A framework of Built Environment attributes for evaluation of conviviality of a Public open space

Leena Thombre and Charumitra Kapshe

Department of Architecture and Planning, Maulana Azad National Institute of Technology, Bhopal M.P., India

ABSTRACT

The objective of this study is to identify attributes and indicators of the built environment to evaluate the conviviality of public open spaces. In literature, conviviality is discussed as the subjective quality of public spaces. Conviviality means, being happy in the company of others. From different studies, it was found that there are physical aspects as well as socio-psychological aspects of public open space design which influence conviviality. The paper discusses contribution of physical and built factors in increasing human interaction at public open spaces. First of all review of literature on the social, psychological and human behavioral aspects of conviviality are carried out. An attempt is made to relate cognitive, affective interpretative perception with the physical space to contributing attributes of the built environment. Attributes are further explained to derive quantifiable indicators of built form which can be evaluated for any public open space on conviviality. This study propose a scientific and applicable framework of indicators of the built environment attributes with an understanding of human perception in public open space. The suggested set of indicators can be used by urban planners, designers, and developers in various interventions of building open spaces for human interaction.

Introduction

In people's daily lives, access to public open spaces is limited to neighbourhood parks, office plazas, market places, transit-oriented spaces, etc. In such a scenario, a convivial public open space gives the opportunity to make friends, sit around and take a pause in a busy schedule. Display of culture, presence of people on streets and plazas, casual interactions in public places are indicators of a healthy, stable, and safe society (Jacobs, 1961). Conviviality isan independent term often used in social and psychological studies, but these days it's importance in the public realm is discussed under several urban design studies (Banerjee, 2001; Shaftoe, 2012; Rossini and Yiu, 2020). However, a lot of literature is available on conviviality, but selected aspects of conviviality are discussed in measurable form.

This paper attempts to bring more objectivity in understanding the feeling of conviviality in public open spaces and translate it in a quantifiable form. Thiswork is based on literature and examines the influence of built environment aspects on convivial human behavior. Based on the study, a framework of attributes and indicators of the physical built environment is proposed to evaluate conviviality in public open spaces.

Public Open Spaces and Built Environment

The term 'public open space' used in this study is all the open space available between built spaces. It is neither defined under any hierarchy of public open

spaces nor considered under any public spaces classification. It may be of a neighbourhood scale or an open space between streets.

Whyte (1980) in his book "The social life of small urban spaces" starts his discussion with an example of children's preference of playing in streets irrespective of the availability of playgrounds and parks. It happens so because the built units in the streets provide a sense of territoriality, closure, and human dimensions for psychological comfort. Gehl (1987) in his book "Life between buildings"has also described several convivial scenarios like scene of children playing in the streets, pedestrians walking on side walks, people sitting on benches. He says several conditions influence such outdoor activities and the physical environment is one of the major conditions. This study explores influencing factors of the physical built environment concerning to public open spaces and conviviality.

Conviviality

Convivial philosophy came into prominence with Ivan Illich's work-'Tools for conviviality' in 1973. His concern was about industrial development and dependency on machines which willdecrease human contact and lead towards an unsatisfied and lonely society. To understand this, he gave an example of cars which have resulted in a lack of public interaction in public places (Illich, 1973). The term "Conviviality" originated from the Latin word "convivere"means living together; it has been associated with sociable, friendly and festive traits (Vertovec, 2014). It evokes a connection between a mood and an atmosphere that requires the presence of others (Abspoel, 2017).

Convivial behaviour at a public open space could be just catching up with friends, passing by, staying for a while, having some food or drinks or could be just people watching (Whyte, 1980). Such optional activities are most likely to occur when the outside environment is highly feasible (Gehl, 1987). In understanding the role of the built environment in bringing conviviality in public open space, we have tried to form the relation of the built environment by understanding perception of conviviality.

Convivial Perception

The perception of places is formed due to cognitive thinking in initial stage. Affective factor adds emotions or feelings to cognition. Individual's experience, memory and comparison produce an interpre-

tation of the experience. This interpretation leads to the final evaluation of whether the overall perception of place is good or bad (Ittelson, 1960). The built environment plays an influential rolein influencing perception at a place (Moystad, 2017).

In the following part of the paper, the impact of the built environment in convivial perception formation is discussed at differentstages of perception (Fig. 1).
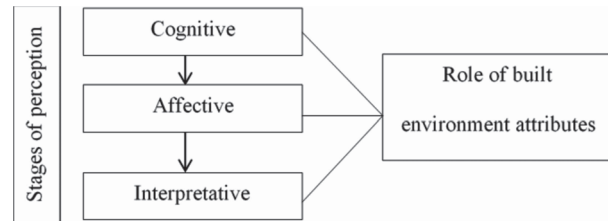

Fig. 1.   The relation between convivial perception and built environment attributes.

Cognitive

Cognition is a continuous process of gathering and filtering information to make the best sense out of it. At the cognitive stage, one is more aware of orientations, directions, built and open spaces composition (Lynch, 1960; Kaplan and Kaplan, 1982). How built environment attributes influence cognition is discussed in following section.

More the components of the organization are legible; they quickly make sense. Landmarks like tower, sculpture, statue or fountain act as focal points for orientation. The feeling of conviviality initiates with the presence of others'. Presence of others increases in well-integrated spaces. Nodes like squares and plazas converge more people at an end. Good weather facilitates outdoor activities. Climate-responsive built spaces can mitigate difficulties of weather. At the cognition level, the enclosure also influen sense of intimacy or loss.

Human scale deliver comfort to human senses (Gehl, 2010). If the place is regularly visited it generates sense of territoriality (Tibbalds, 1992). Thus, physical space at the cognition level affects human perception in several practicalways.

The built environment attributes may overlap in serving different sensory activities, for example, the human scale provides comfort, but comfort can also be gained with climate responsive design. The cognition level's sensory experience is explained under four psychological aspects of cognition with influ-
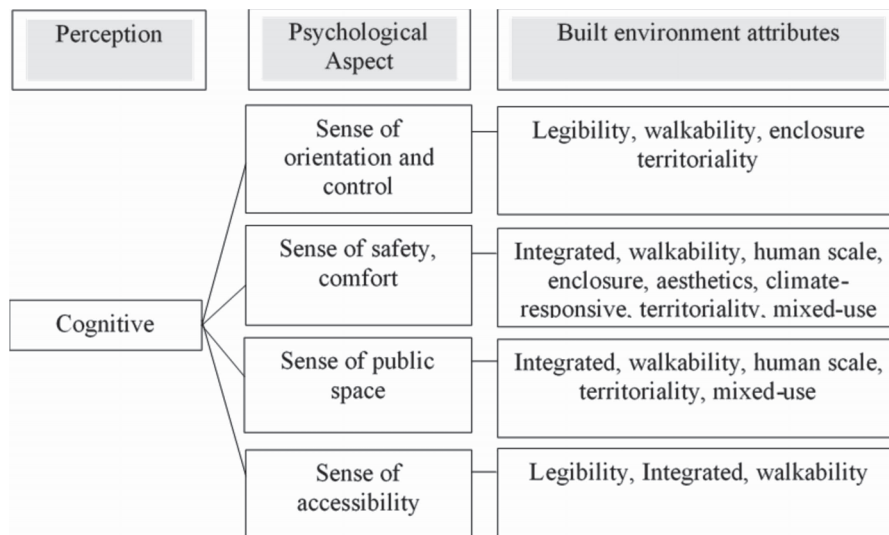
Fig. 2. Impact of the built environment attributes on cognition.

encing built environment attributes (Figure 2).

Affective

Affective perception is referred to as arousal or emotional perception in different studies (Carmona *et al.*, 2010). In environmental psychology, pleasure and arousal are conceived as two fundamental dimensions of affective responses that indicate people's feelings (Rofe and Weinreb, 2014; Khaleghimoghaddam *et al.*, 2018). Mehrabian and Rusell (1974) gave a model of pleasure-arousal which indicates one's state of feeling in a physical space which was later modified by Russel and Barret (1998) (Figure 3).

A convivial setting is expected to provide pleasure as well as motivating feelings. A convivial affective perception is all qualities mentioned at the right side of the pleasant axis in Fig. 3. Based on the discussion done by Whyte (1980), Tibbalds (1992), Banerjee (2001), Carmona *et al.* (2010); Shaftoe (2012) it is understood that form and function of built environment can affect certain feelings. Following four feelings of conviviality are identified as convivial feelings - relaxing, lively, engaging, and delightful.

Visual factors such as the built environment's aesthetics play a vital role in the affective stage of perception. An intricate façade detail instigates interest and curiosity, orderly building forms provide calmness, a careful contrast creates surprise, a visual harmony can relax, and grandeur makes one feel delightful (Gehl, 2010; Carmona *et al.*, 2010; Tibbalds, 1992). On the other hand, any cluttered

space increase anxiety or anger (Shaftoe, 2012). Climate also plays a vital role at affective stage of perception, a cool breeze in hot summer or a sunny day in chilly winters are essential parameters to affect the mood and emotions. Human scale also provide relaxation and comfort (Shaftoe, 2012; Gehl, 2010). Mixed-use in public space increase liveliness and engagement (Tibbalds, 1992). The connection between convivial feelings and built environment attributes is given below (Fig. 4).
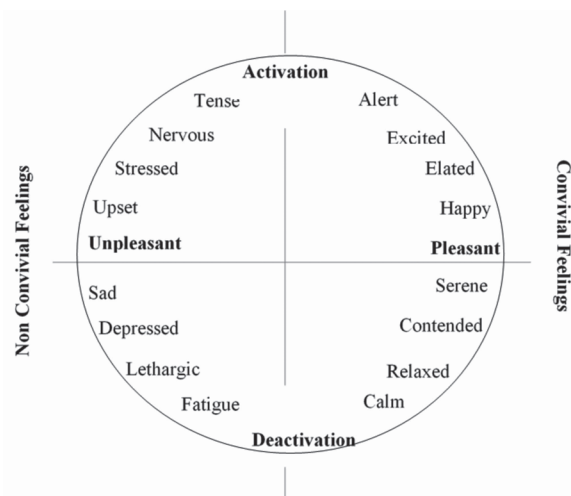

Fig. 3. Convivial and non-convivial feelings identified in pleasure- arousal model.

Interpretative

The cognitive and affective stage of perception leads towards interpretation when associative value is

assigned to the experience. A sculpture, statue, or monument placed as landmark adds character for interpretation in a public open space. In everyday conviviality, the built form in public open spaces having active facades andopenings like the market-place or bazaars are interpreted as friendly, welcoming and associative. Sometimes people add themeaning to the place depending upon cultural association. Memories of good times also develop associative feeling. A bench or a corner could create lasting memories of friendly gatherings. Particular season or a particular time of a day at a place also create strong associations. Due to familiarity with the surroundings, one can also develop strong belongingness towards it. A place offering such moments become part of memory and interpreted as more convivial. The connection where the built environment attributes can affect interpretative psychological aspects is given below (Fig. 5).

In this paper, the understanding of Built environment aspects on conviviality is explored by understanding the role of perception. Built environment attributes which affect psychological aspects of convivial perception at a public open space are summarized in Fig. 6.

Built Environment Attributes

In the next part of this paper, the contribution of physical built environment attributes mentioned in Figure 6 is discussed. Along with that quantifiable indicators of built environment attributes are also discussed with measuring tools such as survey, mapping, and softwares.

Legibility

Legibility is defined as the ease with which the mind can organize an environment within an imageable and coherent pattern (Lynch, 1960). It helps in cognition while orienting one self in an environment by following easily recognizable elements of the built environment. Lynch (1960) in his study of how people perceive the image of the city found that people save mental pictures of spaces and divide their imagination into districts, paths, nodes, landmarks, and edges as elements of the built environment.

The simple, coherent, understandable, and perceivable environment is considered as the legible environment. At the same time too much monotony and predictability make the space boring (Tavassolian and Nazari, 2015). Therefore, space
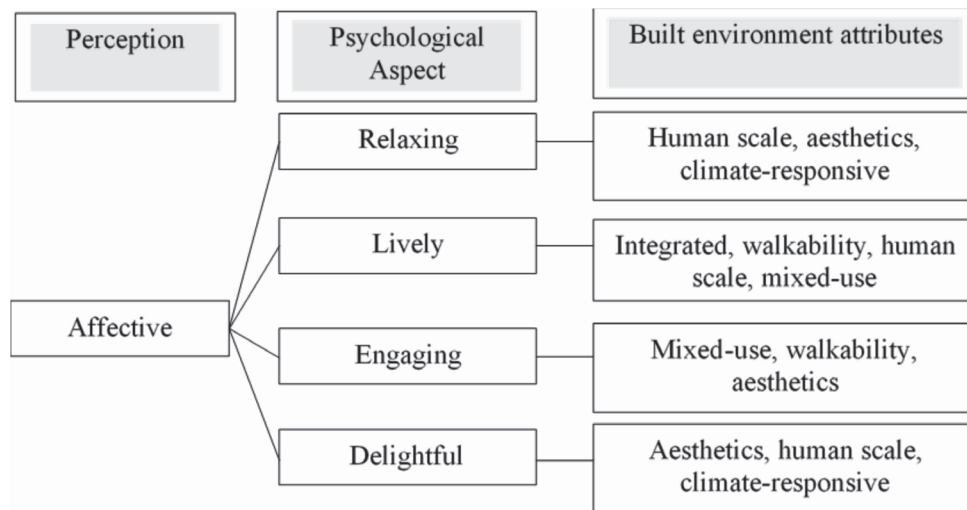

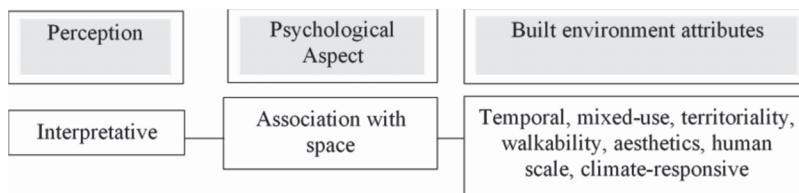**Fig. 4.** Impact of the built environment attributes on affective perception.

Fig. 5. Impact of the built environment attributes on interpretation.

should be carefully designed with distinct, distinguished and percievable urban features. Statues, historical characters, distinct trees, etc. which identify with local culture and historical background act as landmarks (Moghimi, 2017). All these associational properties due to legibility inbuilt space increase conviviality. Clutter, confusing signboards, incoherent design elements reduce legibility inpublic open spaces (Shaftoe, 2012). The legibility could be measured with the complexity of layout and landmarks' saliency (Koseoglu and Onder, 2011).

Integrated space

We have experienced that many spaces that are not designated public open spaces become convivial, only because they are located across the well-integrated node or square. Whyte (1980) studied people's behaviour in plazas of New York City found that, for a space to function genuinely, it must be central to the zone it is to serve. Tibbalds (1992) pointed out that one of the principal reasons' town centres are essential is that they provide opportunities to bump into people. These observations suggest that a well-integrated spaces results in convivial spaces.

To quantify how much a public open space is integrated space syntax is a popular tool. Space Syntax is capable of using integration to predict the pedestrian movement at the local and larger scales (Hillier, 1984).

Walkability

The quality of public open space also depends upon approach and accessibility. Walking contributes to a sense of safety in a community as it increases the number of 'eyes upon the street'. Therefore, walkable areas have been classified as more democratic places (Jacobs, 1961). The presence of retail activities along the streets is a significant inducer of walking as a transportation mode (Neto, 2015).

To measure walkability ped shed analysis is a popular tool which calculates actual walkable area to theoretical area within 5 min walking radius. A steep slope or gradient often influence the choice of walking. A rise up to 1:10 is considered comfortable for walking (Neufert, 1980). Modal conflict and encroachments are other issues that pedestrians face
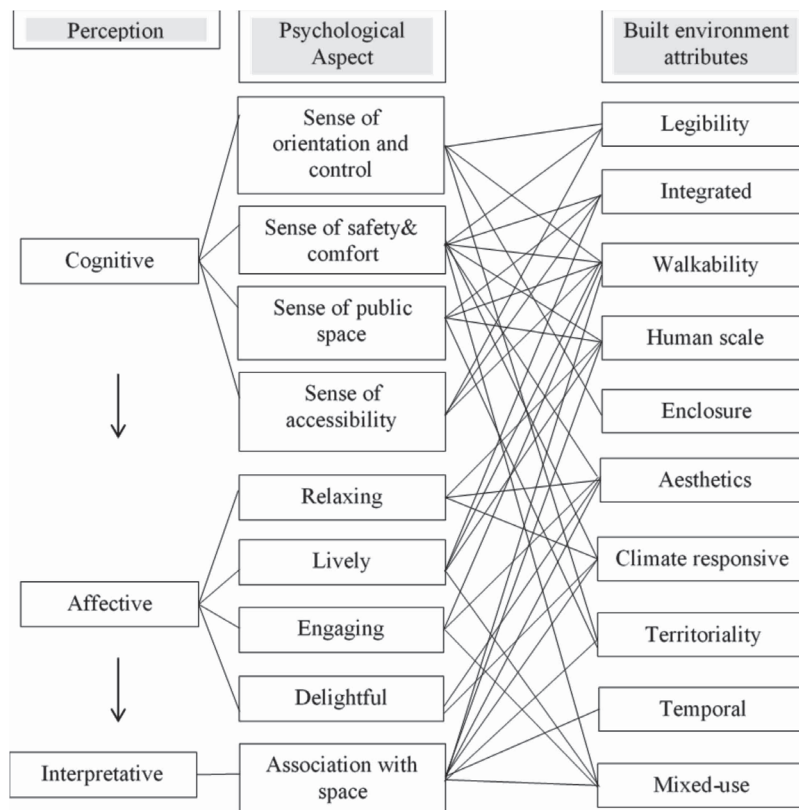

Fig. 6. The relation between built environment attributes and psychological aspects of perception.

while walking in Public open spaces. If street furniture is provided along the walking path, it supports walking. Active facades also helps to create engaging visuals while walking (Gehl, 2010).

Human Scale

Urban areas exist for human beings. Tibbalds (1992) in his famous book "Making people friendly towns" explains how modernist rejected the city and city space, and shifted their focus to individual buildings. He gave example of Venice, which was designed to adapt pedestrian traffic, makingit a working model for planning with the human dimension. Gehl (2010) suggested to build exciting spaces at eye level to achieve human scale in public open spaces. Therefore, active façades play an important role in achieving the human scale. He has suggested many properties of active floor designs such as small units with many doors (15-20 doors per 100m), large variations in function, no blind, few passive units, lots of character in façade relief, good details and materials, etc as measure of creating active facades. The street furniture like lamp, dustbin, and benches bring comfort to human senses as they are meant for human use and their dimensions help in bringing the scale. Accessories for universal human activities such as to walk, stand and sit, watch, listen and talk should be provided to achieve the human dimension (Whyte, 1980). Food and drink outlets can provide such opportunities where an excuse to sit, stand and stop for a while appear completely normal and engaging, at the same time provided furniture tends to develop human scale.

Enclosure

Enclosure directly affects the senses to develop the feeling of being lost or intimate. Safety is another psychological value attributed to the enclosure (Jacobs, 1961). Extreme high values of enclosure evoke claustrophobia and confinement, while extreme low values evoke discomfort because of a lack of psychological shelter. Enclosure or closure helps us to perceive objects as a whole. Huge streets or open spaces are rarely perceived as a whole entity. Small space makes people deal with each other and facilitate interaction.

Many urban design theorists have argued that there are proper width and height ratios that can create a "sense of enclosure" for open space (Gehl 2010; Jacobs, 1961; Lynch, 1960). The most preferred ratio is 1:1 and other preferred ratios range between 1:1 to 1:3 with best being 1:2.5. At 1:4 it is considered as lost. In convivial open public spaces, the appropriate ratio of the enclosureensure the presence of more people.

Aesthetics

Nasar (1994) defines aesthetics as arrangement of elements to produce a pleasantly heightened intellectual and emotional awareness. The Renaissance used symmetry, proportion, restraint, regularity, and balance as vital components of beauty.

To explain why we prefer some views over others, Ramachandran and Hierstien (1999) have suggested two sets of distinguish qualities that lie in creating unity and variety. Harmony, order, symmetry, balance, and proportion are considered under unifying qualities. Variety, complexity, and contrastare usefulin creating interest and surprise. Considering the following aesthetical qualities of built facades (Fig. 7) one can visualize its impact on conviviality.

Climate responsive

Whyte (1980) studied the effects of the sun on open public plazas in New York. He observed that people prefer sun over shade until a specific temperature and shift their sitting positions accordingly. Social and optional activities such as sitting, chatting and meeting friends occur in good weather (Gehl, 1987). Weather produces local microclimatic conditions that vary remarkably in different built-up environments (Zacharias, 2001). Many convivial spaces have good microclimate caused by the enclosure effect of buildings. The relationship between climate and use of public open spaces is strongly correlated. Temperature, wind, and sun conditions explain to some extent the significant variations in use of public open spaces.

By providing practical design aspects, the outdoor heat stress can be mitigated through shading (Mayer *et al.,* 2005). Building materials play an essential role in determining heat stress. Their surface behaviour towards solar radiation in the open helps to determine the local temperature at a place (Ali-

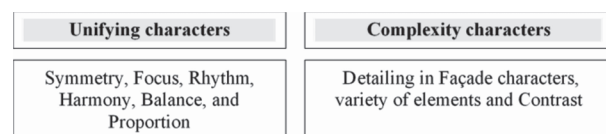| Unifying characters	Complexity characters
Symmetry, Focus, Rhythm, Harmony, Balance, and Proportion	Detailing in Façade characters, variety of elements and Contrast

Fig. 7. Unifying and complexity characters of aesthetics in built structures

Toudert, 2005). Massing, layout, materials, orientation to the south, and prevailing winds account for large proportion of the local variations in microclimatic conditions (Zacharias, 2001). Built forms help for mutual shading. Trees with foliage provide shade. Trees can also help to direct wind speed in public open spaces. Thus built environment and landscape can affect microclimate, helping us build convivial public open spaces.

Territoriality

Territoriality sets invisible boundaries within which one feels comfortable and safe. Taylor and Stough (1978) empirically states that the frequency of visit and duration of the visit by someone to a place increase its value, control and importance in their life. Karrholm (2005) talked about territorial appropriation through repetitive and consistent use of an area by a person or group. Therefore the sense of territory based on repetitive use is a critical factor in building conviviality. Sommer (1969) in his book on space psychology, said that having a territorial behaviour lead to the fulfilment of other needs like identity, motivation, security, self-actualization, and self-esteem.

It is expected that most of the visitors in public open space have territorial behaviour at the neighbourhood scale. Often at new places, cognitive territoriality could be observed through seeing across area and listening to others. By this, a sense of control and awareness forms where we feel comfortable about the vicinity (Shaftoe, 2012). Few distances can be regarded as territorial distances such as 100 m distance, one can see what is approaching towards them, and at 7 m distance, one can see facial expressions (Gehl, 2010).

Temporal Dimension

The temporal dimension is the intangible aspect where the time factor is physical quantity but not built part. At different times of the day and night, the urban environment is both perceived and used differently. The mixed-use generally create more time lines in a location. With the change of time in a day, the conviviality changes. Temporal dimension changes character of the space (Carmona *et al.*, 2010). During different periods, change in activities can bring change in conviviality. At times, old structures or heritages also helps to determine temporal impact. Their presence creates an interest in under-

standing the evolution of space from then and now.

Mixed-use

Sometimes people only pass by, and sometimes they prefer to stay. Those who choose to stay find purpose like eating, watching others, meeting friends, etc. Such convivial activities are often possible in mixed-use spaces. Since Jane Jacobs published her landmark insights in 1961, there has been supporting for mixed occupancy and use of urban areas, in contrast to a planning of post-war years that had encouraged segregation and zoning. The famous plans by such as Abercrombie, Le Corbusier, Tibbalds, Lutyens, and Howard are characterized by an obsessive devotion to simplistic single-purpose zoning and segregation of uses which appear to lack conviviality. The more well-used and varied public open spaces are, they are likely to have people friendly atmosphere. The mixed-use city centres provide for culture, entertainment, leisure, recreation, civic life and the exchange of community views. Greater diversity helps to create a more livable city.

Mixed land use facilitates such conditions which helps to increase social capital (Nabil and Elsayed, 2015). Existence of a single purpose at space can generate very few origins and destination goals. Mixed land use can invite the public at different timings for different purposes creating continuous origin-destination cycles. For measuring conviviality, the activities such as meeting friends, drinking and eating in the open or watching street activities, etc can be documented. A GIS map showing all activities and services and their tangibility of interaction can produce a clear picture of public open space to be convivial or not (Manaugh and Kreider, 2013).

Framework for Evaluating Convivial Attributes

Built environment attributes can overlap each other in fulfilling different aspects of psychology in convivial perception. Figure 1, 2, 3, 4, 5 and 6 show the relationship between convivial perception and influencing built factors. The discussion on built environment attributes suggests indicators which can be quantified for evaluation of conviviality. Based on the above discussion a framework (Fig. 8) is developed. In the given framework quantifiable indicators of built environment attributes are shown along with their basis of evolution from perception of conviviality.
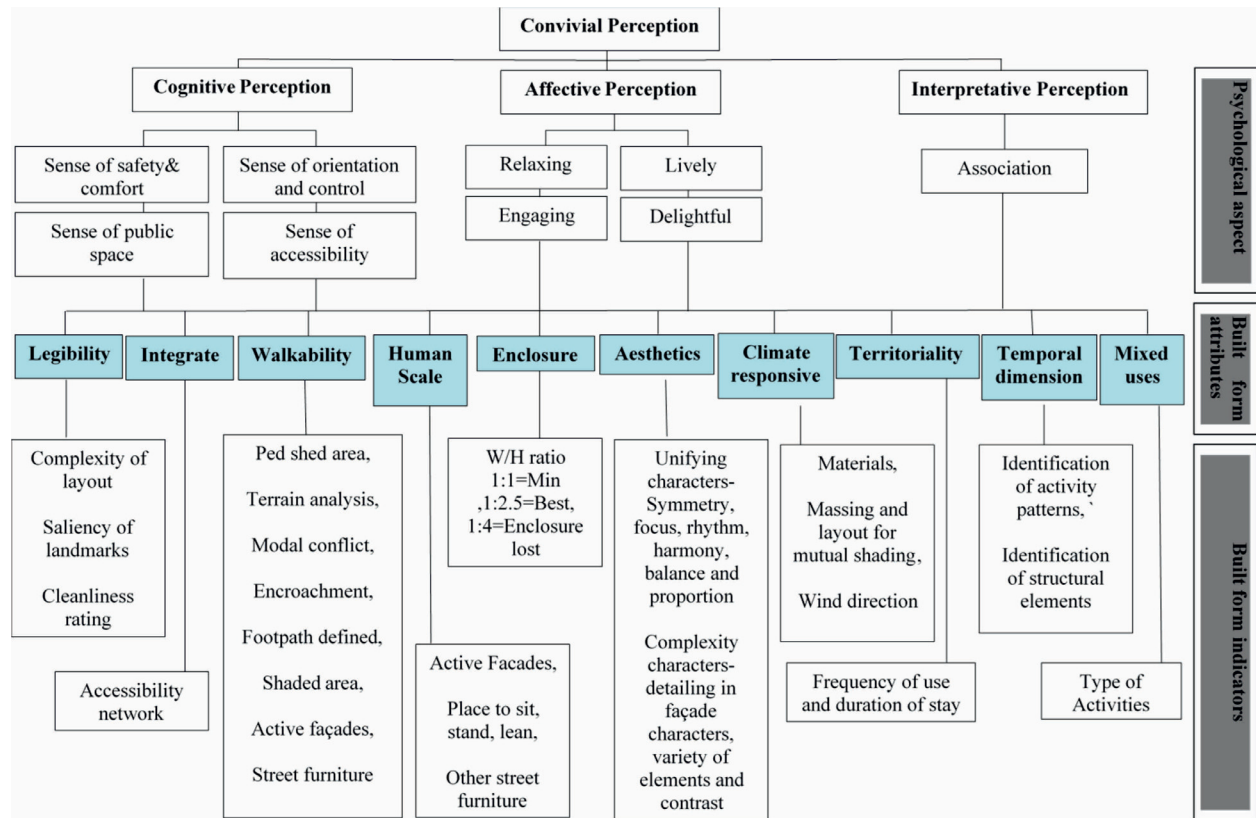
Fig. 8. Framework for evaluation of conviviality

Conclusion

The discussion on conviviality is critical as public open spaces are facing a reduction in human interaction. The approach adopted in this paper to increase human interaction in the public realm is based on the understanding of human behaviour and perception. In this paper several tangible and intangible aspects are addressed which can influence conviviality. The study helped to bring objectivity in the quantification of conviviality. It also deals with the complexity and overlapping between layers of the built and open environment to create an effective convivial atmosphere. Impacts of physical attributes of the built environment on cognitive, affective, and interpretative perception about public open space led to a framework based on psychological aspects. The framework helps to reduce the subjectivity of a qualitative concept like conviviality. The framework translates psychological aspects into the following ten built environment attributes-1. Legibility 2. Integratedness 3.Walkability 4. Human scale 5. Enclosure 6. Aesthetics 7. Climate respon-

siveness 8. Territoriality 9. Temporal dimension, and 10. Mixed uses, which are briefly discussed with their quantifiable indicators. This framework is useful for urban designers and planners to build more human and livable cities with convivial public spaces.

References

Abspoel, Peter. 2017. In praise of foolish conviviality. *Internatiional Journal of Philosphy and Theology.* 78 (3): 234-257.

Ali-Toudert, F., Djenane, M., Benasalem, R. and Mayer, H. 2005. Outdoor thermal comfort in the old desert city of Beni-Isguen, Algeria. *Climate Research.* 28 : 243-256.

Banerjee, Tridib. 2001. The future of public space-Beyond invented streets and reinvented places. *Journal of Americal Planning Association.* 67(issue 1) : 9-24.

Carmona, Mathew, Steven Tiesdell, Tanner Heath, and O Tim, O. 2010. *Public places - Urban spaces:The dimensions of urban design(2nd ed.).* Oxford: Architectural Press.

Gehl, Jan. 2010. *Cities for people.* Washington: Island Press.

1987. *Life between buildings- Using public spaces.* New York:

Van Nostrand Reinhold Company Inc.

Hillier, Bill. 1984. *Space syntax as theory.* London: Bartlett.

Illich, Ivan. 1973. *Tools for conviviality.* New York: Harper and Row.

Ittelson, W.H. 1960. *Visual space perception.* New York: Springer Publishing Company.

Jacobs, Jane. 1961. *Life and death of great American cities.* New York: Random House, Inc.

Kaplan, Stefen, and Rachel Kaplan. 1982. *Coginition and environment: Functioning in an uncertain world.* New York: Prager.

Khaleghimoghaddam, Navid, Bala, and Havva Alkan. 2018. The impact of environmental and architecture design on user's effective experience. *YBL Journal of Built Environment.* 6(1) : 5-19.

Koseoglu, Emine, and Deniz Erinsal Onder, 2011. Subjective and objective dimensions of spatial legibility. *Social and Behavioral Sciences*. 1191-1195.

Lynch, Kevin, A. 1960. *Image of the City.* Boston: The MIT Press.

Manaugh, Keving, and Tyler Kreider. 2013. What is mixed use? Presenting an interaction method for measuring land use mix. *The Journal of Transport and Land use.* 6(1) : 63-72.

Mayer, Helmut, and Ali Toudert Fazia. 2005. Numerical study on the effects of aspect ratio and orientation of an urban street canyon on outdoor thermal comfort in hot and dry climate. *Building and Environment* 94–108.

Mehrabian, and Rusell, J.A. 1974. *An Approach to Environmental Psychology.* Cambridge: MIT Press.

Moghimi, Behnoush. 2017. Urban legibility,analyzing urban elements. *European online Journal of Natural and Social Sciences*. 6 (1).

Moystad, Ole. 2017. *Cognition and the built environment.* New York: Routledge Taylor and Francis group.

Nabil, Noha Ahmed, and Geham Elsayed. 2015. Influence of mixed land-use on realizing the social capital. *HBRC Journal.* 11(Issue 2) : 285-298.

Nasar, Jack, L. 1994. Urban design aesthetics. *Environment and Behavior.* 23(3) : 377-401.

Neto, Luis. 2015. The Walkability Index." Manchester: Dissertation submitted to University of Manchester for degree of Planning in Humanities.

Neufert, Ernst. 1980. *Architect's Data.* Oxford: Blackwell Science Ltd.

Ramachandran, and William Herstein. 1999. The science of art: a neurological theory of aesthetic experience. *Journal of Consciousness Studies.* (6) : 6-7,16-51.

Rofe, Yodan, and Amelia Rosenberg Weinreb. 2014. Mapping feeling:an approach to the study of emotional response to the built environment. *Journal of Architectural and Planning Research*. 127-145.

Rossini, Francessco, and Melody Hoi-lam Yiu. 2020. Public open spaces in private developments in Hong Kong: new spaces for social activities? *Journal of Urbanism: International Research on Placemaking and Urban Sustainability*. 13(2).

Shaftoe, Henry. 2012. *Convivial urban spaces-Creating effective public spaces.* London: earthscan.

Sommer, Robert. 1969. *Personal space: The behavioral basis of design.* New Jersey: Prentice Hall Trade.

Tavassolian, Golnaz, and Mostafa Nazari. 2015. Studying legibility perception and pedestrian place in urban identification. *International Journal of Science, Technology and Society.* 3(2-1) : 112-115.

Taylor, Ralph, B, and Roger Stough. 1978. Territorial cognition: assessing altman's typology. *Journal of Personality and Social Psychology.* 36(4) : 418-423.

Tibbalds, Francis, 1992. *Making People Friendly towns.* London: Longman Group UK, Ltd.

Vertovec, Magdalena Nowicka and Steven. 2014. Comparing convivialities: dreams and realities of living-with-difference. *European Journal of Cultural Studies.* 17(4) : 341–356.

Whyte, William. 1980. *The social life of smal urban spaces.* New York: PPS.

Zacharias, John. 2001. Microclimate and downtown open space activity. *Environment and Behaviour.* 33(2) : 296-315.