MODELLING PEDESTRIAN MOBILITY AS A DESIGNER’S TOOL IN URBAN PROTECTED AREAS

1Ognen Marina, 1Jovan Ivanovski, 1Bojan Karanakov, 1Ana Ivanovska, 1Ivana Topalovska, 2Milena Stavric

1Faculty of Architecture, University “Ss. Cyril and Methodius”- Skopje
Bul. Partizanski odredi, 24, 1000, Skopje, Republic of Macedonia
Ph./Fax: +389 2 3116 367. E-mail: ognen.marina@arh.ukim.edu.mk

2Institute of Architecture and Media, Faculty of Architecture, Graz University of Technology
Inffeldgasse 10/2, 8010 Graz, Austria
Ph.: +433168734738. E-mail: mstavric@tugraz.at

The study exercise the complex analysis of pedestrian mobility within the Skopje’s historic district with use of dynamic models and representation of patterns of pedestrian behaviour in time as scientific knowledge and architectural tools for better understanding of processes that are shaping our city and more sustainable design of cities. The derivation of architectural tools and planning techniques as a result of modelling spatio-physical dynamics of pedestrian mobility and their interaction with patterns of human scale perception and streetscape morphology is elaborated through data collection, visualisation of data and creation of model of complex interaction of different aspect of urban phenomena. Local designing formats that encourage dynamic tensions between complexity and coherence of perception, mobility and built environment are proposed as a case study of Skopje’s historic district.

Keywords: pedestrian mobility, protected areas, modeling, designer’s tool

1. Introduction

Cities, the biggest and most complex creation of mankind [11], can be best recognized through their distinctive shape, complex organization and density of the built environment. Urban form as a dominant physical structure in the built environment is the materialization of this complexity and it is the way humanity expresses its culture and society in a spatial manner [5]. It is believed that within the spatial systems of the city distinctive characteristics of the societies exist and that their knowledge is conveyed through the space itself and through the organization of spaces [2]. This means that the urban form is a spatial emanation of the social order of the cities and is relative and depends upon the human activities within it.

Hence, the spatial mobility of people is important activity in the cities; it enables people to become the foundation of the social and economic processes that drive the urban system and sustain the urban fabric [12]. People organize and exercise their activity within the framework of the architectural and urban form and through the spatial and social configurations of the urban environment, but it is the movement between the static forms of the cities that is the real emanation of the complexity of the cities. This mobility between the buildings is the driving force that enables the spatial experience of the urban environment and is the driving engine for its vitality and viability.

Programs for preservation of the historic district in Skopje have led to a separation and isolation through fixing in time the physical structure of the city. This approach does not recognise the distinctive dynamics of the way the urban space and architecture are perceived and used, especially by the pedestrians. Better understanding of the emerging patterns of pedestrian behaviour within the urban environment and their interaction with the built environment can help us become more sensible to the processes that are occurring in the protected areas of the cities and especially within the historic districts that are frequently proclaimed protected pedestrian areas.

The purpose of this research is to investigate how pedestrian mobility data from Skopje’ historic district and especially how the pedestrian perception can be visualized and presented in multilayered model that will provide cohesion and interaction between two or more aspects of this activity within the urban environment and to suggest how this novel information can be used for evaluation and better design of urban protected areas. This paper concludes with ideas how using the multilayered and comparative...
model of pedestrian mobility for representing complex data and different variables of the urban environment could generate a result that would elucidate the complexity of the urban dynamics and would serve as a valuable tool for architects, planners, local authorities, citizens and even retailers in their effort to create more liveable and human urban environment.

2. Research of Pedestrian Mobility

The pedestrian activity within the urban protected areas can be generally considered as a result of three dominant aspects – the configuration of the street network, the location of the attractors and the morphology of the built environment and streets. In order to understand the influence of each of the stated aspects of the context over the pedestrian activity it is necessary: firstly, to observe and record the movement of pedestrians through the intensity, routes and patterns of use of street network; secondly, to explore and classify the morphological elements and regularities of urban form and the streets where the pedestrian activity occurs in order to recognize certain influences and interdependences between the form and the activity; and finally, to map the configuration aspect of the street network and the built form in general.

The standard techniques for recording and measuring pedestrian activities, in the sense of the mobility flows, are based on physical counting of the number of people passing through a virtual points or ‘gates’, strategically positioned at the crossroads of the street network. Although these techniques can be quite valuable in research of pedestrian mobility, they are restricted only to providing indications of the relative intensity of movement without explaining the causes; even less they could be solid ground for prediction of the future patterns of pedestrian activity [12].

On the other side, the physical form and its morphology could make an impact on the level of comfort of walking through different types of environments and the physical attributes associated with them. This can be additionally explored through maps of perception or attractiveness and liveliness of different urban set-up. It can be measured with the Levels of Service (LOS) indicator that attempts to measure the level of comfort of the pedestrian within the urban setting [3]. But beyond the shear geometry of the streets, the intensity of pedestrian flows and their physical dependence, there is another non-tangible aspect of the urban form that influences the patterns of pedestrian behaviour. It is the overall geometry of the system of streets and more important, the relations between them, an aspect that determines the configuration and the spatial nature of the streetscape. Many attempts to investigate the impact of spatial configuration have been made as late as the ’70 [9] that focused on some problems of applying geometry and mathematical tools for description and analysis of complex urban layouts; the research in this field pertains to be one of the most active ones [8], [5]. Cellular automata models, besides the simplicity of the rules for producing complex results, are not always suitable for modelling pedestrian mobility. Their mechanisms are not easily interpretable [6] and the main challenge of cellular automata modelling is to find the set of rules that would validly generate these emergent patterns in pedestrian movement [1]. Agent based models have been more focused on the behaviour of the agents than on the real interaction and interdependence between the people and the urban environment [7].

People do not move in cities for mysterious reasons, they move because of the activity they are engaged in. These activities occur in urban environment that is defined by its attributes; physical like their morphology or less physical like configuration. Therefore, pedestrian mobility is always a function of activities and these environmental attributes. The system that we intend to use in order to represent the complexity of the pedestrian mobility has to acknowledge this interdependence and to observe human activity and built environment as a meaningful whole.

3. Modelling Pedestrian Mobility as Architectural Knowledge

The pedestrian behaviour can be described at three major levels: strategic level, tactical level, and operational level [6]. At the strategic level, the pedestrian decide what activity they will perform and the activity order. This level is generally comprehended even before arriving at the pedestrian area and therefore is considered exogenous for the models of simulation of pedestrian behaviour. The tactical level is an expression of short-term decisions of the pedestrians regarding the movement within the urban area. While on the strategic level pedestrian have determined the list of the activities they plan to perform, on the tactical level pedestrians decipher: the order or schedule of activities; the choice of the activity area, and; the choice of the route. This level introduces the plan of sequence of activities and the timeframe of each activity, as well as the spatial area or the place and the route of the activity. At the operational level pedestrians make instantaneous decisions for the immediate time period and the built environment around
them whether it is based on its physical or configurational aspects. Decisions made on this level are recognized as the walking behaviour of the pedestrians. This level brings up the interaction between the activity of the person, its spatial perception and its interaction with the urban environment.

Different levels of pedestrian activity are connected with different levels of human perception and different scale and level of detail of urban environment. By linking the patterns of behaviour and different levels of pedestrian activity with the knowledge how people percept and experience urban environment with the designers path of conceiving and comprehending phenomena that they create, we focus on the links between them and try to model the non-tangible information into the model of pedestrian mobility that through its multilayered representation will indicate the interdependencies between morphology, intensity of flows and configuration of the streets and transform the whole system into the valuable tool for better design. Hence, the strategic level of pedestrian activity is linked with the general idea of the activity and is depended on conditions and reasons beyond the scope of this research. The strategic level is equal with the larger parts of the city form and city infrastructure that cannot be reduced to a single place or a single programme (Fig. 1).

![Figure 1. Diagram of correspondence between levels of pedestrian activity and urban scale](image1)

The tactical level of pedestrian activity constituted of spatial and temporal order of the activity along with the choice of the distinctive route corresponds with the street network topology and its configurational aspect. The operational level of activity engaging the actual movement – walking as well as performing the activity conceived at strategic level and planned at tactical level corresponds and is influenced by the morphology of the place, the existence of attractors and obstacles as well as the characteristics of the immediate urban context. An interaction exists between different processes and attributes of the built environment at each decision level, conditioned by the physical nature and morphology of the urban context as much as the level of perception and the configuration of streets.

Therefore in the following chapters we will closely observe the morphology of the place, representation of the recorded intensity of pedestrian flows, patterns of pedestrian mobility and level of integration of street configuration, linking them into meaningful model of pedestrian mobility in protected area of Skopje’s Old Bazaar.

### 4. Urban Context of Pedestrian Area of Skopje’s Old Bazaar

The city of Skopje can be historically recognized as a Balkan traditional city that goes through a series of transformations. Succession of the different historic events and developments followed by dissolution of previous urban forms and patterns has led to creation of complex urban strata that overlaps and creates the unique and complex imagery of the city [10]. This complexity of the city is primarily perceived on the level of urban morphology and through the existing urban elements and networks. Skopje Old Bazaar is a mediaeval city fragment with a specific appearance (Fig. 2).

![Figure 2. Skopje’s Old Bazaar](image2)

The oldest inherited element of the Bazaar with un-doubtful authenticity is the street network disposition. Over the centuries it didn’t experience significant changes. Therefore, the streets are relatively
small in size and informal in structure. However, the street network makes the very strong and comprehensible spatial network since its elements and their junctions rhythmically repeat within the system, creating a picture that resembles certain manifestations in the nature. The irregular street disposition creates short street perspectives, often finishing with a building as a framed view. These streets are subtly guided through the complex; they are interconnected, repeatedly changing their direction, widening or opening towards significant views over certain urban landmarks situated within the Bazaar. At certain points, usually at important junctions or in front of a monumental building, wider open spaces emerge, offering better views and very often greenery and water – an echo of the Ottoman culture of interconnecting the architecture and the landscape. These were important social hubs especially having in mind the fact that during Ottoman times, besides the religious buildings, the Bazaar was the only place for everyday social gathering. The streets can be also considered as a stage for everyday life. Although on administrative level they belonged to the city and the public domain, they actually represented a kind of a common space serving the mutual interests of the users of Old Bazaar.

5. Mapping Pedestrian Activity in Urban Protected Area of Old Bazaar

5.1. Morphology of streets

The analysis of the Old Bazaar street morphology detects several types of streets. The main street is a type of street that usually connects both ends of the protected area and links it with other parts of the city (Fig. 3). They start with entrances – a sort of gates of the Old Bazaar and serve as a main pedestrian route that links the centre of the city with the green market. Some of these main streets enter into the area and then an alternative route is offered (street type 1 and 2).

The second type of the street is the street type 3, 4 and 5 that serves as a connection-links between the main corridors in the Old Bazaar. The physical attributes regarding street width and height of the street facade are not different with the dimensions of the main streets- the fact that suggest that infrastructural development as well as the construction of the buildings has been subjected to a central regulation that dictates equal opportunities and conditions for everybody within the Old Bazaar regardless of its position, religion or trade. The main characteristic of these streets is that they usually end into small squares or nodes of converging streets, acting as a small public space. Finally, there are streets that act as small links between sections of other streets; with length more of a passage than of a street (type 6). These streets regardless their physical dimensions are very important for the street network functioning and contribute significantly to the picturesque image of the Old Bazaar. They usually don’t contain specific programs and sometimes the street facade is monolithic wall of any of the public or private buildings in the Old Bazaar.

The elaboration and exploration of the street network morphology and of the other elements of the urban form within this study is only for the purpose of establishing a meaningful and interdependent relationship between different aspects of the context and the actual activity of the pedestrian mobility where each influence the other and create a unique urban pedestrian environment of the Skopje’s Old Bazaar.

5.2. Intensity of pedestrian mobility

The recording of the pedestrian activity intensity has been performed within the urban protected, pedestrian area of Skopje’s historic district and specifically in the Old Bazaar. The diagram of intensity of the pedestrian activity (Fig. 4) shows the distribution of pedestrian activity in time-throughout the week. It should map the existence of certain regularities or irregularities that affect the pedestrian flow by timely
determined activities or attractors. It also should map in reality the activity scheduling at the tactical level of pedestrian behaviour.

Figure 4. Time distribution of pedestrian movement within timeframe of four days

The diagram of spatial distribution of pedestrian movement intensity (Fig. 5) maps the distribution of the measured intensity on different points – parts of the Old Bazaar for the same record time daily. It should map the activity area choice made by pedestrians at the tactical level of their behaviour. The spatial distribution of measured intensities of pedestrian movement exhibit several regularities that can be recognized once the result is positioned at the 3D model of the Old Bazaar: firstly, the highest intensity in pedestrian movement is recorded at the entrances of the Old Bazaar area; secondly, the highest intensity of pedestrian movement is positioned and recorded along one or two main streets connecting the centre of the city with the green market; thirdly, most of the points-gates with low level of pedestrian movement are grouped and positioned in compact parts of the Old Bazaar.

Figure 5. Spatial distribution of pedestrian movement within the area of Old Bazaar

The pedestrian choice to use certain streets within the urban protected areas besides depending on the morphology of the urban elements – the street network, the position of the attractors etc., will be influenced by the level of services as well as the level of comfort. It is also connected with the level of comfort provided with possibility for shelter, protection from weather, other traffic and crime. This pedestrian preference of points that are visually more open and connected to other parts of the route is confirmed with the analysis of the visual fields from all seventeen points – gates where a record of pedestrian movement has been performed.

Map of visual fields (Fig. 6) exhibits the interdependence of routes preferred/chosen by the pedestrian with higher intensity of pedestrian movement which open bigger visual fields from the points-‘gates’ along the routes.

Figure 6. Visual fields of the gates along the pedestrian routes in the Old Bazaar

Finally, these requirements for anticipation of the spatial experience of pedestrians during planning, favour development of more complex and more flexible information representing system. These maps work on the topological level where the condition of each of the elements of the system is determined by its relation with all the other elements within the system. This situation creates a special
case of spatial representation of intensities of pedestrian movement when they are interpreted like topologically determined points of the structure (Fig. 7).

These images represent the new topological model of pedestrian mobility in the Old Bazaar interpreted through the intensity of the pedestrian movement. It emphasises the configurational aspect of this spatial knowledge related to a temporality and spatial distribution of the pedestrian activity. They are necessary for better understanding of the dynamics of the movement that appears in a very small sequence of time in a specific position but fundamentally affects the way that we experience and understand the urban space.

5.3. Configurational aspects of street network

The configurational aspect of the built environment is a concept that is related to the complexity of the system and not just to its part and can be defined as a multitude of relationships between the elements that create a distinctive whole [4]. It is through the configurational aspect of the built environment that functionality and culturally determined patterns, through its “deep” structure, are manifested. With this, the architecture and the urban form become socially relevant and meaningful and it is the way humanity expresses its culture and society in a spatial manner [5]. In order to explore the configurational aspect of the built environment in the Skopje Old Bazaar we used Space Syntax analysis [4; 5], to map the integration values and connectivity of the street network. Through these maps we should depict the elements-streets and zones within the Old Bazaar that are more integrated within the street network and therefore, on the configurational level, should be more likely to experience higher intensity of pedestrian movement.

The overall level of integration value of the street network in the Old Bazaar is presented on Fig. 8 (red colour – more integrated, blue colour – less integrated) where it is evident that the streets with the highest integration value are the streets in the middle of the area while the peripheral streets as well as the ones far from the centre are those with lower integration values.

It means that the integration value of the street network through this analysis exhibits the zones that are more integrated and connected on configurational level and are most likely to be recognized as dominant routes for pedestrian mobility. However, in order to confirm this, it is necessary to confront the results from the record of intensity of pedestrian movements with the results from the Space syntax analysis and along with the maps of the visual fields and the morphological elements of the streets in a series of comparative analysis to decipher and to map the regularities and the interaction of different aspects of the built environment on the phenomena of pedestrian mobility.

6. Interaction of Pedestrian Mobility with Built Environment – Comparative Analysis

There has been large amount of data and knowledge collected through various methods of recording, measuring and analysing of the street network morphology, depth maps and integration value, intensity of pedestrian mobility, patterns of movement and visual fields. This data is very important and
informative for the process of comprehension of the regularities of pedestrian mobility and the way people use the space within the Skopje’s Old Bazaar. However, this data will remain only a preview of separated and fragmented information about parts of the urban protected area and the activities within it.

Therefore, comparative analysis of different layers and aspects of pedestrian mobility and urban environment has been performed on two distinctive points representing different and indicative conditions within the Old Bazaar. This analysis and the selection of these points should depict the usefulness of the comparative analysis through modelling the pedestrian mobility as a tool for designing and planning better and more sustainable environments in urban protected areas.

6.1. Case study 1 – Gate 1

Point 1 (Gate 1) is positioned at one of the main streets entering the Old Bazaar area (Fig. 9) and developing along the historic north-south axis. Within the street network hierarchy, this street is positioned as a type 3 street, although it is one of the main gates toward the centre of the area and, through a route that extends across the historic Stone Bridge, a major link of the Old Bazaar with the centre of the city.

Morphology

The width of the street is varying from 4.5-8.5 meters. A unifying aspect of the different buildings constituting the street facade is the same height on the ground and first floor level. The sides of the parcels/buildings facing the street are narrow and small. This enables multitude of buildings and shops within the relatively short length of the street. Usually, the ground floor program is commercial (shops) and the first floor is occupied with services, workshops or storage area for the shops. Along this route, there are no specific or dominant cultural or historic monuments that might serve as special attractors of the pedestrian movement. On the contrary, it is the versatility of shops and services united in a coherent and yet picturesque image of the streetscape that attracts most of the visitors of the Old Bazaar.

![Figure 9. Position of Gate 1 within the Old Bazaar](image)

Intensity of pedestrian movement

The high level of comfort, provided by the morphology of the streets, the picturesque streetscape and the positive visual experience, is confirmed by the high level of intensity of pedestrian movement through this gate. People, through their sensorial apparatus, through the way they perceive the street configuration and the level of service together with the pragmatic and rational system of decision making, make this gate a point of their choice. The level of intensity of pedestrian movement through gate 1 is showed on Figure 10. It depicts the daily rhythm of activity and its temporal distribution throughout the week.

![Figure 10. Diagram of the level of intensity of pedestrian mobility at Gate 1 and new model of pedestrian mobility](image)

This diagram also points out that the activity at the beginning of the week is allocated in the morning and during the working hours, while in the evening it declines. It is evident that this pattern of activity continues throughout the week and changes only in the higher level of the intensity of pedestrian mobility expressed in the afternoons, during the weekend. These indicates that during the working hours of working days most common users passing through this gate are the commuters and people having business in the Old Bazaar walking through the Bazaar from and toward the centre of the city; during the
weekend the most eligible visitors and users of the space of the Old Bazaar are the shoppers and the clients of the cafes and bars.

**Visual Fields**

From the position of Gate 1, a user of the space of the Old Bazaar has a very good visual field that on one side extends toward the main route to the centre of the city, and on the other side toward the centre of the area. In the vicinity of this point the street bifurcates into two distinctive routes (Fig. 11). The first is in the line of the site and continues towards the periphery of the Old Bazaar, with the steep topography heading toward the Old City Fortress, neighbouring the Old Bazaar. The second arch of the street leads toward the centre of the Old Bazaar and is one of the most commonly used pedestrian routes. Good visual fields enable the pedestrian to make a clear spatial reference to the parts of the city one is coming from, as well as a good insight of the places that they are heading toward. This situation raises the level of comfort and provides a good perceptual infrastructure for a safe and effective pedestrian movement.

![Figure 11. Visual field, axial depth map and level of integration of nodes justified to axis 1 (node 1)](image)

**Axial depth map and level of integrations**

The use of Space Syntax methodology provides us with valuable information of the level of integration of distinctive streets. This data is presented through depth map of axes of the whole area of the Old Bazaar and the integration values of junctions (Fig. 8). When the street network is observed as an isolated and self-sustained system of streets, the highest level of integration is visible at the centre of the area and it declines toward the periphery, reaching lowest level of integration at the streets at the north and south end of the area. This situation is a result of the longitudinal disposition of the Old Bazaar area; the streets at the north and south end are far from the centre compared to the streets at the east and west periphery. In this map the links with other parts of the city are not taken into consideration. So, this map does not represent the real condition of the integration values of the streets and although it maps the configurational aspect of the street network it is less valuable for our analysis. But, if we justify the depth map according to the distinctive streets and especially according to the sequences where the Gate 1 is positioned, the model will provide us with valuable information (Fig. 11). It presents the level of integration of the street within the street network that emerges exclusively from the configurational aspect of the network. Most important thing is that it represents the level of integration of all streets within the network justified to the position of the virtual pedestrian at Gate 1. This map shows us the parts of the street network that are more integrated with the street where the Gate 1 is positioned, as well as the parts of the Old Bazaar street network that are less integrated. This configuration is most likely to influence pedestrian choice of the route as well as the general spatial disposition of their activities on the strategic level. Considering this justified depth map, the most integrated streets are the streets that develop along the longitudinal north-south axis, connecting Gate 1 with the other end of the Old Bazaar, where one of the biggest attractors is situated – the Bit Bazaar green market. It is also highly integrated with the central area of the Old Bazaars that provides many choices of the alternative routes and patterns of activity from this point on. Besides the morphological preconditions, this is probably the main reason for the high level of intensity of the pedestrian movement through this point.

6.2. Case study 2 – Gate 17

Point 17 (Gate 17) is positioned at one of peripheral streets developed along the north-south axis. It does not connect any of the active nodes of the area and is additionally delimited in its integration capacity by the topographical oscillations along the route.

**Morphology of the street**

The width of the street is varying from 5-9.5 meters. These streets have the same morphological characteristics and elements like the rest of the secondary streets. Their bordering position is a result of
the destruction of a part of the urban structure of the Old Bazaar, due to the new developments in the last three decades (Fig.12). The administratively imposed limits over the urban protected area of the Old Bazaar, enforced the status of these streets as remains of the once complete historic structure. In the same time are new programs and urban elements attached to them, with morphology unusual for the Old Bazaar. Along their routes, there is difference in levels, due to the specific steep topography especially toward the city fortress as the highest point of the area. The street profile is discontinuous as a result of existence of new, out of the scale of the Old Bazaar, morphology. The height of the buildings from the historic structure of the Old Bazaar is usually ground and first floor, with similar distribution of the program as elsewhere within the Old Bazaar.

![Figure 12. Position of Gate 17 within the Old Bazaar](image)

**Intensity of pedestrian movement at Gate 17**

The level of intensity of pedestrian mobility at Gate 17 is very low throughout the day and the week (Fig. 13). Compared to other nodes and parts of the Old Bazaar, this part, at certain periods of the day, especially in the evening is almost without pedestrian movement. The level of pedestrian mobility shows no specific pattern of activities and is occurring more as an accident than as an impulse and attractor oriented movement. Although the street is composed by morphological elements similar to the other secondary streets in the Old Bazaar, it is obviously at the margins of the pedestrian map of desirable and potential routes. The discontinuities of the street facade pattern, topographically specific obstacles and the lateral position are among the main reasons for this condition of the pedestrian mobility at Gate 17. The low level of comfort is augmented by the low level of services and facilities that might generate or direct the pedestrian flow.

![Figure 13. Diagram of level of intensity of pedestrian mobility at Gate 17 and new model of pedestrian mobility](image)

**Visual Fields of Gate 17**

The visual field from the Gate 17 is spread in all directions with the emphasis on the north-south axis. This visual potential, apart from the marginal position and a sort of the spatial exclusion of this part of the Old Bazaar area, is a distinctive quality of this node.

![Figure 14. Visual field, depth map and level of integration of nodes justified to axis 17 (node 17)](image)
It provides the virtual pedestrian, once has entered the Old Bazaar, to have the first spatial reference of the potential route choice. The closely positioned junction of several streets can also be seen as a desirable next disposition of the pedestrian along his route. The low level of materialisation of the morphological elements and the visual discontinuity can, besides the existence of wide visual field, discourage pedestrians from using this corridor for entering the protected area of the Old Bazaar.

**Axial depth map and level of integrations**

The axial depth map justified to node 17 within the street network deciphers that the Gate 17 is integrated only with the neighbouring streets and almost nothing else from the Old Bazaar area. The streets that this node is connected with are those which visual filed provide direct visual insight and spatial reference. This does not go beyond the close circle of adjacent places. The fact that this street and the gate 17 on in, are not integrated within the rest of the Old Bazaar area indicates that the reasons for the spatial isolation, also confirmed by the low level of pedestrian movement, is not just a result of its morphological and topographical attributes, but most of all is based on the level of integration of the street within the configuration of the street network.

Therefore, the knowledge gained through this complex and multilayered analysis of different aspects of the pedestrian mobility and the built environment, using various methods of data recording and analysis of the activities and configurational nature of the urban environment, is essential for any future planning and designing activity.

**7. Conclusions**

The configuration of the street network and the level of integration of the streets is not the only aspect of the built environment that determines the way people behave – the disposition of the attractors, weather and many other variables can impact the final pattern. However, it is the one that can be mapped and used along with other data as a tool for understanding the pedestrian mobility. The fact that the patterns of activity could change, regardless the fact that configuration of the streets rarely changes does not delegitimize the usefulness of this tool. This is the main reason why this mapping of the level of integration methodology should be used in comparison and in combination with other types of data recording and research results. Only through an integrated analysis of complex and different types of data, exploration of different aspects of the pedestrian mobility, as well as their interaction and influence within the built environment, we will be in position to understand the regularities and the patterns of activity. These patterns of the pedestrian activity will be complex results of the process of modelling pedestrian mobility – the process that will enable us as designers and planners to contemplate, design and build more useful and successful pedestrian urban space within the protected urban areas.

**References**


