Budapest University of Technology and Economics

Department of Urban Planning and Design

Kádár Bálint

MSc in architecture

PEDESTRIAN SPACE USAGE OF TOURIST-HISTORIC CITIES

COMPARING THE TOURIST SPACE SYSTEMS OF VIENNA AND PRAGUE TO BUDAPEST

Principal results of the PhD thesis

Supevisor:

Dr. Benkő Melinda

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Introduction

> *"Given the quantitative importance of urban tourism, it is curious that very little attention has been given to questions about how tourists actually use cities." (Ashworth & Page, 2011).*

Tourists have been visiting cities since the antiquity, however, urban tourism studies is a relatively young discipline in the field of tourism studies. Geographers, economists and sociologists contributed to this field in the past decades producing a large quantity of case studies, theorising some important aspects of cities as objects of tourist consumption. Architecture and the built environment have always been the main attractions in cities, however, architects and planners started to be interested in tourism studies only in this century. Theoretical research and practical planning had few connections in this field until recently.

The geography of urban tourism has important literature, still, more evidence and theory is needed on how tourists use urban spaces and how they consume the built environment of cities. In such questions an architectural and planning background is helpful. One of the main contributions needed from this field would be to find more connections between the tourist usage and visitor's experiences on one hand, and the architectural qualities and morphological structure of a city on the other hand. Research with such focus can also contribute to the understanding of local-tourist conflicts, leading towards a more sustainable tourism system in cities.

In this thesis I propose a new method to measure tourist and local space usage in tourist-historic cities, and I develop a graph model to describe the pedestrian tourist space systems of tourists. These two new tools allow comparable city analysis regarding tourist space usage. I use these tools to compare the tourist systems of Vienna and Prague with the one of Budapest. After evaluating the results I propose tools of urban planning and design to develop the system of Budapest in a balanced and sustainable form.

Backgrounds and research methods used in the thesis

This thesis is the result of the past years work to conceptualise the tourist space usage of large tourist-historic cities, continuing and synthetizing different discourses in urban tourism studies. The backgrounds of this work are multiple. First, the understanding of the general discourse of tourism consumption and urban tourism in tourist-historic cities position this work in the field. Second, the various methods to obtain data on urban tourist space usage and the modelling attempts of the tourist city give the background for the new method and model used to quantify and compare tourist space usage and systems. Third the overview of the last decades of urban development and tourism development in the three Central European cities – Vienna, Prague and Budapest – gives the background needed to understand their tourist systems. Forth, the case studies of different projects in various cities and finally in Budapest give the theoretical basis for the proposed planning tools to develop the tourist system in a sustainable way.

1. The general discourse on urban tourism poses just as many questions as young as this discipline is (Ashworth & Page, 2011). The field of this thesis is mostly defined by two of the most cited books in urban tourism research. The "Tourist-historic City" of planner-geographers Ashworth & Turnbridge (1990) define the object of this study – the historic parts of cities where tourism is relevant in space usage. I aimed to further develop their basic model of the tourist-historic city, also synthetizing most of the relevant studies based on that work since 1990. "The Tourist Gaze" of sociologist John Urry (1990) framed the visual aspect of tourist consumption I built my method on. Urry set also the socio-historic background of my work, first defining the phenomena of post-modern tourism, much different than previous forms of modern mass tourism. Consequently the field of this thesis is the study of urban tourism from a planning perspective, focusing on the spatial structure of the tourist-historic city, analysing the spatial consequences of postmodern tourist consumption, using tools related to the visual aspects of such consumption.

2. This dissertation emerges from the recognition that a better mapping of local and tourist space usage and more accurate conceptualisation of tourist movements in cities can contribute not only to the field of urban tourism studies, but also to the sustainability of tourist-historic cities. One of the major obstacles to a better theorisation of urban tourism is the lack of data on tourist space usage. There are no good ways to count and compare tourist flows in urban spaces, where locals and tourists wander together seamlessly. Statistical data only exist at city level for arrivals and bed nights in hotels. Some of the attractions in cities do have attendance statistics, but these are valid only for paying visitors inside a venue. Scholars use questionnaires and make time-space diaries from these to define the movement of tourists in the urban space. To obtain more accuracy GPS tracking devices have been used in the past 10 years (Shoval & Isaacson, 2007). These devices were given to single tourists who had to return them after the visit, but this way only the quality of the data obtained became better (Shoval, 2008), while quantitative data was still not available. A portable device able to record geographical data which is much used by tourists is the photographic camera. A new potential to use information from the tourist photographer came with the spreading of geo-tagged photography, as a great quantity of images became attributed with a geographical reference given by the device itself (GPS of smartphones for example) or by the user placing them on a digital map. Very few published attempts exists to use such data from image sharing sites for quantitative data retrieval (Girardin, Fiore, Blat, Ratti, & Dal Fiore, 2008). I aimed to further refine the methods of such data retrieval, quantifying the spatial distribution of tourist photography in urban environments.

The quantitative method based on geotagged photography made possible the development of a graph model of pedestrian urban tourist space system. The bases of such model and the network analysis method to study it was laid down in 2001 by a Greek architect and urban planner recognised in urban studies, Aspa Gospodini (2001). She and other scholars could not continue to develop the graph based model of tourist networks in lack of data of tourist space usage. With the new databases

retrieved from Flickr.com I could start to test the usability of his method, building a graph model based on the mental mapping principles of Kevin Lynch (1960). Pedestrian tourist flows can be abstracted into a graph system where the main points of interests are the nodes, connected with edges according to the effectively used paths tourists use: pedestrian streets, bridges, or any public (or non-public) space used by flows of tourists. Gospodini proposed to analyse these graphs in Space Syntax, a software and method developed to analyse syntactic spatial networks in architecture and urban design. As the usability of Space Syntax to network analysis is limited by the geometric definiteness of syntactic maps, I chose Agraph (Manum, Rusten, & Benze, 2005), a straightforward version of Space Syntax (Hillier, 1996), which do not require the application of such maps. AGRAPH calculates specific integration values from depth calculations, indicative to compare the integrity of different cities' pedestrian space networks. Gospodini (2001) stated that the more integral is the network, the more choices tourists would have to discover a given number of attractions, using more diversely the public spaces of a city, dispersing more and concentrating less in the city. I tested this thesis in the dissertation on the cities of Vienna, Prague and Budapest.

3. My work to measure and model tourist activities in the urban space had the main goal to be able to compare the tourist system of Budapest with its regional rivals, Vienna and Prague. The comparison of the three cities had to imply precise studies on the history, urban development, tourism history and urban policy. The literature review revealed a great difference in the space consumption of these cities. While the tourist industry of Vienna was the most balanced one, causing the least problems between locals and tourists, Prague had major socio-economical conflicts related to tourism (Cooper & Morpeth, 1998; Deichmann, 2002; Hoffman & Musil, 1999; Simpson, 1999). The main differences are historical and morphological. A hard topography defining a poorly interconnected urban structure together with the special historical conditions of a sudden tourist boom, uncontrolled market liberalization and property re-privatization, and the lack of tourism management lead to a segregated use of the city centre of Prague, while a planning and management work consistent since 1955 both in the field of tourism and in urban development made the much simpler morphological structure of central Vienna an ideal tourist destination and one of the most liveable cities at once. Budapest has a morphological system unifying the positive and negative aspects of its rivals, and a special historical evolution of the tourism industry slowly developed after a great fall experienced in the 1990's. Budapest has lower arrival numbers than Vienna and Prague, but its potentials make it an ideal city to study and develop as a tourist destination. For this reason I made separate analysis for Budapest, not only registering and comparing the present situation, but also tracking the changes of the past 20 years, analysing specific case studies of different districts.

The new methods presented in this thesis to compare the tourist space systems of these three cities were completed not only by an extensive literature, but also by specific field trips to these cities,

analysing the urban space usage and morphology of Vienna in 2010 and 2012 and that of Prague in 2009 and 2010.

4. The role of urban design and architectural design in the development of an urban destination have been studied extensively only from the 2000s, as a result of the impact of the Bilbao Guggenheim Museum opened in 1997 by Frank O. Gehry. Since then the attracting and branding effects of architecture were extensively studied (Klingmann, 2007; Specht, 2014). I made previous studies on the possibilities of contemporary architecture to renew existing buildings to attractive places of interest, which can extend the tourist systems even of historical cities with protected morphologies and building stocks (Kádár, 2011a). Such examples do exist in all three cities analysed, therefore I could compare their tourist usage and attractiveness.

Urban design is not as often mentioned as a tool for tourism development, even if its effects could be even greater in a tourist-historic city, where the morphology cannot be altered, but the functions and design of public spaces can easily be upgraded. Few authors have realised the tourism related importance of such interventions (Gospodini, 2004).

Finally tools of urban planning were also reviewed, as the tourist space system of cities can be only planned at such level. I used case studies from different cities to underline the importance of urban planning, urban design and architectural design in the sustainable development of urban tourism and its spatial system. The cases most deeply studied were those of the different tourism related developments undertaken in Budapest. The “Heart of Budapest” program and other examples of public space renewal were analysed, but also the processes in the Inner-Erzsébetváros and the development of the Millennium City Centre were studied.

Principal results of the thesis

1. Result - *(Kádár & Gede 2013; Kádár 2014a)* – CHAPTER 2

I developed a new method to measure tourist activities in cities which I called the "spatial quantification of geotagged photography". From the internet database of the image sharing service Flickr.com we were able to retrieve data regarding the geographic position of photographers considered tourists and locals, and we could make geo-visualisations of their spatial distributions (Kádár & Gede). I defined a method to measure tourist and local activities in the urban space around places of tourists' interest. (overall result: 33% Gede, 66% Kádár)

1.1 We defined a method to retrieve geographical data from image sharing websites like Flickr.com together with Mátyás Gede (60% Kádár, 40% Gede). A previous method to use tourism related spatio-temporal data from Flickr.com separating tourists from locals (Girardin et al., 2008) was further refined. Users were considered to be tourists if they took pictures in the geographical area of the city in a time-span of no more than 5 consecutive days (based on the average of 2.5 days spent by a tourist in a Central European capital city). I named all users taking pictures in a larger time-span locals, based on studies confirming the large differences in the space usage of first time visitors and longer staying or repeat visitors (Donaire & Galí, 2008; Popp, 2012; Russo, 2002). Mátyás Gede (2012a, 2012b) developed the method to retrieve data from the API of Flickr.com, using only the geo-tagged images with the maximum accuracy (meaning that GPS enabled devices were used or the manual placement on a map happened at maximum zoom level). We were able to measure and compare spatial activities of first-time tourist and other leisure-time users of cities.

1.2 We defined a method for the geo-visualisation of tourist and local space usage together with Mátyás Gede (40% Kádár, 60% Gede). The geo-visualisation technique of 3d bar diagrams in a grid of 10x10 meters was used similarly to Shoval (2008), but separated for tourist photos and local photos. Mátyás Gede (2012a, 2012b) created the geo-visualisations on the virtual globe of Google Earth, which enabled the geographical analysis and the precise measuring of data. The geo-visualisations showed the differences in space usage of users considered tourists and those considered locals.

1.3 To demonstrate how this is a valid method for measuring tourist activities in cities, I verified that data retrieved with the method of "spatial quantification of geotagged photography" correlates with existing tourism statistics. Flickr data from 16 European tourist-historic cities were downloaded, and four correlation coefficients between the numbers of photographs, users, registered bed nights spent and tourist arrivals were calculated. The correlation coefficient between registered tourist bed nights and both user numbers and number of photographs was a considerable 0.92 for the year 2011. I also verified that the largest clusters of geo-tagged photography are found around the most popular urban attractions.

1.4 For the measurement of the intensity of tourist use in an urban place I defined the quotient (q) of tourist users (U_t) / local users (U_l) uploading to Flickr.com. I showed the places of exclusive tourist usage, where tourist users (first time visitors) are present more than 1.5 times more than all other users (called locals).

1.5 I found a connection between the number of photography a user makes at an attraction and the visual and functional complexity of that tourist attraction. The visual richness of a tourist place leads to more photographs only among tourist users, while the functional richness of a place leads to more photographs only among local users.

2. Result - *(Kádár 2012; Kádár 2013a)* – CHAPTER 3

I completed an original graph model of the pedestrian tourist space system, capable to compare the tourist space usage of different cities. I applied a method of mathematical comparison between graphs of different tourist space systems by calculating integration values deriving from depth calculations of the graphs.

2.1 A method of abstraction had to be defined to create graphs of tourist space usage using the metric data from "spatial quantification of geotagged photography" and the geometric constraints from the morphology and from levels of pedestrian accessibility of urban spaces studied on-site. For the pedestrian tourist space system I defined the nodes of the graphs as the places of tourists' interest, using the most popular spatial clusters of geo-tagged tourist photography, and the edges of the graph as the public spaces offering a pedestrian-friendly connection used by tourists. The resulting graphs represent the aggregated mental maps of tourists and describe the choice of movements an average tourist had in the urban space.

2.2 I managed to construct the pedestrian space systems of previous historical moments before data from the "spatial quantification of geotagged photography" existed. The graph projected back to a year before a pedestrian friendly connection was developed cannot contain that edge, and a graph from a year before an attraction was marked or constructed cannot contain that node, this way different time periods can be reconstructed back to some decades from when there was sufficient data.

2.3 By combining the Space Syntax method of spatial analysis (Hillier, 1996) with a spatial system corresponding to the mental maps (Lynch, 1960) of tourists defined by their actual urban movements (2.1), I further developed the method proposed by Gospodini (2001) to analyse the tourist space system of urban areas. I could retrieve numerical evidence of the level of integration or segregation of tourist space systems using the Agraph software (Manum et al., 2005) capable to calculate integration values from complex graph depth analysis with the method used by Space Syntax, but using the

constructed graphs of pedestrian tourist space usage instead of syntactic spatial maps. The depth is the number of nodes the minimum path between the node and another node has. We call *total depth (TD)* the sum of the depths between a node and all other nodes. Integration values *(i)* can be calculated using the following formulas:

$$i = 1 / RA$$

$$RA = 2 * (MD - 1) / (K - 2)$$

$$MD = TD / (K - 1)$$

where *RA* is the relative asymmetry, *K* is the number of nodes, *MD* is the mean depth and *TD* is the total depth for a node.

2.4 I applied the observations of Alexander (1965) and Salingaros (2005) regarding urban systems and of Gospodini (2001) regarding tourist systems to the pedestrian tourist space systems of cities, stating that a network similar to a "tree" graph, having lower integration values causes more congestion and less experience than a network more similar to a "semi-lattice", having higher integration values.

3. Result - *(Kádár 2013b; Kádár 2014a)* - CHAPTER 4

I compared the tourist space systems of Vienna, Prague and Budapest using graph models of the pedestrian tourist space system constructed with data of the spatial quantification of geotagged photography. I found a semi-lattice structure for Vienna where most places of interest are equally photographed by tourists and locals, a tree structure for Prague where all places of interest are more photographed by tourists than locals, and a hybrid structure for Budapest, with tourists outnumbering locals in the Buda side where the system has tree-like branches only, and a more balanced local-tourist space usage in Pest, where the core of the pedestrian space system is more similar to a semi-lattice.

3.1 The data of geo-tagged Flickr.com images for Vienna, Prague and Budapest was analysed using more than 100,000 results for each city. I compared the number of tourist and local images and users and their U_t / U_l coefficients using only data from the whole year 2011. I found that tourists outnumber locals in Vienna and Budapest by 20%, while in Prague by 100%. Half of the places of tourists' interest in Vienna, one third in Budapest, and none in Prague had U_t / U_l coefficients lower than 1.

3.2 I drew the graphs of pedestrian tourist space usage for Vienna, Prague and Budapest using data from 2011, making the 3 graphs comparable by using the first 40 most photographed sites being interconnected by a pedestrian friendly network. I calculated the integration values of the graphs using Agraph software, resulting in the lowest *i* values for Prague, the highest *i* values for Vienna, and a value in-between for Budapest. The structure of the graph of Vienna is similar to a semi-lattice with few branches extending outwards the integrated core. The structure of the graph of Prague consists of few linear elements (axis) intersecting each other at only few nodes, resulting in many tree structured sub-graphs. Budapest has a hybrid structure more similar to the tree structure of Prague in the Buda side and to the semi-lattice form of Vienna in the Pest side.

3.3 Decomposing the graphs of 2011 by subtracting any public spaces reconstructed for pedestrian friendly use since 1989 (edges) and by subtracting any attractions not marked or developed back then (nodes), I could draw the graphs of pedestrian tourist space usage for Vienna, Prague and Budapest from the year 1989, prior to the politic and socio-economic changes in the region. I found that the tourist space system of Budapest developed the most in this period, creating a semi-lattice structure from an underdeveloped tree-like structure in central Pest, but leaving the tree-like structures of Buda without developments.

4. Result - *(Kádár 2013b)* - CHAPTER 5

I evaluated the effects of the level of integration of the tourist space systems on local space usage and on the tourist experiences, demonstrating negative effects in relation with the low integration of the system of Prague, and showing how no such negative effects can be uncovered in relation to the more integrated tourist system of Vienna. I also demonstrated how the intensive urban renewal program that took place in Budapest after 2000 had a positive effect both on the integration of the tourist system and on the experiences of tourists and locals.

4.1 I demonstrated how the socio-economic tensions described in the centre of Prague (Cooper & Morpeth, 1998; Deichmann, 2002; Hoffman & Musil, 1999; Simpson, 1999) are in correlation with the tree-like structure of the tourist space system. The special historic morphology and the sudden transition to market economy parallel to re-privatization lead to a tourist space system where most visitors follow few beaten tracks, causing congestion and out-crowding all local functions. Local functions are concentrated around the tourist-historic centre, resulting in segregation between locals and tourists, diminishing also the authentic and urban experience of visitors.

4.2 In the integrated semi-lattice tourist space system of Vienna none of the problems described in the case of Prague could be found. I attributed Vienna's ideal system to a more rationally planned urban development (from the roman structure through the baroque and historicist interventions like the Ring until today's MQ and Danube Canal developments) and a carefully planned and supervised tourism management integrated into urban planning. All urban areas (except single monuments) showed a healthy balance between local and tourist space usage here, the tourist space system distributed ideally visitors in the centre, and the attractions were developed to give varied experience. Tourism in Vienna today has more benefits than costs, resulting in one of the most liveable cities in the World.

4.3 I presented how the development of the tourist space system of Pest lead to positive results in the tourist and local space usage, and how it was a planned process connecting previous small interventions into a consistent network from 2010 in the "Heart of Budapest" program. I also showed how parts of the tourist space system not developed coherently cannot offer a desirable tourist experience (Buda Castle, Millennium City Centre), or they do cause conflicts between tourists and locals (Inner-Erzsébetváros)

5. Result - *(Kádár 2014b)* - CHAPTER 6

I presented how the model of the tourist space system based on the methods of tourist quantification and graph abstraction is an appropriate tool to use in urban planning, urban design and architecture, even in the evolved morphology of the tourist-historic city. I demonstrated how urban planning can develop the tourist space system to be more integrated, how urban design and urban space renewal can develop more connections (edges) and also new places of interest (nodes) in the system, and how architecture can be used to convert existing buildings to places of tourist consumption, forming again new nodes in the system.

5.1 By analysing the planning processes from the past 25 years regarding the tourist space systems of Vienna, Prague and Budapest, I demonstrated how only consistent urban planning lead to a more integrated pedestrian network, resulting in better tourist experiences and less conflicts between locals and tourists. In Vienna most tourism development was always tied to a complex planning processes, while Prague failed to use spatial planning practices to develop its tourist system in the period of transition. In Budapest I could identify important programs based on consistent planning but also situations where planning was not used properly. I deduced from these cases that developing the pedestrian tourist space system is a task of urban planning, and I identified the basic principles to carry out a balanced development.

5.2 I presented how tourist space systems in different scales can be used to achieve balanced tourist networks from a city-wide level to the level of the singular districts and neighbourhoods, and also tourism related spatial networks of smaller or larger scales can be rational, though not examined in this thesis. I showed how the use of integrated tourist space systems are useful tools in different scales of urban planning.

5.3 I showed how tools of urban design can be used to enrich the tourist space system both with nodes and with edges. Refurbished public spaces can become attractions themselves, if they are designed to carry both visual and functional attractiveness. The refurbishment of public spaces is the only effective tools to create new connections (edges) in the space system of a tourist-historic city having an evolved morphology.

5.4 Even in a historic urban context with much of the morphology and building stock being protected there are possibilities to develop more places of interest with tools of architectural design (Kádár 2011a). New buildings, or old ones converted for new uses, or heritage building being re-interpreted for tourist consumption can become new nodes of the tourist space system if proper architectural tools are being used.

Utilisation, limitations, and further continuation of the results of the thesis

The findings on the strengths and weaknesses of the tourist system of Budapest were from the beginning meant to help the planning profession to improve the spatial aspects of the tourist offers of this city, aiming a sustainable tourist system more similar to the one of Vienna than to the one of Prague.

I do believe that the method of spatial quantification of geotagged photography is a useful tool to measure tourist space usage, applicable to any cities with relevant tourism (of western type), making tourist activities comparable between most cities. Such comparative tool did not exist before for scholars of urban tourism studies, and as a result comparable spatial models defining urban tourism at street level were also missing. Just as the method based on geo-tagged photography cannot measure all tourist activities, the proposed model of pedestrian tourist space systems cannot model all aspects of tourism. The urban experiences of tourists and locals cannot be measured, and liveable cities offering an attractive urban experience cannot be automatically created with the proposed application for spatial planning of these tools. Still, such methods can give relevant information on the tourist systems of many other cities, and by the application of the principle of well interconnected pedestrian tourist space systems to planning some of the problems related to overcrowding and tourist-local segregation can be avoided. For such reasons I recommend the application of the principles of Chapter 6 (5. Result) for urban planning, as I also aim to use these in my future professional work, as already demonstrated (Kádár, 2014b).

I have the intention to further develop the results of this thesis, continuing the studies on urban tourism. The spatial quantification of tourism related data will derive probably from new sources, as Flickr.com is a very contemporary media, with an uncertain future, while data will certainly be more accessible in the future as people share everything on more and more channels. The model of tourist space system has to be further refined with layers of hotels, public transport and a variety of tourist activities. I believe that responsible planning must be backed up with up-to-date research, therefore I will remain involved in both, trying to connect these two worlds.

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