Chapter 12

An Evaluation of Measuring the Publicness Level of Interiors in Public Building Design: Visual Graph Analysis (VGA) Approach

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ABSTRACT

This study examines the publicness level of the interior spaces of public buildings. As a method, VGA (visual graph analysis) is used for analyzing the early design phases of selected municipal service buildings. In this study, the authors utilized from VGA for quantifying the publicness level of the two selected architectural competitions of municipality buildings. The method allows us analyzing the floor plans of each project in obtaining an eventual assessment of permeability and accessibility which give an idea of the levels of publicness comparatively. Subsequently, representation parameters are compared under two main criteria: connectivity and integration. The aim of the study is to understand the level of publicness and efficiency of spatial settings for the users circulating in the public buildings, which have dissimilar plan schemes. This method would be used by the designers for early design stage and provide useful feedback for understanding the level of accessibility and permeability of the structures and adjust their schemes accordingly.

DOI: 10.4018/978-1-7998-5849-2.ch012

1. INTRODUCTION AND MOTIVATION

Municipal service buildings, which reflect public structure, identity and the society's periodic ideological stance, represent an important type in these public administration structures. Therefore, public administration buildings and within these, municipal service buildings, assume an important role of visual mediation between the public and the administration. Functional and formal maturity is simply not sufficient by itself for a representative aura of municipal service buildings. This is why municipal service building designs represent an important type in terms of examining the concept of publicness and publicness value. Additionally, public buildings are defined as a public domain, where everybody can use the space in an equal way, and which does not belong to a particular person, affinity group or foundation. In this context, public usage becomes crucial.

In the late 20th century, public realm discussions increased in the global architectural agenda after Hannah Arendt, Jürgen Habermas and Richard Sennett published their explorations on public space. In 1984, in Turkey, after the drastic social and political changes of 1980, one of the most significant liberal changes introduced was the sovereignty of local municipalities in the development of a master plan, instead of a central government and The Ministry of Public Works. The aim of this this study is to determine the changes in the design of public space use of service buildings. In order to do that, this research focuses on analyzing selected architectural competitions of municipality service buildings from 1984 to 2013. This study focus on the selected architectural competitions of municipality buildings for design experimentation and simulation that can be used at an early design stage. In pursuing this specific goal, the following questions constitute the core of this study:

- How can we interpret the publicness level in the spatial layout of municipality service building design of architectural competitions?
- How does the publicness in the spatial layout of the architectural design competition projects differentiate?
- How can we understand the forms of publicness through examining the physical structure of architectural designs?
- Can Visibility Graph Analysis (VGA) method be used as a quantitative tool to determine the differences in the publicness levels of the projects in terms of permeability and integration?

This study's content is based on selected municipality buildings with criteria to determine the publicness level through permeability. The criteria are consisted of being chosen from the national competitions, which concern the architectural programs of municipality service buildings. The selected projects were picked on the basis of the precondition that they are smaller than 20.000 m^2 and they do not serve for any other public utilities and neither contain any function that belongs to the buildings of other types. This filtration process provided a shortlist of two selected projects.

In this study, however, only plan schemes have been used, because this study does not only analyze public measures according to real structures and spaces, but also examines from the perspectives of the designers and their design reports. These levels of publicness belong to closed spaces of the selected municipality service building projects. The study focuses exclusively on the publicness levels of closed spaces, as opposed to open public spaces. In this regard, it provides a new frame of measuring levels of publicness for these locations, which can be measured by integration and connectivity measures of visibility graph analysis.

1.1 Method of the Study

Architectural design competitions are the main sources of creative novelty in the architectural history of a country. Jury reports, competition contracts, jury criteria for the winning projects are the sources that transfer information tools. In this context, architectural design competition projects become the repository for architectural understanding over long time-ranges. Statistics of architectural design competitions indicate that these are mostly opened for public buildings, especially for municipality buildings in Turkey. The method of this study is based on space organization analysis of selected architectural competitions of municipality building designs' layouts through their level of publicness. This measuring is based on the conceptions of the selected projects. Interpretation of results stand on the measure of integration and the correlation between most used common spaces and their functions, correlation of public areas and the cores and way-finding. Therefore, this study investigates the relationship between the spatial layout of the selected architectural competitions of municipality buildings and their public usage. Additionally, the level of publicness in the selected floors of the buildings are examined through the original design phase of each building. Project's floor plan layouts are analyzed by the visibility graph analyses. Subsequently, the results of the analyses are normalized to compare with each other in consequence of having different plan type.

2. SPACE SYNTAX AS A QUANTITATIVE APPROACH IN SPATIAL ANALYSIS

Space syntax is a theory and a method to analyze spaces both in urban and building scale. The method was developed by the research team led by Bill Hillier in the University Collage London (UCL) since late 1970s. As mentioned in the book of 'The Social Logic of Space' written by Hillier and Hanson in 1984, space syntax method is used to understand the relation of social life and space. The theory based on that social life comes out from the space's physical organization (Hillier and Hanson, 1984). There are studies on space syntax that have analyzed the relation between spatial layout and movement (Koohsari, M. et al., 2019), (Turner, A. et al., 2001), (Othman, F. et al., 2019), communication (Bafna, 2003), personnel encounters (Goldfarb, M., Donegan, L., 2017), co-awareness and way-finding (Hedhoud, A., et al. 2014). Space syntax method is used as an analytical method, which scholars have used to describe spatial arrangements on permeability that refer to physical environments with spatial behaviors (Hillier, 1984).

Space is a vital environment that is comprised of bringing individuals together, allowing them to perform their actions and detectable limits. There are lots of definition of space until today (Lefebvre, 1991), (Soja, 1996), (Hasol, 1998). Kuban (1998) mentioned that space within a building is a phenomenon that created by restricted space and common elements of the limits together and it is impossible to define it with only its limits and volume. Lefebvre (1991) defines space as a social product or a complex system that based on values and social production which affects spatial perceptions and practices (Lefebvre, 1991). It can be described in accordance with geometrical rules or rational aspects and perceived by anyone who moves in space as a subject different, emotional and irrational (Ataç, 1990). Benedikt (1979) describes space as;

"Historically psychologists and architects have shared a vital interest in the nature of space. Coinciding with the birth of modern experimental psychology, it was the late nineteenth century when space was first propounded as being of the essence in the experience of architecture" (Benedikt, 1979, p.20).

Physical components have a great impact in the formation of space together with the influences of human behaviors and relationships. Social and cultural structure are the predictors of human's behaviors to the contrary physical spaces. There are two main subject of a spatial form. These are the residents, who live within the space and the relationships of the residents with visitors who are coming from outside (Hillier and Hanson, 1984).

According to Hillier (1993); space is one of the primary means by which the ascent of a building as cultural transmission to architecture and a theoretical intent is made. This means that one aspect of the abstract comparability of forms in architecture centers on spatial form, which implies space as an objective property of buildings. Hence, buildings and cities stand for us in two different ways; as the physical forms that we see, and as the spaces that we use and move through. After the late nineteenth century and onwards, architecture began to represent theories about space. During the twentieth century, space was increasingly articulated as a dimension of architectural expression. By the end of this century, most architectural and urban theories include a chapter related with space (Hillier, 2005).

On the other side, Hillier (1993) explains what spatial forms carry in the book of *Space is the Machine* as below:

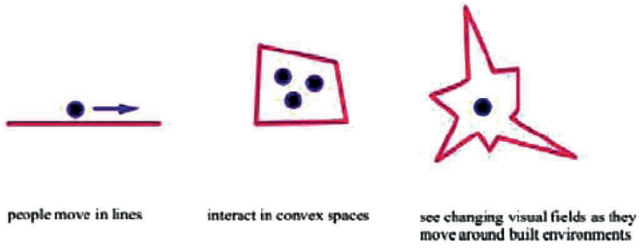
"It is because this is so that spatial organization through buildings and built environments becomes one of the principle ways in which culture is made real for us in the material world, and it is because this is so that buildings can, and normally do, carry social ideas within their spatial forms. To say this does not imply determinism between space to society, simply that space is always likely to be structured in the spatial image of a social process of some kind" (Hillier, 1993, p. 52).

According to Hillier and his colleagues (Hillier and Hanson, 1984), the relation between social structure and space have a mutual interaction. Space is a product that is affected by the society and social structure, as well as it affects the society (Hillier and Hanson, 1984). The concept of spatial enclosure defines the space by reference to the physical forms. (Hillier, 1993). Hence, space syntax focuses on creating a platform for space and society to give a spatial nature to society as well as giving a social dimension to space (Karimi,1997). Today spatial approach is benefited from architecture, urban design, planning, transport and interior architecture to archeology, information technology, urban and human geography, anthropology, landscape architecture and informatics. This method is not only being used to understand the city's physical components and the relationships between them, but also aims to understand the social, economic and conceptual components and the relationship between the physical components. Space syntax, including housing and urban scale is used to analyze the spatial organization of different scales (Steadman, 2014).

Hillier and his colleagues (1987, p.217) define space syntax as "a model for representation, analysis and interpretation". Building entrances have a role in forming the relation between the inside and the outside as well as the residents and the outsiders. The understanding of the method stands on how buildings gather together and define a continuous open system (Hillier et al., 1987).

Space is not the background to human activity, but more than that it is the background to the movement (Hillier, 2005). So there is more an intricate relationship between space and movement. Space is as a fundamental state of everything human beings do (See Figure 1.). In this sense, there are three types of spaces. Linear space, as people move through space, convex space as people interact with each other in a space, and isovist space as people have different point of view from a particular point in space. How we use or experience space is described by each of these geometric organizations. For this reason, how we

Figure 1. Movement and Space
(Hillier, 2005)



create, use or understand spatial configuration stands on how the buildings and cities are organized in terms of these geometric ideas. Geometric language reflecting human behavior and experience creates the language of the city (Hillier, 2005).

Space syntax methodology identifies relational characteristic of space as spatial configuration and proposed the idea that it is its characteristic forms which define human behavior and social knowledge. Space syntax aims to develop strategies for the description of configuring inhabited spaces with underlying social meanings. Effects of spatial configuration on various social or cultural variables let the research field to develop more practical explanations. Thus, the methodology seeks to understand not only the configured space itself, but also its developmental process and its social meaning (Bafna, 2003).

2.1 Public Space Studies in Space Syntax

Space syntax covers the properties as spatial and physical characteristics of space, accessibility of movement networks (pedestrians, bus, cars etc.), pattern of land-use attractors and quality of public realm. Besides, space syntax has pioneered the development of new techniques for the public space. There are various studies examining the accessibility of public squares within cities via using space syntax method. These studies either assessed how integrated those public spaces within the urban grain of the city or examined their location for the possibility of use by various residents or visitors (Ruben, T., 2012), (Knöll, M. et al., 2015), (A. Barry, G. Thomas et al., 2012). Hillier (1984) studied on the performance of public spaces that a successful urban square depends on the correct balance between static and moving people, whereas the number of people choosing to stop and make informal use of the public space. This value is calculated by the sum of integration values of all lines. (Hillier, 1984).

The most important point in space, which comes together and creates a meaningful whole is relational structure. In order to understand relational structures of space, *morphological studies* should be carried out. Morphology, in the most general sense is known as physical form or structure formation, -morph meaning shape, fom and –ology meaning knowledge (Hamawand, 2011), in "Architectural Morphology "(1983), it is mentioned that past and present design mainly deals with the composition and shape of architectural elements and bringing together the two-dimensional space and its elements. In order to determine the process of bringing the spaces together, it is emphasized that spatial relationships should be understood and efforts should be made to solve the structure formation (Steadman, 1983). The concept of building and space analysis in architecture is defined by the structured physical environment. This definition occurs according to different criteria as a result of the architectural design and building construction. Configuration on space syntax techniques defines the abstract relational order of the structure's

characteristic forms (Hillier and Hanson, 1997). It does not only define the simple relationship but also the complex relationship between each element.

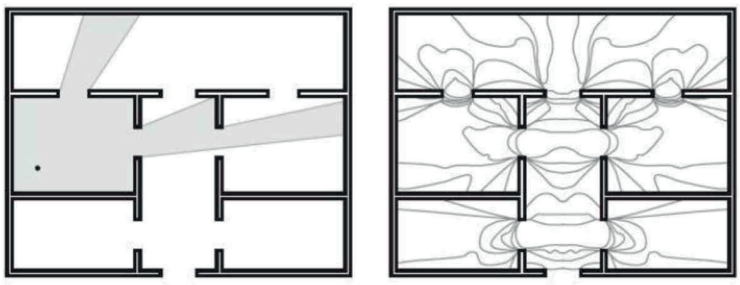
In many areas such as; architecture, urban planning, interior design, landscape architecture, transport and IT, space syntax methods are used. In parallel with, representation graph varieties and scales belonging to "Space Syntax" and "VGA" method, application areas and units of measure are discussed. VGA focuses on building scale. Amongst the classification of the spatial analysis in the research, VGA will be used as a method to understand the spatial configurations and linkages between physical environments. Besides, VGA is identified as a method for providing social understanding of buildings in terms of way-finding. The reason for application of this scientific method is the numerical and statistical data desired to be obtained in the changes of the selected public projects for further correlations between integration, connectivity and circulation. Mapping of the space organization and the accessibility of the changed situation through forms of publicness is examined with this method. It helps to enunciate the social meaning behind the confirming inhabited spaces. When trying to find measurable indicators for each of the themes of publicness, it is understood that a crucial aspect related to a space's publicness is its accessibility. The accessibility of a public space can be judged by its own connections to its surroundings both physical and visual. A successful public space is visible both from a distance and up close as well as easy to get to get and get through (Whyte, 2000). Based on the small-scale buildings and public building type studies, VGA method is used.

2.2 Visibility Graph (ISOVIST)

The application of visibility graph analysis to building environments was first introduced as early as 1980 by Braaksma and Cook (Turner, 2001). They calculated the co-visibility of various units within an airport layout, and produce an adjacency matrix to represent these relationships, placing a "1" in the matrix, where two locations are mutually visible, and a "0" where they are not. From this matrix, they present a measure to compare the number of existing visibility relationships with the number which could possibly exist, in order to quantify how usefully a plan of an airport satisfies a goal of total mutual visibility of locations (Tahar and Brown, 2003).

Visibility analysis and the use of isovists are introduced in the form of analysis, isovists and isovists fields by Benedikt (1979), in which he defines isovists as 'the set of all points visible from a given vantage point in space and with respect to an environment' (Benedikt, 1979, p.49). Measures of isovists,

Figure 2. The isovist and isovist field
(Turner, 2004)



such as their areas, perimeters, circularity and radials variance and skewness can be used to compare the quality of different spatial experiences (See Figure 2).

Established on the idea from Benedikt (1979) that involves the experience of a space is related to the interplay of isovists, Turner and his colleagues (Turner et al., 2001) developed the technique of *visual graph*. This is used to determine how visible any point in the spatial configuration is from any other point. Based on the technique, they developed the software which is called "Depthmap", that divides any given plan into a grid, whose size can be determined by the user. All mutually visible points across the grid are connected. The resulted visibility graph has two sets of elements, the set of vertices and the set of edge connections joining pairs of vertices. The properties of isovist are represented in several different measures based on (according to the) the number of vertices and edges (Turner et al., 2001). Visible points can be transferred into accessible points in the context of program. All mutually accessible points across the grid are connected as well. Accessibility analysis regards glass walls and ponds as blocks considering accessibility whereas these are visible in visibility analysis based on the aim of the study. All mutually accessible points across the grid are connected as well. Based on the aim of the study, visibility analysis and accessibility analysis are used. This method is to understand how visual characteristics at locations are related and one that has a potential `social' interpretation. Graph based representations used in social theories of networks lead us to use isovists to derive a visibility graph of the environment, the graph of mutually visible locations in a spatial layout. Through movement and occupation of the environment that the graph represents, the effects of spatial structure on social function in architectural spaces become defined (Turner et al., 2001). In this sense, the visibility graph is a tool with which we can begin consciously to explore the visibility and permeability relations in spatial systems. The relation between visibility and permeability is a vital component of how systems work spatially and are experienced by their occupants (Tahar and Brown, 2003). In invisibility graph analysis, it is aimed to analyze the organization of movement in complex structures such as museums, hospitals and exhibition centers, the analysis of important parameters to improve the quality and sharing of structures especially like museums, pre-construction choice of location for any structure or activity, estimate of the effects of the newly added structure to the urban scape in the context of organization of movement, determination of the interior organization of architecture, investigation of indoor use in the historical development of traditional architecture and to investigate the effect of space organization in the variations of the typology of structure (Su & Sailer, 2015).

Visibility Graph Analysis (VGA), one of the spatial analysis techniques that particularly emphasize the role of visual information on space syntax, concerns the effect of the visual information on the choice of movement routes. In order to investigate the relationship between spatial layout, the delivery of social network spaces, and space use patterns are directly observed from Visibility Graph Analysis (Turner, 2001). Subsequently, the predicted movement of sighted persons in the same spaces is determined by the use of the Depthmap software. From the results provided by this software we utilized the connectivity and integration values.

Depending on the nature of the boundaries, the accessibility, i.e. permeability, and visibility between inside and outside can be controlled. Both permeability, where you can go and visibility what you can see directly, affects how buildings are xxx organized? in general. Visibility analysis provides that visual fields have their own form that result from the interaction of geometry and movement and that the shape and size of the isovist is especially important in relation to the information provided to the observer (Güney, 2007).

Visibility Graph Analysis is used to calculate the visual integration and connectivity of each building in a technical way. Apart from storage areas, elevators and staircases, all spaces were included in the analysis.

2.3 Syntactic Measures of Space Syntax

The spatial relationship between the spatial elements such as boundaries, convex spaces, axial lines and units can then be described by several measures. By applying these measures to the description of building form, space syntax scholars believe they can capture the spatial and functional differences in different plans (Chai, 2012). Hillier and colleagues (1983) consider each place as a system in which each point has two dimensions. The first dimension is the immediate relationship of the point with its environment (local dimension), the second dimension is the point's place in the overall system (global dimension). These two features come together to create patterns with different characteristics (Hillier, 1983). In other words, spaces create sub-spaces with different degrees of integration and perception. Thus, analysis of the graph is divided into two types as global and local measures. Global measure refers to be constructed using information from all the vertices in graph whereas local measures refer to be constructed information from the immediate neighborhood of each vertex in the graph. The user may elect to perform both or either of these types of measure by selecting from the program according to the aim of the research (Turner, 2001).

Briefly, connectivity and integration are reviewed as the representation of spatial elements in the building layouts of this study. Remarkable result with respect to way-finding and usability issues is the correlation of integration with connectivity. Hence, this study utilizes from the two space syntax measures; *integration* and *connectivity.*

2.3.1 Connectivity

Connectivity is a local spatial property that refers to how many immediate neighbors each node can see. It refers to the degree of direct visual connection (Turner, 2004). Connectivity or degree of a node captures the amount of space directly visible or accessible from another space. It measures the depth between spaces and refers to the degree of intersection.

In the analyses routes with high connectivity values are shown with warm colors. Spaces, which are connected to more spaces are respectively shown in red, orange and yellow colors means that these spaces are more permeable and connected to other spaces in the configuration. Additionally, the correlation between local and global values is called 'intelligibility'. The spaces, which have the higher value of local and global means that these spaces have the high potential for meeting points.

2.3.2 Integration

Integration value is a global measurement. It refers to a measurement of the depth of a space within the existing relationship. If the integration value is low, it indicates that the space is shallow, means that the space is not integrated to the whole spatial organization. (Hillier, 2007). In other words, less integrated spaces mean they are the places visited less by the people. Integration measures how many turns and changes one has to make in order to access from one space to the other in the whole system. It discloses how a space is related with the whole in terms of integratedness and segregatedness (Can, 2011). A

place has the value of being a strong option means choice, when it has the shortest transport routes, it is linked to all places in the system and pass through facilities have been provided. These differences manage the effect of space of movements within the system. Less deep space will attract more movement and the deeper space will attract less movement (Hillier, 2001). This depth will give the most important formation related to the whole which is the integration value. This states clearly the inverse relationship between the value of depth and integration values. It is a measure which indicates the encounter rate and intensity of use. If more accessible places are considered as syntactic centers, integration values are used as criteria for the comparison of different sized systems. The higher the integration value of a site line the shallower the place, the lower the integration value the deeper the place (Hillier, 1983). In other words, the higher the integration value the more accessible the place, the lower the value the more difficult it is to access the space in the system. Integrated places have the potential to bring together all the people that live in a place or who are there for any reason. The most integrated spaces are places where you may even pass through to go somewhere else. These places are called integrated cores. Integration value; is calculated by calculating the average depth value for each line for all lines in the system (n). This is the global integration (R-n) value for the whole area (Hillier, 1984).

Integration value is the main criteria for space shaping parameters. According to this, accessibility rates are expressed respectively with red, orange and yellow color lines (Gündoğdu, 2014).

Spaces of the whole system can be ranged according to their integration levels. Space which stands in the middle of the whole system, the spaces around it get increased then it shows that the space is integrated. It shows that the space can be accessible according to its integration level. According to Hillier (2005), the closeness of each element to all others is in fact the integration value of a space, we can color from red for high integration through to blue for low in order to understand the degree of accessibility (Hillier, 2005). They are represented as a spectral range from indigo for low values through blue, cyan, green, yellow, orange, red to magenta for high values (Turner, 2001).

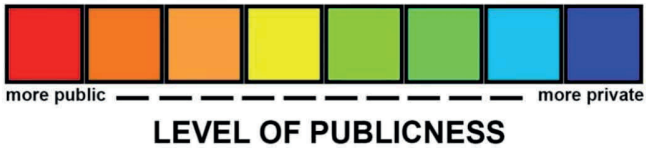
3. CASE STUDIES: PUBLICNESS CONVERGENCE OF MUNICIPALITY BUILDINGS

The selected projects on municipality service buildings in Turkey are examined by VGA analysis. This method allows the selected floor plans of each project to be analyzed in purpose of obtaining an eventual assessment of permeability, which is the level of publicness. Collected results in the form of thematic maps and mathematical values that reflect permeability levels are then compared with the jury reports of each competition. Chosen from the national design competitions which concern the architectural programs of municipality service buildings, the selected projects were picked on the basis of the pre-condition that they are smaller than 20.000 m^2, they do not serve for any other public utilities and neither contain any function that belongs to the buildings of other types to make them comparable with each other. This filtration process provided a shortlist of two selected projects. The data for the analysis was prepared by conducting a CAD file drawing of each project plan. This data was then specifically prepared on the basis of Depthmap requirements in order to be made ready for the eventual VGA analysis.

Towards analyzing the integration and connectivity relations of specific municipality service buildings of architectural design competitions, a VGA is implemented on each building's chosen floor on the basis of its relation with the ground level and public usage. All spaces except storage areas are included in the analysis. It is important to emphasize that the set grid parameter in the Depthmap program was selected

to be a standard 0.5 at all projects since this allowed the specific identification of permeability and integration levels in the study to be defined on a common basis of publicness level. Visibility representation parameters are compared under two main criteria: *Connectivity* and *Global Integration*. The adjacency matrix specifies the relationship between the locations by allowing '1' to indicate the mutually-integrated locations and '0', to the non-integrated locations. In consequence of this, the VGA integration measure was found to be a highly significant discriminator between the preferred and non-preferred locations in terms of privacy. The integration and connectivity maps obtained from the analyses are interpreted according to a color chart that exhibits a range from red to blue. The chart basically indicates that the red color represents a high level of publicness and connectivity, whereas purple or the darkest blue represents a high level of privacy and lower level of connectivity (See Figure 3.).

Figure 3. Color range of Depthmap



Since the building layouts comprise of different scales and involve detached buildings on the same floor, the integration and connectivity values obtained from each building were normalized through dividing these specific values into the number of the grid cells of the nodes. This calculation procured an integration and connectivity value for each node, ensuring different buildings to become comparable on a standard plain. Total visual node counts were taken from Depthmap. Subsequently, high integration and connectivity values belonging to each of the building layouts were taken from Depthmap column properties for calculating the selected visual node counts with high integration and connectivity values. In order to calculate the percentage of areas with high levels, the selected visual node counts with high integration and connectivity values were proportioned to the total visual node count of each layout. These values and percentages were evaluated with circulation percentage of the projects. This is how the circulation areas reveal public usage and accessibility. Each of the projects is assessed on the basis of four criteria, listed below:

- Remarks in the report that reveal jury's evaluations on publicness and public use of the project.
- Remarks in the report that reveal competitors' interpretations on publicness and public use of the project.
- VGA analysis and its results; integration and connectivity levels, critical access points (their relation between the core – staircases and elevations), the most and the least accessible and integrated public functions of the layouts.
- Comparison of the relative percentage of high connectivity and integration levels with the relative percentage of circulation areas of each project.

In order to provide a series of sample buildings which can be studied through comparative structural analysis, the below criteria has been followed:

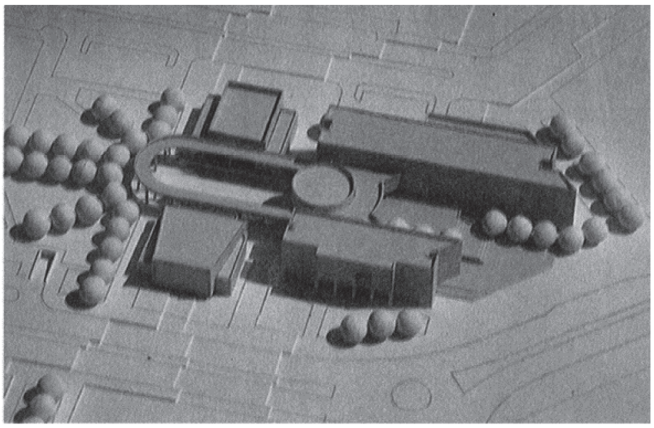
- The examined architectural competitions were limited only with national architectural competitions in Turkey.
- Architectural Design Competitions were selected if only their program covers administrative and public functions of municipality service buildings. The competitions, which also include mixed used functions were excluded in order to provide programmatic homogeneity of the samples.
- The size of the selected samples was narrowed down to a maximum of 20.000 sqm. in closed space. Because bigger municipality building's spatial layout changes as its corporate structure changes.

Within these framework, nine projects were selected in the thesis whereas in this study two projects are discussed regarding plan type as; fragmental and compact: Gaziantep Municipality Service Building project and Karabük Municipality Service Building project.

3.1. Architectural Competition of Gaziantep Municipality Service Building Design (1986)

Gaziantep Municipality Service Building Design Competition was held by Gaziantep Metropolitan Municipality in 1986. Hasan Özbay and Tamer Başbuğ were awarded by the jury. The project is approximately 20.000 m^2 (Circulation, elevators and staircases etc. included) (See Fig. 4., 5.).

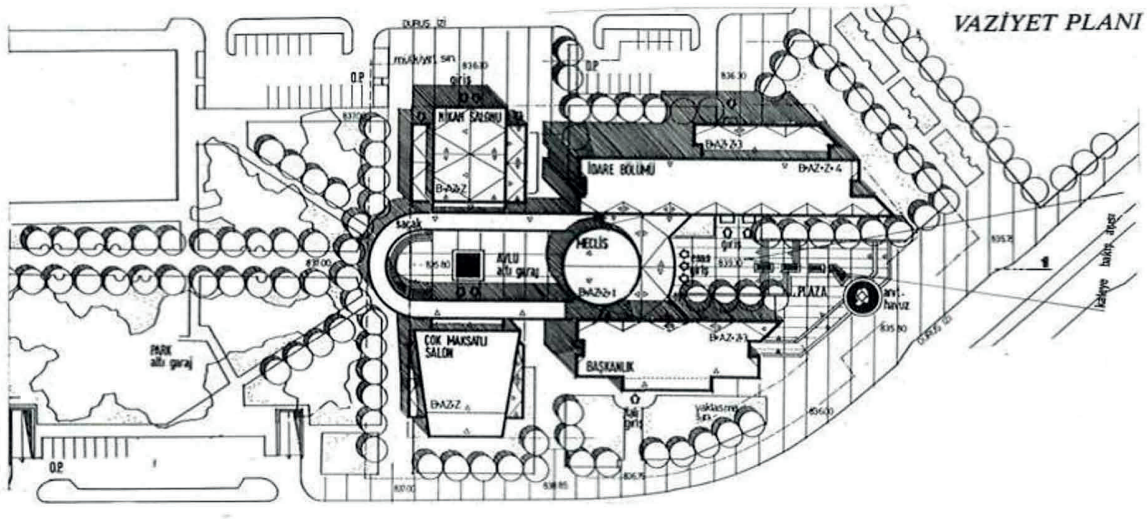
Figure 4. Municipality Service Building Competition, Model



3.1.1. Design Approach of the Designer

According to the designers, the main idea of design relies entirely on the 'council chamber'. The platform that rises through the eastern and western directions ends by the council chamber; constituting the main entrance. At the very center of the geometry, the Council Block (Figure 4. and 5., Building SG2) possesses important functions. Its ground floor includes the main entrance, its sub-ground floor the dining hall and its basement floor, the kitchen and depots; all of which are the common spaces used by all of the units of the building (See Figure 4. and 5.). The council chamber structure around the other four

Figure 5. Gaziantep Municipality Service Building Competition, First Prize, Site plan



masses constitutes the president's office and relevant offices. The other side of the president's office is inhabited by administrative offices. The remaining two blocks are located around the yard, incorporating the wedding hall and a multi-purpose hall. (See Figure 4. And 5.) Thus, each single unit is defined as a proper functional group and the function groups altogether complete a whole.

3.1.2. Jury's Evaluations on the Project

The jury members have found the overall composition formed by the scaled outdoor spaces on the background of the outside blocks from the city centre compliant and positive. The continuity of the entrance axis that develops through the east and west; the controlled entrances located at the northern and southern directions and the continuity of the spaces that remain between the outdoor spaces and the blocks have also been found favorable. It is furthermore emphasized in the report that the indoor and vertical circulations in the project bear an excellent relation. The jury deemed that there exists sufficient wideness in the indoor circulation and that the milestones of this circulation, as well as the direction choices in the general planning, the publicness function of the yard, the relation of the wedding hall with the car park and the entrances are all well-defined. The plastic of the outdoor and indoor spaces in addition to the mass in scale of the indoor and outdoor spaces were especially found successful. The building's public use was given importance by the jury and specifically mentioned in the jury report. On the other hand, the wedding and meeting halls were found small in terms of size by the jury. It is reported that the lack of visual connections of spaces and the invisibility of the entrances from the highest plato are found inadequate in means of accessibility (Specifications, 2015).

3.1.3. VGA Analysis and Results

According to the results put forth by the integration and connectivity maps of the sub-ground floor, the highest connectivity and integration value belongs to the part of the foyer at the wedding hall entrance

Figure 6. Gaziantep Municipality Service Building Competition, First Prize, Connectivity map of sub-ground floor plan

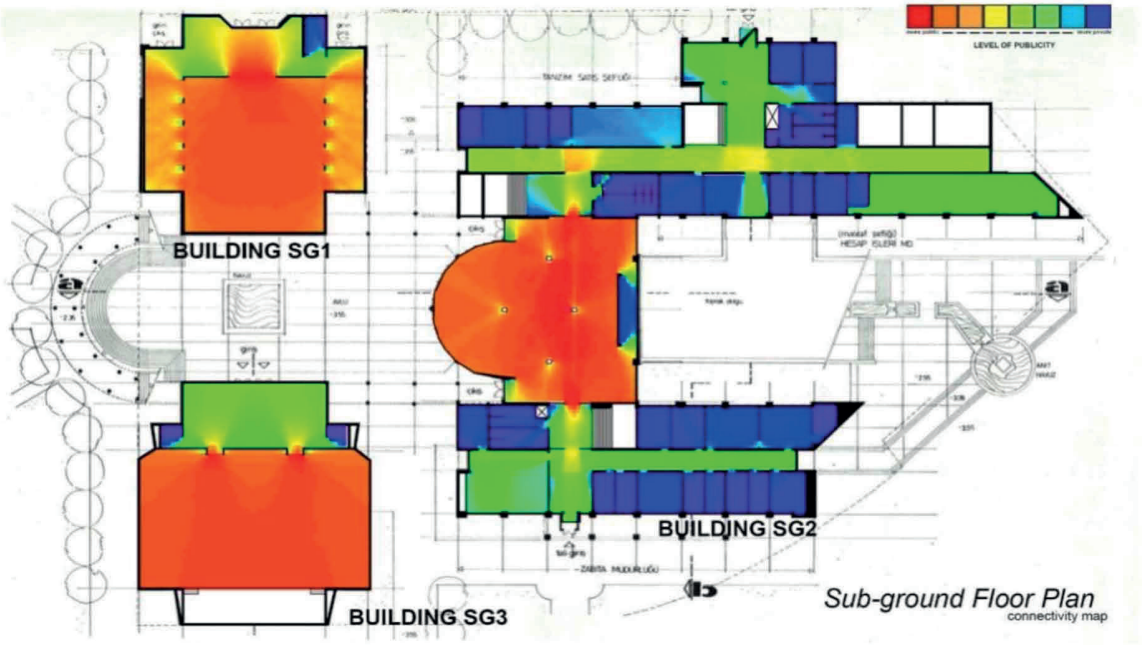


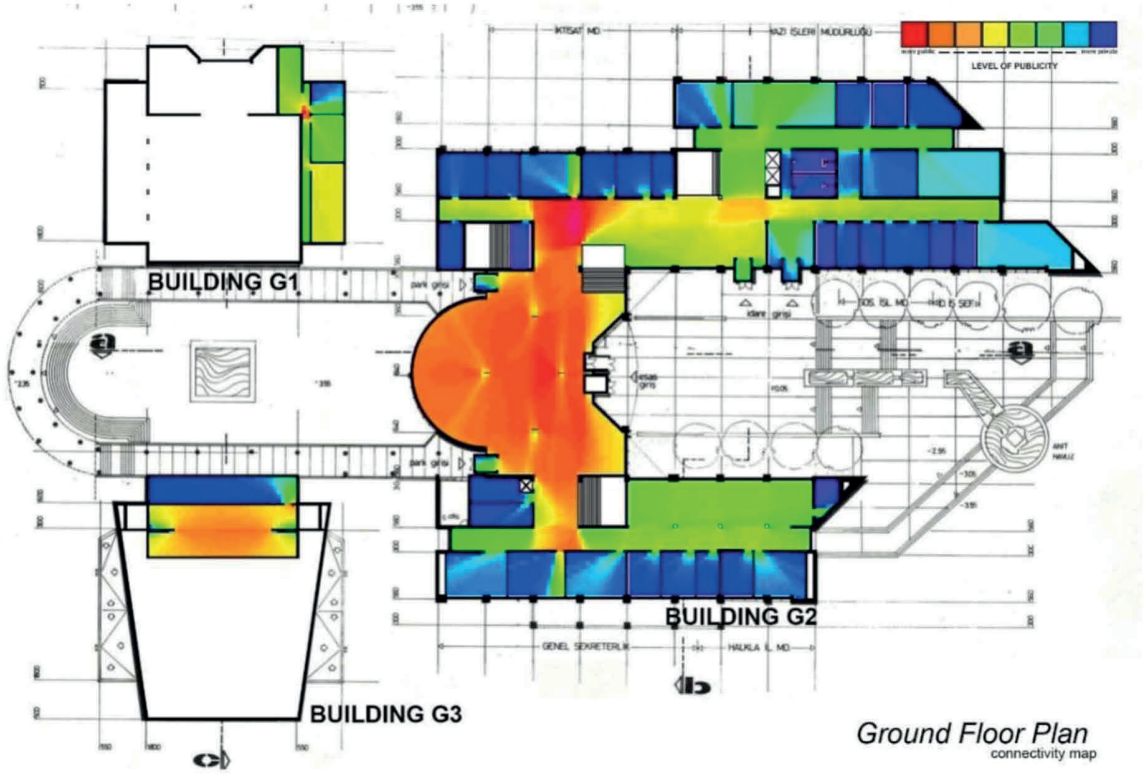
Figure 7. Gaziantep Municipality Service Building Competition, First Prize, Integration map of sub-ground floor plan

in Building SG1 (HH Value:107.475, Connectivity Value:2298). The lowest connectivity and integration value meanwhile, is identified at the staircase that is close to the entrance. (Connectivity Value: 83, Integration Value: 9.04) It can be figured out from the layout of the Building SG1 that the wedding hall has been planned as the main public space (See Figure 6.).

The integration and connectivity maps of Building SG 2 on Sub-ground plan indicate that the highest integration value belongs to the dining hall (HH Value: 11.73, Connectivity Value: 2146) Spaces located at the northern and southern part of the plan scheme, such as the offices, are the deepest spaces of the layout. (Connectivity Value: 29, Integration Value: 2.37) (See Figure 8. and 9.) (See Table 1.).

The multi-purpose hall is the space with the highest connectivity and integration value at Building SG3 (Connectivity Value: 1804, Integration Value: 55.15). The lowest connectivity and integration value meanwhile, belongs to the service places on the eastern and west side of the foyer in Building SG3 (Connectivity Value: 10, Integration Value: 4.77) (See Figure 8. and 9.).

Figure 8. Gaziantep Municipality Service Building Competition, First Prize, Connectivity map of ground floor plan



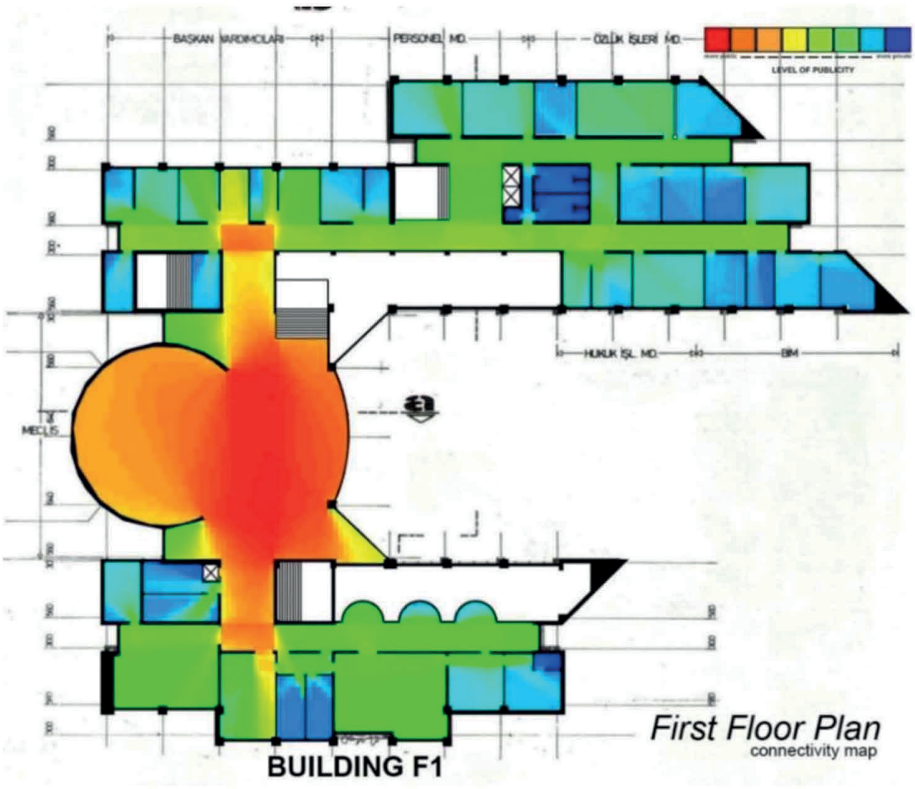
Ground Floor integration and connectivity map results set forth that the corridor intersection area is the most integrated and connected public space in Building G1 (Connectivity Value: 52, Integration Value: 52.48). The deepest space meanwhile, is the office next to the staircase. (Connectivity Value:1902, Integration Value: 6.60) In Building G2, the corridor in the northern side which connects the exhibition

Figure 9. Gaziantep Municipality Service Building Competition, First Prize, Integration map of ground floor plan

hall and the economy department appears to be the most integrated and connected public space (Connectivity: 2031, Integration Value: 90.777). It opens to more spaces than the spaces at the southern part. The deepest space is the archive which bears the lowest level of integration, connectivity and publicness. This result is natural since this room needs to have a high level of privacy (Connectivity: 209, Integration Value: 2.25) (Figure 10. and 11.). Staircases located in Building G2 are both close to the corridor connection points and to the most integrated parts. The middle part of the balcony is the most integrated and connected part of the layout of Building G3 (Connectivity:2359, Integration Value: 91.64). In this building, the deepest space is the projection room. The reason of this is that the projection room is a technical space which does actually need privacy (Connectivity: 9, Integration Value: 5.95) (See Figure 10. and 11.).

The integration and connectivity maps of Building FF1 exhibit that the corridor that connects the chamber council with the foyer is the most integrated and connected public space in Building F1. (Connectivity: 2414, Integration Value: 9.70). This is why this specific intersection part opens up to more spaces than the southern intersection part does, as the First Floor connectivity map shows (Figure 10. and 11.). Archive room at the north part has the lowest level of integration in Building F1 (Connectivity: 5, Integration Value: 2.03). The analyses show that these are private spaces (See Figure 10. and 11.). Staircases in Building FF1 are both close to the corridor connection points and to the most integrated and connected parts. Main routes are highly integrated and connected (See Figure 10. and 11.).

Figure 10. Gaziantep Municipality Service Building Competition, First Prize, Connectivity map of first floor plan



According to the VGA results of the project (see Table 1.), the integration value after the normalization process to compare with each other is 0.0084 and the connectivity value is 0.343. Building SG1 and SG2 are at the sub-ground floor while Building G1 and G2 reveal a higher integration and connection level than the average because of having larger spaces with public use (Table 1.). The relative percentage of circulation areas to the total building area indicates that the circulation areas have a high integration and connectivity value. 7.9% of Building G2 consists of circulation areas. Against this low circulation rate, there exists a high integration and connectivity value; representing that Building G2 contains spaces with a high level of connection and integration (see Table 1.). This is why the main function of Building G2 is defined with the exhibition hall and offices.

Staircases and lifts are located in close proximity with the spots that indicates high connectivity and integration values on the sub-ground, ground and first floor. The main routes of the sub-ground and ground floors seem to be shallow. This can be associated with the purpose of providing ease of way-finding to the visitors (See Figure8., 9., 10. and 11.).

Figure 11. Gaziantep Municipality Service Building Competition, First Prize, Integration map of first floor plan

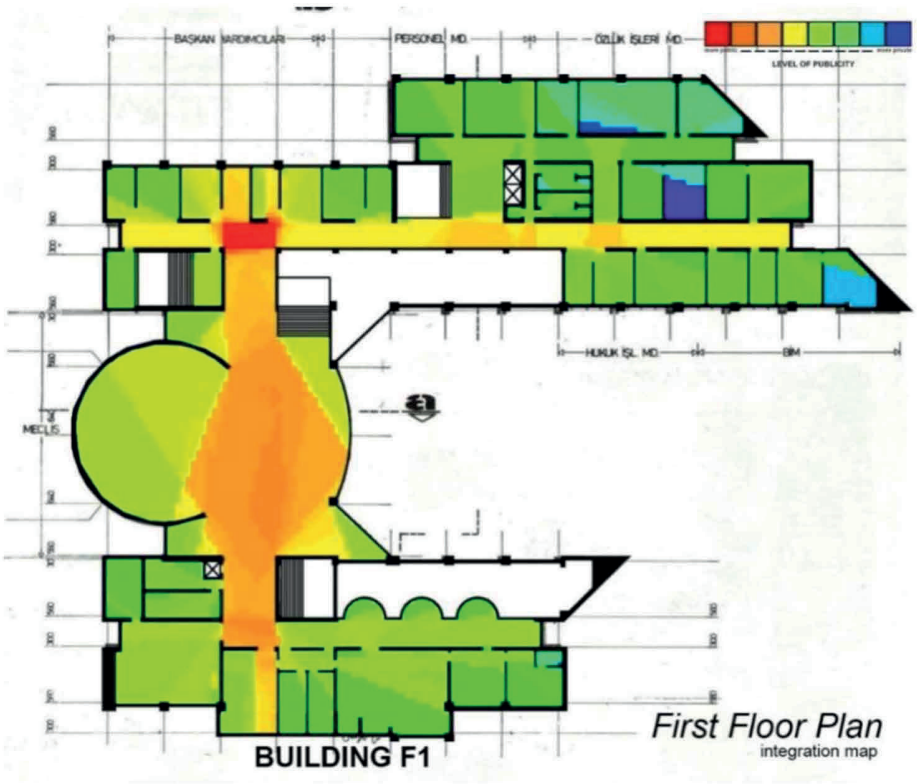


Table 1. VGA Results and Relative Percentage of Circulation Areas of Architectural Competition of Gaziantep Municipality Building Design

Architectural Competition of Gaziantep Municipality Building Design (1986)									
	Building Names	Mean Value of Connectivity	Mean Value of Integration	Visual Node Count	Integration Value after Normalization	Connectivity Value after Normalization	Relative Percentage of Areas with High Integration Level	Relative Percentage of Areas with High Connectivity Levels	Relative Percentage of Circulation Areas to Total Areas
Sub-ground Floor	Building SG1	1741.87	36.084	2.495	0.0140	0.698	30%	33%	28.6%
	Building SG2	1651.28	30.581	2.519	0.0120	0.655	73%	51.6%	21.2%
	Building SG3	697.498	6.495	7.422	0.0008	0.093	33%	25.2%	28.1%
Ground Floor	Building G1	98.746	5.178	399	0.0120	0.247	12%	44.3%	24.2%
	Building G2	301.521	11.450	597	0.0190	0.505	25%	84%	7.9%
	Building G3	763.156	5.336	7.767	0.0006	0.098	37%	27.1%	45.9%
First Floor	Building FF1	800.182	5.152	7.368	0.0006	0.108	32%	27.3%	32.8%
				AVARAGE:	0.0084	0.343	34.5%	41.7%	26.9%

3.2 Architectural Competition of Karabük Municipality Service Building Design (2005)

Karabük Municipality Service Building Design Competition was held by Karabük Municipality in 2005. Architects Erkin Mutlu and his team were awarded by the jury. The project is approximately 16.500 m^2 (Circulation, elevators and staircases included) (See Fig. 3.9 and 3.10). The project has compact plan scheme.

Figure 12. Karabük Municipality Service Building Competition, First Prize, Model
(Anonymous, 2015)

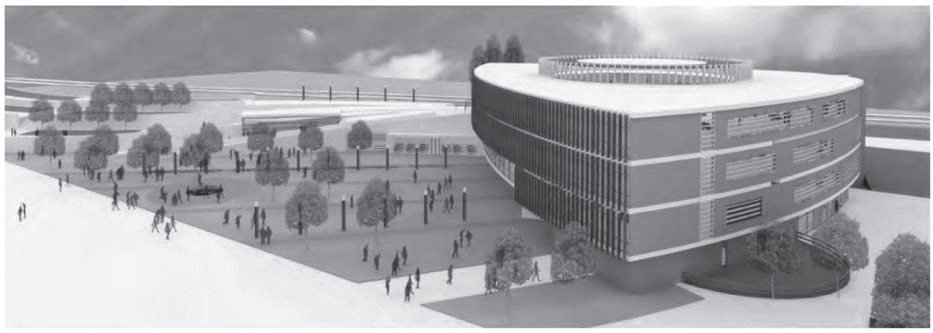
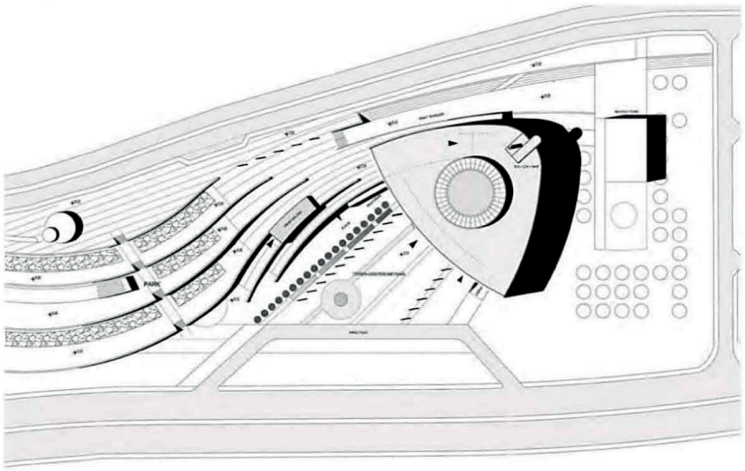


Figure 13. Karabük Municipality Service Building Competition, First Prize, Site plan
(Anonymous, 2015)



3.2.1. Design Approach of the Designer

Benefiting the opportunity of opening the building to the city both through upper and lower levels has been the main idea of the project. As a result, there are two entrances from two different levels to preserve the existing topography. The main entrance of the building is designed as a space for ceremonies. The continuity of the pedestrian flow which approaches from the upper and lower level is ensured by the interior void and this generated a visual perception in the interior (Anonymous, 2015).

3.2.2. Jury's Evaluations on the Project

The jury assessed the competing projects on the basis of the three following criteria:

- Fire escapes should be easily accessible.
- Service places and their relation with other places, priority of access to the kitchen, should be well-designed.
- Offices should not be organized as cellular offices but as a single open office.

3.2.3. VGA Analysis and Results

Integration and connectivity analyses set forth that the highest connectivity at Building G1 ground floor belongs to the front side of the restaurant which intersects with the exhibition hall. The highest integration on the other hand, belongs to the greeting room by the restaurant (Connectivity Value: 4760, Integration value: 9.780, see table 3.2). In truth, the exhibition hall and the greeting room constitute the main function of the Building's ground floor. The main staircases are far away from this area. The least connected space is the WC which is close to the wedding hall on the west side of the layout (Connectivity Value: 5, Integration Value: 1.950) (See Figure 14. and 15.).

Figure 14. Karabük Municipality Service Building Competition, First Prize, Connectivity map of ground floor plan

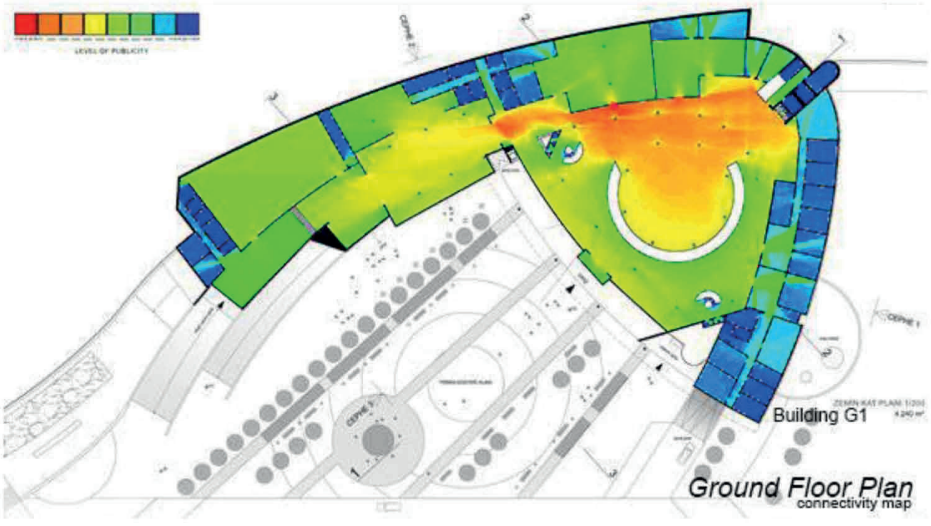


Figure 15. Karabük Municipality Service Building Competition, First Prize, Integration map of ground floor plan

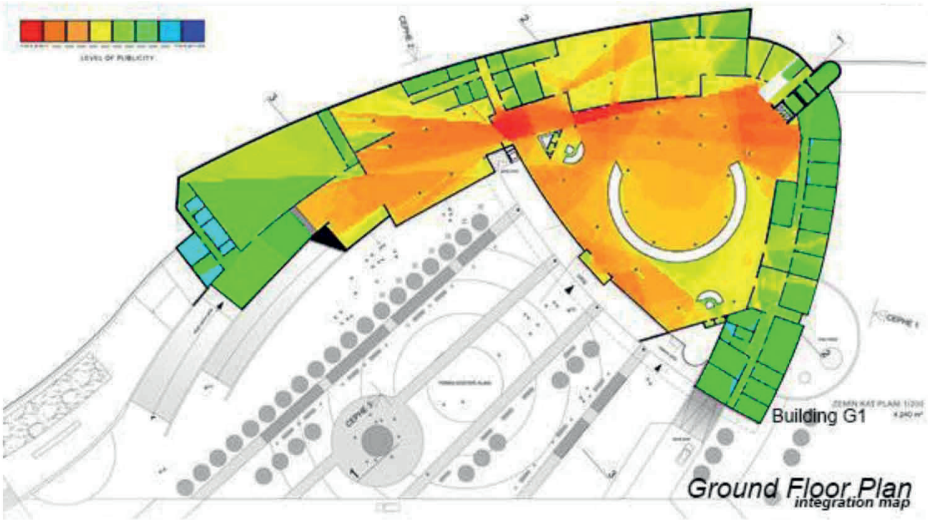
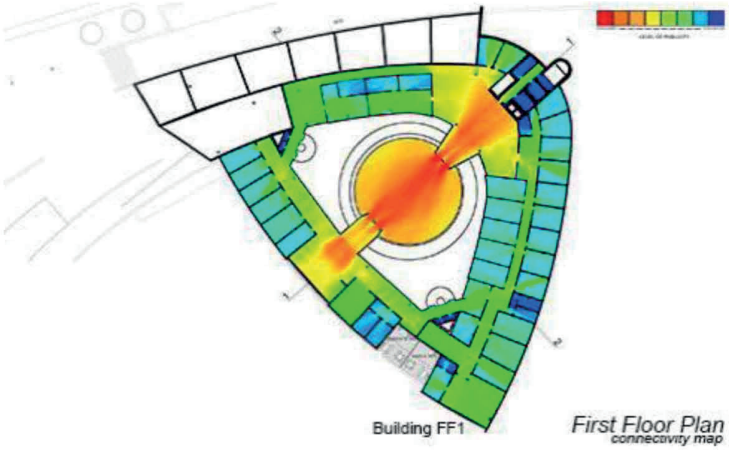


Figure 16. Karabük Municipality Service Building Competition, First Prize, Connectivity map of first floor plan



According to the results of integration and connectivity analyses, the highest value of connectivity at Building FF1 first floor is owned by the corridor which opens to the council chamber (Connectivity Value: 1975). The highest value of integration meanwhile, is of the municipal council room which is close to the council chamber (Integration value: 7.466) Besides, the main staircases are close to corridor leading to the council chamber whereas far away from the borough council. The least connected and integrated space was legal affairs on the layout. (Connectivity Value: 1, Integration Value: 2.127) (See Figure 16. and 17.).

Figure 17. Karabük Municipality Service Building Competition, First Prize, Integration map of first floor plan

Table 2. VGA Results and Relative Percentage of Circulation Areas of Architectural Competition of Karabük Municipality Building Design

Architectural Competition of Karabük Municipality Building Design (2005)									
	Building Names	Mean Value of Connectivity	Mean Value of Integration	Visual Node Count	Integration Value after Normalization	Connectivity Value after Normalization	Relative Percentage of Areas with High Integration Level	Relative Percentage of Areas with High Connectivity Levels	Relative Percentage of Circulation Areas to Total Areas
Ground Floor	Building G1	1553.45	5.941	16052	0.0003	0.0967	37.6%	24.2%	45.4%
First Floor	Building F1	570.327	4.785	8244	0.0005	0.0691	40.6%	29.5%	26.4%
				AVARAGE:	0.0004	0.0829	39.12%	26.8%	35.9%

According to the VGA results, the integration value after normalization is 0.0004, while the connectivity value after normalization is 0.0829 (see table 2.). Building G1 at its ground floor possesses a higher integration and connectivity level than the average, whereas Building F1 at its first floor has a lower integration and connectivity value than the average. This is because Building G1 has more spaces than Building F1. In spite of the presence of a high rate of relative circulation, the relative percentage of the areas with a high level of relative connectivity and integration is low in Building F1 (Table 2.). Staircases and lifts are positioned in close proximity to the areas that bear the highest connectivity and integration values at the ground floor. However, the same cannot be said for the first floor since neither the staircase nor the lifts are close to the areas with the highest connectivity and integration values here. The main routes of the ground floor and the first floor appear to be shallow. This can be interpreted to the purpose of promoting ease of way-finding (See Figure 14., 15., 16. and 17.).

4. FUTURE RESEARCH

Further research on this topic can involve further three dimensional data regarding common public areas such as courtyards, gallery voids, etc. In this study, the publicness level of the building interior spaces was determined. Publicness levels of exterior spaces of buildings must also be measured at the urban scale. If these are supported by VGA, surveys and observation techniques the results may be more rewarding. The analysis conducted in the study was oriented to measure the level of publicness of only the plans of the drafts. Thus, in the VGA analyses obtained it is beneficial to measure the qualifications of the designs made quantitatively. Also if VGA is cross-correlated with other scientific methods better information about the results are given. The most accurate results can be applied as the building is used and with user's feedbacks. This study includes only assessment that can be made early in the design phase. Finally, publicness evaluation via VGA can be done in the early design phases by the correlation of the relative percentage of circulation areas with the relative percentage of areas with high integration and connectivity levels.

5. CONCLUSION

This study utilizes from VGA analysis in order to determine the publicness level of the floor plans of selected municipal service buildings. Approaches regarding public use were assessed by jury reports and competitor's objectives of each of the competitions. Places with high integration and connectivity values have been examined whether being open to public use or not. As a result of the analysis, correlation tables have been created. These tables helped us to review the ratio of the areas with higher average integration and connectivity values in each project in comparison to the whole area. Additionally, the ratio of circulation areas with high permeability is considered as common areas in comparison to the whole area. Moreover, in each project the proximity of the core to places with high integration and connectivity is taken into account. In terms of plan schemas, projects are divided into two; sprawled programmatic solution in two or more buildings (fragmental schema), and compact programmatic solution in single buildings. Amongst the projects which are considered as sprawled programmatic solution in two or more buildings are considered as compact programmatic solution in a single building (see Figures 18 and 19). The reason for this is that the layout of sprawled programmatic solution in two or more buildings the interior setup of circulation areas has more accessibility and permeability levels.

Figure 18. Distribution of Connectivity Value of Each Project after Normalization

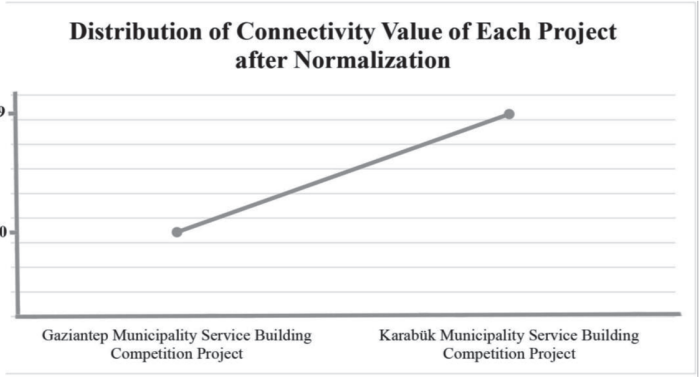
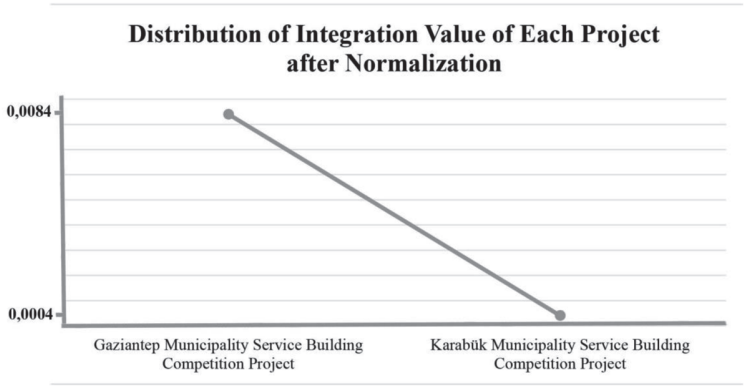


Figure 19. Distribution of Integration Value of Each Project after Normalization



Various overlapping methods might at least contribute to a better understanding of determining publicness levels within the architectural design competitions projects. Regarding to the research questions, this study had explored the results and their correlation of closed space organization and social interaction in two different architectural competition of municipality service design building through using VGA method approach.

Each case is evaluated and compared by objective graphs and mathematical relative percentage of permeability and connectivity to understand how the publicness level is changed. By correlating and overlapping the results of each one, a more holistic comprehension is achieved. Space syntax models can be used for research without modification as well for design experimentation and simulation. Through using an analytical representation technique of space syntax, VGA, we can extend both isovist and graph–based analyses of architectural space in order to form a new methodology for the investigation and configurational relationships. The measurements of local and global characteristics of the graph is a growing interest from an architectural perspective. These measurements allow us to describe a configuration with reference to accessibility. Also they can be compared from location to location within system and systems with different geometries can be compared too (Turner et al., 2001). Though, Space syntax, especially VGA methodology can be used at an early design stage which can prove beneficial feedback in assessing the strengths and weaknesses of publicness level of municipality service buildings. Through VGA analysis method, publicness level can be measured according to their connectivity and integration levels.

The interpretation of publicness levels through architectural design competitions is a statistical process. In order to obtain the data needed, selected architectural projects have been investigated. Secondly, jury reports via designer and team reports have been analyzed if aims and intentions match with the evaluations of the jury. Then floor plans of each selected projects have been analyzed by VGA method. There is a point of view which is the limitation of the study includes only the designers and jury attitudes. Lastly, the results have been implemented and correlations have been made. Within this correlation, relative percentage of areas with high integration and connectivity values of the projects and relative percentage of circulation areas have been studied. Comments have been made about the project in accordance with these values. This gives us interesting results about the publicness level. Projects which have a high rate of relative percentage of circulation area, their publicness level associated with connectivity and integration levels are also high. It is accepted that if the relative percentage of circulation areas are

high and relative percentage of areas with high connectivity and integration levels are low, public use is low. And if relative percentage of circulation areas are low, and relative percentage of areas with high connectivity and integration levels are high then the layout is more open to public use.

Public administration buildings and within these, municipal service buildings, assume an important role of visual mediation between the public and the administration. Functional and formal maturity is simply not sufficient by itself for a representative aura of municipal service buildings. These buildings are ideally rather expected to reflect the administration's philosophy and ideology to the public, communicate with the people and use in this very context their publicness as a tool. This is why municipal service building design competitions represent an important type in terms of examining the concept of publicness and its value. In this context, examining the publicness level and comparing to each other is important in this study.

Reference to the visibility and accessibility, VGA properties may give the clues to interpret manifestations of spatial perception such as way-finding, movement and space use within a building. Based on the case studies, in terms of way-finding, it is possible to define meeting points. By the help of it, proper place for notice boards can be defined on this public building. The hierarchy of public and private spaces are defined in a logical manner, helping to maintain confidentiality and publicness.

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KEY TERMS AND DEFINITIONS

Axial Map: Set of fewest and longest lines of sight or access that passing through all spaces of a system.

Clustering Coefficient: the number of edges between all the vertices in the neighbourhood of the generating vertex divided by the total number of possible connections with that neighbourhood size.

Connectivity: A local measurement that refers to how many immediate neighbours each node can see.

Depthmap: A program to perform visibility graph analysis.

Integration: A global measurement that refers how many turns and changes one has to make in order to access one space from another space in whole system.

Neighbourhood Size: The set of vertices immediately connected through an edge.

Visibility Graph (Isovists): The set of all points visible from a given vantage point in space and with respect to an environment.