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The effect of spatial configuration on social interaction: a syntactic evaluation of a faculty building*

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Abstract

The properties of physical environment affect the psychological processes of the individuals and groups using that environment and their socialization with their environment. Every physical environment includes the existence of a social environment and every social environment includes the existence of a physical environment; because socialization is one of the basic human needs. The fulfillment of this basic requirement is possible when the spaces are designed in a way to have properties giving opportunities to social interaction. Among education spaces faculty buildings are social environments giving opportunity to young people to socialize, share interests, have relation with each other, develop the relationship within groups and belonging feelings. Social behaviors, social interactions and gathering areas of students in faculty buildings are important issues from the point of architectural programming and architectural design performance. This study is depended on the evaluation of social environments in faculty buildings considering the students' social interactions upon the selected faculty building. In the scope of this evaluation long term observations directed at the determination of students social interactions and gathering areas will be done, the plan of the building will be analyzed through Syntax 2D and as a result the effect of the spatial configuration on social interaction will be evaluated.

Keywords: Space syntax, environment-human behaviour, spatial configuration, social interaction, faculty buildings.

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This paper is prepared from the unpublished PhD thesis named as "The Syntactic Analysis of the Effect of Spatial Configuration on Social Interaction in Faculty Buildings" written by Süheyla Büyükşahin Sıramkaya under the supervision of Prof. Dr. Dicle AYDIN.

1. Introduction

As a result of the two-way interaction between human and space, while the space forms the behaviours of the individuals using it with its physical characteristics, the human's spatial behaviours change and transform the space. The spatial configuration exists in the relationship between a series of spaces where the individuals move in, come across and notice others. The location of these spaces, their way of coming together with other spaces, the physical characteristics of the space and its connection with outer space can develop movement patterns on humans that will support or prevent their interactions (Hillier, 2007). In this sense, spatial configuration can be planned in a way to provide or obstruct the realization of social interaction as a spatial behaviour mode.

Social interaction -as a state of free togetherness in which people with different physical and mental abilities find opportunities for interaction- is one of the basic human needs since his birth. Maslow's (1970) hierarchy of needs includes social interaction as a need and it contains actions and feelings like being belonged and attached, joining a group, loving, being loved, accepted and etc. Socialization, establishing social relationships is very important for youth development. The young should gain earnings aimed at socialization like establishing positive social relationships and adapting to the milieu they live in for their psychosocial structures to develop in a healthy way. In this sense, the faculty buildings as the young's milieus for education are important from the points of physical, social and psychological views.

Faculty buildings are complicated social organizations composed of structural, social and functional elements. In these spaces, there should be spatial arrangements for young people to expand their social network with others and interact with the ones of the same age and adults. In this way they can feel connected or belonged to the society. These arrangements are supportive in an improving direction for basic needs of young generation. These needs can be named as friendship, affection, safety, to become an individual, to have difference, to feel belonged to a society, to experience adventure and new experiences and to learn (Siramkaya & Aydin, 2013).

It is important for designers to identify what the spatial characteristics should be in the environments where the social interaction is important and necessary. In this study -which is handled with the aim of interrogating the effect of spatial configuration on social interaction in architectural design- the existence of social interaction in faculty buildings and effect of the spatial configuration on this interaction are investigated via space syntax analysis.

2. The relationship between social interaction and space

Today environmental designers specify that architecture feed social interaction. When the architecture is considered in the direction of this aim, it is necessary to evaluate the spatial configuration. In this sense, spatial configuration is evaluated in the scale of the physical and functional distance between people, groups and activities. The arrangement of rooms, walls, doors and separators affects the opportunities of people to see, hear and react to each other. Barriers, openings, street locations and physical arrangements can provide opportunities or form obstacle for social interaction (Wells, 2009).

Gibson's "affordance theory" includes important clues about social interaction and space. Gibson (1966) examined the interaction between physical environment and individuals. According to this, the thing providing opportunities for the individual to interact with his environment is the characteristics of physical environment and the conditions he lives in. Affordance theory focuses on how the physical environment can encourage an individual to do cognitive activity. These are the characteristics of the perceived and identified environment, which may cause behavior because of their functional

importance. In this sense different environment patterns supports different behaviors, in other words they support some behavior while restrict some others (Yıldız&Sener, 2006).

The formation or degree of social interaction is directly related to the physical conditions of the space. Therefore, there are circumstances preventing or supporting the social interaction in the space (Figure 1). While some factors like the walls, long distances, and high speed between individuals obstruct the social interaction, short distances, low speed and right locations can support social interaction (Gokce, 2007).

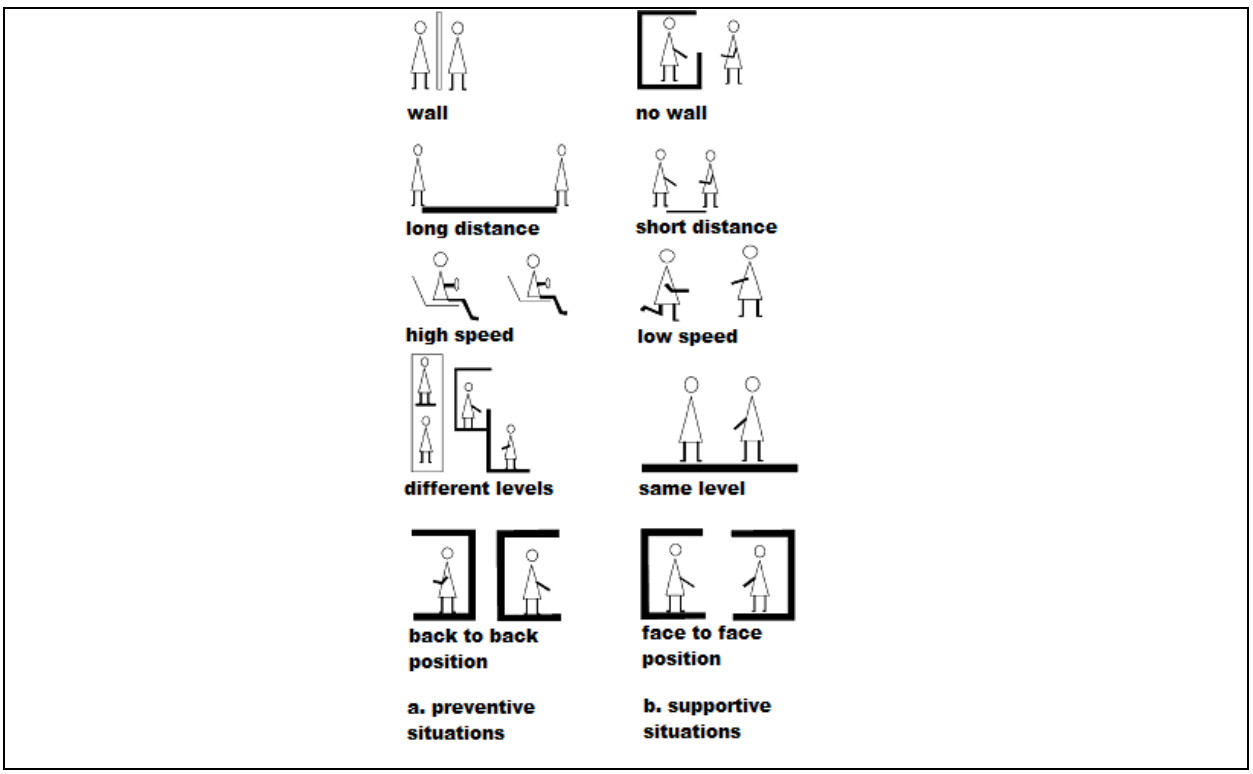


Figure 1. Supportive and preventive conditions depending on the physical environment for social interaction (adapted from Gehl, 1987).

From the point of social view, the built environment can be defined as an area for meeting, existing together and being aware together. The boundaries separating the built environment and the connections combining it arrange the behaviors, activities, and the people to come together and stay away from each other. The boundaries, surrounding and the characteristics of adjacency, containment, sub-section, accessibility and visibility in the space create relationships (Peponis & Wineman, 2002). In researches, spaces are identified as “low interactional (sociofugal)” and “highly interactional (sociopetal)” environments according to their characteristics determining the level of social interaction (Sommer, 1969). The concepts of sociofugal and sociopetal are the concepts firstly exposed by psychologist Humphrey Osmond to explain the space quality. According to Osmond (1957), “the spaces providing the opportunities of eye contact and conversation distance between people” are named as sociopetal. As oppose to this, sociofugal arrangements obstruct the interactions of the people in conservation distance by causing them to look different ways from each other. Unlu (1998) expresses that low interactional environments are the spaces, which can be defined as “hard architecture” where personalization is extremely difficult, while highly interactional environments provide some options appropriate to personalization forms in the level of behaviors. Brand (1998),

mentioned that the process related to how the space for a useful and effective social interaction can be designed is very complicated and requires a dense knowledge. In this complicated process, it is quite important to evaluate personal and cultural characteristics of the individual, spatial characteristics, perception of the space and the qualities of the social relationships in society as a whole to design spaces supporting social interaction.

3. Methodology

Research methodology is formed to investigate the effect of spatial configuration on social interaction. Faculty buildings are specified as area for case study and Selcuk University Faculty of Engineering having a gridal plan with inner courtyards is examined. In this faculty building "low interactional" and "highly interactional" spaces are determined by observation, these spaces are evaluated in a way depending on syntactic parameters and the characteristics of spatial configuration those allowing and disallowing socialization are defined.

3.1. Space syntax analysis

The plan is uploaded to the "Syntax 2D" program licensed by The University of Michigan to apply space syntax analysis. Spatial configuration is analytically evaluated by space syntax analysis and quantitative data is obtained. Movement and vision areas are superposed on the plans of sample building and the potentials of users to come together are determined. A number of points are identified on the plans to understand characteristics of different regions and obtain comparable values. These points are selected among the spaces, which are important components of the spatial configuration (entrances, circulation areas (nodes, corridors)), the main spaces with determined functions (cafeteria, foyer) and the regions thought to be planned as social interaction areas. The values of mean depth, connectivity, integration-n, isovist area, isovist perimeter and circularity parameters are obtained by the means of the program.

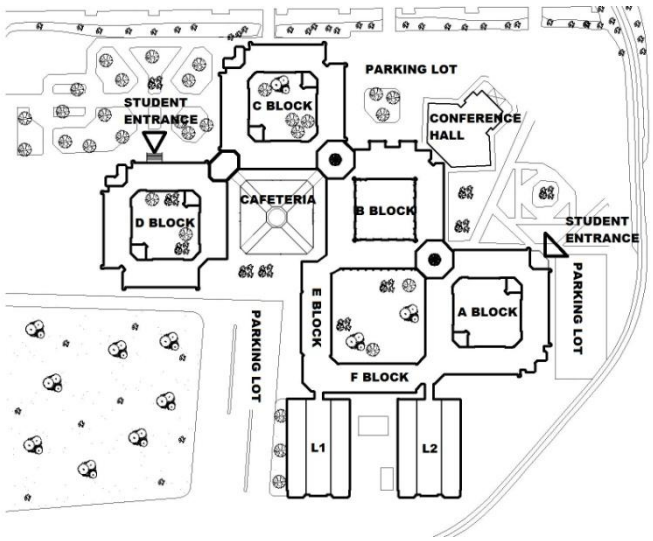
3.2. Statistical analysis

The values obtained from space syntax analysis, the data of observation are overlapped and syntactical values of "low interactional", and "highly interactional" spaces are achieved. In this context, the findings of observation are integrated and improved by space syntax analysis. The syntactic values are transformed into nominal values and classified in 3 groups. The social interaction activities determined as a result of observation findings are also digitized and classified. The relationship between these nominal values are relatively evaluated and interpreted through SPSS 16.0 (Statistical Package for the Social Sciences) Chi-square tests.

4. A case study evaluating the effect of spatial configuration on social interaction

The Selcuk University Faculty of Engineering (Table 1) building was constructed in 1996 in central region of Alaaddin Keykubat Campus in the north of Konya in Turkey. The faculty building with the courtyarded gridal plan was built as 4 blocks (A, B, C, D) and then 2 blocks in the same plan schema and 2 rectangular laboratory buildings were added in 2010. There are rooms for academic and administrative staff, classrooms, ateliers, laboratories, a conference hall and a cafeteria in the building. The building has ground+3 floors and designed with open inner courtyards.

Table 1: Faculty of Engineering



Site Plan

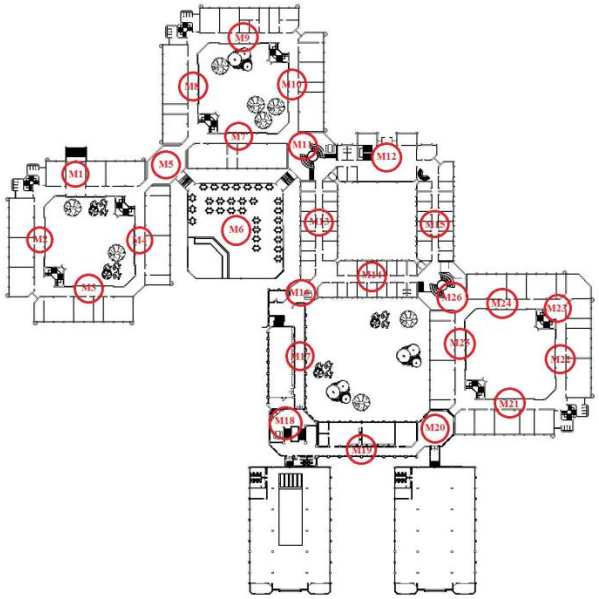
West Facade

South Facade

Before starting the analysis it is determined that there are social interaction activities on ground and first floor of the building as a result of pre-observation study. No social interaction activity was observed on other floors or in the laboratory blocks of the building. For this reason ground and first floor of the building are examined in the case study. Besides as a result of observation; the points where social interaction occurs or not among 50 points (Table. 2) defined on the plans were determined.

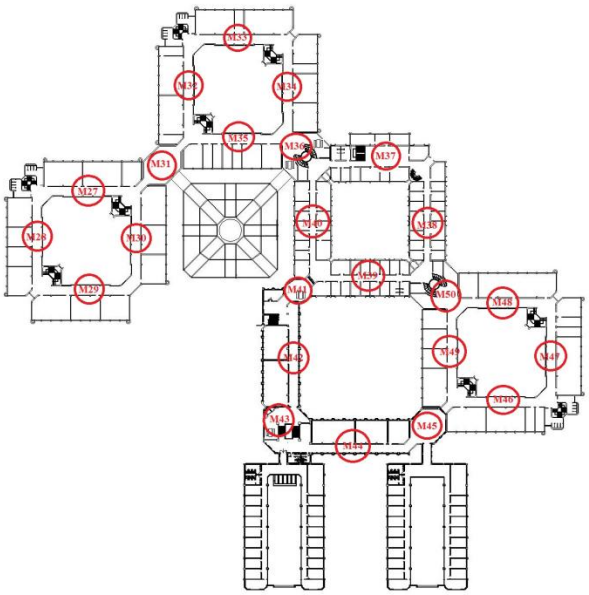
The spaces preferred by the students for social interaction activities are determined as cafeteria (M6), nodes (M11, M16, M36) and corridors (M10, M17, M27, M30, M34) as a result of observation. Among these spaces it is seen that cafeteria (M6) and node (M36) are more frequently used for social interaction.

Table 2: The points determined on the floor plans and their functional classification



ENTRANCES
Student Entrance: M1, M23
Deanery Entrance: M12
CIRCULATION AREAS
Nodes: M5, M11, M16, M18, M20, M26
Corridors: M2, M3, M4, M7, M8, M9, M10, M13, M14, M15, M17, M19, M21, M22, M24, M25
MAIN SPACES WITH IDENTIFIED FUNCTIONS
Cafeteria: M6

Ground Floor



CIRCULATION AREAS
Nodes: M31, M36, M41, M43, M45, M50
Corridors: M27, M28, M29, M30, M32, M33, M34, M35, M37, M38, M39, M40, M42, M44, M46, M47, M48, M49

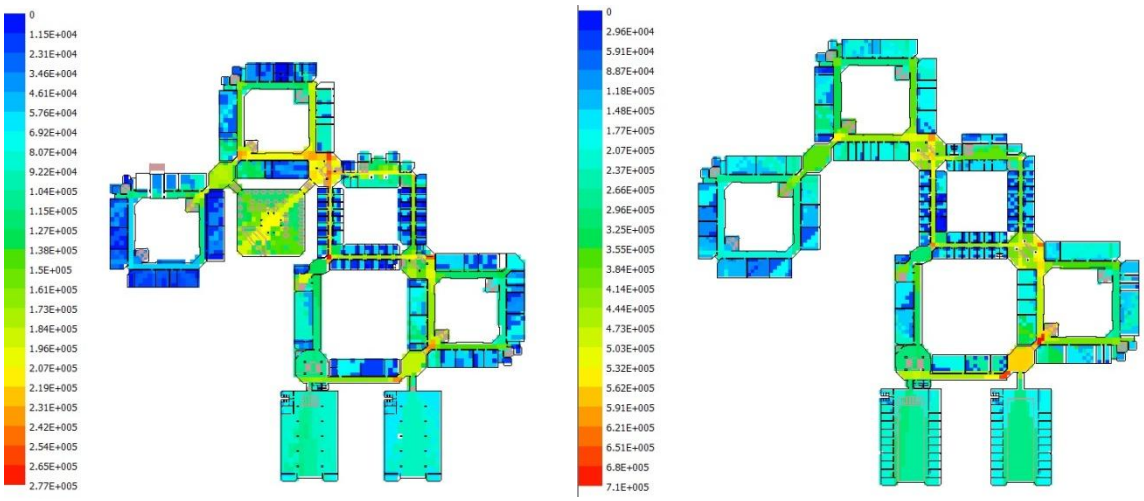
First Floor

4.1. Findings from space syntax

The integration-n, mean depth, connectivity, isovist perimeter, isovist area and circularity values are determined for the points defined on the plans. It can be seen on the graphical view of the analysis that the plan schema of the faculty is not an integrated configuration. The areas with high integration-n value (colored in red) cannot be observed in the general layout of the faculty. The areas having low integration-n value (colored in blue) in other words regions with low degree of movement are dominant on the plan (Figure 2).

As it can be seen on Figure 2, the spaces with higher integration-n value are the nodes, which are the intersection points of the circulation areas. In general layout it can be seen that spaces with

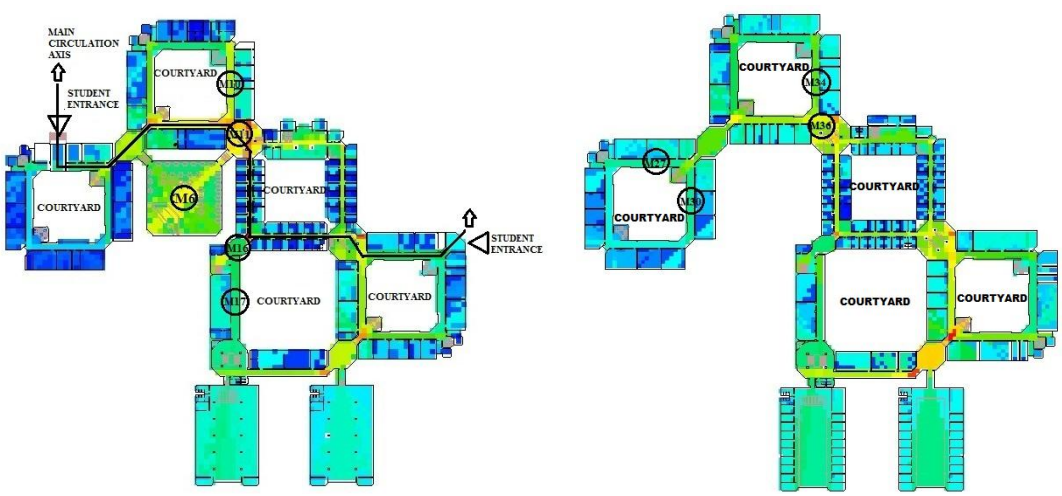
highest integration-n value are placed in central areas of the plan, integration-n value decreases in spaces connected to the circulation and the depth of the spaces increases.



Ground Floor First Floor

Figure 2. Integration-n graphic of Faculty of Engineering floor plans

The integration-n graphic of floor plans and spaces preferred for social interaction are coincided and marked together with the main circulation axis on the plans (Figure 3). According to these analysis it is seen that the regions with high integration-n value and the social interaction spaces overlap in nodes (M11, M36) and cafeteria (M6), but does not overlap in corridors (M10, M17, M27, M30, M34) and node (M16). In addition to this it can be said that the social interaction spaces used more frequently by the students (M6, M11, M16) are placed even on the main circulation axis (M11) or directly connected to that axis (M6, M16).



Ground Floor First Floor

Figure 3. The relationship between integration-n graphic and social interaction spaces

4.2. Comparison between Space Configuration and Social Interaction Activities Data

The relationship between the syntactic values of the points defined on the plans and nominal values of social interaction activities (Table 3) is analyzed with Chi-square test.

Table 3: The syntactic values of the defined points and social interaction activities

		Connectivity	Mean depth	Integration-n	Isovist area	Isovist perimeter	Circularity	Social interaction
M1	Stud.Ent.	9	6,93	0,39	0,63	0,38	24	-
M2	Corridor	22	6,79	0,60	1,33	1,13	97	-
M3	Corridor	29	6,78	0,58	1,07	1,09	111	-
M4	Corridor	19	5,93	1,16	1,15	1,15	115	-
M5	Node	64	4,95	1,84	2,72	2,73	279	-
M6	Kafeterya	189	4,51	2,08	7,98	3,52	156	+
M7	Corridor	41	4,64	2,04	1,37	1,12	93	-
M8	Corridor	21	5,30	1,47	1,14	1,09	106	-
M9	Corridor	40	5,86	1,18	1,25	1,20	115	-
M10	Corridor	49	5,18	1,81	1,60	1,65	170	+
M11	Node	102	4,40	2,32	3,50	2,51	180	+
M12	Dea.Ent..	58	5,01	1,52	2,26	1,66	122	-
M13	Corridor	26	4,34	2,17	1,02	1,17	134	-
M14	Corridor	27	4,43	1,77	1,05	1,38	183	-
M15	Corridor	28	4,82	1,70	0,99	1,08	119	-
M16	Node	26	4,62	1,33	1,09	0,64	38	+
M17	Corridor	42	5,42	1,14	1,35	1,07	85	+
M18	Node	76	5,88	1,10	2,83	1,98	138	-
M19	Corridor	25	5,59	1,63	1,23	0,97	77	-
M20	Node	81	4,93	1,88	3,20	2,00	125	-
M21	Corridor	21	5,19	1,43	1,17	1,18	118	-
M22	Corridor	29	5,73	0,98	1,26	1,25	126	-
M23	Stud.Ent.	80	5,10	1,37	2,94	2,26	174	-
M24	Corridor	49	5,16	1,25	1,85	1,99	214	-
M25	Corridor	43	4,64	1,69	1,34	1,09	89	-
M26	Node	101	4,49	1,99	3,34	2,49	186	-
M27	Corridor	66	6,02	2,71	1,50	1,48	147	+
M28	Corridor	56	6,86	2,05	1,24	1,34	146	+
M29	Corridor	51	6,87	2,06	1,18	1,10	104	-
M30	Corridor	50	6,04	2,73	1,05	1,14	125	-
M31	Node	80	5,27	3,79	1,83	0,95	50	-
M32	Corridor	52	5,38	3,46	1,11	1,09	108	-
M33	Corridor	53	5,87	2,85	1,15	1,18	122	-
M34	Corridor	68	5,20	3,85	1,59	1,66	175	+
M35	Corridor	67	4,71	4,39	1,48	1,61	175	-
M36	Node	134	4,06	6,09	3,01	2,09	145	+
M37	Corridor	77	4,91	3,84	1,75	1,71	168	-
M38	Corridor	38	4,91	3,99	1,02	1,14	128	-
M39	Corridor	42	4,41	4,39	1,13	1,40	173	-
M40	Corridor	50	4,39	4,55	1,18	1,53	201	-
M41	Node	50	4,63	3,12	1,12	0,65	38	-
M42	Corridor	64	5,26	3,24	1,54	1,31	112	-
M43	Node	73	5,72	3,06	1,55	1,90	234	-
M44	Corridor	58	5,39	4,59	1,24	1,02	84	-
M45	Node	175	4,72	5,66	4,05	1,72	74	-
M46	Corridor	50	5,04	4,08	1,12	1,12	113	-

M47	Corridor	51	5,54	2,85	1,16	1,20	117	-
M48	Corridor	53	5,03	3,58	1,49	1,57	166	-
M49	Corridor	69	4,52	4,72	1,48	1,45	142	-
M50	Node	131	4,32	5,59	2,76	2,33	198	-

(Dea.Ent: deanery entrance, **Stud.Ent**: student entrance)

According to the results of the analysis; it is determined that the mean depth (x^2=7,973, df=2, p=0,019<0,05), integration-n (x^2=17,039, df=4, p=0,002<0,05), isovist area (x^2=17,024, df=4, p=0,002<0,05) and isovist perimeter (x^2=16,024, df=4, p=0,002<0,05) values of the space directly affect the social interaction which will occur in that space. It is seen that there is no effect of the connectivity (x^2=8,785, df=4 p=0,067>0,05) and circularity (x^2=8,785, df=4, p=0,067>0,05) values on social interaction.

5. Discussion

The analyses and comparison tests exposed that spatial configuration has effect on social interaction as follows:

- The mean depth, integration-n, isovist area and isovist perimeter values of the space positively affect the social interaction possibilities in that space. The individuals have higher possibilities to interact socially in easily accessible spaces with low mean depth values. The spaces preferred for social interaction have high integration-n values. High isovist area and perimeter values which provide wide and uninterrupted visual domination and give the sense of controlling the space can be seen as supportive data for social interaction possibilities in that space.
- It is determined that the connectivity and circularity values of the space do not have any effect on that space to be a social interactive space. The number of the connected spaces, permeability level or the form of the space to be circular or not do not affect social interaction possibilities in that space.

6. Conclusion

Depending on the research results, it can be said that it will be possible to do more effective designs for social interaction in faculty buildings by paying attention to the integration-n, mean depth, isovist area and isovist perimeter values of the space in the design process. In complex multi-functional buildings with high number of users, circulation network must be uninterrupted, regular and accessible for spaces to be integrated and appropriate for social interaction. In general layout, it is important that social interaction spaces should not be deep spaces, they should be directly accessible. When the importance of visual contact for social interaction is considered the solutions which do not limit the visual area are significant for social interaction areas.

In this study social interaction is defined as one of the basic needs of students in faculty buildings and planning spaces with social interaction possibilities is introduced as a design problem. In the result of the research, architectural characteristics of social interaction spaces are determined by interpreting the findings of space syntax parameters. In addition to the integration-n and mean depth values which were presented as values positively affecting the social interaction in the space in other studies before, the positive effect of the isovist area and isovist perimeter values of the space on social interaction is determined in this study and in this sense an important contribution is provided in research area.

Social interaction is one of the basic needs for human beings especially in recent years as technological developments in communication area put the people away from each other. In this

sense, it is important to plan social interactional places for users in architectural design. As Syntax 2D is a tool to analyze human movements and gathering areas, it will be useful to analyze building plans and design accordingly. In further studies, this analysis can be broadened and used in other types of complex public buildings to design places for people to socialize.

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