blocks preserve the same construction principle and architectural layout, and the variation is created by minor changes.²⁵



Figure 4.2: The Site Plan of Eryaman 3^{rd} Stage, Divided into Two Sub Regions by HDA (Colored by the Author of the Thesis)²⁶

Gülgönen responds to the question whether the concept of "flexibility" was an input during the design process of Eryaman 3rd stage housing project, or not, as follows:

²⁵ Since the focus of this chapter is on the structural system, service spaces, architectural layout and furnishing in the light of flexibility, the variation depending on the position on the site and number of floors are disregarded in this study. In that sense, there are three types of blocks.

²⁶ Eryaman 3rd Stage housing projects are no longer accessible in the archives of the Housing Development Administration has been disposed of. Architectural drawings of these projects were found in the archives of Etimesgut Municipality, and redrawn and colored by the author of this thesis.

The concept of flexibility has been a prominent concern in my approach to architectural design. Additionally, the necessity to tackle a project of this size within a short period of time as an urban design project affected the approach to design ... In contrast to conventional social housing projects, a generous, humane and respectful environment, which is also in a harmony with its landscape, is created. (Gülgönen, Personal Communication, 2009)

In brief, in this project, there are mainly three types of housing blocks, which contain a number of housing units (Figure 4.2) and they are scattered in the whole area. These three types of blocks are discussed under four themes: 1) structural system, 2) service spaces, 3) architectural layout, and 4) furnishing for flexible.

4.1.1. The Structural System

The structural systems used in these three blocks are generally composed of reinforced concrete column and beam system with additional load-bearing walls (Table 4.2). In type C, for instance, the columns are positioned on the periphery of the building, while, in type A and B, in addition to the columns on periphery, there are also columns located at the center of the building. On the other hand, load bearing walls are used for the service spaces (vertical access units) in all three blocks which at the same time, form the structural cores of the blocks. Gülgönen states that "the structural system of the buildings is composed of reinforced concrete column and beam system which is an advantage for flexibility" (Personal Communication, 2009).

The architectural design of the blocks can be described as a "**base structure**" that is composed of supports with an exterior envelope. Gülgönen's residential blocks remind the *Weissenhofsiedlung* by Ludwig Mies van der Rohe (1927, Germany) (Table 3.1.) and *Kristalbouw* project by Jan Trapman (1952, Amsterdam) (Table 3.2.), which were influential in the development of Habraken's "Support and Infill" theory in 1960s (Table 3.2.) (Schneider & Till, 2007, p. 69). *Kristalbouw,* like Gülgönen's blocks, has a bunch of columns positioned both on the periphery and inside the building, and the load bearing walls are used to hold the service spaces.



Table 4.2: Analysis of the Structural System (Drawn by the Author of the Thesis)



However, Gülgönen did not leave the rest of the plan as incomplete; he built in the units by using partition walls. The interior partitions are positioned according to the permanent components of the buildings: the columns, load bearing walls and the external envelope.

Gülgönen's structural system provided him the opportunity to develop a variety of unit types. In each block, the structural system is capable of accommodating either one or two units of one or two storey between 45 to 100 square meters. Habraken's "Support and Infill" theory was based on the idea of giving the users the opportunity to tailor the main indeterminate space to fit to their needs. In this project, the initial decisions about the placement of partition walls were made by the architect himself. In this sense, Gülgönen's design approach does not entirely match with Habraken's theory of "Support and Infill". In these blocks, flexibility operates in the background. The form of the blocks, (structural system, servicing and the construction technique) is designed as "soft". In each of the three residential blocks, Gülgönen designed the support system in such a way that it became possible for users to adjust the space according to changes in use.

4.1.2. Service Spaces

Service cores including the access units and wet spaces are the other fixed components of the blocks. Gülgönen designed different types of access units. He created clusters with inner courtyards that provide access to the blocks (Figure 4.3 and 4.4).

Two types of access units are used to reach the units located on different levels: an open gallery and closed access systems provide access to the housing units. Such units are used also in the low-cost housing project composed of 23 units in Tourcoing, France, which was designed by Gülgönen (Figure 4.3).



Figure 4.3: A View of the Blocks from the Street to the Courtyard (By the Author of the Thesis), Right, Low-Cost Housing Design in Tourcoing, France (1989, p. 28)

In multi-unit housing, open access galleries function as decks, and considered as spare space from the perspective of flexibility in terms of use (Figure 4.4). Schneider and Till emphasize that "[e]mploying excess circulation area can also build-in the potential division of one large unit into two units or the possible separation of work/live arrangements in one and the same dwelling" (2007, p. 149). Thus in Eryaman 3rd stage project, access galleries/units do not limit users to expand or divide their units. The variety in the access to units also creates the possibility of the "combination or subdivision of territories" of each unit (Habraken, 2008). That is not a frequently used system in Turkey. In this respect, Gülgönen's approach in Eryaman housing can be considered not only an innovative approach to housing design but also an attempt to increase the number of possible variations of units.

The closed access units are fixed service cores located in the middle of each residential block and are used to serve to the entire building (Table 4.3). These cores contain staircases, and in type B, an elevator shaft, a small appliances room and also accommodates the entrance of the building.





Open Access Galleries

Entrance for the Closed AccessUnits

Figure 4.4: Open Access Galleries and Entrance for the Closed Access Units within the Building (By the Author of the Thesis)



Table 4.3: Analysis of the Position of Service Spaces (Drawn and Colored by the Author of the Thesis)

0 <u>5</u> 10 15m

Wet spaces such as kitchens and bathrooms, on the other hand, are positioned next to the load bearing walls in the units. As Gülgönen (Personal Communication, 2009) points out: "the sensible solutions of the relation between service spaces and the main spaces of the units, offer the possibility to make adjustments over time". There are no restrictions for future use in the dimensions of wet spaces.

Hence, the service spaces are adaptable and they allow change. As it has been stated above, these blocks, according to their structural system, construction techniques and servicing, can be regarded as "soft" form.

4.1.3. The Architectural Layout

Gülgönen designed the blocks for Eryaman 3rd Stage when he was in France and thus, he did not have any information about the possible inhabitants. Thus, the user participation during the design process was not an issue. The "soft" form of three types of blocks allows Gülgönen to offer choices to the users through designing a variety of unit types. With the future provision of users, he designed 24 types of units.

Types of Units

Gülgönen responds to the question concerning how he managed to obtain variety in his housing units by pointing out that,

Designing structural elements as a part of a generic system gives the opportunity to propose various unit types. This characteristic of the project makes it different from the conventional housing examples. (Gülgönen, Personal Communication, 2009)

In the project, there are 24 different types of housing units that range from single storey units to two storey ones and of 45 square meters to 100 square meters. These 24 types of units are configured in different ways on each floor of the

blocks (Table 4.4). This project, in this respect, can be assessed as fulfilling the diverse needs and demands of the users before occupancy.

The units are capable of being "divided" or "joined together" in the architectural layout. The joined units and the divided units can be seen in type A and type B block plans (Table 4.4). For instance, type 15 is achieved by joining type 4 and 5. The structural system and the layout provide the users with the opportunity for change. The idea of "shared rooms", on the other hand, is valid only when two of the units are attached to each other. For instance, the second storey of type 22 can share one of the rooms with the next unit, type 22 (Table 4.4). However, in reality, that kind of changes may not be possible, for instance, when the neighboring units are occupied by different families. There may not be a chance for integrating these units. By the same token, it may not be feasible to make such external changes for economic reasons, as well. In this context, there are limitations in terms of the changes related to the territories of the units.



Figure 4.5: A view from one of the residential blocks' façade, showing the added on balconies (By the Author of the Thesis)



Table 4.4: Analysis of Different Configurations of Units (Drawn and Colored by the Author of the Thesis)

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Some of the types of the units have balconies. Çavdar used these varied open air spaces to design different types of unit layouts. These balconies, however, are commonly "added" to the units by the users (Figure 4.5). It happens out of architect's control.

In brief, Gülgönen did not leave the units as indeterminate or incomplete; instead, he determined 24 different types of units. Thus, the architectural layout of the project can be regarded as an architect-determined one. Architect worked in the foreground during the design stage. Gülgönen, on the other hand, allows the users to adapt the units according to their future wishes and demands to a certain extent. However, it is more feasible to adapt and adjust these units without making any changes related to their sizes. In that sense, the project can be evaluated as an example of "hard" use. During post occupancy, however, the users have the control.

Spatial Organization of Units

Gülgönen summarizes his intent in spatial organization as:

The spatial organization of units were configured according to the superposition of several functional systems: diverse lifestyles of the users, the transitional zone in between interior and exterior spaces, the dialectic of main interior spaces and the secondary spaces within the unit, landscape of the site, climate data and so on. (Personal Communication, 2009)

Changes in the configuration of the units may be required, as it has already been pointed out, due to demographical changes such as increase/decrease in the number of household members, and practical changes required by an occupant's loss of abilities to do certain things, mostly because of aging. The span of the columns is also appropriate for dividing the interior space into rooms with standard dimensions that are appropriate for a diversity of uses. The absence of fixed interior partitions, as discussed above, allows users to adapt their units by moving some of the interior walls (Figure 4.6). Thus, users have the opportunity to make changes within their units by putting in or removing non-load bearing partitions. For instance, in most of types such as 10,15,16,17,19,20,21,22,23 and 24, users can "join" two or more rooms together (Figure 4.6). Additionally, rooms can be integrated to living rooms or kitchens as well (Figure 4.6).

Plans, on the other hand, also pose some problems. As Cengizkan emphasized "[t]here is no doubt that this plan research brought usage problems into the housing, such as toilets or bathrooms entered from the living room [type 2]" (2005, p. 51). That kind of architectural layout solutions also limits the usage of the unit as against the concept of flexibility.



Figure 4.6: The Idea of "Joining" the Kitchen to Living Space or "Dividing" them up (By the Author of the Thesis)

In brief, Gülgönen's design offers a certain amount of freedom to users to adapt and adjust the internal configuration of their units to a certain extent. For the changes related to interior space of the units, users have the control, in contrast to the prior to occupancy period, as it has been stated above. Owing to the "soft" form of the blocks, users can make adaptations and alterations according to their wishes. Thus, these blocks, in this context, can be regarded as an example of "soft" use during post occupancy.



Table 4.5: Different Organizations and Consequential Variation on Unit Types (Drawn and colored by the author of the thesis)

79







balconies

balcony

ROOM

two balconies

balcony

ROOM

ALCON

តា

KITCHEN

Table 4.5 (continued)

One storey unit with three rooms (and a balcony)

4.1.4. Furnishing for Flexible Use

Gülgönen determined the location of the storage areas. Such areas were located in the entrance, bedrooms, and also under staircases (Figure 4.7). Gülgönen did not design any other niches or articulate surfaces on walls for furnishing, as storage spaces. In his design, furniture was not used as a separator in between spaces.



Figure 4.7: To left out spaces for storage (By the Author of the Thesis)

Examined from the perspective of flexibility, it can be said that Eryaman 3rd stage housing project reflects an innovative way of thinking. Gülgönen offers freedom in the use of living spaces by the design of permanent components of the blocks. These blocks can be regarded as examples of "soft" form in terms of their structural system, servicing and the construction technique.

"Soft" form of the blocks gives Gülgönen the opportunity to design a variety of units in the design stage and the users the opportunity to adapt their units in time. Thus, prior to occupancy, the architectural layout was determined by architect. He was able to offer different units to users before occupancy, which is one of the characteristics of flexible housing. Users can join together/divide up their units. Unfortunately, such changes may not be feasible and possible for users. Thus, in this context, blocks are designed as examples of "hard" use. On the other hand, adaptations and adjustments can be made within the unit itself, after occupation, users have the control over their units and owing to the "soft" form of the blocks, they are free to make changes. In brief, the architectural layout of the blocks can be evaluated as an example of both "hard" and "soft" use in different stages.

4.2. Eryaman 3rd Stage Housing Blocks, Tuncay Çavdar, 1993

Project Name:	Eryaman 3rd Stage Housing Project	
Project Type:	A Social Housing Project	
Location:	Eryaman, Ankara	
Architect(s):	Tuncay Çavdar ²⁷	
Date Designed:	1993	
Construction Completed:	Built in phases from 1993 to 1995	
Number of Housing	515 Units	
Units: ²⁸	Diversification in between 45 to 100 square meters and one	
	storey to two storey	
Client / Developer:	The Republic of Turkey Housing Development Administration	
	(HDA) by a competition	
Managed By:	Alarko	

Table 4.6: General Information about Project

²⁷ "Dr. Tuncay Çavdar [who] has established and leads Atelier T, is the author of a series of architectural oeuvres, successful worldwide." (Atelier T). Çavdar with Atelier T, has designed many vacational resorts.

²⁸ "A total of 3.195 residences were produced in the third stage and of these, 2.680 were in Gülgönen's area and 515 in that of Çavdar" (Cengizkan, 2005, p. 45).

A second neighbourhood on the periphery in Eryaman 3rd stage was designed by Tuncay Çavdar (Figure 4.8).²⁹ Like Gülgönen's project, this project too started by taking important design decisions, which can be listed as designing residential blocks with "elevated inner streets" and offering "typological variety" in housing units.

The first important characteristic of Çavdar's approach is that he designed some of the residential blocks with "elevated inner streets" that provide access to the units. These are used in type A and are located in the middle of the blocks, on each side of which the housing units are positioned (Figure 4.8). This type of open access corridors in residential blocks is not common in Turkey and can be considered as an innovation in the design of circulation.



Figure 4.8: The Site Plan of Eryaman 3^{rd} Stage (Drawn and Colored by the Author of the Thesis)

²⁹ An additional question was conducted to Tuncay Çavdar about one of his previous residential project called "İzmit Housing project":

[•] Have you transferred the experience to this project from a previous housing development of yours in Izmit where you worked with Aydan Bulca and Ilhan Tekeli? If so, to what extent have you influenced by it?

The second prominent characteristic of the project is that Çavdar offered "typological variety" in units. They are either one or two storeys and have sizes ranging from 45 to 100 square meters, as previously applied by Gülgönen to his own design in the same stage. Thus, the project included 515 housing units offering 11 different types for the future users.

Çavdar emphasized in his written response to the interview questions that his previous design experience in İzmit Housing Project³⁰ influenced the design of Eryaman 3rd Stage. He calls the method of this project as "a participatory design approach"; "it was finished with a specifically compatible technology, which has never been used before" (Personal Communication, 2009). One of the important features of this experience is that, he made interviews with more than a thousand families both individually and collectively, to fulfill the requirements of participatory way of design (personal communication, 2009). İzmit Housing Project was designed with "user participation" (Chapter 3).

The designer debated with the users of the dwelling, about their residence preferences, future expectations and choices. Following this debate, the architectural layout of the units was visualized and the last touch-ups were done with the approval of the users.

While this milieu developed the users' consciousness of space, their neverending demands cutting across all boundaries were challenging our designers' accustomed way of thinking.

We were not able to repeat this experience again but in every practice, İzmit Housing Project was a very good guide. The input to transform the unit into a "home" through users occupying it was very essential to this "guide" as they introduced the concept of flexibility. (Çavdar, Personal Communication, 2009)

³⁰ "In the 1970s, the Mayor of İzmit (a town within the metropolitan boundaries of Kocaeli), initiated the design of a participatory public housing project. The 'New Settlements Bureau' of the local municipality directly managed this project under the supervision of Aydan Bulca. Ilhan Tekeli from the Department of City and Regional Planning at Middle East Technical University worked as the general consultant of the project. Tuncay Cavdar, a nationally well-known architect was in charge of the design aspect of the project. Ergun Unaran managed the company established to realize the implementation of the project" (Bulca et al., 1979).

Tuncay Çavdar summarises the design process of the project as: "Izmit housing project, although it was not materialized, was created in 4 years by us, thinking and working on it 24 hours a day. It was the same project that sparked the demand from the community for urban justice against the obstacles which makes it very important as it emphasizes the importance of design and planning process" (Personal Communication, 2009).

It is important to emphasize that Çavdar did not design the residential blocks in Eryaman 3rd stage by participating the users into the design process. However, he adapted the data about the user needs and demands collected from his previous experience in İzmit Housing Project. "The users' possible future demands, needs and wants" constitute the data, used by Çavdar in Eryaman (Personal Communication, 2009). In this respect, Çavdar designed the blocks as a base structure in the support level, and afterwards, he designed the main indeterminate space according to the data about users. Çavdar developed 1000 different types of housing units in İzmit Housing project, and in case of Eryaman 3rd stage, he reconsidered these types and adapted them in order to produce 11 types.

In this project, there are two different types of housing blocks, which contain a number of housing units. These blocks are discussed under four themes: 1) structural system, 2) service spaces, 3) architectural layout, and 4) furnishing for flexible (Figure 4.8).³¹

4.2.1. The Structural System

The structural system of these two blocks is concrete-reinforced frame structure that is composed of column and beam system. The columns are positioned on the periphery of the block in Type B; whereas, in Type A, of three rows columns, two are on periphery, and one at the center (Table 4.7). The frame structure provides adequate spans so that space within is indeterminate and allows non-load bearing partitions to be used. The service cores for vertical access are separated from the main structural system of the buildings. Thus, in contrast to Gülgönen's design, Çavdar did put in load bearing walls within the main indeterminate space. In this way, the living areas are not interrupted by any load bearing walls.

³¹ Actually, in type A, there are two different buildings connected with elevated inner street. However, in this study, the whole block is considered as one type.

The architectural design of the blocks can be described as a "**base structure**" that is composed of a frame with an exterior envelope. The span between the columns allows for different configurations of the units (Figure 4.9) and the layout of the blocks is based on a regular structural grid system. Çavdar's blocks, in this respect, can be regarded as more flexible, in terms of structural system, than Gülgönen's blocks.



Figure 4.9: Structural System and the Configuration of Two Different Modular Types of Units (Drawn by the Author of the Thesis)

This kind of structural setup is similar to a "soft" system. Moreover, the structural system of the project also reminds Habraken's "Support and Infill" theory. Çavdar did not develop a form specifically to achieve flexibility. Flexibility operates in the background in terms of form, thus, this project can be assessed as an example of "soft" form. It is also important to emphasize that Çavdar did not leave the units as incomplete; instead, he designed each of them separately to show the possible configurations. In other words, the form of the building allowed Çavdar to design the main spaces of the buildings in different ways. At the same time, he allowed users to adapt their units according to their individual needs.



Table 4.7: Analysis of Structural System (Drawn and colored by the Author of the Thesis)

0 5 10 15m

4.2.2. The Service Spaces

Like the structural system, the service cores including access units and wet spaces are the fixed components of the buildings. Kitchens, bathrooms and the entrances of the individual units are located in a single zone in the middle of the blocks in type A. In type B, however, they are located on one side of the blocks (Table 4.8).

Çavdar attempted to separate the access units from the residential blocks. In order to achieve that, he created entrances to the units from a street or a garden to make the units "home-like" (Çavdar, Personal Communication, 2009). In type A, for instance, there is an open street or an access gallery (an "elevated inner street") in one level, between two rows of housing units (Figure 4.10). The vertical access cores are attached to these corridors on each end. In type B, the vertical access cores are also separated from the main building and the access to the individual entrances are provided from open-air access galleries (Table 4.7). As a result, there is diversity at the level of entrances to the units (Figure 4.10).

The wet spaces are positioned as a row facing the inner streets in the middle. The zoning of service spaces allows users to adapt and change the configuration of their units during occupancy. The main space can still remain indeterminate. It grants freedom to users in future adaptations and adjustments.

To sum up, the permanent elements of the building, the structural system and the service spaces can be assessed as being designed in a flexible way. Çavdar's approach to the design of service spaces and the position of service cores in both types of blocks can be asserted as adaptable for future changes. Hence, in terms of the design of the permanent components, as stated above, these blocks can be assessed as "soft" in form.



Figure 4.10: The Connection of "Elevated Inner Street" to Units at Different Levels (By the Author of the Thesis)



Table 4.8: Analysis of the Position of Service Spaces (Drawn by the Author of the Thesis)

4.2.3. The Architectural Layout

Tuncay Çavdar designed Eryaman 3rd Stage residential blocks without being able to benefit from user participation. Çavdar states that:

Naturally, we were not able to proceed with a participatory design approach in Eryaman 3rd Stage since there was not any information on the users of the units at the beginning of the design. However, we knew that the user profile for this project was going to be similar to that of İzmit and we managed to bring in Christopher Alexander's pattern language to meet the likely demands of the users. (Çavdar, Personal Communication, 2009)

In this way, he tried to offer choice to users through designing a variety of unit types. Additionally, the "soft" form of the blocks in terms of structural system and the position of service spaces, and the construction technique gave freedom to Çavdar during the design process.

Types of Units

As stated earlier, the structural design of the buildings, together with the position of service cores, are important to achieve flexible buildings. Architects provide opportunities to the users in two ways: by offering different choices prior to occupation, and by allowing users to make adjustments and adaptations in time.

In terms of the former, Çavdar responded to the question concerning how to achieve different solutions in housing units by stating that,

What we did in Eryaman 3rd stage housing project was to integrate and adapt a thousand different types and utilization methods that were developed in İzmit Housing Project; we thought they constituted a good sample. The huge demand for this type of housing can actually be a proof that they really were a good sample. (Çavdar, Personal Communication, 2009)

In this project, there are 11 types of housing units. The configuration of these units varies on each floor. For instance, in type B, while there are two storey units on ground floor, there are one-storey units above, and two detached two-storey units on the upper levels (Table 4.8). In both of the blocks, however, each floor is composed of only one or two types of units. In other words, in contrast to

Gülgönen's blocks, these blocks have not such a variation in unit configuration on each floor. In type A, for instance, every floor accommodates only one type of unit except from type B (Table 4.9).

Architect allows users to make changes in their units according to their changing wishes and needs in time. None of the internal walls are load bearing in the blocks, partition walls can be removed in order to make new spatial combinations. This gives the users the opportunity to "join" their units with another unit or later-on "divide" the larger unit into smaller ones. The idea of "shared rooms", on the other hand, is valid in this project as the units are attached to each other (Table 4.4). However, even the fixed components of the building permit such changes and adaptations over time; they may not be possible and feasible for users as in the case of Gülgönen's design. Thus, interior adaptations and changes are more valid than the changes in the size of the units. During post occupancy period, however, the user have the control on the changes related to the interior configuration their units.

The units on ground floor have open-air terraces, and those on the upper floors have balconies. Çavdar used these open air spaces to design different types of unit layouts. These open spaces are commonly "added" to the units by users (Figure 4.11). It happens out of architect's control. Instead, Çavdar used these varied open air spaces to design different types of unit layouts.



Figure 4.11: Open Air Terrace which can be added-on to the unit by the users (By the Author of the Thesis) $% \left({{\rm{B}}_{\rm{T}}} \right)$


Table 4.9: Analysis of Different Configurations of Units (Drawn by the Author of the Thesis)



In brief, like Gülgönen, Çavdar also did not leave the units as indeterminate or incomplete. He determined each unit prior to occupancy, thus, these blocks can be regarded as an example of "hard" use. Users are in the background and the architectural layouts of the units are determinate. None of the internal walls is load bearing in the blocks, partition walls can be removed in order to make different spatial combinations. These give the opportunity to users to "join" their units with one another or "divide up" a larger unit into smaller ones. However, it is more feasible to adapt and adjust these units without making any changes related to their sizes. In this respect, these blocks can be regarded as "hard" in use. These buildings can be assessed as example of "soft" use. It is discussed in detail under "Spatial Organizations of Units".

Spatial Organizations of Units

Çavdar designed the units in a way that users can easily adapt the interior space to their changing needs by putting in or removing non-load bearing partitions within the units. Service spaces, being located on one side of the units, allow for a range of possibilities. For instance, users can make adaptations or adjustments within their units such as "joining together" two rooms or "dividing up" a large room into two smaller rooms, for instance in type 3,4,5,6,7,8,9,10 and 11 (Figure 4.12).

The housing units, on the other hand, do not have enough space, and therefore, it is not very useful and efficient to separate the kitchen and the dining area. (Figure 4.12) (Table 4.10).





Figure 4.12: Type 4, Type11 as examples for "joining" rooms (Drawn by the Author of the Thesis)

A room of two storey units in type B blocks is located next to the entrance and can be used for a variety of purposes. Its function is not determined by the architect. In this sense, this room can be described as a multi functional space, adaptable for various purposes (Figure 4.13).



Figure 4.13: Multi functional space in type 10 and 11 (By the Author of the Thesis)

In brief, Çavdar's design offers a certain amount of freedom to users to adapt and adjust the internal configuration of their units to a certain extent in time. as in the case of Gülgönen's blocks, in these units, during post occupancy period, the users can make adaptations and alterations according to their wishes. The "soft" form of the blocks grants freedom to them. Thus, these units can be assessed as an example of "soft" use over time in terms of the opportunities for change related to the interior configurations of units.



Table 4.10: Different Organizations and Consequential Variation on Unit Types (Drawn by the Author of the Thesis)

4.2.4. Furnishing for Flexible Use

Like Gülgönen, Çavdar determined the storage areas within the housing units in advance (Figure 4.14). Such areas are generally located in the entrances, bedrooms and in some cases, under the staircases. Furthermore, in open-air balconies, or gardens, there are storage units. Apart from these storage areas and units, Çavdar did not design any other niches.



Figure 4.14: The Storage Areas in Type 11 (By the Author of the Thesis)

The housing scheme of Çavdar is not much different from Gülgönen's blocks. His approach is also an innovative one. Çavdar designed the blocks as "soft" form in terms of their structural systems, servicing and construction techniques. Like Gülgönen's project, flexibility operates in the background.

In his earlier project, the "user participation" method was used and the users were communicated either individually or as a group for obtaining data about their current and possible future demands. This data was adapted to Eryaman 3rd stage housing. In this respect, Eryaman 3rd stage housing project can be said to offer a "variety" of choices in terms of unit types prior to occupancy. As it is determinate and architect had the control in this period, his blocks can be assessed as examples of "hard" use. He was able to offer different units to users before occupancy, which is one of the characteristics of flexible housing. For the

changes related to interior configurations of the units, users are free and have the control over design. Like Gülgönen's blocks, the architectural layout of the blocks can be evaluated as an example of "soft" use.

4.3. Levent Loft 1³², Tabanlıoğlu Architects, 2005-2006

Project Name:	Levent Loft 1 ³³
Project Type:	Loft concept
Location:	Büyükdere Rd. No: 201, Levent, Istanbul, Turkey
Architect(s):	Melkan Gürsel & Murat Tabanlıoğlu (Tabanlıoğlu
	Architects) ³⁴
Date Designed:	Designed between June 2005 and April 2006
Construction Completed:	Built in phases from January 2006 to February 2007
Number Of Housing Units:	30,159 square meters and 146 units, a variety of unit
	configurations (21 alternatives) diversified between 68 to 182
	square meters and either duplex or one storey units
Client / Developer:	Akfen Holding Co. Inc.& Sağlam Construction
Managed By:	Altaca Construction

 Table 4.11: General Information about Project

Levent Loft 1 is located at Maslak - Levent axis, which is a business center of Istanbul during the last decade (Figure 4.15). Levent Loft 1, like the other cases, started by taking important design decisions, "functional transformation from an office building to a residential one", designing a residential building in "loft" concept and offering "typological variety" in housing units.

³² Levent Loft 1 is one of the projects with which Tabanlıoğlu Architects won "three big awards at Cityscape ceremony awards on October the 6th" (Tabanlıoğlu Architects , 2008).

³³ Levent Loft 2 (*Levent Loft Bahçe*) is currently under construction as the second realization of Loft concept in the same region, on Levent-Maslak axis in Istanbul. It can be noted that unlike Levent Loft 1, Levent Loft 2 is not a transformed project.

³⁴ The consultant architects are listed as Hacer Akgün, Eda Lerzan Tunçbil, Süleyman Akkaş, Ahmet Çorapçıoğlu, Volkan Lokumcu, Emre Apak, Kaan Keleş, Handan Dama Bilgin.



Figure 4.15: The location of the Levent Loft (Google Earth Image) (Hasol, 2008, p. 76)

One of the unique characteristics of Levent Loft project is that the building was transformed from an unfinished office building to a residential block by preserving the existing concrete basic structure. According to Ömer Ganjuk (personal communication, 2009) who was the construction site supervisor of Levent Loft 1, informs that the office building was designed by Serdar Inan and the basic construction was completed by Inanlar Construction between 2003 and 2004.³⁵ The office building was transformed into a residential block by Melkan Gürsel and

³⁵ Source: a telephone conversation with Ömer Ganjuk.

Murat Tabanlıoğlu between 2005 and 2006, and the construction was completed in February 2007. In this respect, the architects introduce the project as a "reincarnation of a building that in an earlier life was an office block" (Tabanlioglu Architects Projects: Levent Loft, 2005).

The building that was redesigned as a residential block is composed of two towers and a link between them. The tower that faces the street has 11 storeys, whereas the one behind it has 7 storeys (Tabanlıoğlu Architects t. D., 2009). In addition to this, there is a five-storey link between these two towers. Except the ground floor that includes sports facilities and a lounge area, and underground floors that serve as car parking, all floors are used for residential purposes (Figure 4.16).



Figure 4.16: Diagrammatic Section Drawing that shows the Spare Spaces for Residential Use and the Other Facilities (Drawn by the Author of the Thesis)

The second prominent characteristic of the project is that Tabanlıoğlu Architects designed the building in the concept of a "loft". It is important to explore what Tabanlıoğlu Architects understand from and how they interpret "loft" type housing, prior to an investigation about flexibility, adaptability and typological variety:

The concept of 'loft' emerged in the 1970's by American artists as a result of a quest for space, and today not only a reflection of living styles of city culture, but also being a reference point for contemporary architecture. The living spaces that are open and recalling industrial aesthetic offer the functions of living-work-creativity together within the same space and offer flexibility in relation with interior and exterior space. (Personal Communication, 2009)

This quotation shows that Tabanlıoğlu Architects describe their project as being "open", "flexible" and "adaptable". The architects projected the possible future scenarios during the design process. Nevertheless, when their contexts and the scale of the housing blocks are considered, this project is different from the two projects of Eryaman 3rd stage. Eryaman 3rd stage, as mentioned previously, is a large-scale social housing project whereas Levent Loft 1 is a single residential block located in the city center. Hence, in this project, it is possible to observe a different interpretation of the concept of flexibility:

Flexibility is an inevitable concept in terms of space and usage when embracing the "loft" concept in housing. Levent Loft is designed as flexible in terms of the relation between interior and exterior spaces, the capability of adjustments according to users' needs such as using light partition walls or furniture as a separator. The project is being reshaped with user interference. (Tabanlıoğlu Architects, Personal Communication, 2009)

The third characteristic of Tabanlıoğlu Architect's approach is that they too offered "typological variety" in units. They are either one or two storeys in height and have sizes ranging from 68 to 182 square meters (Tabanlıoğlu Architects, 2005). Thus, the project included 21 different types of units for users with different lifestyles.

Here, Levent Loft 1 is investigated in detail, in terms of its structural system, service spaces, architectural layout (variety in unit types, and spatial organization) and furnishing for flexible use.

4.3.1. The Structural System

The structural system used in Levent Loft 1 is composed of reinforced concrete columns and beams, positioned with a span of 5.45 meters on the periphery of the building, and two service cores (vertical access units), enclosed by reinforced-concrete load bearing walls. With large spans of the structural elements, the main free spaces are indeterminate and open (Table 4.12).



Table 4.12: Analysis of Structural System (Drawn by the Author of the Thesis)

0 5 10 15 m

The structural system of the building is a "**base structure**", which is introduced by Schneider and Till as a system appropriate for achieving flexibility in housing (Chapter 2). As the building has been transformed from an unfinished office building to a residential one, it has the capacity for functional transformation from a residential building to something else.

This project reminds the construction system of "speculative office" types of buildings. They are constructed around "dump, generic, frame" (Schneider & Till, 2007, p. 165). One of the prominent characteristics of speculative office is its potential for a different functional use.

[The speculative offices] are designed with no specific tenant in mind and allow continual adaptations to be made to the basic shell to suit the occupants at any given time. Importantly, they also allow upgrading and easy relocation of services. (Till & Schneider, 2005, p. 288)

The structural system of Levent Loft 1 is similar to "speculative office" buildings'. The structural characteristics of speculative office buildings are described by Schneider and Till as follows:

The speculative office is the classic shell and core structure. The external shell is relatively inflexible; the core provides access and services. In between the space is indeterminate, with large spans and open plans allowing non-loadbearing partitions to be put in and removed at will. (2005, p. 288)

Questions about flexible usage and flexibility of the building come to the fore, e.g., whether or not, the building offers a variety of housing types, and it is capable of adjustments or "changes" according to the changing needs and demands of the users over time. The shell of Levent Loft 1, however, is relatively more flexible as compared to that of a "speculative office" (Figure 4.17).

The constructional idea of Levent Loft 1 is different from Le Corbusier's "bottle rack principle" which is described as Schneider and Till:

The suggestion is that dwelling units are prefabricated and interchangeable overtime. The closest that one gets to realization of this approach is at the Marseilles Unitè, where the initial idea was that individual 'bottle-like' units would be assembled off-site and hoisted in place within the concrete frame (Schneider & Till, 2007, p. 168)





6.8 Bottle rack principle derived from Le Corbusier.

Figure 4.17: Le Corbusier's "Battle Rack Principle" on the right (Schneider & Till, 2007, p. 168) and Levent Loft Project on the left (Hasol, 2008, p. 77)

Although the constructional techniques and schemes are different, the façade of the building reflects:

conceptually an assortment of boxes arranged within the reinforced concrete frame. Each aluminum-framed module is expressed with a range of colours and lights integrated in the curtain wall system." (Tabanlıoğlu Architects, 2005)

They also left the structural system readable within: "[w]alls were usually unplastered brick work, services were exposed and floors were of concrete screed" (Tabanlıoğlu Architects, 2005) (Figure 4.18). Architects actually allow users to make articulations on the façade, but the control of the general appearance is still in the architects.



Figure 4.18: The Construction Elements Creating a Raw Space (Levent Loft 1)

To sum up, the structure of Levent Loft 1 can be regarded as a "base structure" composed of 1) reinforced concrete columns and beams located along the longitudinal sides of the building and 2) two cores enclosed by reinforced loadbearing walls. It constitutes a frame structure and modularly designed units. Considering these structural characteristics, it can be described as an "indeterminate building" (Schneider & Till, 2007) that provides freedom in architectural layout. Therefore, this project can be regarded as an example of a "soft" form. This allows Tabanlıoğlu Architects to design the main indeterminate spaces in different ways. In other words, it grants freedom to the architects to develop different types of units in the design process.

4.3.2. The Service Spaces

Service cores, like the structural system, are among the permanent components of a building. In this project, service spaces are located in a longitudinal zone (Figure 4.19). While, the structural system is located on the periphery, the service spaces, including access units and wet spaces, are positioned in the middle (Table 4.13).



Figure 4.19: Levent Loft Project Zoning in Plan (Redrawn and colored by the author of the thesis) 36 and in Section (Drawn by the Author of the Thesis)

Tabanlıoğlu Architects designed two service cores including vertical access units. On every floor, there are horizontal closed access corridors positioned in the middle of the building that serve to connect vertical access units to the housing units (Figure 4.19).

The wet spaces are located at each side of the horizontal closed access corridor in the middle (Figure 4.19). Tabanlıoğlu Architects designed a linear service zone in the middle that includes kitchens, bathrooms, and storage areas. There are no restrictions for future use in the dimensions of the wet spaces. They are easily adjustable and adaptable.

³⁶ Autocad medium drawings of Levent Loft Project were sent by Volkan Lokumcu, from Tabanlıoğlu Architects.



Table 4.13: Analysis of The Service Spaces (Drawn by the Author of the Thesis)



Figure 4.20: A View of Inner Access Corridor (Levent Loft 1)

These configurations of service spaces provide flexibility not only at the building scale, but also at the scale of housing units. Therefore, the main spaces within the frame and service spaces are indeterminate allowing non-load bearing partitions to be put in or removed in order to design different types of housing units. The service spaces are adaptable and they allow change. As it has been stated above, this building can be regarded as an example of "soft" form, according to its structural system, construction techniques and the servicing.

4.3.3. The Architectural Layout

Tabanlıoğlu Architects offered choices to the users through designing "modules". There are 20 types of housing units. The structural system and the position of service spaces granted freedom to Tabanlıoğlu Architects during the design stage and also users to make changes in time.

Types of Units

The floor plans of the building are completely open, without any internal structural columns. The span between the columns on the exterior surface, 5.45 meters, determines the width of a "module" (Figure 4.21). In this project, the architects attempted a configuration of modules to provide typological variety: "the design idea for the housing units is based on "modules": attaching "modules" together according to different needs" (Tabanlıoğlu Architects, personal communication, 2009).

The basic unit is composed of two or three modules: the first one with a kitchen and living space either separately or together in an open plan and the second one with a bedroom and a bathroom together. By adding one or half modules that serve for different functions, 21 different types of housing units were developed (Table 4.14).



Figure 4.21: Basic modules, L: living space, K:Kitchen, B: Bedroom (Drawn by the Author of the Thesis)



Table 4.14: Analysis of Different Configurations of the Units (Drawn by the Author of the Thesis)

In this sense, the housing units offer a variety of "choice" for a way of living appropriate for one, two or more users (Table 4.14). The possible future changes in needs and demands can be estimated from an increase/decrease in the number of household members, practical changes required by an occupant's loss of abilities to do certain things, mostly because of aging, or possible functional transformations of the building from residential to something else.

Variety in unit plans is achieved in two ways: firstly by diverse combinations of the modules to make a larger unit or smaller ones, and secondly, by different spatial configurations in the internal layout of the modules, for different uses that is as it is discussed under the title of "Spatial Organizations of Units".



Figure 4.22: Examples for Joining together and Diving up the units. Types 5,7,20,2,4 (Redrawn by the Author of the Thesis)

The building allows users to change the spatial configuration of units. "Joining" or "dividing" the units, "switching" and "adding-on" one or half modules are theoretically possible. These methods are investigated on four selected types of units (Figure 4.22).



Figure 4.23: Sharing /Switching Room Possibilities in Type 12 and 6, and 8 and 10 (Redrawn by the author of the thesis)

For instance, users can "divide" their unit into its modules for a smaller house. On the other hand, in order to expand their units, users can "join together" modules or just "switch" one module or half module with another user (Figure 4.23).



Figure 4.24: *Wenswonen* by Williems van den Brink, 2002, The Netherlands, the "Addingon" Strategy for Providing Flexibility in Multi Residential Housing Context (Till, Wigglesworth, & Schneider, Flexible Housing Project, 2004-6)

It is not always appropriate and feasible to add modules as it can be done in The Dutch *Wenswonen* (Desirable Living) in 2002 in The Netherlands, designed by Heijmans N. V. (Figure 4.23). This project was designed by adopting the same construction techniques with Levent Loft 1 project, which is the use of a frame structure and modular design³⁷. Schneider and Till point out that "[t]he overall volume of the base building can also be extended through adding modules, at design stage or later on, at two pre-specified points: on the rear façade and/or the addition of a third storey" (2007, p. 139). In Levent Loft 1 project, however, users are not allowed to integrate the open air spaces to interior space; the balconies in type 3, 6, 9, 10, 11 and 12 and open air gardens in type 1 and 14 (Table 4.14). Because this kind of changes is related to the appearance of the block, the control is still on the architects.

³⁷ In this respect, when these two projects are compared, *Wenswonen* seems to adopt user participation in the design process:

Wenswonen uses a systematic design and construction process with a combination of factory and on-site construction. Future homeowners can select not only the size of their dwelling (additional factory produced room units can be attached to the concrete base building) but also façade and interior layouts (Schneider & Till, 2007, p. 138).



Figure 4.25: Type 10 and Type 6 with Open Air Balconies (Redrawn and colored by the author of the thesis)

In order to enlarge a unit, "joining together" is regarded as "[a] more economical solution to expansion within the multi-occupancy housing" (Schneider & Till, 2007, p. 141). Besides "adding-on", the other methods such as: joining together, dividing up, switching /sharing a room/module, are applied in Levent Loft 1 in a quiet similar way as described by Schneider and Till. However, it is important to emphasize that like Gülgönen's and Çavdar's projects, in this project, although the permanent components of the building allow such changes on the size of the units, it may not be always possible over time.

In brief, like Gülgönen's and Çavdar's projects, the architectural layout of Levent Loft 1 was not left incomplete. Tabanlıoğlu Architects designed the different types of housing units. However, being based on the loft concept, these units can be regarded as less determinate than Gülgönen's and Çavdar's projects. Architects left the interior configuration of the units as more indeterminate through proposing modules. It is important to emphasize that flexibility is one of the concerns during the design process. However, during the design stage, architects worked in the foreground and had the control over design. Thus, the project can be evaluated as an example of "hard" use prior to occupancy. The changes related to the size of the units are not feasible in this project as well. Furthermore, all the possibilities are determined by the architects and offered as different types of units. Like the other two cases, in post occupancy, users are allowed to make changes in the interior configuration of units according to their needs and demands; it is discussed under the title of "Spatial Organizations of Units". This project is an example of "soft" use in this context.

Spatial Organization of Units

The architectural layout of the units embraced an open space design concept. In this respect, Levent Loft 1 is differentiated from both of the Eryaman 3rd stage housing projects. It has an indeterminate open plan, whereas Eryaman housing projects are designed through a more determinate plan layout.

The position of wet spaces and staircases provides a large free space in units. Units are designed according to modules that can serve for kitchen and living together or individually, sleeping space, space for another adjustable bedroom/working space/dinning space, and the spaces such as balconies or open roof gardens (Figure 4.26). These modules are not separated by fixed walls, instead, sometimes by using furniture, sliding/folding or movable walls and in two storey units, by level differences.



Figure 4.26: Different Types of Modules that Compose Different Types of Units (The half modules refer to spaces with no labels which can be used for any function) (Drawn by the Author of the Thesis)

The circulation is "**permeable**", hence appropriate for a person with a wheelchair. On the other hand, for instance, type 20 seems to be an appropriate living unit for two different groups of adults living together, one of which can be comprised of elderly people. This is a commonly seen lifestyle and a need for Turkey.



Table 4.15: Different Modular Organizations and Consequential Variation in Unit Types (Drawn by the Author of the thesis)



Table 4.15 (continued)



Table 4.15 (continued)





Within this unit, each people have private areas for themselves, not merely bedrooms, as can be seen in conventional housing schemes. The inhabitants might be two different families living together. Therefore, the approach in this project can be regarded as an innovative one for Turkey.

The variation of the units, in general, depends on whether there are "spaces/rooms with no labels", or not. These spaces are also appropriate for switching them with the next unit as it has been explained above. For instance, one can easily enlarge the wet spaces. One can also "join together/divide up" the spaces within the unit itself according to his/her needs. Architects also allow the users to make alterations or changes by using folding elements or putting in or removing the furniture that divides the space. In this respect, this building seems to be adaptable and changeable over time in accordance with the possible changes in the number of the household members. For instance, the units such as types 11, 13, 14 or 20 can be adjusted according to the number of the household members by joining a sleeping space with the living space or with another sleeping space.

In brief, Tabanlıoğlu Architects offer a certain amount of freedom to users to adapt and adjust the internal configuration of their units to a certain extent in time. Users have the control for the changes in interior configuration of the units. Owing to the "soft" form of the blocks, users can make adaptations and alterations according to their wishes. Thus, Levent Loft 1, in this context, can be regarded as an example of "soft" use.

4.3.4. The Furnishing for Flexible Use

As usual in loft type housing, the architectural layout has an open plan and the interior space is left as raw space that has an "industrial aesthetic" through the unplastered walls, exposed technical equipment and concrete screed floors (Tabanlıoğlu Architects, Personal communication, 2009). Interior furnishing is not strictly determined by the architects.



Figure 4.27: Furniture as a separator. (Levent Loft 1).

Nonetheless, the architects articulate the surfaces of the separators of two functions. The separators, which are given different functions on their two surfaces, are located in between the living space and the other spaces serving for different functions. The surface facing to living space, for instance, serves as a base for a television set, whereas; the other facing to sleeping area serves as a storage unit as it can be observed from types 2, 6, 7, 9, 10, 11, 14.

The wet spaces in some other unit types, on the other hand, are located as a separator: to separate living space and the sleeping space, see type 8, 12. Although the storage areas and the position of the television set are predetermined by the architects during the design process, there are no other permanent storage units in the rest of the unit. Thus, the users are allowed to furnish their units according to their needs and wishes.

It can be said that Levent Loft 1 project reflects an innovative way of thinking when compared to the conventional housing examples. Firstly, it was a transformation project from an office building to a residential block by conserving the existing reinforced concrete frame system. The building has the capacity to change function completely. With its frame system and the position of service spaces, Levent Loft 1 is an example of a "soft" form project. Flexibility operates in the background.

Secondly, in terms of architectural layout, the architects offer perhaps all different possible configurations, which can be formed by putting together the modules, for different uses. "Adding-on", "joining together/dividing up" and "sharing/switching" rooms are the methods for users to adjust their units for their needs and demands. Like the other two projects, the architectural layout can be evaluated as an example of both "hard" and "soft" use. During the design stage, Tabanlıoğlu Architects offered a variety of choice; they did not leave the main space as an indeterminate or incomplete. Thus, prior to occupancy, architects have the control over design. They determined the use of the units; "hard" use. On the other hand, architects allow users to make adjustments and changes related to the interior of the units. After occupancy, users are in the foreground and they can change their units according to their wishes. The project is an example of "soft" use.

4.4 Conclusion

As it was presented through the study, non-mainstream architectural design approaches in Turkey in terms of flexibility, adaptability and typological variety, are investigated over these three selected innovative housing projects from different contexts. In these selected cases, flexibility can be said to operate in the background. Throughout the study, it is aimed to highlight the importance of the architects' way of thinking during the design process, and additionally, the selected methods and strategies that can contribute to the realization of the goals of flexible housing design.

The permanent components, which are the structural system, and service spaces, have the characteristics of "soft" form in all the three cases. That grants architects to design a variety of choices. Additionally, that yields freedom to users to make alterations and adaptations in their units in time.

As the architects designed and completed the units, the use the buildings can be evaluated as "hard". These cases offer initial flexibility through providing typological variety in unit types. Users have the opportunity to select the most suitable housing unit from a variety of unit types. Although they do not use fixed interior partition walls, it is not feasible and always possible to make changes in the size of the units over time. On the other hand, users are able to adapt and alter their interior configuration units. Thus, in this context, the use of the units is "soft".

CHAPTER 5

CONCLUSION

"If the housing does not respond to the changes it becomes at best unsatisfactory, at worst obsolescent" (Schneider and Till 2007, p.35). From this perspective, today, one of the prominent problems related to housing design all over world is to perceive housing as a static commodity with fixed design parameters. It becomes more significant to design residential buildings with a consideration of short term needs and demands of the market. However, "short term expediency overcomes long term sense" (Schneider and Till 2007, 4). In terms of social, economic and physical implications, the issue of housing becomes more problematic. Inflexible construction of residential blocks cannot fulfill the changing needs and demands of the users. Furthermore, wishes and needs of users may change over time. The inflexibility in housing, therefore, means that once the users' needs change, as inevitably they do, they have to move to another residential unit. That kind of housing design according to fixed parameters refers to inflexibility in residential architecture.

The obsolescent housing, therefore, emerges from the inflexible design approaches. The main scope of flexibility and the related concepts of adaptability and typological variety in the housing context were presented throughout the study in which housing should offer a typological variety before occupancy, called "initial flexibility", and provide opportunity to users to make changes and adaptations in their houses according to their changing wishes and needs over time, called "permanent flexibility". For this purpose, the study highlights the importance of working out design strategies and methods that help to achieve flexibility in housing design. The design of the fixed components of a building, its structural system, and service spaces are all-important. Besides, the configuration of the main free space should also be taken into consideration from the point of flexible housing design. In design of the fixed components and free space, the intention of architects through the design process and the role of the user throughout the occupation period are investigated in the light of the "soft" and "hard" analogy proposed by Schneider and Till (2005b, 2007).

There were two controversial approaches to flexible housing design during the twentieth century; which refer to "the rhetoric of flexibility", as Schneider and Till (2007, p. 5) calls. The first one is defined as an indeterminate way of design that allows "endless change", and the second one is described as a determinate way of design that includes too much technical and complicated solutions. The selected case studies from Turkey do not belong to any of these two controversial design approaches in flexible housing. They are designed neither in indeterminate way with "endless solutions", nor in more architect-determined way with too much technical and complicated solutions. In these selected examples, flexibility operates in the background.

Throughout the study, it was aimed to reveal some non-mainstream design approaches and three examples indicating the current state of flexible design approach in Turkey. Flexibility in the design of residential architecture is achieved with the integration of "long-term" consideration the use of domestic units. This study, in this respect, looked into three housing projects: Eryaman 3rd stage blocks designed by Ahmet Gülgönen, another group of blocks within the same stage designed by Tuncay Çavdar and Levent Loft 1 designed by Tabanlıoğlu Architects. The discussion was based on how the design and planning of both the residential blocks and the units considered flexibility under four themes: structural system, service spaces, architectural layout and furnishing for flexible use.

The cases in Eryaman 3rd stage are social housing projects designed according to minimum space standards. Levent Loft 1, on the other hand, is a transformation project from office building to residential one and there were no restrictions in space dimensions. These housing projects are all different from the

conventional residential blocks in certain ways, as they have been discussed in detail in Chapter 4.

It should be emphasized that all these three blocks are regarded as flexible according to the investigation under four themes: structural system, service spaces, architectural layout and furnishing for flexible use. The buildings are constructed as "base structures" by not using load-bearing walls within the block, or by limited usage of these permanent elements. Furthermore, the positions of service spaces do not disturb the main indeterminate space and allow access to the technical equipment for future innovation and adaptations. It can be stated that all these projects are designed to create indeterminate space that allows architects to design a variety of choice in housing units and users to adapt their units according to their changing needs in time. However, during the design process of these buildings, architects did not leave the stage to users; instead, they designed the main space by offering different choices to the users. Thus, "initial flexibility" is achieved in all three cases.

Prior to occupation, the buildings permit users to make changes or adjustments, so architectural layout of the housing units can be varied according to the needs and demands of the users. On the other hand, for the "permanent flexibility", it is noted that although the permanent components and the layout of the buildings give the opportunity to make changes in the size of units, this is often much more limited than the opportunities prior to occupation because of several reasons. For instance, if users want to expand their units by joining the next unit to theirs', the next unit should not be occupied by other users. If not, this change may be very expensive and infeasible. Thus, users can still prefer to move to another unit instead of making these changes related to the size of the units.

After occupancy, these three residential blocks, however, have the capacity to make adaptations and adjustments related to the interior configurations of the units. Users can "join" rooms together or "divide" a larger one into smaller ones. Furthermore, they can also "reduce" or "expand" the size of wet spaces. The design of permanent elements grants freedom to users to make several

adaptations and changes in time. These three projects are assessed as examples of "soft" use in terms of the capacity for internal changes. Therefore, it is important to emphasize that permanent flexibility is not totally achieved in a successful way in these selected three multi residential projects.

Under the fourth theme, furnishing for flexible use, in the first two projects designed by Ahmet Gülgönen and Tuncay Çavdar in Eryaman 3rd stage, only the storage spaces are determined by the architects, whereas, in Levent Loft 1, besides the storage areas, architects designed furniture as partition elements to separate two different functional spaces.

In brief, integrating flexibility and the related concepts, adaptability and typological variety, in housing context is important and can inspire "a new and challenging kind of architecture" (Habraken, 2008, p. 291). Additionally, operating flexibility in the background, instead of being a foreground intention during the design process, would be better for a more successful housing design.

The information and discussion provided can be used as a background for further researches on the issue of flexibility in housing design. In this sense, further researches on flexibility in housing context or in different functional buildings can investigate other strategies and methods to achieve flexibility. This study can be a departure point for further studies on the functional transformation of existing buildings to residential ones. The potentials of the functional transformations of existing buildings can be explored and new strategies can be developed. Furthermore, sustainability can be included into the discussion of fulfilling the changing needs of users with diverse lifestyles. The notion of sustainability in flexible design approach brings to mind another issue called "sustainable communities"; designing multi use spaces for people with diverse lifestyles. Therefore, further studies related to flexibility and sustainability can benefit from information and discussion provided by this study.

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