Multi-Functional Use of Spaces in Traditional Residential Architecture: Insights from Flexibility in Ottoman Houses in North Nicosia, Cyprus.

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Abstract

Usually, the flexibility of multi-functions in traditional houses enable the people to utilize the spaces with all the activities they need without extra areas. People often have a capacity to change the design of the spaces, and use any fixed furniture with more than one functions, characterized by the variety of uses. Flexibility enables changes and adjustments of the spaces as people need. However, fixed furniture is often very heavy and it is difficult to move them. This causes difficulty to utilize a space for other functions or for more users as expected.

Houses in Nicosia has similar issues although they are made to serve daily life. In fact, Nicosia is a good example of traditional houses distinguished by spaces that offer flexibility and multi-functionality. Houses are built with a flexible strategy in order to accommodate all the needs of the people. Moreover, houses of Nicosia are influenced by the needs of daily life such as agrarian and economic activities inside the main spaces of the houses. However, not much is known about the ways in which multi-functionality of Spaces manifests in the traditional architecture. In this context, this research examines flexibility in Ottoman houses in North Nicosia, Cyprus.

The study employs case study as a method observing and analyzing the houses examining their existence in the past and also current modifications. It focuses on the knowledge of flexibility of multi-functional standards for adaptations. It ascertains how it improves the function and comfort in the traditional houses in terms of cultural spaces.

In conclusion, it derives the Ottoman principles that enable actualizing adaptability and flexibility in house building, learning lessons for creating such affordances in the future.

Keywords: Flexibility, multi-functional use, Traditional Houses, Ottoman, North Nicosia, Cyprus.

Introduction

People always search for stability. Therefore, they establish houses with multi-functions designed in a way to meet their needs, where it includes all activities such as sleeping, eating, cooking and working (Hillier, 2005). Moreover, every group makes a pattern for their houses and villages to meet the necessities and face the circumstances of life. As the feelings experienced in an architectural space and especially in domestic space while meeting the needs can be different for each person, spatial organization also strengthens the self (Pallasmaa, 2018). Transformation of traditional architecture and houses specifically can be recognized as a culture that creates a dynamic environment changing according to that period's needs (Rahmi & Tamimi, 2023). In addition, the human needs in the past have been adopted with the environment. As an example, it is seen that the need of the tent was because of the transportation (Kronenburg,2004), or existing material found nearby was used to settle on the specific lands (Rapoport, 1969;1982). In these two patterns they rely on moveable furniture and local materials from the same environment.

Indeed, flexibility as a multi-functional use was one of the significant patterns that dealt with the circumstances and necessities of the complex needs of the people. Moreover, flexibility makes any space simple to modify to meet people's needs and gives capacity to utilize the components of the house. Flexibility in the architectural knowledge help establish a space with capacity to adapt with the circumstantial necessities in unique frameworks to allow the shape to be more associated with the people.

Nicosia is the capital city of Cyprus, the island that had been under the rule of the Ottoman Empire for almost 300 years between 1571-1878. Most of the houses in the walled city of Nicosia are from the Ottoman Period that mirrored the culture that prevailed in it with natural sources to reflect the religions and Islamic cultures (Pulhan,1997). In fact, the Ottoman houses in general has the pattern of intermingling of open and closed spaces as open, semi-open, and closed areas.

In this context, this research investigates flexibility as the multi-functional use of the Nicosia houses, where it matches the strategy of flexibility in order to investigate the aspects of the layout and use of the interior space. The paper aims to understand the ways in which multi-functional use of spaces manifests in traditional residential architecture in Nicosia.

Its objectives are as follows.

1. To prepare a checklist that can be used to assess the flexibility capacity of buildings.
2. To establish the level of flexibility capacity of Ottoman Houses in Nicosia.

Theoretical Background

Flexibility in Space

This section presents the scientific aspects of flexibility in space as technical flexibility, material flexibility, furniture flexibility, and other types of flexibility. It also discusses the numerous patterns of flexibility. At the heart of these discussions is 'space' because,flexibility offers the spaces what is known as 'affordance.'

According to Darmayanti & Bahauddin (2020), space can be defined as the 'activities container' where public and private activities are realized. The common meaning in English for the word "flexibility" from Cambridge and Oxford dictionary refers to the easy reformation of a shape as follows:

- Ability to change or be changed easily according to the situation (URL:1).
- The quality of bending easily without breaking (URL:2).

At the same time, flexibility has a various meanings offered by many scholars such as Andrew Rabeneck, David Sheppard, Peter Town (1973), Steven Groák (1992), Gerard Maccreanor (1998) and Tatjana Schneider and Jeremy Till (2007) as shown in the Table 2.

Table 2: Definitions of Flexibility
Source: Omar, 2022

No	Authors	Flexibility
1	Andrew Rabeneck, David Sheppard, Peter Town 1973	It is proposed against "tight-fit functionalism". (p.698) Flexible housing should be capable of offering "choice" and "personalization" (p.698)
2	Steven Groák 1992	It is "capability of different physical Arrangements". (p.15-17)
3	Gerard Maccreanor, 1998	It is "a designed idea that leads to the collapse of the traditional layout". (p.40) "Flexibility does not imply the necessity of endless change and breakdown of accepted formula". (p.40)
4	Jeremy Till, Tatjana Schneider, 2007	It is "achieved by altering the physical fabric of building" (p.5)

Principles of Flexibility

The flexibility principles affected the internal spaces and external buildings and were considered as one of the architectural foundations. Schneider & Till (2007) point out that flexibility is "housing that can adjust to changing needs and patterns, both social and technological." According to Bostrom (1987), accessible houses do not look different from other houses but have features that in only minutes can be adjusted, added, or removed. There are four main principles for flexibility in housing as follows:

Principle of Adaptatability

Adaptability: It offers alterations to develop and give a solution for improving spaces as a definition from Cambridge and Oxford dictionary.

- Capacity to be modified for a new purpose or use (URL:3).
- Ability to change in order to suit different conditions situation (URL:4).

The principal relies on gradually developing according to the user needs such as increasing the number of people in the same space as the Fig. 1 shows.

Principle of Moving Parts

This principle considers using flexibility as a physical property for the geometrical shapes inside the interior spaces in order to utilize the space as a multi-functions space (Abdulpader, Sabah, & Abdullah, 2014). These include spaces such as in the houses in the Japanese culture as shown in the Figs: 1 and 2.

Fig 1: Geometrical Spatial Organization in Japanese Culture - interior
Source: https://www.fiverr.com/frederickpormes /make- isometric- japanese-restaurant

Fig 2: Geometrical Spatial Layout in Japanese Culture
Source: https://www.pinterest.com/pin/372813675408668066

Principle of Multifunctional Elements

This principle allows changing the room type from the old structure approach to new functions (Živković, Keković & Kondići 2004). It relies on using the structure within the wall, floor, and ceiling as storage for room furniture and using as a user need. It also allows for integration, separation, and division of space such as shown in the Gary Chang house where it creates a 350 -square-foot to include 4 rooms as shown in the Fig. 3.

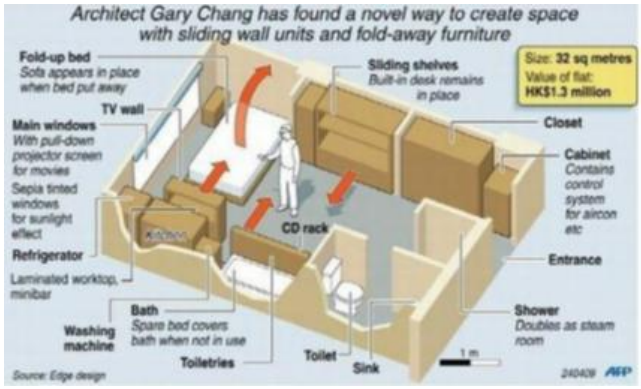

Fig 3: Gary Chang House
Source: https://www.researchgate.net/figure/Left-Naked-House-by-Shigeru-Ban-Right-Plan-of-a-Hong-Kong-apartment-by-Gary-Chang_fig2_280643004

Principle of Architectural Structure

This principle divides the structure into layers. Duffy (1995) divides the structure into 6 layers where these layers aim to increase the lifespan of the buildings. The Table 2 explains the purpose of each layer. He believes that it can change the use of the space to meet the needs of the users.

Table 2: Building Layers
Source: Bostrom, 1987

Longevity	Description	Layer
Eternal	Geographic setting, urban location	Site
30 to 300 years	Foundations and load bearing elements	Structure
20 years	Exterior surfaces (Facades)	Skin
7 to 15 years	Wiring, plumbing, HVAC systems	Services
3 years	The interior layout	Space Plan
Daily to monthly	Furniture, kitchen	Stuff

Principle of Patterns of Flexibility

The pattern of flexibility is divided into 3 main categories according to, Hofland & Lans (2005) as shown in the Table 3.

Table 3: Flexibility Pattern
Source: Hofland & Lans, 2005

Pattern	Type of flexibility
Structural	Possibility for change of floor plan.
	Possibility to reshape apartments.
	Modernization flexibility.
Functional	Robustness for calamities.
	Neutral for furnishing.
	Flexibility for changing safety requirements.
	Wheel chair adaptability.
	Capacity for expansion.
	Multi functionality.
	Finance flexibility.
	Capacity to shrink.
	Parking flexibility.
Character	Character flexibility.

Structural Flexibility

This is the idea of investing flexibility in the structure. It establishes a 'modular unit system' in order to control the structural system from all directions by creating spaces without any walls. It then divides as needs show up. Table 4 shows the structure of the classifications which contains to extendibility expansion from Freidman, (2002) and Gulaydin (2004).

Table 4: Structural Flexibility Pattern
Source: Gulaydın, 2004 and Freidman, 2002

Gulaydin								
Direction Expansion			**Scale Expansion**			**Form Expansion**		
Horizontal and vertical	Vertical	Horizontal	Settlement	Building	Component	Clustered	Linear	Radial
Freidman								
Add-on			Add-in					
Expansion design beyond the accommodations (add-on)			Growth into a space within the perimeter of the original volume'					

According to the above table, the patterns of structure from Gulaydin, (2004) view relies on form, scale, and direction. Moreover, Freidman (2002) relies on broadening the structure from outside by additions.

Functional Flexibility

Functional flexibility utilizes the spaces as much as possible, by using all directions of the area to form the space by using structure or furniture, versatility and convertibility. It forms the units by reconfiguration or separation, and create a plumbing system and electricity, in order to meet the user's needs as seen in Dom Eno House shown in the Fig 4.

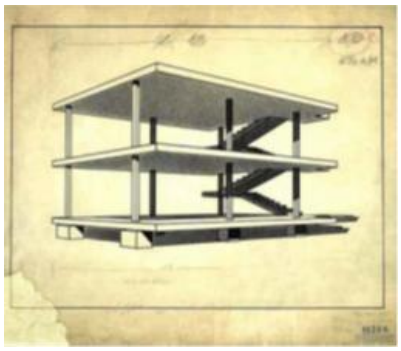

Fig 4: The Dom Eno House, 1919
Source: Estaji, 2017

In fact, Le Corbusier relies on the developed plan to create spaces using existing columns where it establishes an empty area and can add every function needed by using mobility and transformation elements (Risselada,1991).

Character Flexibility

In Character Flexibility, the interior space is redesigned. It also looks to provide the exterior and interior privacy (Oskouei, 2016). One of best example is the Robie House where the number of rooms are increased with movable walls Fig 5a & 5b.

Fig 5a: Robie House Interior

Fig 5b: Robie House Plan
Source: https://www.archdaily.com/60246/ad-classics-frederick- c-robie -house-frank-lloyd-wright

Type of flexibility

One of the flexibility strategies is a physical property to allow changing the interior space to meet the user's need (Abdulpade, Sabah & Abdullah, 2014). Moreover, according to Schumacher Schaeffer & Vogt (2009), flexibility strategies as a physical property uses 5 elements: walls, floors, ceilings, stairs, and mobile cells. The type is divided into 4 main types:

1. Sliding Walls Type

It is created by using the movable walls to control the spaces as needed. It is also limited to slips elements concepts (Hall & Hall 1969) and used on furniture such as cabinets. Skinner (1971) defines this as seen in the Fig. 6.

Fig 6: Sliding Walls
Source: https://360photography.in/?p=15918

2. Transforming Elements

Transforming elements can modify the room activities by increasing the hidden inside movable walls or fixed wall furniture in the same room as seen in the Graham Hill apartment as shown in the Fig 7. (URL:11).

Fig 7: Transforming Elements
Source: http://www.apartmenttherapy.com/ lifeedited- graham- hills- tinyapartment treehugger-171768

3. Pop-Up Interactive Unit

The name comes from the remaining forms' design processes to create many shapes in the same space at the same time. It also relies on imagination and centralization. Moreover, according to Skinner (2002), it is characterized by being easy to transport in a short time. In fact, that makes it the best temporary strategy as seen in the Fig. 8.

Fig 8: Pop-Up Interactive Unit
Source: https://360photography.in/?p=15918

4. Multi-Folding flexibility

This is the idea of multi-function looking to create a unit with a lot of furniture and storage inside a wall, floor, or ceiling. This furniture is characteristic of machines that can easily fold or use it (Skinner, 2002). In fact, Gary Chang's House is one of the best examples, where it uses folding furniture inside the wall and many separated parts (Amin & Cohendet, 2004), (Fig. 9).

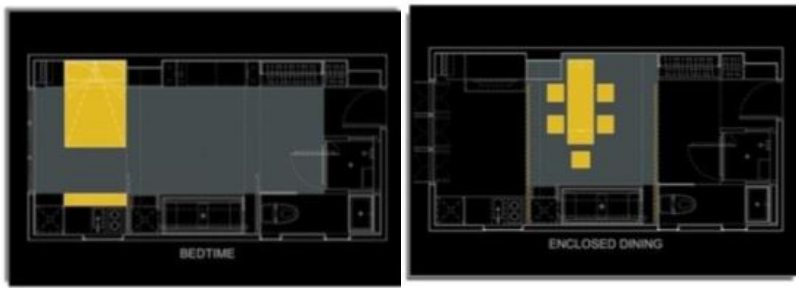

Fig 9: Gary Chang's House Plans
Source: http://www.archdaily.com/59905/gary-chang-life-in-32-sqm//

Elements of Flexibility: Internal Structure

Usually, the floor and the ceiling limit the area of a building as boundaries of the space. The walls divide a space into many. The elements serve flexible strategies by storing the flexible furniture as well.

- Flexible Walls: By using moveable walls or partition walls to divide the space (Gjakun, 2015).
- Flexible Floors: By establishing the floor to use it as a secondary level
- Open space: These are kinds of spaces used as multi-functional spaces

Flexible Furniture Design

There are 3 types of flexible furniture: movable, molder, and multi-functional, and all of them aim to use them just when needed and hidden after use to utilize the space for more than one function at the same time.

Movable Furniture

One of the best solutions in a small space. This technique aims to allow the furniture to transform from one place to another or collected together (Homedosh, 2021).

Modular Furniture

This type relies on forming the units from many parts in order to create furniture as the functions of a room to meet the user's needs, and these parts have geometric shapes to be easy to form as needed (Heidegger, 1993).

Foldable Furniture

Multi-functional unit concept is putting an item of furniture for one type of room such as a bedroom inside one unit or putting more than one piece of furniture in one unit to utilize the spaces and transform the space for any function needed (Heidegger, 1993).

Flexible Mechanisms

Flexible mechanisms are the tools used for establishing mechanical systems like electricity and plumbing.

Table 5: Flexible Mechanisms
Source: Omar, 2022

Electricity Mechanism	Plumbing Mechanism
Flexible Electricity Heat shrinked tubing TPU wire reinforced hose, Cables	Air Conditioner Sink Drain Pipe Stainless steel wire braided Kitchen and bathroom mechanism tools

As can be seen, these ideas of flexibility exist today and have been employed in designing houses that offer flexibility as a strategy of catering to the multitude of needs that arise over time in housing. However, the same has existed in the traditional settings like those

in Nicosia, which this paper intends to examine. For this purpose, the theoretical framework discussed above would be extremely useful.

Review of Literature

Multi-functionality of spaces in traditional environments has received much attention in previous research. According to Oliver, (1995) traditional is one of the many terms used to define a building with certain environments. Rapoport (1969;1982) points out that it is the tradition related to life aspects such as values or norms. Therefore, the socio-cultural factors are considered the main aspects that drive the establishment of houses. Among them, multicultural identity has received much attention. For example, Christodoulos (2008) says that Nicosia has a multicultural identity, because it had many different people from different backgrounds living in it throughout history. He says that the capital city was under the Lusignan Rule and at that time, it acquired a medieval design structure. After that, the city is changed under the Venetians, until 1570, when the Ottoman-controlled it and spread its culture. In fact, during that period until the end of it, the social structure and the environment of the building changed in the city.

As Pulhan (1997) shows, for that reason, the Ottoman houses are the most prevalent design in the city. The urban traditional houses rely on the area, which had been influenced by the foreign powers, and the factors of the environment where it led to a continuous change in the forms of the houses (Dinçyürek, Numan, & Pulhan, 2001). Adding to this, Gilani (2012) brings to light that the urban traditional houses in Nicosia are characterized by their multi-functional spaces where it could change the area according to the user needs such as using the room to sleep at night and for other activities during the rest of the day. Moreover, there is also the capacity to change the design of the furniture.

According to Hertzbeger (1991), the Ottoman house style depends on the modules with the same dimensions to be utilized as multi-functional spaces. Modularity is considered as a reflection of the development of the growth of the family from the possibility of functional changes such as expansion and division. The modular flexibility characteristic is enhanced by the capacity to distribute the house tasks between the upper floor and the ground floor.

Moreover, the spaces rely on the room design established by a beam or arches in the middle of the room in order to be divided into two or more sub-spaces. In addition, the design of open spaces is established between what is called semi-open (in Turkey, it is called ‘sündürme’) and inner hall where these zones are established to be utilized in a flexible way. It is transitional between the zones. It is the tradition of Turkish people who utilize sündürme as a multifunctional space where it is used for hosting guests, sleeping, and resting (Erturk, Erturk, & Gunce, 2007). In fact, the courtyard was also in the same pattern of flexibility used by the children as a playground. However, it was also used to do the house jobs such as cleaning and processing the olives, tomatoes, grapes, and carobs (Oktay, 2001, Dinçyürek & Turker, 2007).

According to Oktay (2006), the main room in the house called a sofa room was used as a living room, and is considered a closed space. At the same time, it was used for eating, cooking, and sleeping, Oktay (2006) also points out that every sub-space in the Ottoman traditional houses has different functions in the same space and the user can convert and exchange between them. It was flexible because the spaces were used as bedrooms for all the family members or were used for two functions such as a bedroom and a living room or kitchen and storage. On the other hand, the space has a boiling facility to cooking and raises the temperature of spaces.

Moreover, Ateshin (1997) reveal that the Living space in the traditional houses in Cyprus was huge. It was rectangular in shape in order to take most of the activities. Furniture in the houses were moveable in order to be easily rearranged as needed. Turker (2002) adds that the room was also established without any middle constructions from the inside.

As a summary, spaces were multi-functional by being available for daily activities such as sündürme sofa, eyvan, etc. They also used flexible construction with a partitions wall made by wood, which used it to divide the room into many parts in a ground floor (Kılıç, 2021).

The Nicosia Ottoman Houses

It is noteworthy that Ottomans culture cared for family rules where there was a consideration of gender roles and privacy. In fact, they cared about social intercourse in the daily life of the Muslim people (Numan & Pulhan, 2001). Therefore, the houses contain two main parts: first one is a courtyard and the second is a building. Ateshin (1997) shows that the plan put the courtyards on the back of the building away from the road or inside it. The building contains two floors. Thus, urban houses are of two kinds. According to Pullhan (2002), the first one is the house with an outer hall- called 'Sündürme' and the second is the house with an inner hall called the 'Sofa.'

The Table 1 shows the most common room type in the Ottoman houses in Nicosia where all the houses have these rooms.

Table 2: Common Room Type in The Outman Houses
Source: Kuban, 1995

Room Type	**Function**
Sofa	Used as a living room, and at the same time, it was used for eating, cooking, and sleeping
Sündürme	Used for hosting guests, sleeping, and resting
Eyvan	The main entrance where it a high door inside a 3 high wall
Wood a partitions wall	Divide the room into many parts
The courtyard	Used by children as a playground and to do the house jobs such as cleaning and processing the olives, tomatoes, grapes, and carobs
Taşlık	Utilized to connect service spaces with courtyard such as a fountain and a pond.
Köşk	Big room with high number of of windows
The Başoda	the larger room in the ottoman house creates to serve the guest and is designed to be very large with a lot of windows to get benefit from the sunlight and to get a scenery view. Moreover, they put a lux design on this room such as lamp niches, ornamentation, and timber ceiling mirrored the significance of this room.

In the urban house in Nicosia, the rooms are considered as closed areas utilized for the multifunctional needs such as cooking, sleeping, and as a living room for all the family activities that life demands (Pulhan, 1997). Moreover, Pulhan, (1997), Dinçyürek, (1998), Numan & Pulhan, (2001), Turker, (2002), Erturk, Erturk, & Gunce, (2007) see the courtyard as a semi-open space because it connects the outdoor and indoor spaces. Ottoman houses have private spaces found in the rooms and the inner and outer halls. The hall at the same time is classified as semi open when the hall connects the courtyard with the rooms.

This investigation in to previous research related to this issue shows that much research has gone into the examination of flexibility in the traditional houses in Turkey and there is a great deal of understanding on this. However, research into Nicosia is limited. Although there are similarities between the traditional architecture in Turkey and Indonesia, there are nuances of differences between them too. Undeniably, there is a gap in research which need to be focused upon, which this research intends to do.

Research Methodology

In the walled city Nicosia in North Cyprus, there are traditional houses constructed during the Ottoman Period. These houses have met the needs of the communities for many years. This research investigates architectural design of three traditional houses in order to reveal flexibility how the strategies presented in the theoretical framework manifest in the spatial organization of the traditional Ottoman houses within the framework of flexibility.

The three houses are chosen on the basis of having the most typical plan layout of their time. At the same time, they all have had restorations and are in very good condition. Another reason is that Derviş Paşa Mansion is used as a museum. Saçaklı Ev is used as an art & cultural

center and Boncalian Mansion is being used as a restaurant recently. Thus, they offer opportunities for making direct observations.

The research employs case studies as a methodology with a historical-interpretative method for interpretations. In the first stage, direct observations are done on the use of space and the buildings. Simultaneously, uses of the spaces are found from literature and archival material (text and photos). In the second stage, plans, drawings and readings are acquired which are compared to deepen the understanding of the use of spaces that meet the daily activities and room types.

In order to check flexibility of these houses, a table is produced in the third stage (Table 6). All the ideas discussed in the previous sections like: Patterns of Flexibility, Type of Flexibility, Flexible Furniture Design, Elements of flexibility within the internal structure, Flexible Materials and Flexible Mechanisms are used in the table so that the table can be used as a checklist.

Table 6: Proposed Flexibility Checklist Table
Source: Omar, 2022

Flexibility Patterns	1	
	Spatial (structural) Flexibility	
	Functional Flexibility	
	Character Flexibility	
Flexibility Type	**2**	
	Sliding walls	
	Elements of Transforming	
	Pop-Up	
	Flexibility Multi-folding	
Flexible Furniture	3	
	Movable	
	Modular	
	Foldable	
	Multiple functions	
Flexible Materials	4	
	Solid	
	High flexibility	
	Manufactured	
Flexibility Elements into the structure	5	
	Wall	
	Floor	
	Ceiling	
	Open space	
	Closed space	
	Semi-open	
Flexible Mechanisms	6	
	Plumbing Extensions Tools Mechanism	

The Table 6 shows the strategies of flexibility according the scholars such as Gulaydin (2004), Freidman (2002), Schneider and Till (2007). They explain The Elements of Flexibility within the internal structure. Similarly, Habraken (1972) explains the Flexible Furniture Design. Dittert (1982), Hofland & Lans (2005), as well as Van Eldonk & Fassbinder (1990) explain the patterns of flexibility. The table included all the flexible strategies divided into 6 topics.

Interpretation of data is done with the help of the table prepared by the study. These flexibility strategies can be used for other building types.

The Case Studies

In this section, 3 Ottoman houses in Nicosia in the walled city are presented. The first house is Bohcalian Mansion House built at end of the 19th century, located in the Şehit Salahi Şevket Street (Victoria Street) with building number 53. The second one is The Eaved House built in the 1850s. The building is located in the Kütüphane Street with building number 8. The 3rd house is Derviş Paşa Mansion built in 1801. The building is located in Beliğ Paşa Street.

Case Study 01: Bohcalian Mansion House

The Bohcalian Mansion house plan shows that the house has two floors with an inner sofa room on the ground floor. The U shape staircase connects the upper sofa and the ground-floor sofa. The sofa room reflects flexibility. It is used as a multi-functional transition space from the public to the private spaces.

Fig 10: Bohcalian Mansion House Second Floor Plan
Source: Turkan, 1998

The Sofa was used in the living area room and for transition. The 'Başoda' (main guest room) was used as a guest room and generally, the bathroom and the kitchen are located at the courtyard.

Case Study 02: The Eaved House

The Eaved House L-shaped plan shows that the house contains two floors that bounds an inner court. The 'başoda' (main guest room) is to the right of the entrance. The room to the left of the entrance is for daily activities. A linear staircase leads to the second floor and the kitchen, and the bathroom. Storage are located on the ground level in close relation with thec courtyard.

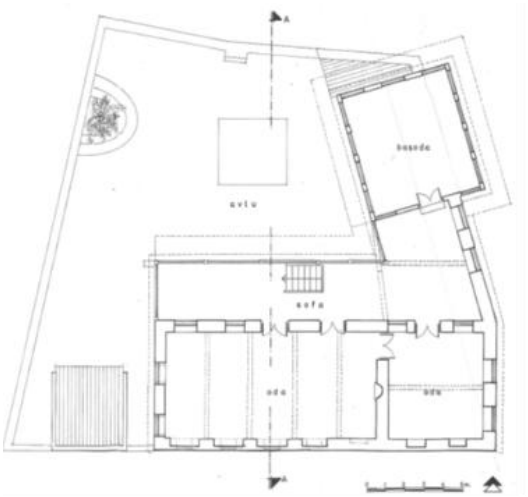

Fig 11: The Eaved House Ground Floor Plan
Source: Turkan, 1998

Case Study 03: Derviş Paşa Mansion

Derviş Paşa Mansion plan shows that the house contains two floors, with five rooms and a main living room (Sofa). The Başoda serves guests, and then there are 3 other bedrooms. It also has two Eyvans: one to be as the main entrance and the other one as the balcony. The staircase is in the courtyard. Moreover, there are five service areas located in the courtyard such as the kitchen, the bathroom, the storage, the bathroom, and the laundry.

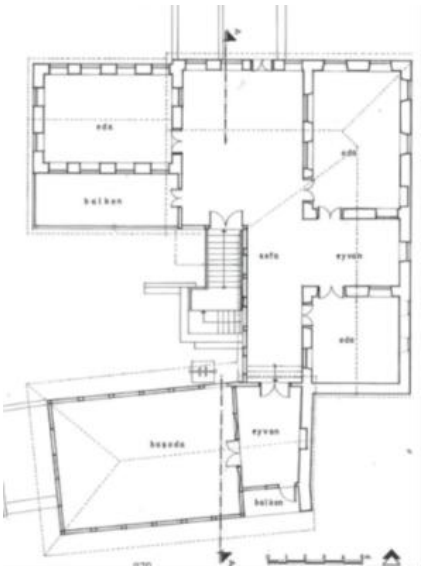

Fig 12: Derviş Paşa Mansion, Second Floor Plan
Source: Turkan, 1998

In all the three Ottoman houses, it is seen that the houses are designed to meet all the needs of the family members and the guests. Sofa at the center of the rooms is a transition space and it serves as a living room. The main bedroom is generally double the size of the other bedrooms. The courtyard is more like an open-air room where the daily facilities are carried like cooking, eating, drying clothes and sitting etc. are carried out.

Findings

The Proposed Flexibility Checklist Table is used to check the flexibility capacity of the three Ottoman Houses in Walled City Nicosia.

Table 7: Flexibility Capacity of the three Ottoman Houses
Source: Omar, 2022

Proposed Flexible Strategy			
Patterns of Flexibility	**Traditional Ottoman Houses (Cases 01, 02 and 03)**		
Spatial Flexibility	Living room \ courtyard	√	
Functional Flexibility	All rooms \ courtyard	√	
Character Flexibility	Additions of rooms	√	
Flexibility Type	**2**		
Sliding Walls	Cabinets as walls	√	
Elements of Transforming	Furniture	√	
Pop-Up	Courtyard: kitchen, service, play and sleep area	√	
Multi-folding flexibility			X
Flexible Furniture	**3**		
Movable	Sitting elements, pillows, duvets	√	
Modular	Kitchen		X
Foldable	Mattresses	√	
Multiple functions	Bed and sitting	√	
Flexible Materials	**4**		
Solid	Wood \ pebble stones \ adobe brick	√	
High flexibility	Wooden construction system filled with adobe	√	
Flexibility Elements into the structure	**5**		
Wall	Cabinets within walls for storage	√	
Floor			X
Ceiling			X
Open space	Courtyard	√	
Closed space	Rooms	√	
Semi-open	Verandah (porch)	√	
Semi-Closed	Entrance	√	
Flexible Mechanism	**6**		
Plumbing Extensions Tools Mechanism	Kitchen and wc		X

When the Flexibility Table is used to check the Flexibility Capacity of the Traditional Ottoman Houses, it is seen that the success of the houses meeting the users' needs for a very long time is that they have a very strong flexibility capacity.

The rooms are designed as multi-functional rooms, allowing the functions to change easily and increase in the number of users. In fact, the table reveals that the Nicosia Ottoman houses used a flexible pattern strategy, such as Functional, Spatial, and Character in order to modify the furniture. The Nicosia Ottoman Houses used a flexible sliding wall strategy such as the partition wall, and cabinets as dividing walls which allowed to re-design the spaces as needed. The Sofa at the center of the rooms created a transitional area that is richer than the regular corridor. The use of Sofa for the daily activities helped this layout to have longevity in the Nicosia Ottomans houses.

As a summary, the finding of the availability of flexible strategies shows that these strategies have the ability to increase the functions of the spaces, such as using the courtyard for cooking, playing area for children, sleeping and sitting. It is understood that it was mainly the flexible strategy that helped the space to absorb all the required functions in one room.

Conclusion

In this study, multi-functional use of spaces in traditional residential architecture was examined in order to generate insights from the flexibility in Ottoman Houses in North Nicosia, Cyprus. For this purpose, a table as a checklist is formed to analyze existing Ottoman Houses in order to understand the layers of flexibility that can be a guide for future designs.

Among all the building types, residential buildings play the most important role for human beings. They spent longer times in their houses. Furthermore, a residential building houses different family types, of different ethnic groups, and ages responding to the needs of all. Hence the spatial performance level for meeting all these different users' needs is the capacity of that residential building to house different scenarios of living.

In the contemporary world, because of migration, population growth, economic or environmental crises people are changing places and there is a severe house shortage all over the world. Small houses with flexible spaces, foldable as well as multi-functional furniture are being designed as a solution for this shortage. Covid 19 experienced recently on the other hand shows that a kitchen can turn out to be a study area or an office or a living room which can turn out to be a playground for the kids. The expectations of the users have been increased once again.

A century from today, Ottoman Houses in Nicosia were large mansions for the Ottoman officers or trades people. The residents were large families where kids, grown-ups and elderly all lived together. It is worth analyzing the structure of the Ottoman Houses to understand how they continued functioning so long within the context of flexibility. In order to do the analysis, a checklist is prepared by putting the basic elements of flexibility strategy.

In general, it is noted that the flexible strategy has led to establishing a multi-functional space, which helps the interior spaces to complete all the tools that met the users' needs to have a livable optimum space. The analysis of the plans when matched with the Flexibility Checklist Table indicates that the three Ottoman Houses fulfills the flexibility strategy. They allow the space to be fully used for different functions without making façade changes to the street. The additions and changes are made internally. The flexible strategy helps the space to absorb all the required functions in one room.

Moreover, it is seen that houses with higher capacity of flexibility helps to improve the capacity of the building to achieve sustainability and feasibility even when the façade as an urban element is not changed. This is while the interior changes are provided by the flexibility strategy. In this context, this article provided researchers with an understanding of the flexibility capacity of Ottoman houses at Nicosia, It highlighted the importance of flexibility strategy to create a multi-functional space for future house designs.

Nevertheless, this study is not without limitations. It is a case study of only three houses and this appears to be inadequate to make generalizations. In any case, case study findings cannot be generalized although they can provide insights. Further research therefore, is needed. They can examine how these strategies actually are carried through in the contemporary houses and what lessons from the traditional can be continued to the future.

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