STUDENT BEHAVIOR MODES IN EDUCATIONAL BUILDINGS

INTERPRETATIONS ON VISIBILITY AND PERMEABILITY PARAMETERS

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ABSTRACT

Behaviour of the people are affected by stimuli of various kind in the built environment, whereas one of the major issues is the “interaction” and in which interface the interaction is taking place is crucial. In the context of this study interaction is defined as interaction with other people; interaction with the space and its geometry; and interaction with the occasions within the environment. “Interaction” herein is also mainly based on three parameters that are co-presence, visibility and permeability.

In this study, spaces and the inhabitants of the selected universities are the focus point in case of the relation between configuration of space and behaviour. The study improved upon the “interface possibilities” in social interaction spaces of selected universities of Istanbul that are also educational buildings. In Space Syntax Theory, interface is defined in the context of individuals (visitor-inhabitant; different kinds/groups of users of the building); whereas in this study, interface is taken as the interaction of different kinds of spaces that is space-space interaction.

In addition, permeability is taken as the feature of a space to be accessed at knee level and visibility is taken as the feature of a space to be accessed via eye level. While defining these, in permeability analysis, all the obstacles at knee level (obstacles related with the physical access) are taken into consideration whereas in visibility analysis, just the obstacle at eye level (obstacles related with the visual access) are taken into consideration.

For the interface possibilities, two types are defined: interface based on visibility and interface based on permeability. The main question is whether permeability or visibility within the environment is more effective on the behaviour of people, this argued upon the relative asymmetry of these concepts. For the investigation of this main discussion five architecture schools in Istanbul are selected as case studies which has different characteristics and possibilities in case of visibility/permeability relations. In these schools, entrance floors are the focus point as they are hosting both two parameters more than other floors of the faculties.

The cases are examined through quantitative methods including convex space graphics that are produced from justified graphs; visual graph analysis; space syntax analysis and statistics are supported with the qualitative methods based on observations of users’ behavior modes. In order to evaluate the analysis firstly, convex space analysis based on visibility and permeability evaluated comparatively between five schools and some pre-results put forward. Then results from “syntax 2D” analysis and observations overlapped with statistical analysis of Regression Analysis investigated through SPSS and compared with foreseen situations from the comparison of convex space graphs.

In conclusion, the behaviour of people seemed to be depending on visibility more than permeability in social interaction spaces of architecture schools. Moreover, informal usage of the spaces seems to be more in spaces where relative asymmetry is high as it is stated in the study of Araguez and Psarra (2015) for Rolex Centre, as well. Further discussions to be held in other levels and other organizational charts.

KEYWORDS

Visibility, permeability, interface, interaction
1. INTRODUCTION

Higher educational buildings are one of the important facilities in the city as holding a place in the lifetime of most of the citizens in different terms of their lives. In the knowledge era, education becomes multilayered when compared to previous times. Recently, education lie beyond the classes and laboratories to corridors, courtyards and to all faculty; combining the academic education with experience and sharing, as well. Universities are the place of education not only in academic way, but also for the self development of the individuals in academic and social manner. For understanding how the universities work for both social and academic way; one should have an understanding on the ‘spatial organisation’.

Organizational and spatial patterns lead creating the character of the building and creates the framework for the usage of the inhabitants. Main focus of this research is behaviour of people in educational buildings by the leading of the space. This paper consists of two main parts including, the university spaces and user behaviour in relation with the configuration of these spaces. The relation will be held upon the terms, co-presence, interaction, interface possibilities and visibility/permeability contradiction.

For the educational spaces, architectural faculties are used as the focus point. They include more interpretable spaces than other faculties since the character of the architecture education itself differs from the other faculties and much more interrelated with the spaces of the building. All the building itself, becomes the studio area for the architecture faculty students. Mostly, there can be find more flexible spaces, which can create different possibilities in interface possibilities, co-presence, interaction, visibility, permeability relations. Entrance floors of architecture schools are the concentration point as contains more social interaction spaces and usage ratio by different users of the building. So that, entrance floors have higher potential in the aspect of interface possibilities, interaction, co-presence and user behaviour examination through configuration of space.

The main question of the study is whether permeability or visibility within the environment is more effective (based on relative asymmetry) on the behaviour of people. Visibility and permeability duo is the key concept behind all concepts like interaction, co-presence, co-awareness, Environment Behavior Theories and Space Syntax Theory that discuss the effect of the configuration of space on the behaviour of the users.

Basically, permeability defines the characteristic of the space that one can move through. Visibility defines the characteristic of the space that one can see and perceive through. Koch (2012) approaches the issue with a pratic viewpoint and defines permeability as knee-level (isovists based on accessibility) access and visibility as eye-level (isovist based on visibility of space) access. When visibility-permeability duality evaluated; there are three options: a space can be visible and permeable; visible but not permeable; permeable but not visible.

The affect of the space on the behaviour of the user is defined over the psychological factors such as potential for the behaviour variety, sensory access, memorability, sociality by Montello (2007). This affect based also on the physical factors with psychological factors. One of the most important physical factors is visual access. When somebody is in a new place, if visual access increases, the intelligibility of the space will get higher and the stress level of the one will decrease. As in this example, visual access is one of the key parameters of syntax theory and wayfinding. Visual access-visibility is also the key term leading to perception and cognition. Perception and cognition are the key terms that people relate themselves with the environment and these generate upon the visibility. Down and Stea (2011) explained perception and cognition upon the application phase of each: perception is the process that caused by the existence of an object while cognition is the process that occurs in the mind of the subject. It is a psychological process and not directly related to that environment, that time and existence of an object. While visibility is about the first contact and perceiving the environment, permeability allows the one to move through the spaces continuously. Permeability term matches with the term connectivity that held in Space Syntax Theory; and symbolizes the physical, knee-level connection in between different convex spaces/spaces/grids.

Interaction is the concept as it grows upon permeability and visibility and creates the basis for co-presence. Co-presence defined as a by-product of movement created by visitors in buildings and as Hillier states it can be taken as the primary form that has awareness of others (Hillier, 1996; Napatov et all, 2014). This can be interpreted as co-presence is both reason and result of interaction between people. As stated by Benedikt (1979), people move on lines, interact with others in convex spaces and
the relation between behaviour of the person and space characteristic built upon the isovist areas which based on visibility.

Interaction is bidirectional, one actor/subject/object affects another, and the other affects it in return, as well. According to Goffman (1959), interaction is a performance and this performance is happening unconsciously between the actor and other actors and milieu. Hereby, also in this study, interaction is defined both between actor-actor and actor-milieu as both are affecting the behaviour. This generates upon the acquiring of the need of the person to position himself in the milieu with reference to other actors and objects. As Hagerstrand (2009) stated, in daily practices, people are in an endless motion including target oriented and not target oriented moves and during this they have many interactions that can be named “unintended encounters”. The motion shaped by the configuration is named as ‘natural movement’. Co-presence and co-awareness are the results of the motion; the main mission of the building layout is supporting these to occur for the potential social interaction and production (Peponis, 2001; Hillier, 2014).

Space Syntax theory generates around the configuration of the space in order to understand the potential of the space to host interaction, co-presence, etc. This theory is mainly based over ‘visibility’. Syntax theory seems as a mathematical method whereas it is much more about the topology rather than mathematic. Topology corresponds to the configuration of the space in this frame. According to the theory there is a social logic behind the configuration of space. Hillier (1997) defined the configuration as interrelated relations; and enlarged this definition with adding two explanations. There are two issues about configuration; the configuration is changed when the one looked from different viewpoints and if one piece or one relation change in the configuration context, all the system and each piece of that system will be affected from this change. In parallel to this; the space does not mean anything by itself in context of the configuration; the existence of the space is defined with its temporary relations with other spaces and this changes according to the position of the subject and its viewpoint (Vaughan, 2007; Hillier, 2014). In syntax theory there are two values for each concept (depth, integration, connectivity, circularity); local value (the value that calculated in relation with nearby spaces) and global value (the value that calculated in relation with the whole system).

For the examination of all these concepts ‘space’ has to be defined in the frame of this study. The concentrated area is the social interaction spaces on the entrance floors of architecture schools. Another definition is also done for the concentrated space type for this study; the examination goes through the interface possibilities in these social interaction spaces on the entrance floors of architecture schools. Interface can be defined through the ‘in-between’ term. Also, for the interface of the spaces with different characteristics, the values and character of the interface will be equal to total of both spaces, will show character of one space or can put forward a totally different character than those two. Hereby, the interface type is space-space interface. Interface defined on the basis of visibility – permeability characteristics of the spaces on the entrance floors of the architecture schools.

2. DATASETS, METHODS AND CASE STUDIES

As stated in the previous section, the relation between configuration of space and behaviour of the users is analyzed through the higher education buildings. Architecture schools are selected as the case studies since they consist of spaces which have much more spatial capacity, flexibility, distribution of the education to the whole spaces of the building. Spatial relations of the architectural schools are the result of some organizational patterns of the architecture education. Firstly, the hierarchy between academicians and students is sealed up. So, the relations are more flexible and informal compared to other faculties. The hours and spaces of the education is also much more flexible. And these add potential for the users to interact with space and each other much more. Therefore, for this study, the concentration point is the user behaviour – configuration of space relation in the social interaction spaces of the architecture schools and the interfaces in these spaces.

Three architectural schools in Istanbul, Turkey are selected: Istanbul Technical University Architecture Faculty (ITU), Mimar Sinan University Architecture Faculty (MGSU), Bilgi University Architecture Faculty (BU). These three schools have some common and differentiating characteristics. One of the common characteristic of these schools is that the buildings of these architecture schools are all historic buildings which built for different functions and then these buildings reused as architecture schools. The building of ITU was a military establishment which named Taşkısla, means “stone barracks”. The building of MGSU was a summer palace in Ottoman period and the building of
BU was Silahtarğa Electrical Central which was the central electric unit of the area in Ottoman period. All three architecture schools are all in the city center and has its own building in the campus. MGSU and ITU is symmetric when looked on plan but ITU is much central than MGSU. On contrary, BU is not symmetric and planned as an open plan. For the vertical circulation ITU has symmetric circulation plan on four corners, whereas MGSU has vertical circulation through some halls; BU has vertical circulation just through two points nearby the studio (Figure 3). While both MGSU and ITU has outdoor spaces in relation with the entrance floor (ITU, central courtyard; MGSU, open area between building and the sea parallel to all building); BU does not have an outdoor space in relation with the entrance floor. In ITU, visibility-based connections are mostly based on the entrance floor basis or courtyard-corridor relations; in MGSU, both outdoor space hall, gallery entrance floor and on the entrance floor basis; in BU are mostly through the galleries between studios and within all areas on the entrance floor thanks to the open plan structure. Entrance floors of these schools are studied for understanding the configuration of space - user behaviour relation.

**Figure 1: Interface possibilities**

Social interaction spaces of the entrance floors of the architecture schools are the frame of this study. Interface possibilities of these places are investigated upon visibility and permeability. Permeability based interfaces are mostly based on the circulation and movement, while visibility based interfaces are mostly on the interior-exterior relations and relations in three dimensional space, in addition to the circulation and movement patterns. Interface possibilities coded in order to be easier to relate within the graphics during the evaluation of the results phase.

A1 and A2 represent the interface between exterior and interior; for ITU and MGSU cases there are exterior areas which are part of the daily life of the building. For BU case, there is not an exterior area interrelated with the building, but this is also an important input for the study. A3 and A4 represent...
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the interface as the space in-between other spaces instead of a surface in between different spaces. The frame of this categorisation is generated on the soft or hard programmed spaces which defines the flexibility (soft) and functionally dictated spatial configuration (hard or strong) of space by causing ‘to and through movement’ character in that space. A5 represents the galleries and other spaces that have visual connection with each other in 3D; A6 represents the vertical circulation areas, this is also an important one as the focusing area of the study is the entrance floor of the architecture schools and vertical circulation areas are reference points for this floor as they reference to the main functions on the upper floors of the building.

For this study both syntactic and semantic methods are used. The structure of the methods generated mainly on the syntactical graphs and analysis with University of Michigan licenced Syntax 2D programme; after that on site analysis are done based on observation. After the assumptions done through space syntax analysis on paper; results from the on-site analysis are taken into evaluation and correlation analysis are done in IBM SPSS program with information coming from both syntactic and semantic analysis.
2.1 CONCEPTS AND DATA EXTRACTION

Space Syntax Theory basically concentrates on the configuration of space; to be able to display the configuration of space, there are some graphic methods to be used before isovist based graph analysis both on visibility and accessibility. Convex spaces are the basic module of the system that one can create on the building plan to start the syntactic analysis. Firstly, the space is divided into convex spaces; as the whole space of the building consist of convex spaces and the configuration of the space is the result of the interrelations of these convex spaces. All the graphic studies and on site analysis are built upon these for this study as part of the methodological approach of the paper. The photos from the architecture schools (Figure 2), the functional schemata and convex spaces division can be seen (Figure 3) below.

Figure 2: Entrance floor photographs; ITU (above), MGSU (middle), BU (below)
Building genotypes scrutinized to have a real understanding of the spaces of selected architectural schools. Justified graphs are used to show this basically (Figure 4) and the method expanded through Syntax 2D analysis afterwards. Mainly, justified graphs show the connectedness of spaces, which defines the knee level relations that symbolizes “permeability” concept. For this study, the main focus point is visibility/permeability comparison through the possible effect of the configuration of space on...
user behaviour. Therefore, in this study, justified graphs also interpreted in this way and are produced upon the 'visibility' parameter, which defines the eye level relations, as well. As Hillier and Hanson (1984) stated, justified graphs can give syntactic information about the space by generating the graph produced from convex spaces upon the interrelations of the convex spaces; symmetry-asymmetry, shallow-deep, distributedness or non-distributedness characteristics of the space can be defined from these graphs with the inclusion of levelling information. Another important concept upon these justified graphs is ringiness. ‘Ring’ defined by syntactic measures as the situation when two convex spaces are linked to each other with more than one link (Hanson, 1998). Ringiness is one of the important concepts for this study as it supports interaction potential.

Figure 4: Justified graphs produced upon permeability (above) and visibility (below)

While generating the justified graphs, a root space is selected according to the concentration of the research. Hereby, the main entrances of the architecture school buildings are selected as root space since the study is concentrated on the entrance floors and the social interaction spaces on the entrance floors of these buildings. The justified graphs started from the entrance and grows through the convex spaces and visualize the relational graph of the entrance floor of each school.

Some pre-interpretations can be done before Syntax2D analysis. On the permeability basis, depth levels of the three architecture schools are similar whereas when compared by symmetry and distributedness; Bilgi University and ITU gives a much symmetric graph and MGSU gives a graph that show higher distributedness than others. Ringiness arises in all three graphs but in different depth levels. When this is interpreted with the function and relational capacity of these spaces it can be seen that ringiness arises around the courtyard in ITU case; around entrance in MGSU case and around the open studios in Bilgi University case. On the visibility basis, depth values of the graphs do not display a change while distributedness and ringiness increase for all of the cases. In MGSU case, it can be seen that symmetry arises on visibility basis. While MGSU and ITU shows a much central characteristic on the visibility basis; in Bilgi University case, the central characteristic of the building hasn’t changed much. In general, the graphic of BU does not differentiate between visibility based and permeability based. These will be the first evaluation of the cases upon the basic justified graphs and these assumptions are interpreted in relation with syntactic values coming from Syntax 2D analysis and on-site analysis. In visibility analysis, it can obviously be seen that ringiness increases sharply. Upon this, an interpretation can be done that for all three schools the structure of the relation of the spaces are in relation; they are not just planned as function oriented.
When permeability and visibility based justified graphs are compared; for some of the schools the justified graph extractions are not changing whereas for some are changing. The latter situation is much more significant for this study since we are looking for whether the effect of ‘permeability’ or ‘visibility’ is different on behaviour of the users. The latter one gives the opportunity to compare deeply. For the situation which depth decreases when the parameter changed from permeability to visibility; a prediction can be done that this shows, people can understand the structure of the building much easily by leading of the visual relations, as stated by Lazaridou (2013), as well. This affect parity between visibility and permeability is interpreted with the help of semantic and syntactic analysis.

For further space syntax analysis Syntax2D is used (Figure 4, 5 & 6). This analysis also done in dual way (knee-level/eye-level) as all other analysis in this study. Entrance floor plans of three architecture schools selected as case studies are divided into the grid system by providing the similar grid dimensions for each building (20 grids fro meter square); the ratio arranged according to each other. So that, the results can be reduced on a basis that all three schools become comparable to each other. Syntax analysis are done upon these grid systems but the evaluation of the results are made based on convex spaces. For calculating the value of the convex space, the mean value of the grids hosted in that convex space is calculated for each parameter. Moreover, for much detailed analysis, the evaluation upon the interfaces are done with the mean values of the convex spaces hosted through the interfaces.

The calculated parameters in syntax analysis are; integration, circularity, connectivity, isovist area, isovist perimeter and mean depth. Integration and connectivity are in relationship with intelligibility which defines the ability of the comprehending the space (Hillier et al, 1987). These two display parallel values with each other. While connectivity is giving the relations of a grid and the nearby grids upon the number of grids that it connected directly to, integration is giving the mean value upon the relations of the grid with all other grids in the whole system (Hillier et al., 1987). And it can be interpreted as integration value is the macro value of the connectivity. Mean depth is the value that inversely proportional with these two values. This value can also be easily understood from the justified graphs as those graphs show the relative altitude of space in relation with each other. As Klarqvist (1993), Hiller and Hanson (1984) summarised, depth of a grid/convex space in relation with another can be calculated by the number of grids/convex spaces to be passed by while going to that grid/convex space; therefore, depth can be defined as the relative altitude of the spaces. In justified graphs the levelling system shows the depth of that space in relation with the root space while mean depth that calculated in syntax analysis shows the depth of that space, how much it is integrated or how much it is segregated, in relation with the whole system. When ringiness of a space increases, depth of space decreases. Circularity is about the geometry of that space, geometrically a circle tried to be fit in that space and the degree that how much the geometry is approaching to the circle is examined (Klarqvist, 1993). The centrality value increases when the geometry approaches to circle. Isovist area is the polygon that set by the visibility. When the one turns 360 around himself in a space, all the area that he can perceive is the isovist area (Benedikt, 1979). Isovist area and isovist perimeter concepts are both used together, as the latter one is about the geometry of that space. There can be two spaces with similar isovist area values but different isovist perimeter values. This can give idea about the differentiating geometry of that space. So, isovist perimeter and circularity can be evaluated together.

Figure 5: Value based results of Syntax 2D analysis
Observation is also involved in the study to combine the syntactic and semantic methods; combining the paper values to the daily life relations. For the observation phase, the natural observation method is selected which means that the objects of the observation do not aware of the observation and the observer is positioned outside the scene. For each school there are 12 periods of observation; the days are selected according to the intensity of the schools. The observation is done 2 day for each school for 6 periods a day (9.30, 11.00, 12.30, 14.00, 15.30, 17.00); 1 intense day (the most intense day in an architecture school is the studio day) and 1 normal day. The observation based upon the snapshot analysis which defines that the observer records the density and the variety of activities in that convex space in a certain time period while going on a route that planned before on a particular time basis. By doing this daily life of the users in those spaces extracted to the values; qualitative information is transformed to quantitative information. These values create the frequency values and are evaluated in relation with the syntactic data coming from syntax analysis by statistical methods (correlation analysis).

For the last evaluation, firstly the correlation analysis are done for all convex spaces; then for narrowing down the frame correlation analysis are done for the convex spaces including in predefined interfaces. Correlation values given as integration value (if not noted otherwise). Regression value (R) shows the strength of the relation and hanging between -1, +1. The strength of the relation increases
when R approaches +/-1, decreases when R approaches 0. For the R value to be involved to the evaluation p value should be ≤ 0.05.

**Figure 7: Results of the Syntax 2D analysis based on predefined interfaces**

### 3. INTERPRETATIONS ON SOCIO-SPATIAL CHARACTERISTIC OF ARCHITECTURE SCHOOLS

Evaluation of the syntactic and semantic data sets is done after the correlation analysis. Graphic results of Syntax 2D analysis can be seen in Figure 6 and value based results can be seen in Figure 5 and 7. Interpretations about the configuration of space can be done on these.

Here it can be seen that MGSU has the highest integration value, while BU has the lowest. MGSU differentiates in character of space with two parallel long corridors and spaces placed between these (Figure 2 & 3) and mostly consist of spaces which can be categorized in A3 interface type, soft programmed spaces. That’s why it shows significant relation on the topologic relation of user and space at all hours of observation and for many behavior. Some significant results are: R=0.395, P=0.014 (relation of frequency-configuration), R=0.516, P=0.004 (walking / permeability based result), R=0.453, P=0.012 (being alone / permeability based result), R=0.423, P=0.020 (being a part of a group/visibility based result), R=0.485, P=0.007 (being alone / visibility based result).

For A3 (soft programmed space), soft programmed spaces, there are many significant results for user behaviour-configuration of space relation: R=0.556, P=0.039 (walking/permeability based), R=0.602, P=0.023 (being part of a group/permeability based), R=0.616, P=0.019 (being part of a group/visibility based), R=0.624, P=0.017 (being alone/ permeability based), R=0.680, P=0.008 (being alone/ visibility based), R=0.721, P=0.004 (standing/ permeability based). Therefore, MGSU is suitable for the unintended encounters which leads to the co-presence and interaction in a row. And displays significant connections between behaviour and configuration of space.

When circularity values compared between visibility-permeability based values, there is almost no change for BU and a decrease for MGSU. However, for ITU case, circularity increases sharply in the visibility-based graph compared to permeability based one. This could be the affect of the central courtyard of ITU. When parameter changes from permeability to visibility, the whole entrance floor acts like a total square as from any part of the corridors around the courtyard, the one can perceive the courtyard and other side, therefore the geometry approaches to being circle. Here around the
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courtyard, there are A1 (outside – inside based on visibility), A2 (outside – inside based on permeability) and nearby these A3 (soft programmed space) interfaces. There are significant relations between user behaviour and circularity parameter for A2: R=0.969, P=0.031 (walking /permeability based result), R=0.963, P=0.037 (being part of a group /permeability based result), R=0.978, P=0.022 (being alone /permeability based result), R=0.983, P=0.017 (walking /visibility based result); for A1&A3: R=-0.660, P= 0.019 (sitting, permeability based result). For ITU case it can be seen in Figure 6 that visibility-based relations shows symmetry in configurational relations of the space as well as the plan geometry of the building, permeability based relations does not have a special character like this.

Figure 8: Results of qualitative and quantitative analysis based on predefined interfaces A1-A2
For BU, the space character is mostly both permeable and visible; as it can also be seen in the justified graphs at the first step of the study (Figure 4), there is not much difference between permeability based and visibility based justified graphs. This is because of the character of the layout of BU. It planned as an open plan layout (Figure 2&3). After the entrance hall, there is library which the one can freely go through, open studio which has visible and permeable connection with entrance floor and also with upper floors and an open classroom which defined by a few steps and in relation with all around in visible and permeable way. This plan layout does not consist of spaces and some connection areas between those spaces; it consists of main functioned spaces and in between spaces, so that there is a contiunity character. This makes this building interactive, intelligibele and open to interaction by providing co-presence and co-awareness all around the entrance floor. This explains the similarity of visibility-permeability based values.

In BU case, when visibility-permeability based results compared upon the connectivity- integration relation; the local and global character of these terms (as Klarqvist (1993) and Hillier et all (1987) stated), are displayed. While the entrance area connectivity and integration values increase similarly, for the studio are and open library it cannot be said. In the integration graph (Figure 6), the value of
these areas increase, but in connectivity graph, these values increase much sharply. It shows that these areas get much integrated and supporting integration within themselves, but not that much effective for the whole system. There are some significant results at entrance floor scale, R=0.522, P=0.032 (frequency/permeability&visibility based result/mean depth parameter), at A3 (soft programmed space) interface, all the activities show significant relations based on circularity parameter mostly based on permeability: walking (R=0.739, P=0.036 based on visibility); standing (R=0.799, P=0.017, based on permeability); being part of a group (R=0.745, P=0.034 based on permeability); being alone (R=0.780, P=0.022 based on permeability); frequency (R=0.844, P=0.008 based on permeability). At A6 (vertical circulation based on permeability), there is a significant relation between standing behaviour and configuration (R=-0.995, P=0.005, permeability based). There is an interesting result that at A4 interface (hard programmed space, based on both permeability & visibility), visibility and permeability values shows significantly opposite relations per connectivity parameter: (R=0.999, P=0.032 based on permeability), (R=-0.998, P=0.004 based on visibility).

In Figure 8,9&10, graphics show the integration values of each interface for each case based on permeability and visibility with the mean values coming from natural observation snapshot frequency analysis. From these graphics, the evaluation about whether the frequency change in relation with visibility or permeability can be done. This is a general evaluation in order to look if the interface characteristics match with the relational characteristics between user behavior-configuration. At A1 (interface between outside-inside based on visibility), the relation of the usage ratio of the space seems in relation with permeability more than visibility; while at A2 (interface between outside-inside based on permeability) it does not seem to relate with both significantly. At A3 (soft programmed space, based on both permeability and visibility) the relation again seems to be related with permeability rather than visibility.

![Integration Values in Relation With Mean Frequency Values at A3 interface](image1)

![Integration Values in Relation With Mean Frequency Values at A4 interface](image2)

**Figure 9: Results of qualitative and quantitative analysis based on predefined interfaces A3-A4**

At A4 (hard programmed space, based on both permeability and visibility) there is another situation; the relation seems to be related with visibility rather than permeability; however these spaces are the areas that have strong programmes such as canteen, studio, class, etc. As stated by Hiller et all (1993) in the frame of ‘natural movement’ theory, without the spatial configuration as the primary generator, the pattern of pedestrian movement or the distribution of attractors cannot been understand. According to this while configuration is affecting both movement and attractors; it is not a reciprocal relation. But for attractors and movements there is a reciprocal relation, they both affect each other. So that, according to natural movement theory, the functions also affect people use these areas and the relation of the user frequency-configuration ratio cannot be in a significant relation mostly as there are also other inputs that affects the usage of the area apart from space characteristics.
At A5 (vertical connection based on visibility), there does not seem to be a relation based on both permeability and visibility. For A5, there are different characteristics of the spaces for each case. Here the evaluation is done on interfaces, not by each school locally. So that, including different functioned spaces makes A5 to not be able to display a relational result. For instance, for BU case, one of the A5 interface hosts a studio whereas for MGSU case some A5 interfaces host circulation spaces which defined as soft programmed space (A3), as well. One of this has a strong programme while the other no; the latter one is kind of a flexible space. At A6 (vertical connection based on permeability) the relation seems to be related (inversely) with visibility rather than permeability. For A6, there again occurs a similar situation to A4 as this interface locates mostly at stairs-elevators; these areas are king of reference points for the entrance floors as leading up/down to all functions all around the building.

Figure 10: Results of qualitative and quantitative analysis based on predefined interfaces A5-A6

4. VISIBILITY PERMEABILITY DUO EFFECT UPON THE USER BEHAVIOR - SPACE RELATION

General results about the configuration of the entrance floors of architecture schools and the relation of these with user behaviour are evaluated. To widen this evaluation, hereby, this relation is discussed with the visibility-permeability duo; relative asymmetry of visibility and permeability. Relative asymmetry of visibility-permeability differentiates; this depends on how far the values of the permeability are and also the visibility-based results from each other. The question arises here whether relative asymmetry of visibility-permeability have effect on the user behaviour space relation.

In general, relative asymmetry is seen in MGSU and ITU case while cannot be seen in BU case. This creates an important path for the interpretations of the results of this study. The evaluation about the visibility-permeability based differences and the affects of these on the user behaviour can be questioned upon all three cases as they all show different characteristic in this way.
When the comparison done on the entrance floor scale, MGSU case shows the highest asymmetry of visibility-permeability (MGSU>ITU>BU); whereas when the comparison done on the interface scale, ITU shows the highest asymmetry of visibility-permeability (ITU>MGSU>BU). This could be because of the different character of the layouts (Figure 2, Figure 3). So, for the investigation of the user behaviour relation with the space based on permeability visibility duo, ITU can be discussed at interface scale and MGSU at entrance floor scale. So that, the question about whether the user behaviour space relation shows much significant values on locally defined interfaces in parallel with the character of interface upon the visibility-permeability can be scrutinized, in addition to the general discussion on the effect of visibility-permeability on user behaviour-space relation. The general evaluation of this is done in the previous section.

At entrance level scale MGSU shows sharply different values between visibility and permeability based syntactic results. When these results evaluated with on-site studies; significant relation is shown nearly at all hours of observation: at 11.00 (R=0.388, P=0.016), at 12.30 (R=0.370, P=0.022), at 14.00 (R=0.411, P=0.010), at 15.30 (R=0.351, P=0.031). It can be said that spaces of MGSU case do not dictate people to move on strict places and people can move by the configurational desires.

Activity based relations display significant relations, as well: walking (R=0.516, P=0.004, permeability-based results), being alone (R=0.453, P=0.012, permeability based results); being alone (R=0.485, P=0.007, visibility based results), being part of a group (R=0.423, P=0.020). As it can be seen from the correlation results based on activity, space configuration-user behaviour relationship is pretty high. Permeability based activity, walking, shows significant relations with the accessible character of the space. This shows the consistency of the method of the study. In addition to this, being alone situation shows significant relations for both visibility and permeability-based results. So, the space character of the social interaction spaces of the entrance floor of MGSU, makes people gather together by the leading of configurational relations.

At interfaces scale ITU shows sharply different values between visibility and permeability based syntactic results. When these evaluated with on site analysis: significant relations can be seen: at A2 (outside-inside interface based on permeability) interface, walking (R=0.976, P=0.004, permeability based results), walking (R=0.999, P=0.001, permeability based results per circularity parameter), being alone (R=0.993, P=0.007, permeability based results per circularity parameter), being part of a group (R=0.978, P=0.022, permeability based results), walking (R=0.986, P=0.014, visibility based results), walking (R=0.983, P=0.017, visibility based results); at A3 (soft programmed spaces based on both visibility and permeability), being alone (R=0.630, P=0.028, permeability based results), sitting (R=0.660, P=0.019, permeability based results per circularity parameter), being alone (R=0.671, P=0.017, visibility based results); at A6 (vertical connection interface based on permeability), being alone (R=0.557, P=0.048, permeability based results), being alone (R=-0.624, P=0.029, permeability based results per circularity parameter).

At interfaces scale MGSU also shows many significant relations: at A3 (soft programmed spaces interface base on both permeability and visibility); walking (R=0.556, P=0.039, permeability based results), being part of a group (R=0.602, P=0.023, permeability based results), being alone (R=0.624, P=0.017, permeability based results), frequency (R=0.535, P=0.049, permeability based results), standing (R=0.721, P=0.004, permeability based results per circularity parameter), frequency (R=0.677, P=0.008, permeability based results per circularity parameter), walking (R=0.673, P=0.008, visibility based results), being part of a group (R=0.616, P=0.019, visibility based results), being alone (R=0.680, P=0.008, visibility based results), sitting (R=-0.775, P=0.001, visibility based results per circularity parameter); at A6 (vertical connection interface based on permeability), walking (R=0.540, P=0.031, permeability based results), being alone (R=0.640, P=0.008, permeability based results), being part of a group (R=0.614, P=0.011, permeability based results), frequency (R=0.574, P=0.020, permeability based results), walking (R=0.525, P=0.037, visibility based results), being alone (R=0.564, P=0.023, permeability based results), being part of a group (R=0.549, P=0.028, permeability based results).

When concentrated on the activities, for some cases, activities show significant relations with the configuration of space however, for the interpretation of the results upon visibility/permeability, the character of the interfaces seem also to be effective. For instance, a permeability-based interface (e.g. A2, A6) gives much more significantly related results with the spatial configurational values by permeability, while the general results of the same case (including all interfaces based on visibility and permeability) gives much more significantly related results with the spatial configurational values.
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by visibility. For instance, for A6 interface (vertical connection based on permeability) in MGSU case, being a part of a group situation have much more significant relation with the configuration (R=0.614, P=0.011) on permeability basis rather than visibility basis. This can be related with the definition of the interface; A6 is the interface that defined as the areas that provides accessibility in vertical connection. On the other hand, in general context in MGSU case, being part of a group situation shows significant relations with configuration on visibility basis (R= 0.423, P=0.020)

Being alone situation, shows much more significant relations with the configuration on visibility base rather than permeability base. Some significant results: R=0.485, P=0.007 (MGSU/visibility based), R=0.974, P=0.026 (MGSU/A1/visibility based), R=0.969, P=0.031 (MGSU/A1/visibility based-circularity parameter), R=0.680, P=0.008 (MGSU/A3/visibility based), R=0.974, P=0.026(MGSU /A1/visibility based), R=0.671, P=0.017 (ITU/A3/visibility based), R=0.384, P=0.036 (ITU/visibility based). This could be related to perceiving, being perceived and interact with others in the social interaction spaces.

This paper proposes the notion of space through characteristics based on accessibility and perception; permeability and visibility. In conclusion, relative asymmetry of the parameters between permeability and visibility, seems to have a supporting effect on the relation between user behaviour and configurational patterns of the space. When the relative asymmetry increases as MGSU case, user behaviours happen to be more configuration directional while when the relative asymmetry decreases as BU case, user behaviours happen to be less configurationally directed. However, there is another thing about the permeability-visibility symmetric systems that when the relative asymmetry decreases, effect of the integration-based values upon behaviour decreases while effect of the circularity-based values increases. This could be related to the situation that circularity concept is geometry related.

The entrance floor of the architecture schools examined by both entrance level scale and interfaces scale. Both shows many significant values that supports the user behaviour relation with the milieu. The main thing affects this relation is the value of the main system, mean configurational values of the entry level scale. Relative asymmetry is the secondary affect as it can be seen between ITU-MGSU cases; MGSU has the highest configurational integration values at entry level scale while ITU has the highest integration values for each interface. If the relative asymmetry was the main factor on the relation of behaviour-configuration then the result should have shown that MGSU hosts strong relations at entry level scale and ITU hosts strong relations at interfaces level. However, MGSU also shows many strong relations at interfaces.
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