EXPLORATION OF SPATIAL DESIGN IN INTERIOR ARCHITECTURE FROM PHILOSOPHICAL POINT OF VIEW

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Abstract

This article basically investigates relationships between philosophy and **interior** architecture, especially analyses the concept of space as the basic aesthetic unit of **interior** architecture from philosophical point of view. In the paper main focus is on space, contemporary form of space in everyday life, and conceptual form of space by important philosophies and theories in the history of **interior** architecture and consist of mainly 3 theories that are well known architects and philosophers in the literature of **interior** architecture. Theories have been selected in order to focus on space, spatiality, spatial relations and spatial design, thus, beginning with Beatriz Colomina's (1994) 'Publicity and Privacy Architecture as Mass Media' theory, which investigates publicity and privacy inside the house over two important architects' designs which 1st one is **Raum Plan** of Adolf Loos and the 2nd is **Plan Libre** of Le Corbusier as two contrast inventions on space; introverted versus extroverted spatial characters. Second selected theory in the study is; space triad of Lefebvre H. (1972) which introduces space as a social product with its' 'lived-perceived-conceived' dimensions, that focuses on space and spatial relations by 'user-viewer-designer' approaches. Lastly, 'Visibility and Transparency in Architecture' theory has been investigated by space relations which transform static spaces to dynamic spatiality, and create flexible interior architecture by Van Doesburg's Rietveld Schröder house as one of the most important flexibility architecture in the literature and it's aimed to demonstrate the importance of visibility in the creation of dynamic spatial organizations. In the paper, all of these theories are selected in order to investigate spatial design, as the contemporary approach to interior architecture. Thus, all of them have relations with conceptual presentations in the paper that forms the methodology for spatial design. Colomina's public and privacy theory transforms to integration of new space types and segregation of group spaces/compartments in the spatial design, and Lefebvre's (1972) space theory that introduces spaces as a social product has been transform to expandability in the spatial design, then lastly, visibility and transparency in space emphasizes flexibility & convexity tools in spatial organization by movable partitions and furniture usage during the creation of sub-spaces in one big interior shell. To sum up, this paper mainly investigates spatial design in contemporary **interior** architecture from philosophical point of view, and focuses on space by philosophies such as, publicity & privacy in space, space as a social product, visibility and transparency in space, and all of them are used during the spatial analyses such as; integration versus segregation, expandability (the growth of space time to time), and convexity tools. The methodology of the paper consists of mainly two parts, a comprehensive literature survey on the space and spatiality by philosophies and concepts, secondly conceptual and spatial analyses have been presented with Rietveld Schröder House by conceptual and shape grammar analyses. At the end, the study aims to introduce a methodology for spatial design that is demonstrated by architectural philosophies and theories for future studies.

Keywords: Spatial design, Henri Lefebvre, Flexibility, Beatriz Colomina, Shape Grammar

1.INTRODUCTION: A COMPREHENSIVE DISCUSSION ONTO THE THEORIES AND PHILOSOPHIES ON SPACE

Today an unexpected development of open plan (free plan) has been revealed at contemporary interior architecture especially come forward with house, office and home-office planning's. Being totally different from traditional space organizations this new space organization has been developed as spatial design and reveal completely different planning organization from their traditional prototypes. Especially by the loss of solid and concrete walls from interiors, highly dynamic, flexible, visible, transformable, user friendly and sustainable interiors

have been created today. Consequently, the main aim of the study is to investigate todays changing spatial organizations and make investigations over them by well known theorists and philosophers studies on the literature of **concept of space in interior** architecture such as; 1) Integration / Raumplan & Plan Libre, 2) Expandability / The Social Production of Space, and 3) Convexity / The Visibility of Rietveld Schröder House. (Table 1)

Problem Definition & Background

Today, contemporary interiors and designs exhibit totally different space organizations from traditional ones, by the loss of solid walls and the usage of open plan, which shows highly transformable, integrated and dynamic spatiality with its diverse and dual space definitions by new spatial structuring tools as **'integration, expandability, and convexity'** instead of enclosed spaces with concrete and solid walls. Accordingly, the main research interest deals with this dynamic, diverse, dual character of contemporary interior architecture and new space structuring tools and researches the link between spatial design and space theories & philosophies as they can be easily observed today. (Table 1)

SPACE		**SPATIALITY**
THEORIES AND PHILOSOPHIES		SPATIAL DESIGN TOOLS
1.COLOMINA WITH PUBLICITY&PRIVACY		**1.INTEGRATION** TOOL WITH GROUP SPACES AS COMPARTMENTS
2.LEFEVBRE WITH SPACE AS A SOCIAL PRODUCT	**TRANSFORMS TO**	**2.EXPANDABILITY** TOOL WITH TIMELY GROWTH OF SPACES
3.VAN DOESBURG VISIBILITY OF THE SCHRÖDER HOUSE WITH PARTITIONS AND FURNITURE		**3.FLEXIBILITY&CONVEXITY** TOOL WITH PARTITIONS & FURNITURE

Table 1. Main Structure of the Paper

1.2. Research Questions & Aims

This study mainly aims to reveal spatial design of todays interiors with their new space structuring tools differently from traditional space organizations and tries to investigate **concept of space in interior** architecture by well known theorists and philosophers' studies such as; Beatriz Colomina, Henri Lefevbre, David Rosenburg which all of them focuses on space from different points of view such as, publicity and privacy of spaces, social dimensions of spaces, visibility and convexity of spaces. Thus the main research question of the paper is developed as;

Q-1: What is the main link and relationship between the theories and contemporary interior architecture (spatial design) ?

1.3. Research Method & Limitation

At the paper, research methodology has been mainly consisting of mainly three parts; 1) literature review, 2) introduction to the concepts and spatial design, 3) case analyses: conceptual and shape grammar. In addition, the main indicator of the research consists of dynamic interiors (open plan) and sub-indicators are; integration, expandability, flexibility/convexity.

1.4. Literature Review

The paper relies on a variety of bodies of literature with three-part investigations such as; 1) conceptual investigations of space and spatiality including theories and philosophies as, a) Beatriz Colomina's; *'Privacy and Publicity-Architecture as Mass Media'*, b) Henri Lefebvre's space triad; *'Lived-Perceived-Conceived Spaces'* and socially production of spaces, c) David Rosenburg's; *'Visibility and Permeability of Architecture'* with analyses of Rietveld Schröder House. Second part of literature review introduces **spatial design** as the new space organization and structuring method with the tools as; a) integration, 2) expandability, 3) convexity, and lastly, third part introduces shape grammar method for analysing interiors and space relations with justify graphs. (Table 2)

Literature review	Concepts and spatial design tools	Cases analyses
Theories and philosophies -Colomina -Lefevbre -Doesburg	-Space -Spatiality -Spatial Relations -New Space Types & Group Spaces	Rietveld Schröder house -Conceptual and with -Shape grammar
-Shape grammar method	-Integration of spaces -Expandability and growth of spaces -Convexity and furniture effect on creation of sub-spaces	

Table 2. Structure of The Paper

2. AN INTRODUCTION TO THE SPACE THEORIES & PHILOSOPHIES

This part introduces artistic, functionalist and perceptual spatial approaches by important space theories in the architectural literature as; 1) Beatriz Colomina; 'publicity and privacy in architectural media', 2) Henri Lefevbre space triad with 'lived-perceived-conceived' spaces, 3) Von Doesburg; 'perception and visibility in new interior architecture'.

2.1. Beatriz Colomina Privacy and Publicity, Architecture in Media: Colomina discusses architectural spaces over two important modernist architect works by photographs and drawings; Adolf Loos and Le Corbusier. Space has been introduced from different point of view by Colomina, which 1st is Adolf Loos's Raumplan as a spatial plan that has been produced in close relation with fashion for interiors and facades that are designed differently from each other which outside does not reflect inside. Through Colomina, at Loos's house interiors, fashion linked, theather box-like spaces are interconnected to each other by level changes only. At Loos' Raumplan spatial device, spaces become well furnished, decorated theather stages that houses gain introverted character and are separated from outside. They have a very strong private character that from outside it can not be sensed what is happening inside. In fact, this was the reflection of modern man, which he/she borders his/her private area as the home with living spaces , study spaces, bedrooms, kitchen , hobby rooms , and of course the hierarchical order of spaces continue with public and private zones inside the house such as; public open living zone with integrated 'living room-study room-dining room-entertaining space-entrance hall' spaces, and a private zone with 'bedrooms-bathrooms-dressing rooms'. Thus, public and private zones have been successfully separated from each other inside the houses and by the Raumplan, sub-spaces interconnected each other with level changes implicitly, no enclosed borders and walls exist in the house anymore. (Colomina,1996)

In addition, Loos developed his Raumplan device by using fashion in interior walls, and transform different functional spaces into small theather stages, which each different space in the house race with other by its clothing's such as, colours, furnishings, usage of carpets on the walls. The interior fashion, the cladding of walls, usage of materials on interior walls, created well designed and organized spaces for modern man.

On the other hand, as indicated by Colomina, Loos approach to the outside and exteriors is totally different from inside, through Loos outside must not reflect what is happing inside, inside is the private area of modern man, thereby, outside must be pure, colourless, closed and very classic like an English jacket with grey colour, which one cannot sense nothing about inside from outside. In fact, by this way Loos achieved to separate outside form inside with very less windows and openings, and separate correctly dwelling architecture from public architecture, where only households can know what is happening inside. There by, Loos used fashion to make this contrast, an English suit for exterior cladding with very less openings, and very colourful, ornamented, especially with carpets on the walls, theather-stages inside the houses, where one watches the other space, instead of looking outside. (Colomina,1996)

Thereby, as photographs indicates, Loos space approach is more like theather stages for each different functional spaces and the occupants are included to that scenes that are very good decorated. Thus visibility continue between different stages and occupant of one stage become a viewer of the other one, by this permeability social relation between occupants has not been blocked. Houses have secondary public-private zones inside, which public zones are formed by different functional sub-spaces, that are separated from each other by level changes and organized openly, from entrance to the last space, with the unblocked visibility as theather boxes. (Colomina,1996)

Contrast, the introverted character of the Loosian houses transform to totally extroverted character by Le Corbusier as indicated by Colomina, scenery comes first inside the houses with its highly extraverted space character, where inside and outside get integrated totally with the skeleton structure device of the architect with huge glass facades and this time instead of spaces, exterior scenery becomes the main view and this time occupants of the spaces become viewers that look from inside to outside. There by, Colomina introduces two different space architecture by 'Publicity & Privacy Architecture as Media' which first is the Loosian space architecture as an introverted theather box space concept with well decorated rooms that are connected to each other by level changes with the invention of Raumplan spatial structure, and the second one is Le Corbusier's Plan Libre (open plan) , that is consists of integrated spaces within open plan implicitly and by the invention of skeleton structure and huge exterior glass facades, inside can be sensed from outside very easily , no difference occur between inside and outside , as if to talk about fashion this time English jacket of Loosian houses transform to transparent shells at Corbusier's houses. Thus to sum up, by Colomina's theory; introverted versus extroverted, Raumplan versus open plan, theather box stage versus transparent space, fashion base interior and façade design versus functional base interior and transparent glass façade approaches have been revealed. (Colomina,1996)

***The Stross House (1922):** ''This is an unrealized domestic project from Loos' period of 're-orientation' towards classical vernacular for the exterior. The interior develops according to Raumplan principles, with asymmetrical movement and raised levels grouped round a living hall. Nine steps lead form the lobby to a raised cloak roam, from which more steps lead along the external wall to the spacious hall. The other living areas, which have raised floors, adjoin this hall, but in this case do not open onto it. There are stairs in the two recesses in the garden-facing wall; a wide staircase with landings leads from the hall to the bedrooms; the service stairs being on the other side'' (Risselda M.,1988) (Figure 1)

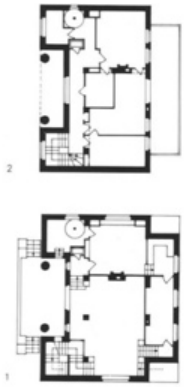
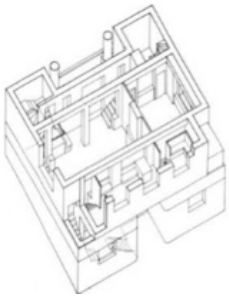
			
Plans of the house	Perspective study of the house	view from the dining area from the hall (The Rufer house-1922)	view from the salon to the dining room (The -Tzara House-1926)

Figure 1. Raumplan _new spatial structure presentation with drawings and photographs

2.2. Space Production by Henri Lefebvre: At this part, study investigates the social part of the space usage as indicated by Lefevbre spaces are not stable areas, they are transformable and change constantly socially by their users.

'(Social) Space is a (social) product. This proposition might appear to border on the tautologous, and hence on the obvious. There is good reason, however, to examine it carefully, to consider its implications before accepting it ' (Lefevbre,1974).

Thus, spaces of Lefevbre have different dimensions and explored by a triad; 'lived-perceived-conceived' spaces that compromises these different dimensions of spaces and produces spaces socially. Firstly, lived spaces are the spaces that occupants use in their everyday practices and consists of physical features such as; walls, floors, ceilings and furniture that users can achieve their routine daily activities. 2nd one is the perceived spaces which spaces gain dual functions time to time and host different activities instead of their real functions, these are the spaces of visitors and they are temporal and generally open to the public. 3rd and the last one is the conceived spaces that are created by planners and architects with building knowledge scientifically and this space type is the most dominant one. The space triad of Lefevbre has been also introduced as;

Spatial Practices, 2) Representational Spaces, and 3) Representations of Spaces, and as indicated by Lefevbre;

'1. Spatial Practice (social space): which embraces production and reproduction and the particular locations and spatial sets characteristic of each social formation. Spatial practices ensure continuity and some degree of cohesion. In terms of social space, and of each member of a given society's relationship to that space, this cohesion implies a guaranteed level of competence and a specific level of performance.

2. Representations of Space (conceived/designed space): which are tied to the relations of production and to the order which those relations impose, and hence to knowledge, to signs, to codes, and to frontal relations. (architectural presentations)

3. Representational Space (perceived space): embodying complex symbolisms, sometimes coded, sometimes not, linked to the underground side of social life, as also to art (which may come eventually to be defined less as a code of space than as a code of representational spaces.' (pg.34)

Like all social practice, spatial practice is lived directly before it is conceptualized; but the speculative privacy of the conceived over the lived causes practice to disappear along with life. (Lefevbre,1974)

Thus in the paper, this triad lived-perceived-conceived indicates user-host-designer's spaces which all of them require different scenarios and if this triad works correctly it must have included dynamic space indicators such as flexibility-adaptability-transformable spatial structures. In order to respond diverse scenarios spaces must be expandable and flexible, and they can be able to change form by sizes time to time, can extend to other spaces and come back again, thus they must include growth ability to adapt changing requirements by its users. Thus, at today interiors, expandability tool ensures (social) space is a (social) production by its users.

2.3. Van Doesburg; Visibility and Permeability of the Rietveld Schröder House by David Rosenberg: Integrated/flexible spaces and the visibility of the new interior was an idea of Mrs. Schröder as the desire to an open and flexible interior, and this idea had been interpreted by Van Doesburg with an interior spatial structure that consists of sliding partitions and built-in furniture. Van Doesburg rejected to use traditional space organization with walls and corridors, instead of this, he developed an flexible interior spatial structure by movable partitions and furniture. Especially for upper floor Doesburg designed a whole integrated open floor which can be separated time to time due to user's necessities and sub-spaces can be created easily in open plan. As indicated by Rosenburg (1996); 'Van Doesburg included open planning in his agenda for the new architecture, suggesting that living might take place in

a general area which could be sub-divided by separating planes, which might even be furniture. This description might almost be a specification for the Rietveld schröder house, and the house does seem to embody the concepts of transparency and de-materialisation which underpin the architectural philosophy of De-Stijl' (Rosenburg D,1996). (figure 2)

Figure 2. a) Plans of the Rietveld schröder house without and with fix furniture, b) Convex break-up of the four modes of the Rietveld Schröder House

Rietveld Schröder house has an important place in literature by the way, flexibility and transformation for different temporary scenarios inside the house has been achieved very successfully without any concrete walls and construction. And as analysed by Rosenburg;

''Justify graphs of four versions of the first floor forms their most integrating space, clearly display their individual properties of depth and ringiness. The mean depth of the open, furnished floor is comparatively high, exceeding that of the partitioned unfurnished floor. Similarly, the closed, furnished version is very deep as a result of combined effect of the partitions and furniture in articulating the plan. However, despite the apparent depth of the open-plan, furnished arrangement it is well-integrated, such more so than the shallower, closed but unfurnished version of the home. The ringiness that openness affords to offset the depth which furniture imposes'' *(Rosenburg, 1998).(Figure 3)*

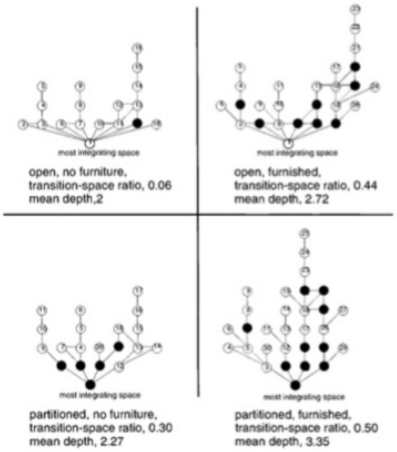


Figure3. Justify access graphs of the four versions of the first floor plan

However, ground floor is divided by walls, on the first floor by using movable partitions sub-spaces can be created, even without partitions as open plan configuration fix furniture increases the convex break-up by eight space from eighteen to twenty-six. This demonstrates the effective role of furniture for the organization of sub-spaces. Thus, the integration degree becomes highest at un-partitioned open and unfurnished configuration, then unfurnished partitioned, the open and furnished and at partitioned and furnished configuration the integration value gets lowest. The perception of space in the Rietveld Schröder house rises by the elimination of walls and addition of furniture which one can see far beyond, and it looks more open than it feels during moving in the interior and the new architecture is totally not about a new way of living but a new way of seeing. And as emphasized by Rosenburg; *''It even sheds a new light on the configurational and social significance of the less tangible architectural phenomena of openness and flexibility as a blueprint for a modern way of life'' (Rosenburg, 1998, pg.196-214)*

2.4.Conclusions of The Chapter

By this chapter study achieved a deep investigation on space and spatiality issues by well known theorists and philosophers in the literature of **concept of space in interior** architecture such as; Beatriz Colomina, Henri Lefevbre and van Doesburg' building by Hillier and Hanson. Thus, these investigations indicated that space has two many

dimensions and it has both artistic and physical features, it has very close relationship with the multidisciplinary arts like fashion (Colomina), dance & movement (Schröder House), Scenario-based design for adaptation to diverse lifestyles (Lefevbre). Thus, these multi-disciplinary relation of space with other arts and philosophies transform spaces to spatial design which eliminates traditional space organizations and classic orders from interiors of modern.

3. CONCEPTUAL DEFINITIONS OF SPACE: SPATIAL DESIGN

After investigating space by important theories, this part introduces conceptual points of space over these theories and interpret them by recent day important interior designs as **concept of space in interior** architecture. In fact, this part of the study has close relation with conceptualization, which creates the main link and integration between the theories on space with everyday life and todays' culture and as indicated by Buchanan (2010); ''one feature of the new conceptualizations of design is the blurring of boundaries between history, theory and criticism, revealing the deeper interconnections that explain the importance of design as a social and cultural influence. The guiding idea of such work is that design is the location of a new exploration of culture that combines theory (ideas about the nature of world) with practice, the skills and purposes of practical action that have an impact on the lives of individuals and communities). The meeting ground of theory and practice in the twenty-first century is the designed world of images, objects, activities and environments' (Buchanan R. 2010).

3.1. Definition of Spatiality & Spatial Concepts & Spatial Design:

This part includes definitions on firstly space than spatiality as the developed and contemporary version of space, and lastly spatial design as a tool for interior architecture and space structuring methods.

3.1.1. Space & Spatiality

***Space:** Firstly, as indicated by Öymen (1996); ''Space is a place of a person or a group pf people very simply. Space is an empty place that is determined by structure, material and character of organization where human beings, human relations involved and its' different from the area''(Öymen Ş.1996). In addition, as introduced by Meiss (2013) ; 'Architectural space is the immaterial that we define with the material. Delimiting a portion of the world in order to render it habitable: this is the very essence of architectural design', Meiss (2013).

On the other hand, Frank Lloyd Wright believed that space is the core of architecture, and as indicated by Nikolaus Pevsner (1943) 'the history of architecture mainly is the history of people that forms the space' , also, through Pevsner; 'Architecture is the art of creating space', thus, it has close relation with the lifestyles of people. In addition, Teymur (1998) believed that 'space is a three dimensional production and distinguishes it form all other design branches', and with space creation human integration begins, 'space without human and human without space can not be thinkable differently'(Teymur,1998).

***Spatiality:** On the other hand, Lefebvre (1974) defines space as a social product and emphasizes that; 'space is neither a mere abstraction nor a perceptible thing, space with all its dimensions Is a content and reality, so it's social, its sum of relationships, and its not stable' (Lefebvre, 1974). Thereby, spaces have physical dimensions with their borders as walls-floors-ceilings and when these borders transform to 3d volumes instead of 2d planes, spaces transform to spatiality. First of all, spatiality is a post-phenelogic, and post-phenological area is spatial. It is the combination of space and area, physical and perceptual, and design and technical drawings, and reflects the user identity and lifestyle. Here, Lefebvre's space trilogy; 'living/perceived/designed' spaces form; 'social-user identity-physical' space dimensions and reveal spatial design that is produced differently from traditional space organizations. Thus, the degree of spatiality depends of how integrated and fit the user with border types and furniture. As emphasized by Loidi & Bernard (2003); 'area-unit spatial boundary related to each other reciprocally: the weaker the spatial boundary is, the more indistinctly it will function as a space-creating criterion, and the area-unit will have to assert itself all the more strongly and clearly. The criteria 'weaker' and 'stronger' always relate to degree of unity of area-unit boundary, or the degree to which they differ from their surroundings' (Loidi & Bernard, pg.50, 2006). In addition, spaces can be defined by different sort of architectural elements such as; nodal elements as columns, vertical planes as walls, ceilings, level changes, floor material differences. (figure 4-5)

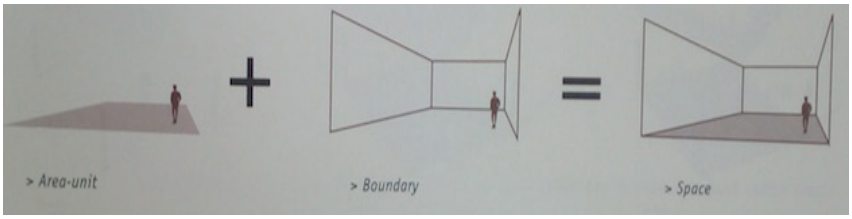


Figure 4. 1. 1st position space is area unit and three-dimensional boundary (area/unit + boundary=space)

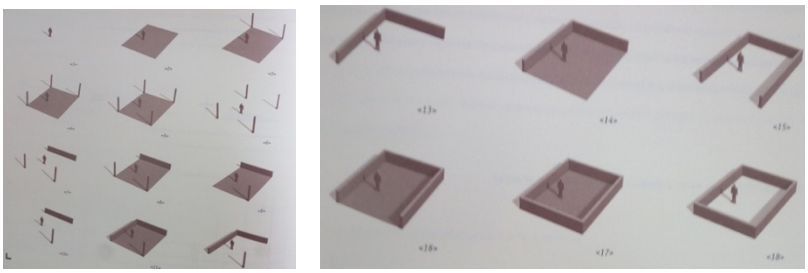


Figure 5. The weaker the boundary, the stronger the area

New Spatial Relations**: As emphasized in the paper previously, spatial design is different from traditional space organizations, and requires different type of space relations such as; depth, density and interpenetration***. Instead of using walls and corridors, by **(1) depth relation**; (a) by overlapping of spaces; high integrated spaces reveal that can contribute to each other time to time, due to user necessities, and the second type of depth is; (b) transparency; an overlapped space covered by other space is better understood by glass material or perforated structures. **(2) Density** relation creates shallow spaces in a very weak way instead of depth with serial visions, all spaces are separated from each other very implicitly by nodal elements, material changes, ceilings or level changes and organized side by side in the interior. Thus, the visual continuity continues between all spaces. Lastly, interpenetration spatial relation creates organization of sub-spaces in one big space more strongly, corridors and halls become visible for different functional spaces, and as indicated by Meiss (2010); 'spatial interpenetration creates continuity from one space to another from the moment an important element of definition-wall, ceiling, floor-appears to belong two or more spaces (Meiss, pg.139,2010). (figure 6-7-8)

Figure 6. Depth relation: a) overlapped spaces, b) glass as transparent divider

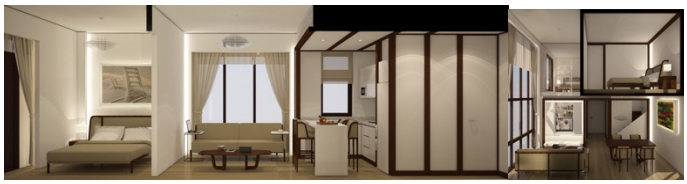


Figure 7. Depth relation: horizontal and vertical overlapping

Figure 8. a) Spatial sequence and connections of spaces openly, b) main space and hall separated from each other by floor material.

3.1.2. New Space Types and Group Spaces/Compartments

In the paper, new space types and group spaces (compartments) have been defined by new spatial relations; depth/density/interpenetration. Because spatial design is different from traditional space organization, classical spaces such as; entrance, kitchen, living room, bedroom, balcony transform to new space types conceptually as; liminal space, niche space, dual space, repetitive space, in-between and open spaces in spatial design. And by the integration of these sub-spaces group spaces have been formed such as; public compartment and private compartments. Public compartments commonly consist of; liminal (entrance hall), niche (kitchen), in-between (halls), dual (living room) spaces and private compartments consist of repetitive (bedroom) and niche (dressing

room) spaces at dwelling architecture. By the loss of; 'interior solid walls, corridors', entrance halls become liminal space, halls become in-between spaces, living room becomes dual spaces for multifunctional usages, bedrooms become repetitive spaces where there are more than two same sized and formed spaces appear in the spatial organization, kitchens and dressing rooms with more compact features become niche spaces, and terraces become open spaces in the study as a result of spatial design (space architecture). All different functional spaces inside the house become sub-spaces in one big interior shell that have high integration ability. At contemporary interiors, spaces no more serve for a specific one function, in order to ensure flexibility; sub-spaces commonly serve for too many actions, can be combined, extend and shrink due to user necessities, thus, new spatial relations create this flexible and adaptable organization without wall separators.

3.1.3. Spatial Design: Weak Space Identifiers

In order to being different from traditional space organization and a conceptual touch to interior architecture, spatial design can be pronounced also spatial identifiers and have been introduced by 7 different types which can be exalted in future, and these identifiers are;

1.Nodal elements that separate two different functional sub-spaces: a column, a nodal shaped furniture,
2.Vertical planes as free standing walls
3.Fix-furniture
4.Level changes between different functional sub-spaces
5.Material differences
6.3D space modules
7.Overhead planes as ceilings or artificial lightings

***Nodal Partitions:** A vertical column establishes a point on the ground plane and makes it visible in space. When centred in space, a column will assert in the centre of the field and create 4 different sub-spaces in one big space. (Figure 9)

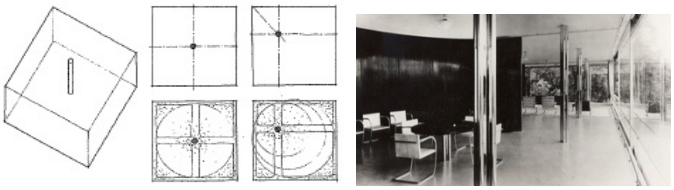


Figure 9. a) column in the space, b) the steel columns (Tugendhat House) define corridor between the glass façade and dining room

***Vertical Planes as Free Standing Walls:** A single vertical plane, standing alone in space, has visual qualities uniquely different from those of a column. A vertical plane has two surfaces, frontal qualities and establish the edges of two separate and distinct spatial fields. However, it can be also different in shape, such as rectangle, square and semi-circle as it is in Tugendhat house defining dining space. (figure 10-11)

Figure 10. a) Vertical plane, b) Free standing plane/onyx wall, Barcelona Pavilion, Mies V.D. Rohe

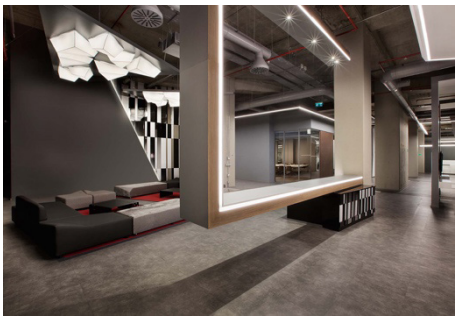


Figure 11. Hanging frame as vertical plane (empty) at todays interior

***Fix-Furniture:** Furniture has space definition ability as indicated at Rietveld Schröder house (theories part-2), and creates sub-spaces in one big space. As indicated by Rietveld Schröder house, at 1st floor especially the un-partitioned and furnished version of the floor, when partitions open, different functional spaces have been formed

by furniture. By using fix-furniture and convexity tool, many sub-spaces can integrate to space organization with any partitions or walls. (Figure 12)

Figure 12. Multifunctional fix furniture-shelves.

***Level Changes:** Raising a horizontal base plane makes a big difference in a large spatial organization. By elevation differences, edges are formed, spatial flow obstacles, thereby, spatial boundaries are determined. (Chİng,1996) At theories part, level changes have been introduced by Colomina's publicity & privacy theory, which Adolf Loos' houses include level changes between different functional spaces and the spatial structure of the house is formed by spaces connected to each other by stairs. By this way, visual continuity and sociality rises in the houses. In addition, Adolf loos houses are marked by a maximum of three dimensional compactness and a concentration of length, width and height. Sitting on the U-shaped seat with one's back to the front of the house, one can look out across the music room and down into the garden; visibility. (Figure 13)

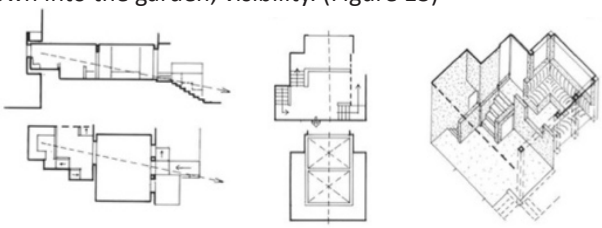


Figure 13. Raumplan, Moller house

***Material Differences:** the surface articulation of the ground or floor plane is often used in architecture to define a zone of a space within a larger context. (Ching,1996) (figure 14)

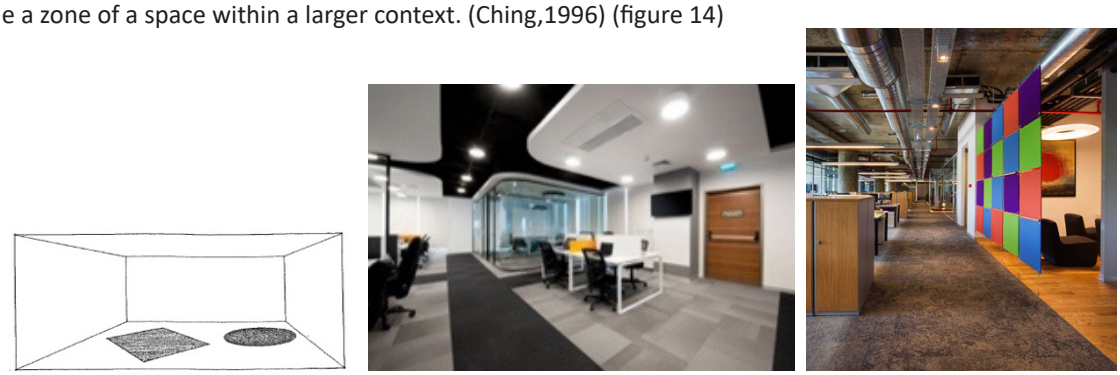


Figure 14. a) different floor and ground coverings define different activities, b) open circulation roads separated from main spaces by material/colour change of the floor.

***3D Space Modules:** 3D spatial structures can also be get diverse from strong to weaker though their activities and places. Its difference from other identifiers come from by exhibiting floor, wall, ceiling borders, in other words, a small shell inside one big interior shell. Thereby, space structures are the strongest space identifiers weakly, and they can be developed from pure geometric forms such as; cube, core, prism, domes, vaults, etc. and they can create 3 dimensional sub-spaces in one big space. (Figure 15-16)

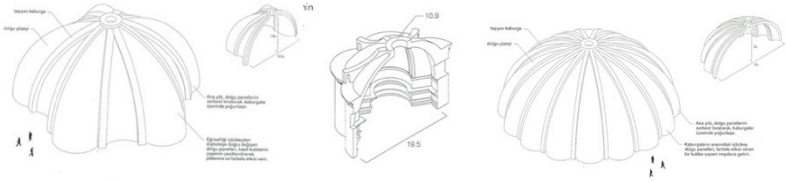


Figure 15. Module structures produced from pure forms, domes & vaults. (Source: Moussavi, 2009)

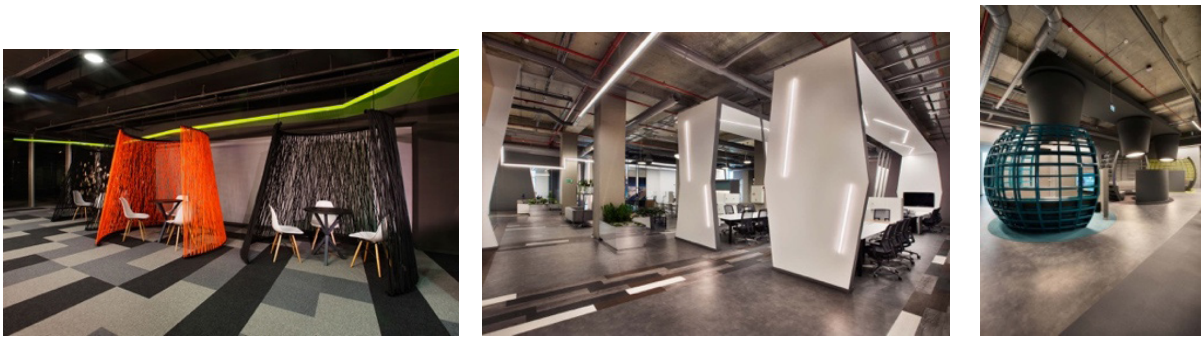


Figure 16. Todays' samples for 3d spatial structures

***Overhead Plane (Ceiling) & Artificial Lighting Planes:** The ceiling plane of an interior space can reflect the form of the structural supporting the overhead floor or roof plane. Since it need not resist any weathering forces nor carry any major loads, the ceiling plane can also be detached from the floor or roof plane and become a visually active element in space. Over head plane can define very simply a different functional space by its form visually. Interior ceiling plane can be designed in order to rise interior comfort, and its form can change due to lighting conditions. (Figure 17-18)

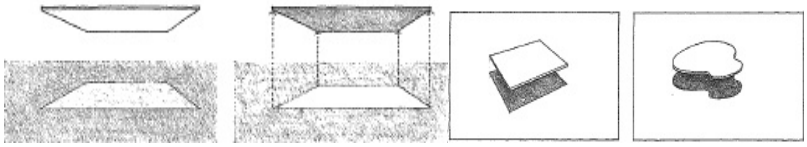


Figure 17. overhead plane configurations

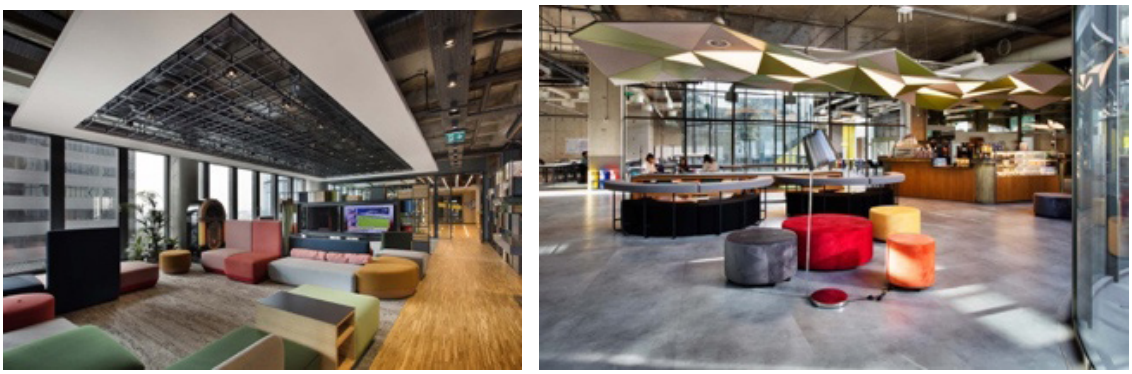


Figure 18. Space defining lightings.

3.2. Introduction of Spatial Tools

There are three dynamic space structuring methods investigated in the paper; 1) integration, 2) expandability, 3) convexity, tools that are used to create flexible integrated interiors in open plan instead of segregated enclosed space organizations with walls and corridors. However, during the spatial structuring of an interior shell, there three tools can be used all together or just one or just two of them.

3.2.1. Integration: Firstly, integration tool creates unity of different functional spaces in one open shell quickly without any construction works, and visibility between them can continue. However, segregated version of spaces indicates the strong borders, integration of spaces requires; flexible, multifunctional usages of spaces by movable partitions and camouflage furniture. These two concepts movable acts and camouflage creates integration of different activities very quickly.

***Movable acts:** as understand its name, movable acts create dual usages of spaces as open and closed with partitions, light separators, rotating planes, which one big space can be separated into many sub-spaces quickly and integrate very easily when necessary by the help of movable light partitions. By this way, different functional spaces can integrate and visibility and sociality between them can be strongly continue as spatial structure of Rietveld Schröder house which 1st floor can be transformed to separated spaces configuration when partitions of bedrooms are closed and again and at Estrade house again by the help of movable partitions kitchen can be hidden and space can be transformed to an office interior. In addition, integration tool is related to Colomina's space theory; publicity and privacy, which when partitions are open publicity of interiors rises and when movable partitions are closed privacy of interiors can be created. (Figure 19-20)

Figure 19. Rietveld schröder house, open and closed version of partitions in the house

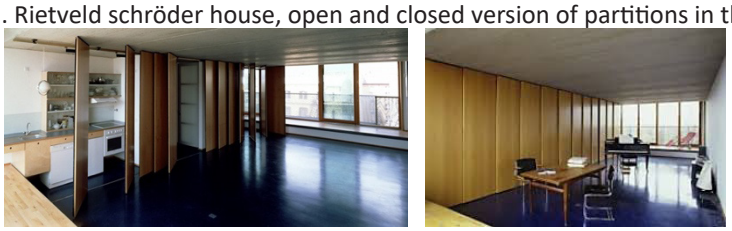


Figure 20. Estrade house, open and closed version of partitions

***Camouflage:** Furniture that can be hidden time to time are named as camouflage concept of integration tool, and by using walls of the interiors. Basically, a disappearing act has one active or deployed configuration and one passive or stowed one. The trick is to make both aspects fully satisfactory. As indicated by figure .x there can be three different usage configuration of one interior space can be created by using camouflage furniture, and living room can transform to study room and bedroom in everyday life. As for furniture, fold-down tables, murphy beds, built-in fold-down secretaries have been used around world for decades and wide variety of similar devices can be found in japan today. (Brown A.,1996) (figure 21)

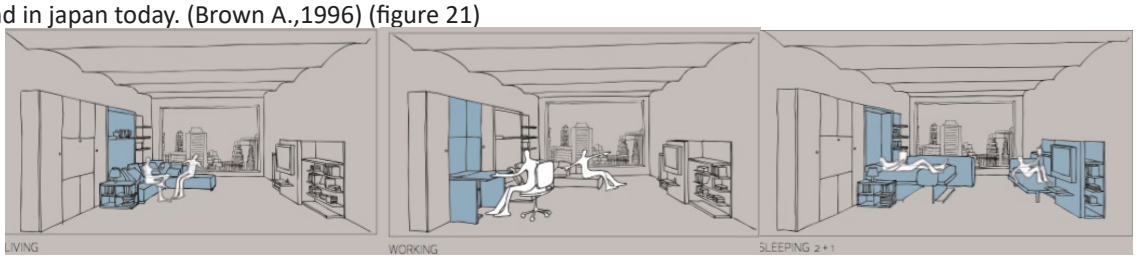


Figure 21. Three different configuration usage of one interior shell; living room, study room, bedroom.

3.2.2. Expandability

Expandability tool has been used to measure growth percentages of the spaces which ensure timely growing of spaces to another space through functional requirements in an open plan. Growth percentages represent flexibility graduations of the interiors. The m2 differences between segregated and integrated plans reveal the growth percentage for that space. To achieve growth and shrinkage of spaces time to time spatial design (weak space identifiers) is required, thereby, different functional spaces (sub-spaces) have been created in one big shell very weakly such as using floor material changes, ceilings or level changes, thus expansions and growth of these spaces to other ones become possible. Expandability tool has been investigated over Lefebvre's space theory, as (social) space is a (social) product! which indicates that space is not inanimate or stable, its with fluid and always extend to other space and come back again. (Lefebvre,1974) (Figure 22)

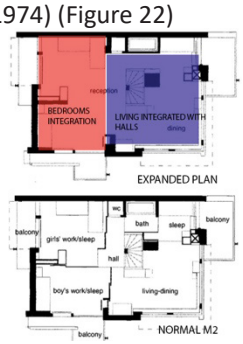


Figure 22. Exploration of expandability tool at Rietveld schröder house, the scheme of extended spaces

3.2.3. Convexity

The inclusion of built-in furniture and partitioning both tend to increase spatial segregation weakly. Opening the partitions increases the integration of spaces but the addition of furniture increases the convexity and defines sub-spaces in one big space. Convexity tool has been identified with Van Doesburg's Rietveld Schröder House and 'visibility & permeability' of interior space theory where spaces are separated and integrated with each other by partitions and furniture only. (Figure 23)

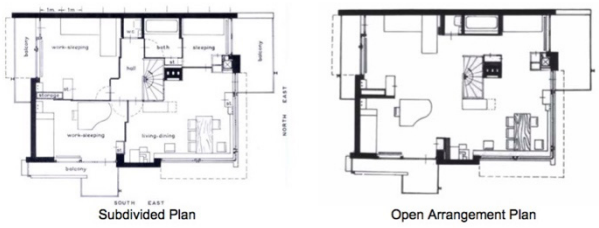


Figure 23. Schröder house 2nd floor plan, source: Hillier &Hanson, decoding houses and homes.

4.Cases Analyses by Shape Grammar

4.1. Application Method of Shape Grammar

Shape grammar as defined by Heitor (2004) and Ostwald (2011) is a graph theory that have focused on generative and analytical application of design, in addition; Bafna and Hillier (1999) have suggested the importance of spatial analysis or topographical configuration by graph theory. On the other hand, Lee & Ostwald & Gu emphasized for their paper study on space that (2013); 'To further explore the second aspect of this field of research, study combines facets of two different computational approaches: space syntax and shape grammar. The particular part of theory of space syntax relates to the process of generating conceptual structures and topological design rules by way of a variation of convex space analysis (using a justified plan graph or jpg). Conversely, shape grammars are patterns of rules that are used to configure architectural form. In addition, through Lee & Ostwald & Gu; 'Shape grammars deal with formal typologies that allow for a design style to be described, analysed and generated' (Lee & Ostwald & Gu, 2013).

In the paper study, it's aimed to define spatiality of Rietveld Schröder House interior by shape grammar, especially to indicate; 1) spatial relations: depth/density/interpenetration, 2) spatial identifiers; nodal elements, vertical planes, level changes, material differences, fix furniture, ceilings, 3d space modules, 3) new space types; liminal, repetitive, in-between, dual, niche, open spaces, 4) new group spaces/compartments; public / private. To demonstrate conceptual and spatial explorations of the study, shape grammar has been used within three rules;

rule-1: nodes = space types

rule-2: links = spatial relations & identifiers

rule-3: nodes + links = public and private compartments

4.2. Case Study: RIETVELD SCHRÖDER HOUSE- Integration-Expandability-Convexity Tools

Conceptual analyses of the Rietveld Schröder house focuses on the comparisons of **integration-expandability-convexity** tools with space plans and justify graphs for each concept. Justify graphs have been especially used to express deep or shallow configuration and the calculation of mean depth values. Firstly, integration has been tested over Rietveld Schröder house, and the comparative analyses of segregated versus integrated space maps indicated that integrated spatiality is much more flexible with a very shallow justify graph and low mean depth value which is 1.2, however at segregated spatiality mean depth is 2.75 with a deeper tree like justify graph.

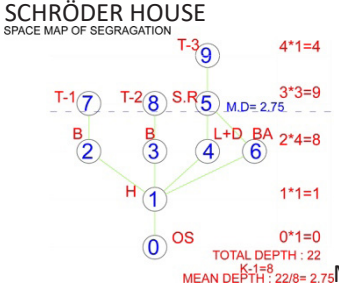
Secondly comparative analyses between static and dynamic (socially flexible) plan configurations, to test flexibility of open plan, indicated that ; girl's bedroom can expand to boy's bedroom time to time and vice versa, in addition, living & dining room can expand to sleeping room due to changing necessities of occupants, and lastly halls can integrate to girl's bedroom/boy's bedroom and expand , thus space growth occur in the house socially, which demonstrates the theory of Lefebvre ; social space is a social product.

Thereby, in order to adapt timely activities spaces can expand and shrink. The interior growth of spaces temporally is found as %76, which is very high and indicates the high spatial flexibility of Rietveld Schröder house. In addition, as Van Doesburg believed, the integration of interior with exterior has been tested, and the second growth calculation is done with the integration of terraces to interiors, or when interiors expand to terraces, and the growth result is found as %100, which indicates the first floor of the Rietveld Scröder house is a highly flexible, adaptable.

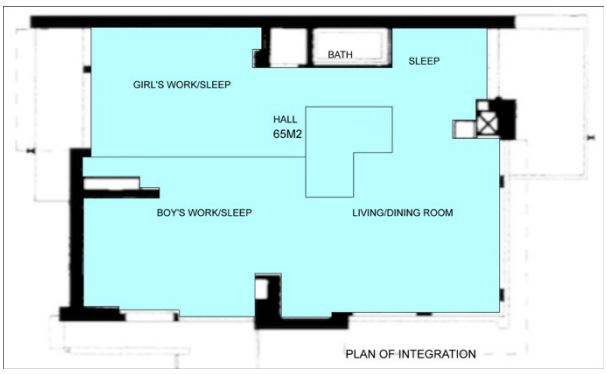
Lastly, convexity tool has been tested, and convex map has been drawn with justify graph and its found that by furniture addition convex break-up rises from 6 space to 28 sub-spaces which indicates space organization character of fix-furniture without blocking visual continuity and the permeability of interiors rises with this new architecture. (Table 3)

1.Integration

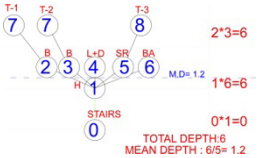
PLAN OF SEGREGATED SPACES OF RIETVELD SCHRÖDER HOUSE



MEAN DEPTH:2.75



PLAN OF INTEGRATED SPACES

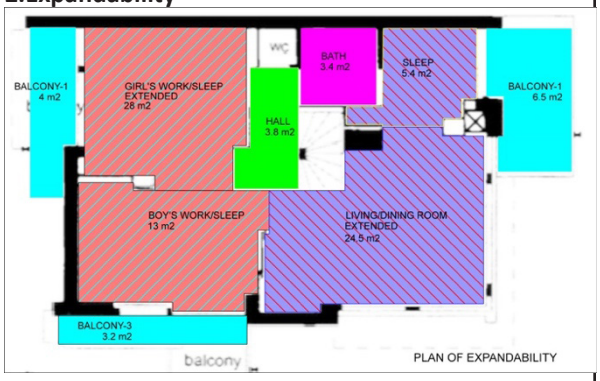


MEAN DEPTH:1.2

PLAN OF SEGREGATED SPACES:
1.GIRL'S BEDROOM=15M2
2.BOY'S BEDROOM=13M2
3.LIVING & DINING ROOM=19M2
4.SLEEP ROOM=5.4M2
5.BATHROOM=3.4M2
6.HALL=3.8M2
TOTAL AREA OF SEGREGATED INTERIOR PLAN= 60M2
7.TERRACE-1=4M2
8.TERRACE-2=6.5M2
9.TERRACE-3=3.2M2
TOTAL ARE OF OPEN SPACES=13.7M2

PLAN OF INTEGRATED SPACES:
1.HALL + GIRL'S BEDROOM+ BOY'S BEDROOM+ LIVING&DINING + SLEEP ROOM
TOTAL AREA OF FLEXIBLE PLAN=65M2

2.Expandability



EXPANDABILITY PLAN
1.GIRL'S BEDROOM (EXTENDED) + BOY'S BEDROOM=28M2
2.BOY'S BEDROOM=13M2
3.LIVING ROOM (EXTENDED)+SLEEP ROOM=24.5M2
4.SLEEP ROOM=5.4M2
5.BATHROOM=3.4M2
6.HALL (EXTENDED)=H+B1+B2=31.8M2
TOTAL AREA OF EXPANDED PLAN=106.1M2
***GROWTH %76**
7.TERRACE-1=4M2, TERRACE-2=6.5M2, TERRACE-3=3.2M2
TOTAL ARE OF OPEN SPACES=13.7M2
*TOTAL ARE OF INTEGRATED PLAN WITH TERRACES=119.8
***GROWTH %100**

3.Convexity
CONVEX MAP & JUSTIFY GRAPH
28 SUB-SPACES CREATED BY CONVEXITY AND MEAN DEPTH : 5.8

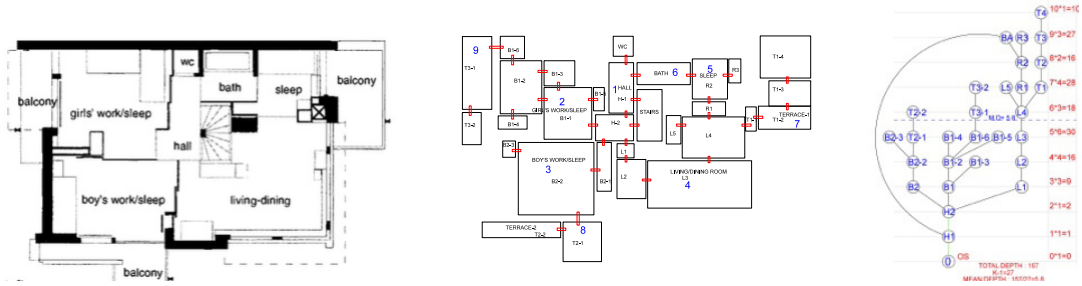


Table 3. Analyses of integration-expandability-convexity spatial tools with space maps, growth schemes and justify graphs.

4.3 Plan of Conceptual Spaces=Shape Grammar Application

This part introduces spatiality of Rietveld Schröder house with shape grammar revealing new space types; *'liminal, in-between, dual, repetitive, niche, open spaces'* that are different from traditional space definitions due to, spatial design is a new approach to spatial structure. Thus, hall is the in-between space and can be contributed to main spaces time to time, girl's bedroom and boy's bedrooms are repetitive spaces, they are volumetric repetition of same sizes and functions, thus, when they integrate a double spatiality and growth occurs. Living and dining room is a dual space which can be used for diverse activities and when integrate to sleeping room by movable partitions, a bigger space can serve for different activities. Sleeping room is a niche space with its small size and compact form. Lastly, bathroom and wc are the service spaces that are close with solid walls.

When these space types as sub-spaces in one big interior shell comes together, different types of compartments are created such as; by the integration of hall-girl's bedroom-boy's bedroom and even living-dining room an open public space occur with the un-partitioned mode of the interior. This time, furniture creates sub-spaces and different activity zones in the interior with high visibility.

Public compartment, differently from private compartment reflects a social spatiality with the open plan, on the other hand, private compartment contrast to social space, occur with the partitioned version where bedrooms are separated from social spaces. In addition, at Rietveld schröder house density relation have been observed, instead of overlapping, integration and segregation between different functional spaces occur by the movable partitions, and when partitions are open, space borders are created by floor material changes. In addition, interpenetration spatial relation occurs between living & dining room and sleeping room, sleeping room is a part of the dual space. By this way, new spatiality of Rietveld Schröder house has been revealed with new space types and compartments.

At this point, shape grammar has been used to express the spatiality of Rietveld schröder house, by plan and justify graphs. At shape grammar graphs **nodes** indicate; liminal (hall) space, repetitive spaces (girl's bedroom, boy's bedroom), dual space (living and dining room), niche space (sleeping room), open spaces (terrace 1-2-3), and **links** indicate spatial relations as density (movable partitions) and interpenetration, lastly **nodes + links** indicate; public and private compartments. (Table 4)

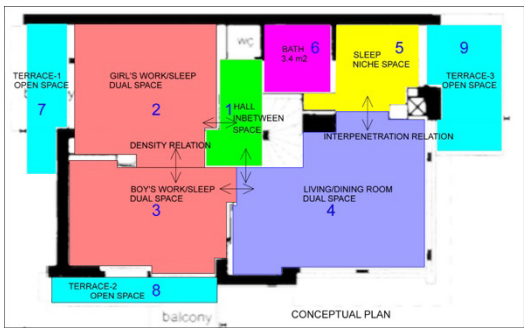
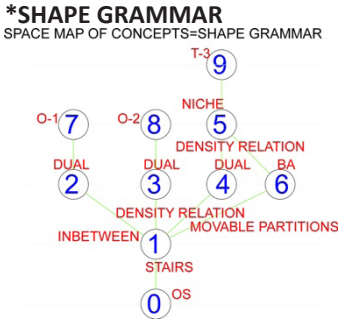
	**Plan of Concepts** **New Space Types:** 1.INBETWEEN SPACE = HALL 2. REPETITIVE SPACE = GIRL'S BEDROOM 3. REPETITIVE SPACE = BOY'S BEDROOM 4.DUAL SPACE= LIVING DINING ROOM 5. NICHE SPACE =SLEEP ROOM 6. SERVICE SPACE =BATHROOM **Compartments When Partitions Are Open** 1.PUBLIC COMPARTMENT: 1 HALL+ 2 GIRL'S BEDROOM+ 3 BOY'S BEDROOM+ 4 LIVING DINING ROOM 2.PRIVATE COMPARTMENT: 4+5+6= LIVING DINING+SLEEP ROOM+BATHROOM COMPARTMENTS WHEN PARTITIONS ARE CLOSE 1.PUBLIC COMPARTMENT= 1 HALL + 4 LIVING AND DINING ROOM 2.PRIVATE COMPARTMENT= 2 GIRL'S BEDROOM + 3 BOY'S BEDROOM
***SHAPE GRAMMAR** SPACE MAP OF CONCEPTS=SHAPE GRAMMAR 	**1.NODES:** 1 HALL, 2 GIRL'S BEDROOM, 3 BOY'S BEDROOM, 4 LIVING DINING ROOM, 5 SLEEPING ROOM, 6 BATHROOM **2.LINKS:** 1 HALL – 2 GIRL2S BEDROOM: DENSITY RELATION WITH PARTITIONS 2 GIRL'S BEDROOM – 3 BOY'S BEDROOM: DENSITY RELATION WITH FLOOR MATERIAL CHANGES AND PARTITIONS 4 LIVING DINING ROOM – 5 SLEEP ROOM : INTERPENETRATION RELATION 1 HALL – 4 DINIGN LIVING ROOM : DENSITY RELATION WITH FLOOR MATERIAL CHANGE AND PARTITIONS **3.NODES AND LINKS :** PUBLIC COMPARTMENT: 1 HALL+ 2 GIRL'S BEDROOM+ 3 BOY'S BEDROOM+ 4 LIVING DINING ROOM PRIVATE COMPARTMENT: LIVING DINING+SLEEP ROOM+BATHROOM

Table 4. Shape grammar application indicating new space types, spatial relations and compartments,

5.CONCLUSION

At the study its aimed to demonstrate new spatiality of contemporary interiors, and spatial design as **concept of space in interior** architecture with the contributions of; Colomina, Lefevbre and Doesburg's space theories which all believe that **concept of space in interior architecture** is different from traditional space organizations with closed rooms and corridors relations and expresses a new **concept of space in interior** architecture that accommodates interdisciplinary arts as; painting, fashion that are integrated scenario and lifestyles which as indicated by Wright ; ' architecture is an art of space creation', and as emphasized by Teymur ; 'Space is a 3 dimensional way of creating art, and it can not be thinkable without human'. Thus, in the study, all three theories demonstrated the artistic way of space creation, fashion by Colomina, lifestyles by Lefebvre and sculptural furniture that shapes (border) spaces by Doesburg. And the answer to the main research question has been revealed as above;

Q-1: What is the main link and relationship between the theories and contemporary interior architecture (spatial design) ?

By Colomina's space theory, two distinct space approaches have been examined that create new spatial structures in one open shell but in different ways and the conceptual definitions from Colomina resulted as; Raumplan versus Plan Libre, introverted versus extraverted, theather stage concept versus functional space concept. The only common feature between Loosian and Corbusier's space architecture was the way open plan organization had been structured. One of them used level changes and cubic repetitive spaces that are linked to each other by stairs and due to introverted character of the houses occupants watch other occupants and other spaces with the very less windows and openings. Thus, the outside integration does not exist at Loosian houses, but contrast, Corbusier used skeleton structure device and covered exteriors with huge glasses, where occupants inside the houses watch outside and all spaces are integrated inside the houses openly. Thus, Corbusier's approach is far away from Loos's artistic theatral fashion base space approach and introduces new generation houses with a functionalist approach. Thereby, both approach is linked to integration tool of the study with different ways.

On the other hand, social space is a social product approach as indicated by Lefevbre, is demonstrated in the study with expandability tool, which time to time through social necessities spaces can growth, thus, this changing activity adaptation of spaces have been ensured by new spatial relation and identifiers in a flexible way by using level changes, material changes, mobile separators, camouflage furniture, nodal elements and 3d space modules that able integration of spaces very easily and quickly.

The last theory, the visibility and permeability of Rietveld Schröder house, on the other hand, totally demonstrates the furniture effect on the perception of sub-spaces in one big interior shell, and especially the rise of space numbers at furnished open plan configuration indicates the importance of convex break-ups of convexity. At Rietveld Schröder house, instead of solid walls construction, the spatial perception comes forward with the unblocked visibility between occupants of the house.

At this point, study collect important spatial concepts from these theories and connect them with spatial design as new **concept of space in interior** architecture, that is different from traditional space organization, and increases quality of interiors by the way responding diverse user scenarios with; artistic, functionalist, social, perceptual points of view, thus, these theories support spatial design from many points of view, and ensures adapts diverse user scenarios, at the end, study shed a light for user adaptable and lifestyle integrated living scenarios from spatial point of view.

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