ITU A|Z • Vol 20 No 3 • November 2023 • 515-531

Analysis of behavioural processes in cultural centres through concepts of configuration and time: A three building comparison in Istanbul

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Received: April 2022 • Final Acceptance: May 2023

Abstract
Cultural centres have changed throughout history in terms of their configuration and usage. Changing design approaches, socio-cultural patterns, technical improvements, and user demands have also changed the usage, content, and function added resulting in changing the spatial configuration and architectural program. In Istanbul, some cultural centres still have some hard-programmed characteristics or strict rules in terms of architectural programming relating to the defined functions in everyday life and social interactions. Other cultural centres maintain flexibility in their architectural program to include various social activities. This study aims to syntactically demonstrate how the social interaction spaces of cultural centres tended to change from the period of 1938 to 2005 by the correlation between syntactic values of configuration and the frequencies of usage. As a result, it can be seen that the spatial configurations have determinants on spatial behaviour. In one centre that is examined, circulation space is more integrated and connective. Therefore, it is used as a social interaction area that supports random encounters. Hence, weak programming rarely has coherence between usage frequency and syntactical values. On the contrary, in the other centres that are examined, the users strictly follow the rules of spatial configurations. Strong programming also has more significant correlations between syntactic values and usage frequency. The crucial role of spatial morphology and user behaviour are highlighted to support social interaction in strong-weak programming. How the architectural program in cultural centres tends to change is argued.

Keywords
Cultural centres, Changing user's demands, Social interaction, Strong/weak architectural programming, Space syntax.

doi: 10.58278/0.2023.19

1. Introduction

Cultural centres are public spaces where people can spend leisure time with many cultural and art activities. Over time, spaces and their usage have changed due to the direct effect of building technology, design approach, socio-cultural patterns, and user demands. Therefore, there is a connection between a cultural centre's configuration and a user's behaviour. A user's behaviour, demands, or perceptual, cognitive, social, and psychological needs can manipulate an architectural program, which changes a building's configuration (Figure 1). Therefore, the symmetry and asymmetry values of a building can change over time. Regarding cultural centres, there are shifts from a mono-centre (single-hall) to a pluralistic system where additional functions are included, and sociopetal areas emerge.

Over time, users' demands and needs have altered the functions covered in the architectural program of cultural centres. In Turkey, cultural centres built with strong programming have gained flexibility when functions and areas for social interaction are added. This change is the main research topic of this study and will be syntactically examined through selected cultural centres.

2. Social interaction theories in the context of cultural centres

There are many theories about developing a design that regulates social interaction relationships among people. Behavioural settings and social interaction are two key concepts of social interaction theories. In Barker's theory (1968), the user refers to the concepts of milieu, synomorphy, and performance to understand the appropriate meaning of the behaviour. These components determine the nature of spatial behaviour. When analysing the environment, the spatial behaviour of the user becomes crucial in the process of usable information transfers of the environmental data.

An environment and behaviour in space are not independent. According to Itterson (1978), people experience the environment and affect change on it. And the very fact of the changing the environment also changes the user's experience of it. In general, people not only respond to their environment, but also people can create it. The study of the environment as a determinant or modifier of experience and behaviour is joined by the study of behaviour as a determinant and modifier of the environment described twofold relation between these two aspects. This reciprocal relationship between experience and action, between knowing and doing (Ittelson 1978).

According to Hillier (1996), the reciprocal effects of environment and behaviour on each other and multiple effects on both arise from patterns of land use and building frequencies, which are themselves influenced by the space-movement relation, that give buildings or cities their characteristic structure, and give rise to the sense that everything is working like a system to create the special kinds of well-being and excitement that we associate with cities or buildings (Hillier, 1996).

There are relationships between the morphological describability of space and how people use it. These elementary relationships between the form of space and its use suggest that the proper way to formulate the relation is to say that space is given to us as a set of potentials and that we exploit these potentials as individuals and collectives in using space. Thus, the relation between space and function is analysable, and to some extent predictable (Hillier,

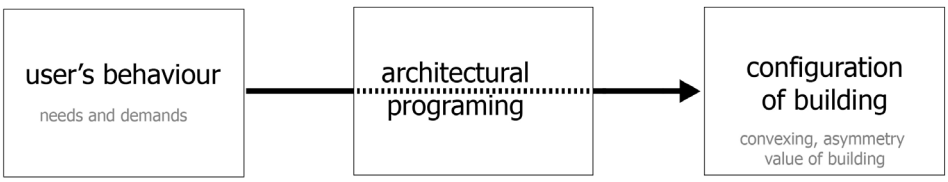

Figure 1. *Diagram exposing the relationship between user' behaviour, architectural programming, and configuration of buildings.*

1996).

In environment-behaviour studies, built environment/arrangements can be defined with the terms "sociopetal" and ", sociofugal" which are defined as "unifying" (bringing people together) and "separative" (separating them apart). These two opposing concepts define the space's social interaction and physical characteristics of the spatial configuration. For example, the sociopetal order provides different positions for users within the residential arrangement placed within social interaction and social solidarity (Lang 1987; Ünlü et al., 2001). Sociofugal space, which inhibits conversation, like a train terminal, is essentially a place for waiting (Bechtel, 1997).

Sociopetal spaces are configured to enable people to focus on the center, thereby bringing them together in large, spacious, and open areas with bright lighting and high ceilings that encourage conversation. Whereas socio-fugal spaces, are configured with dim lighting and low overhangs which tend to drive people toward the periphery of a room, keeping them apart and discouraging social interaction (Sommer, 1969). In the examined cultural centres, linear seating elements are used for sociofugal seating, and mutual seating is an example of a sociopetal seating arrangement. However, some places needed both spaces because some people wanted to have intimate departure conservations while others wanted the anonymity of sociofugal spaces (Bechtel, 1997).

Furthermore, spatial behaviour interacts with parameters such as identity, the structure of thought and mental perception as part of the individual, or society, and the physical, social, and temporal aspects of the space in which it resides (Edgü, 2003). Also, users behave according to different features of the environment, users affect and are affected by the environment with adaptive and maladaptive behaviours.

As well as, behaviour related to internal and external issues, environments are defined by and experienced through actions (Ittelson, 1978), movement, or behaviors. For example, the built environment influence perception, and perception influences behaviour in the space (Fisher-Gewirtzma & Wagner, 2003). According to Montello (2007), the physical environment influences human experience and behaviour through allowing, facilitating, requiring, impeding, or preventing various mental and behavioural acts (Montello, 2007). Thus, the formation of the space character (sociofugal/ sociopetal) and the user can interfere with the weak/ strong program of configuration.

Hillier and Hanson (1984) first argued how buildings can be classified as having strong and weak programming. Before Hillier and Hanson, Levi-Strauss's (1953) mechanical and statistical models can be similar to this categorisation. In the mechanical (long) model, ritual is a set of behaviours in which rules specify all sequences and all relations; however, in the statistical (short) model, there is a generation of new relational patterns by maximizing the randomness of encounter through spatial proximity and movement (Hillier & Penn, 1991). According to Hillier and Penn (1991), "program" is the name of the spatial dimensions of an organisation, and the key element in any program is the interface, or interfaces, that the building exists to construct.

The configuration of the spaces will influence users' behavior by creating various communication and encounter patterns (Penn et al., 1999; Sailer & Penn, 2009; Sailer et al., 2013). The program of a building presents the spatial relation and the spatial configuration of the layout according to allowing or limiting some other behaviour. Depending on this, buildings have two types of programs classified as weak and strong (Hillier, 1984; Capille & Psarra, 2014; Sailer, 2015). According to Sailer et al. (2013), this classification of programming in space syntax theory suggests that in strongly programmed buildings, social life follows the rules of spatial configuration and strongly defined boundaries. There are strict rules and an internal hierarchical organisation (Hiller & Hanson, 1984). While in weak programmed buildings, the use of space is independent of the configuration. There are less rules, weak boundaries, and a lack of hierarchy (Hiller & Hanson, 1984). Space

and control level usage are related to inhabitants and strangers (visitors) in the building. Inhabitants are defined as users who have access to and control over space and who have social knowledge generated in the building. Visitors, on the other hand, are temporary users who have no authority over the building.

Different spatial configurations allow, support, or can complicate some behaviours and interactions among users. So, some buildings have had more strictly separate and differentiated the range of freedom and access for different actors for many different reasons (Koch, 2015). These are 'strongly programmed'; examples are prisons, hospitals, and courthouses.

In space syntax terminology, strong programmed buildings have low integration and connectivity, which restrict movement and unpredictable encounters, both at a global and local scale, thereby restricting opportunities for interaction. Whereas weak programmed buildings have high connectivity and integration, enhancing movement and providing more opportunities for interaction (Pachiloca, 2019). Also, the placement of attractors in the spatial configuration diverts the natural flow of users. To illustrate, in strongly programmed buildings attractors are placed in segregated areas without configuration logic, and there is a dictated motion path. However, in weakly programmed buildings, attractors placed in integrated areas, depending on the configuration logic, there is a random motion path. Moreover, different times and usages are pointed out as variables that indicate the program of a building by limiting certain activities or allowing more activities. In strictly/ rigidly programmed buildings, there is a restriction on the use of space, but in loosely/ weakly programmed buildings, there are no restrictions on the use of space (Sailer et al., 2013).

In their research, Koch and Steen (2012), used the concept of spatial practice for spatial roles and tasks, which depict the interaction between spatial configuration, spatial behaviour, and users' itineraries, that "decompose" as a building program. In strong programming, space practices can be performed in space and time similarly because of the configuration logic of a strongly programmed building. While in weak programming, spatial practices can be carried out differently in space and time because of having more options on how and where to do things in weakly programmed buildings.

Another research by Capilla and Psarra (2013) suggested that the unequal distribution of activities across different spaces and functional areas of a building meant strong programming,

Table 1. *Criteria for strong and weak program buildings as derived from Kerstin Sailer's study 2013.*

	STRONG PROGRAM	**WEAK PROGRAM**
THEORY ORIJIN Hillier, Hanson, Peponis, Penn	• More complex and segregated layout • Strong control of inhabitant-visitor interface: Separate non-interchangeable entrances Easily controlled spaces for visitors, shallow in the building- close proximity to visitors • Strong control inhabitant-inhabitant interface Strong division of categories of uses by division of spaces used. • Activities follow program Examples of building types courts, prisons, hospitals, airports	• Simpler and more integrated layout • No control of inhabitant- visitor interface: Same entrances for inhabitants and visitors No control over visitors • No control inhabitant- inhabitant interface No division of spaces, therefore categories of users are mixed. • Activities follow configuration Examples of buildings type offices, museums, galleries
CONTRIBUTIONS Sailer, Koch/Steen, Heo et. al, Lu et	• Attractors placed in segregated areas without configurational logic. • Activities follow program no influence of a spatial factor on different roles and tasks.	• Attractors placed in integrated areas according to configurationally logic • Activities follow configurational different spatial factors influence different roles and tasks.

whereas an equal distribution highlighted weak programming. In weak programming, integrate people and promote social encounters rather than keep people apart/ heavily used corridors and areas of movement flows thus giving rise to social encounters. Also, the diversity of spatial characteristics allowed for a diversity of usage patterns and accommodate different functions.

Moreover, Sailer et al., (2013) presented in their comparative hospital research that a strong programmed building can also show both strong and weak characteristics, as revealed in the functional and spatial analyses results. The classified weak and strong programming criteria from this literature can be seen in Table 1.

In conclusion of the research of Sailer et al., (2013) weak programmed buildings can indicate the characteristics of strongly programmed buildings, and strong programmed buildings can indicate the characteristics of weakly programmed buildings. For instance, a massive building becomes harder to maintain its "strong programmed" because it shifts socially over time. Because when the number of people in a building increases, the number of places to receive these people and encounters also increase.

In this strong and weak combination or transition situation, Capille and Psarra (2016) emphasized that a weakening of the organisational control of interfaces and activities, and can be understood as a transition from a "strongly programmed" to a "weak programmed" environment. In a "weak programmed building" patterns of occupation and movement are influenced more by the configuration of spaces than by programmatic labels assigned to each space (Capille & Psarra, 2016).

As a result, the number of un-programmed contacts increases as a by-product of operationally defined movement (Sailer et al., 2013).

As well as in Sailer's (2015) research, a library can also show both strong and weak programming; movement flows only partially followed spatial configuration, and the interface the building constructed kept people apart rather than bringing them together. In addition, significant variations in user activities existed in some parts of the library, all of which point toward strong programming. At the same time, however, certain activities showed clear spatial preferences and significant differences in local and global patterns, which illustrates weak programming.

3. Cultural centres between 1938-2005 in Istanbul and their changing process

To openly discuss spatial morphology and differences in social interaction areas in cultural centres, some essential information about cultural centres found in the books and articles has been involved. With the emergence of cultural centres, the formation of typology and morphological changes over time have been classified into three-time frames that occurred between the 1930s and 2000s. Social, political, and cultural incidents in this period will be mentioned through the cultural centres.

When we look at the process of change in the fundamental cultural and social trends of Turkey in terms of socio-cultural centres in Istanbul, this process can be separated into three main periods; 1930-1960, 1960-1990, and 1990- to the 2000s. The first period is between 1930 and 1960. Starting from the declaration of the Republic of Turkey, the first community houses (halkevleri) took place as a publicly constructed environment. Eminönü Halkevi (1937), Kadıköy Halkevi (1938), and Fatih Halkevi (1945) were the first examples of community centres in İstanbul. The Kadıköy Halkevi is a community building constructed in 1938 due to a competitive bid project. Inside the building there is a multi-purpose hall, library, gymnasium, cafeteria, and some classrooms, which are still used today. The building was divided into two separate parts for seventy years (1943-2013): a cultural centre and a courthouse. Today the building still has two doors on the same side. It is used as a cultural centre called the Kadıköy Public Education Centre.

From the young Republic until today, changes in a cultural centre's configuration have depended upon multiple socio-political and socio-cultural

dynamics. When scrutinizing the process between specific times in Turkey since the founding of the Republic, the initial cultural building is community centres (Bayram, 2016). Between 1930 and 1950, centres were built with a rational-functional attitude which is reflected in the powerful programming of the building programs with a strong directive attitude of pre-defined spaces and functions.

In 1951, community centres were locked during the progress of the multi-party era. The state's strength and influence were decreased in the design of cultural centres. It then re-emerged in the private sector with the foundation of summer cinema in the 1950s. With the foundation of the State Planning Organization in 1961, the planning period passed on the examination of the culture and education policy conditions; instead, measuring investments and targets (Bayram, 2016).

Television, which has a lot of social influence, enters houses. In the 1960s, 1970s, and 1980s, military interventions against governance influenced the cultural centres where the people gathered. The effects of these social events led to the cultural centres being delayed in finishing the buildings. The cultural centres remained in our country until the end of the 1990s as intermittent interventions in the design and construction process.

Following the planned periodical transitions is the second period we will examine. Apart from the Ataturk Cultural Centre (1969) and the Pendik Atatürk Cultural Centre (1985), there were not any other buildings established in the years between 1960 and 1990 in Istanbul (Şahin, 2008). The first cultural complex, the Atatürk Cultural Centre (ACC) originally called İstanbul Culture Palace was designed by Feridun Kip and Rüknettin Güney in 1946 and they started constructing it in 1953. However, after three years of budget deficiency, in 1956 construction was resumed by Hayati Tabanlıoğlu who completed the project in 1969. ACC was burned in 1970 and renovated in that year. After thirty-eight years, the building was closed for renovation in 2008. The original building was demolished in 2018 and then it was reconstructed in 2019 by Murat Tabanlıoğlu. The new contemporary building opened to the public as a

Figure 2. *Three periods of culture centers construction between 1930 and 2016 in Istanbul.*

state-of-the-art cultural complex with an opera house, concert halls, theatre halls, cinemas, libraries, design shops, cafes, and restaurants after thirteen years (URL 1). Pendik Atatürk Cultural Centre, which was designed by Sedat Hakkı Eldem in 1984, has a central multi-purpose hall, a foyer, a few classrooms, and service spaces that are used today. However, the building was reconstructed in 2018.

The establishment of the Department of Cultural Centres in 1976 started the construction of cultural centres throughout the country. Until the 2000s, buildings designed through bidding, competition, or re-functioning type of projects, were not built until much later due to budget constraints.

In the period up to the present day, Cultural Centres have come to be known as Public Education Centres, Neighbourhood Mansions, Art Centres, Culture Houses, Culture Palaces, Cultural Sites, Life Quality Upgrade Centres, Community Centres, Culture and Arts Centres, Culture and Performing Arts Centres and Performing Arts Centre which are all very different names (Figure 2). One of them is Caddebostan Cultural Centre, which was built in 2005. There are a few cinema halls, a theatre hall, cafes, shops, an atelier, an exhibition area, and social spaces for resting in the circulation areas.

In brief, in the cultural centres, discussed between 1932 and 1952, sequences of spaces reflected a strong programmed configuration. After 1950, with the emergence of the private sector, the establishment of summer cinemas and the influence of the state on the cultural centre's architectural program began to decrease slightly. With functional privatization, cultural centres and their users, as a matter of fact, were no longer in the city; since they no longer needed large multi-purpose halls and were designed with the flexibility of solving them in all their functions with computer technology.

In the scope of this study, we examine and compare three different cultural centres constructed in different time periods. All three are approximately the same size and can still be used today. Kadıköy Public House (1938) is selected for the analysis of strong programming in the period between 1930-1960. The Pendik Atatürk Cultural Centre (1985) was selected for weak programming in the period between 1960-1990, and Caddebostan Cultural Centre (2005) was selected for also weak programming in the period between 1990-the 2000s. The selected buildings used for comparison, which each have a different typology, reflect their design ideas according to the relevant time period.

The weak/strong architectural programming in cultural centres with different construction years, to which period and configuration comparisons were made, is the focus of the study to compare the frequency of high/low social interaction frequency and deep/shallow syntactic values of social interaction areas. In order to provide data on these focal points, the development of the cultural centres in Istanbul was examined and the infrastructure for the case study was established.

4. Method of case study

The main purpose of this study is to reveal how through spatial configuration, architectural programming, level of social interaction, and space-use relation, a tendency shift in cultural centres' configurations within a selected time frame exists. Space Syntax as a spatial theory and method has been preferred in the study due to the three main factors. The first is that the province allows for comparing social structure and physical structure in cultural centres through the mutual relationship between social structure and physical space (Hillier & Hanson, 1984). Second is that cultural centres with different construction years, and programming can be analysed to examine how people and construction era affect their social behaviour on a morphological basis. The third is that the interior recognizes the level of visual stimuli and gives certain point that also reflect the level of social interaction within the environment. Also, space syntax, used as a method in many academic studies, allows for the analysis of space in a two-dimensional mathematical way through the plan.

First of all, space syntax was termed by Bill Hillier, Julienne Hanson, and

their colleagues at the University College London (UCL) during the early 1980s as an instrument to contribute to architects and urban planners in order to describe layout in terms of the pattern of connections between spaces (Hillier & Hanson, 1984; Askarizad &Safari, 2020).

According to Hillier and Hanson (1984), space syntax is an analysis of spatial patterns, with emphasis on the relationship between local morphological relations and global patterns. Space syntax focuses on how the spatial structures of complex buildings and urban areas become a recognizable part of a culture, reflecting and creating patterns of use and encounter. Also, space syntax gives an analytic definition of layouts' properties involved with how people locate themselves and circulate in buildings (Peponis et al., 1990).

Hillier and Hanson (1984) suggest that, from the point of view of the social use and cultural meanings of layouts, the relation of each space to the rest of the system is of far greater significance than its connectivity. Hillier and Hanson have proposed that the poverty of "integration" describes how a system's parts are linked into a whole (Peponis et al., 1997). Space syntax scrutinizes the state of perceiving the space in fragments by people who experience a space by bringing those fragments together in the brain, narrating them into representation, and revealing them as cognizable, measurable expressions (Hillier, 1996; Şalgamcıoğlu, 2021).

Space Syntax has preconditions for all further analysis, beginning with identifying a "unit" of space (Peponis et al., 1990). So, the unit is defined with a grid initialization basis onto a drawing such as a plan or section drawing imported from vector base drawing software, which is "Autocad" software (2D architectural drawing program licensed by Autodesk) (Şalgamcıoğlu, 2021).

A configurational plan or section constituted by grids can be approached as a system of syntactic relations and can be syntactically analysed by software. Computer analysis layout with most basic principles, relations such as similarities- differences, symmetry-asymmetry, distributedness-non-disributedness has this meaning. Depth, integration, connectivity, isovist area, and perimeter, are crucial parameters of space syntax derived from visibility and the configurational relationship between sequences of spaces. Among these concepts, depth also stands out as an important concept in the asymmetric plan systems that move by passing from one cell to another (Bafna, 2003). Assessment of space as deep or conversely shallow spaces as a result of the analyses involve important data regarding the interaction or integration of space (Şalgamcıoğlu, 2021).

The integration value of a space in a configuration is calculated by first representing the space complex as a graph according to one of several representational conventions: space defied boundaries, fewest and fattest convex spaces, fewest and longest straight lines, then calculating the total number of spaces that intervene between each space and every other space in the configuration. This calculation gives a series of numerical values that express how this particular configurational property is distributed in the complex (Hillier & Penn, 1991). As well as, integration shows which spaces are shallow or not within the whole configuration, and connectivity enables the interpretation of the neighbourhood size. Also, connectivity is a "local" measure that does not describe how each space relates to the rest of the system (Peponis et al., 1997). We can interpret which spaces gradually lie out within the overall relations in the impact field analysed, i.e., which spaces are deeper, or on the contrary, which spaces and fields attend more to the interconnecting area between spaces (Şalgamcıoğlu, 2021).

The Isovist area is about 360° visible area (polygon) from a vantage point (Benedikt, 1979). The perimeter is the boundary of the visible area that rises from becoming indented. Isovist is calculated from a visible polygon, and also perimeter is calculated from the boundary of the isovist's polygon. Perimeter data can describe the state where the dimensions of the perceived space are or are not loner and thinner (Şalgamcıoğlu, 2021).

In this research, isovist area, perime-

ter, integration, and connectivity are selected for graphical and numerical data analyses acquired by using the Space Syntax by way of Syntax 2D to compare and interpret different configurations. These syntactical values are obtained from two-dimensional layouts of the configuration (AutoCAD drawing) by using "Syntax 2D" software licensed by Michigan University. Syntax 2D analyses the layouts through 1x1m2 grid initialization, which is arranged in the same layout for the configuration to be compared by researchers. Syntax 2D also analyses spatial configuration through a 2D plan of the building that is divided by wall, boundary, and reference line types according to blocking the line of sight for evaluation.

In the third part of this research, 1930-1960, 1960-1990, and 1990-the 2000s are the three periods mentioned due to forming effects as a result of the social changes in the world of architecture in Turkey. The cultural centres still in use today are selected for the case study. Selected culture centres belong to the aforementioned time periods and whose years of construction are thought to represent the different period and configuration in which they reside and can be observed on site. For this reason, the Kadıköy Public Education Centre (KPEC)\ built in 1938, was used for the first analysis sample; the Pendik Atatürk Cultural Centre (PCC), built in 1985, was used for the second analysis sample; the Caddebostan Cultural Centre (CCC), built in 2005, was used for third analysis sample. The different plan typologies of the cultural centres, their functions, their use status, and their location were also influential in the selection of examples of cultural centres to be analysed. Although this case study does not claim the period analyses, time is one of the concepts used to analyse changing of spatial programs in configuration.

In order to understand the spaces of the configurations, an observation method is executed at selected cultural centres on the weekends between 12:00 a.m. and 7:00 p.m. through a selected route on the floor of the main hall. In three cultural centres, five observation points were selected from the entrances to the hall (in circulation areas) and almost the same nodes were determined in the research (Figure 3). The entrance, informational/ ticket desk, foyer, sitting areas, and main hall entrance(s) are five analyzing points. In observation, the technique is used to determine how many people are in the selected route and count these people who are moving or static and what they do on the same route in three configurations. This observation represents the behaviour modes and usage frequencies of the interactions between users using different spatial configurations at every hour of the selected intervals (five minutes per hour 12:00 a.m.-1:00 p.m.-2:00 p.m.-3:00 p.m.-4:00 p.m. - 5:00 p.m. - 6:00 p.m. and 7:00 p.m. during the one weekend day). Observation day was selected on week-

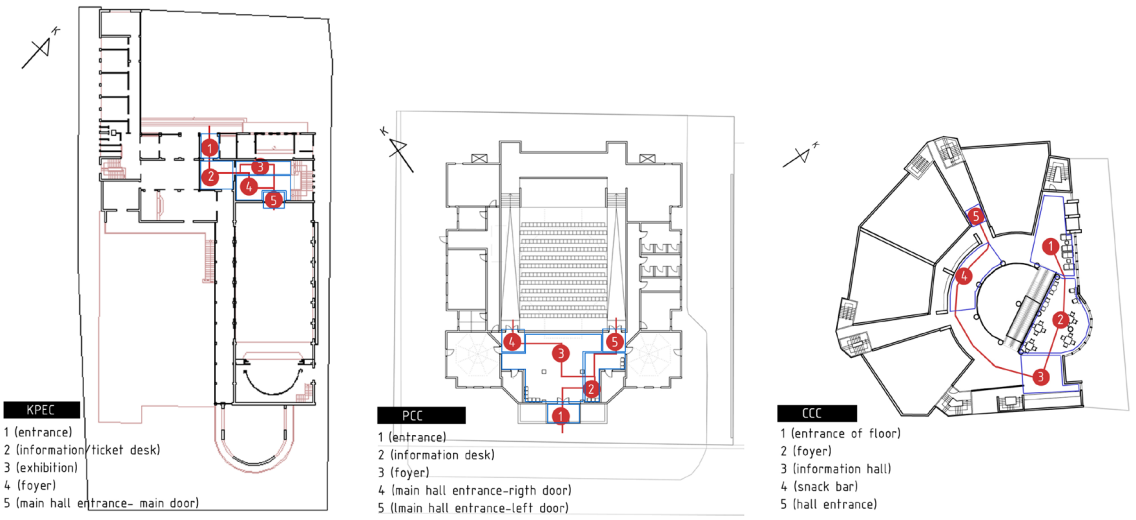

Figure 3. *The analysis areas/points determined at the selected Cultural Centres; KPEC (left), PCC (middle), CCC(right).*

ends because of using more people in buildings than on weekdays.

The empirical data collected concerns snapshot studies of different types of behaviour and occupancy; movement flow at thresholds or entrances, and counting of the users in selected nodes in the main route in the cultural centres. These five points are important for comparison of observation and syntactic analysis values.

As seen in figure 3, the selected route from the entrance to the hall is spread and gets length with time because KPEC has a narrow route, PCC has a medium route, whereas CCC has a long route from the entrance to the hall.

In the three examples of space syntax values, frequency of usage (individual and together behaviour modes) and frequency of social interaction (only together behaviours mode between two or more people) were obtained separately for overlapping observation values with syntactic values. Furthermore, observation data and space syntax values were crosschecked with the "SPSS (Statistical Package for the Social Sciences)" statistical analysis program. These analysis methods were organized into two types of comparison between three cultural centres: the syntactic values- usage frequency and the syntactic values- social interaction frequency.

During the comparison stage, correlation values were formed by overlapping usage frequency (individual and together behaviour modes) data acquired with the Observation Method and syntactic parameters' value (isovist area, perimeter, integration, and connectivity) acquired with the "Syntax 2D" (licensed by Michigan University) were then interpreted within the context of the hypothesis. Eight correlations were obtained by overlapping the data from the space syntax and the observation method (Figure 4).

5. Syntactic analysis and results of social interaction areas in cultural centres

The case study aims to syntactically analyse the hypothesis: that over time the spatial formation for social interaction changes due to weak or strong architectural programming according to space syntax values of social interaction areas of cultural centres and user-space interaction.

In the scrutinized cultural centres' isovist area, perimeter, integration, and connectivity data were measured by comparing the changes between five nodes (entrance areas, foyer, consultation/booking office, and sitting areas) of circulation and social integration areas of the selected spaces within three predefined terms. Isovist area, perimeter, integration, and connectivity values are used to show if the configurations' social interaction spaces match up with users' behaviors and if there is a considerable change related to the configuration of the circulation spaces. In the initial stage, changes in spatial morphology between the selected terms were examined based on graphical and numerical data.

In graphical data, as seen in figure 5, isovist area analysis graphs with visual fields (isovists) from selected five analysing nodes shows visibility graphs for three buildings. The red colour represents integrated, shallow, and highly visible areas, while the blue represents deep areas. The colour range between red to blue in the graph show integra-

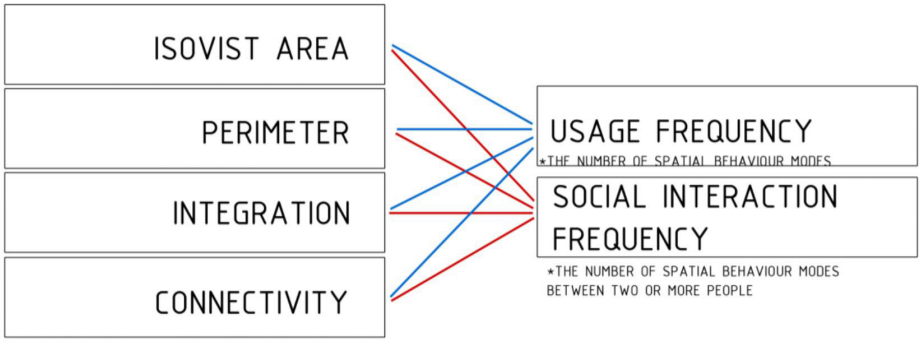

Figure 4. *Compared data for analyzed relationships.*

tion and visibility from high to low. Also, the black colours in figure 5 show the isovist polygon from the five selected nodes for comparison in each configuration. There is the big isovist polygon (visible area) on the multi-purpose hall's threshold in KPEC and PCC due to one big multi-purpose hall in the configuration. In comparison, the foyer in CCC has a bigger isovist polygon than the threshold of the hall.

While KPEC has more divided and depth areas, PCC and CCC have shallow and integrated areas. In KPEC, the front garden has the highest integration value, and the entrance is deep due to having two separate entrances and a linear building typology. In PCC, the multi-purpose hall has the highest integration value because of the compact building typology. In CCC, the circulation area has the highest integration value because of radial building typology and more integrated circulation areas.

First, the spatial configurations of three different cultural centres were analysed based on syntactic values; KPEC was built in 1938 and had solid and divided areas that also have deeper spaces; PCC was built in 1985 and has solid and compact areas; and CCC was built in 2005 having integrated and more shallow areas.

When we look at the numerical syntactic values, due to the linear configuration of the KPEC, the analysis areas remain deep, and their syntactic values are low. The average syntactic values, such as isovist area, perimeter, integration, and connectivity of the entrance, informational desk, foyer, and hall entrance, which are the analysis areas due to the central and simple construction of PCC, are higher than with the KPEC. In CCC, due to the radial configuration, the entrance, foyer and encounter areas are higher than the other two configurations due to the integrated configuration of the layout (Table 2).

According to "*Syntax 2D*" (*licensed by Michigan University*) software's numerical results from all analysis areas (average value of five nodes);

- KPEC's average isovist area value is

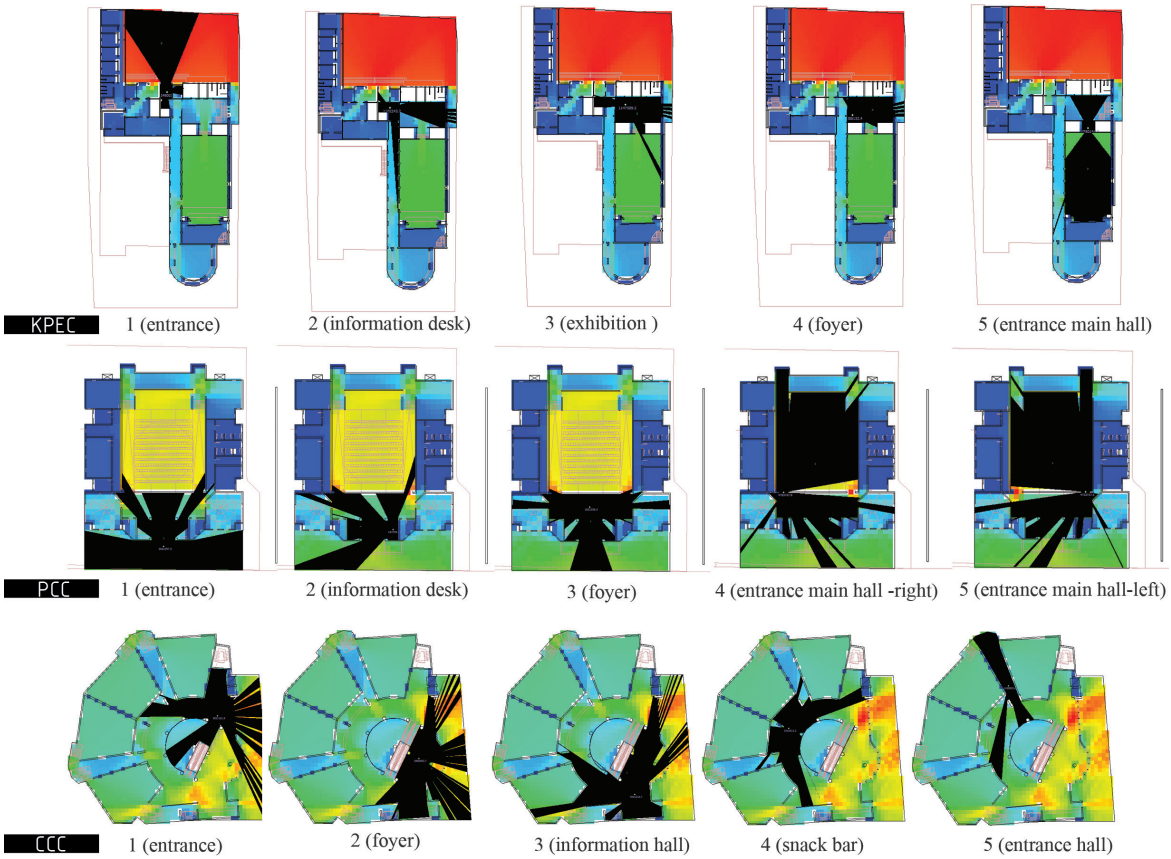

Figure 5. *Syntactic Graph Analyses of KPEC (top), PCC (mid) and CCC (bottom).*

Table 2. *Syntactic data.*

KPEC			PCC			CCC		
Obs. Areas	**Ave. Usage Fre.**	**Ave.Social Interaction Fre.**	**Obs. Areas**	**Ave. Usage Fre.**	**Ave. Social Interaction Fre.**	**Obs. Areas**	**Ave. Usage Fre.**	**Ave. Social Interaction Fre.**
1	307	91	1	273	57	1	386	196
2	216	71	2	61	17	2	687	256
3	148	34	3	266	61	3	432	92
4	77	25	4	301	58	4	399	99
5	150	66	5	323	30	5	50	17
Σ	**898**	**287**	**Σ**	**1224**	**223**	**Σ**	**1954**	**660**

Table 3. *Observation data.*

KPEC					PCC					CCC				
Obs Areas	**Iso. Area Value**	**Iso. Perimeter Value**	**Integration Value**	**Connectivity Value**	**Obs Areas**	**Iso. Area Value**	**Iso. Perimeter Value**	**Integration Value**	**Connectivity Value**	**Obs Areas**	**Iso. Area Value**	**Iso. Perimeter Value**	**Integration Value**	**Connectivity Value**
1	327696	10074	183236	329	1	292304	15319	143848	292	1	353533	35680	249807	351
2	185863	14665	96763	193	2	111008	9126	58851	111	2	393613	34933	276838	397
3	154668	11987	70194	162	3	182558	13778	97939	183	3	391526	34589	274699	396
4	133204	9747	59819	138	4	332207	21712	193029	342	4	236049	16858	177626	236
5	174625	10159	71446	179	5	352579	22355	201648	386	5	119756	9393	80308	120
$\Sigma/_5$	195 211,2	11 326,4	96 291,6	200,2	$\Sigma/_5$	253 991,9	16 419	138 940,4	262,8	$\Sigma/_5$	298 895,4	26 290,6	211 855,6	300

195 211,2 PCC's average isovist area value is 253 991,9; and CCC's average isovist area value is 298 895,4.

- KPEC's average perimeter value is 11 326,4; PCC's average perimeter value is 16 419; and CCC's average perimeter value is 26 290,6.
- KPEC's average integration value is 96 291,6; PCC's average integration value is 138 940,4; and CCC's average integration value is 211 855,6.
- KPEC's average connectivity value is 200,2; PCC's average connectivity value is 262,8; and CCC's average connectivity value is 300,0.

The average values are measured by the sum of each grid value divided by the grid's number. This reduction of numerical expression can make easier the comparison of three buildings. Thus there is a linear increase when comparing selected nodes in social interaction areas of the building's average isovist area, average perimeter, average integration, and average connectivity values (Figure 6).

Observation is another method used to determine behavioural modes that reflect the frequency and duration of the use of space and users' social interaction. The sum of all of the users' collective, individual and social interaction modes, either passing by, waiting, or sitting, which is the first value extracted, is counted in the observation period and gives the frequency of use from the observation method. The numerical sum of modes of conversation (standing chat and sitting chat) between two or more people counted in the observation period constitutes the frequency of social interaction, which results in the data obtained from the second observation (Table 3). Moreover, in KPEC sum of 898 people are observed, and 287 people have social interaction with other people. In PCC, a total of 1224 people are observed; 223 people have social interaction with other people. In CCC, a sum of 1954 people are observed; 660 people have social interaction with others. Usage frequency has a linear increase in comparing configuration subsequently, whereas social interaction frequency has not a linear increase.

When the social structure change that constitutes the research's subject is analysed through the cultural centres, the existence of the relationship between the Space Syntax and use values obtained in the selected cultural centres was analysed by the Statistical Program of Statistics (SPSS).

The existence of this relationship will provide an assessment of how the cultural centres still in use today and selected from three different periods

of construction year have changed. Average/mean integration, connectivity, isovist area, and perimeter values of the three buildings are taken out, compared and how the change of tendency between the periods is revealed.

The change between periods has some commonalities and differences in the three cultural centre's design configurations. The differentiation in the spatial configuration or the same remains is discussed in more specific places such as the entrance, foyer, consultation/ ticket entrance, and hall entrance.

In the case study, statistical data has been obtained by observation and space syntax methods. The relevant data is as follows: the frequency of use which includes all modes of spatial behaviour in the environment, as well as the frequency of social interaction resulting from behavioural modes involving social interaction (talking, standing, and sitting between two or more), isovist area, perimeter, integration, and connectivity value. Cultural centres with different typologies and three different built years can be compared to usage and configuration with this data. Binary correlations analysis of frequency and syntactic values were performed with the "SPSS" statistical program to explain whether the spatial behaviour of configuration and user are working together or not.

In order for simple regression correlation results to be related, the value of "r" must be close to 1 between +1 and -1 (whether the sign is positive or negative), and the value of "p" must be below 0.05. "p" value determines the degree of relationship when p is equal to zero, it means that there is no relationship. If the "p" value is below 0,02, the relation is more significant. The regression values obtained by observation and space syntax in KPEC, PCC, and CCC, which are the three samples, are tabulated in Table 4. Significant findings are shaded. The increasingly irrelevant usage frequency- syntax data correlations indicate that the cultural centre design evolved from strong programming to weak/ flexible programming. In addition, there was no significant correlation between the frequency of social interaction and syntax values.

At the second stage of the analysis, the correlation between syntactic values and the frequency of the use of buildings were acquired from the

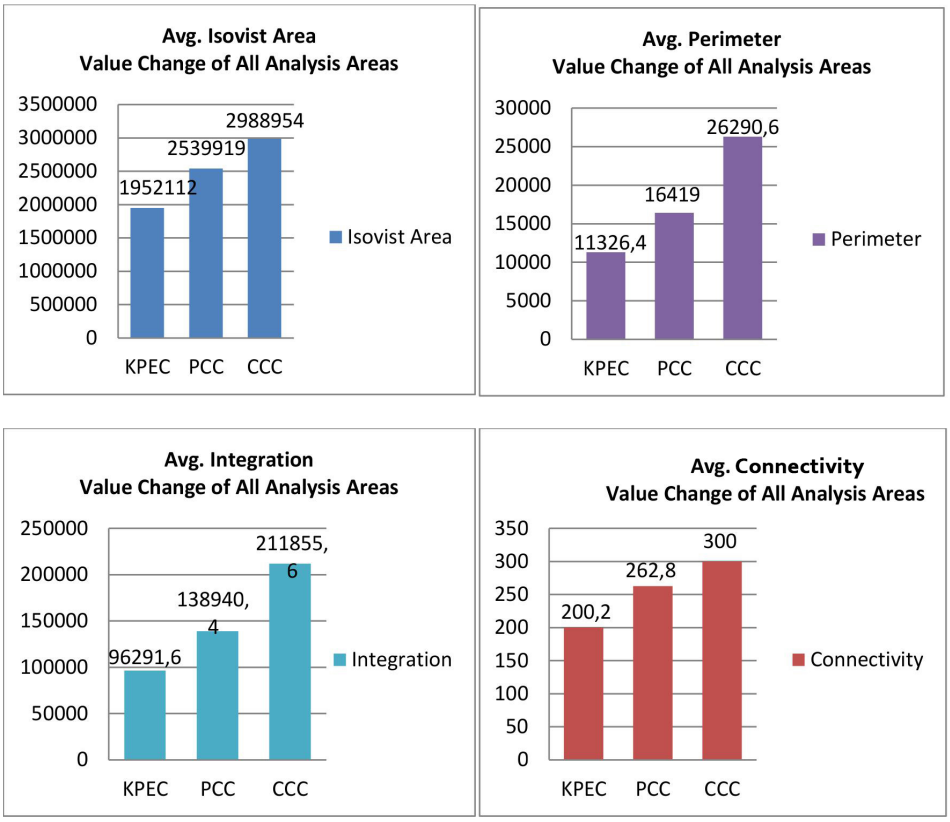

Figure 6. *Syntactic Value Change of All Analysis Areas.*

Table 4. *Correlations of frequency and syntactic values of spaces.*

CULTURE CENTER	SYNTAX DATAS / OBS. DATA	**Isovist Area Value**	**Perimeter Value**	**Integration Value**	**Connectivity Value**
KPEC	**Usage Frequency**	**r=0,933; p=0,020***	r=0,193; p= 0,756	**r=0,939; p=0,018***	**r=0,940; p=0,017***
	Social interaction frequency	r= 0,847; p=0,070	r= 0,129; p=0,837	r= 0,817; p=0,091*	r= 0,850; p=0,068
PCC	**Usage Frequency**	**r= 0,871; p=0,055**	r=0,858; p= 0,063	r= 0,851; p=0,067	r= 0,859; p=0,062
	Social interaction frequency	r= 0,358; p=0,566	r= 0,290; p=0,636	r= 0,290; p=0,636	r= 0,277; p=0,651
CCC	**Usage Frequency**	r= 0,854; p=0,065	r=0,765; p= 0,132	**r= 0,874; p=0,054**	r= 0,856; p=0,064
	Social interaction frequency	r= 0,765; p=0,132	r= 0,776; p=0,123	r= 0,769; p=0,129	r= 0,758; p=0,137

building's physical and social structure respectively. KPEC's correlation value between the *isovist area* and *frequency of usage* (r:0,933; p:0,020) is more significant than CCC (r:0,854; p:0,065) and PCC (r:0,871; p:0,055) where a positively correlated tendency are found. Also, KPEC's correlation between the *user's frequency and integration* (r:0,939; p:0,018) is more significant than PCC (r:0,851; p:0,067) and CCC (r:0,874; p:0,054) where a positively correlated tendency are found. Similarly, KPEC's correlation between the *user's frequency and connectivity* (r:0,940; p:0,017) is more significant than PCC (r:0,859; p:0,062) and CCC (r:0,856; p:0,064). Nevertheless, correlations between *user's frequency and perimeter values* in KPEC, PCC and CCC have no significance.

By elaborating the morphology of circulation and social integration areas in cultural centres and their usage, the interrelation between the space syntax values and the social interaction frequency between two individuals or more are also obtained and overlapped. But, there is no meaningful correlation between syntactic values and social interaction frequency. Also, the correlation between usage frequency and syntactic values can give clues about how the circulation and gathering spaces in cultural centres tended to transforming over time and which configuration or typology is stronger than others and why.

The correlations between syntactic values and the frequency of the users were acquired in the buildings' physical and social structures. KPEC's correlation between syntactic values and the users' frequency is more considerable than CCC's and PCC's correlation rates. These correlation values show the spreading of social interaction in building over time. This is because KPEC users have emerged with strong programming and positive correlation (correlation). This correlation, over time, has been altered by the change of the syntactic values of buildings. The sequence of spaces in KPEC is more distributed and has deep and predefined spaces. KPEC is strongly programmed because users follow the sequence of spaces, so spatial values and usage frequency have significant relation. In PCC, the sequence of spaces surrounds the main hall, spaces are more compact and shallow than in KPEC. PCC tends to correlate with configurational values and usage frequency. CCC has more

integrated spaces with radial configurational typology, circulation spaces have visual accessibility between sequences of spaces. There is no significant correlation, but there is a tendency between syntactic values and usage frequency in CCC and PCC which can be classified as weak programmed. The spatial morphology of cultural centres has more segregated spaces with defined functions before more shallow and integrated spaces with more functions added.

Consequently, it is seen that cultural centre's building typology and design program tended to change over time based on the social interaction areas from highly regulated and limited social interaction spaces to layouts that act generatively and enable a random pattern of encounters. In the context of the article, the transforming building program of the cultural centres that have shifted with various functions is confirmed by space syntax theory and methodology. Cultural centres which is built many years ago with strong spatial/ architectural programming tended to gain flexibility compared to two other relatively new built counterparts.

6. Discussion and conclusion

In cultural centres with multiple functions, the change of architectural programming over time can be analysed and interpreted by space syntax theory. It emphasizes how the cultural centres come from the program within the publicity context and how they tended to change. It is shown that the strong programming of the building typology tended to soften over time based on the context of the user's behaviour and spatial configuration.

Also, the culture centre's linear configuration typology (has an early building time) is a non-distributed building, and social interaction does not spread in the building. Compact configuration typology (has a middle building time) is a symmetric building, but social interaction does not spread in the building because of being stuck. Radial configuration typology (has the last building time) is more distributed, and asymmetrical building value and social interaction are spread in the building.

From the 1930s to the 2000s, social interaction spread into the buildings of the different cultural centres. In the context of this paper, the transition of the architectural or building program of the cultural centres that have various functions has been described by space syntax methodology, in which programs in the situation of commonality and how they have a tendency to change are analysed. The change in the use of space, building symmetric-asymmetric values and function added, has been examined from 1938 to 2005 and depends on many behavioural, sociocultural, and political dynamics.

Continuous population growth, changes in user demands, popular culture, technical improvement, etc., change a cultural centre's program needs with new approaches and functions added. With the use and diversity of social interaction points within new functions added, new design and relation approach tended to change the strong building program by softening it over time.

This suggests that the planning scheme has changed from strong programming to increasing cultural centre buildings with varying functionalities. It is revealed that when cultural centres in Turkey constructed in the 2000s were evaluated, additional functions were added as a consumer culture contributed flexibility to the building's strong program. The architectural program can change socially. As more people used the spaces simultaneously, more functions were added for the more users and more behaviour modes. This has enabled the user to have different modes of behaviour with various functions in a cultural centre design which also changes the building's asymmetrical and symmetrical values.

The intention of this work is not to criticise the cultural centres' typology for changing the original role before and now. Instead, we seek to understand how architectural programming relates to the association and formation of social interaction in the cultural centre's buildings. We try to understand the differences between built different periods' sociocultural life and different configurations of architectural programming as a social instrument

of representation and as an actual field of social interaction.

In this paper, there are three different configurations built in a different year and a set of variables of potential interest have been discussed. Also, this paper does not claim to analyse the period, instead an architectural programs and configurations which were built in different periods in Turkey.

Acknowledgement
We would like to thank Assoc. Prof. Dr. Mehmet Emin Şalgamçıoğlu and the reviewers for their constructive comments, which help us to improve the paper.

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