A SYSTEMS SCIENCE APPROACH TO ADDRESS THE URBAN TOURISM ROLE IN THE CURRENT RE-URBANIZATION PROJECT OF MEXICO CITY

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ABSTRACT

Nowadays, faster population growth as well as new lifestyles which societies have adopted, partly due to the intensive use of Information and Communication Technology (ICT), have lead governments to provide alternatives to reduce the problems caused by population growth mainly in large cities, besides addressing the necessities and requests of their citizens and visitors. The aim of this research is to generate the first approaches for the urban tourism role, as one of the main Economic sectors for cities, in the Digital, Smart and Knowledge city (DSKC) of Mexico City under a systemic approach. Thus, the Soft Systems Methodology (SSM) is applied. At the same time, the Strategic-Management Model (SMM) is used in a complementary and parallel way. The results achieved so far allow us to propose: i) a definition of the DSKC; ii) an approach to the urban tourism role in the DSNC; iii) a first outline of the systemic model of urban tourism in the DSKC of Mexico City; iv) the conflicts among the components of urban tourism and the DSKC; v) the key stakeholders of the system and; vi) the mission of the system in study, as well as feasible strategies to implement shortly to accomplish the mission. Hence, the bases are stablished in order to continue with the remaining steps of the Methodology and model for the construction of a systemic model proposal of the urban tourism incorporation in the DSKC of Mexico City.

Keywords: DSKC, Innovation-Tourism, System Science, Strategic-Management.

INTRODUCTION

The increasing need and demand of human beings for improving their lifestyles have led them to modify the areas they inhabit and their surroundings, causing negative impacts in the environment due to the lack of territorial planning and a poor population growth management. In this sense, sustainable and maintainable places are becoming more recognized in both rural and urban areas, but mainly in the second ones as they concentrated most of the population. For this reason, new models of cities have been designed in order to give solutions to those problems, as well as to meet the new requirements of citizens and visitors.

As examples of these, the Digital, the Smart, the Innovative, among others, have been applied in cities such as Amsterdam, Barcelona, and Medellin, respectively. In Mexico, Guadalajara is being development into a Digital one, Colima into a Smart one, and

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Pachuca into a Knowledge one. However, The Government of Mexico City (GDF in Spanish), has been working in the development of three models in one project, the Digital, Smart, and Knowledge City (DSKC), with the aim of re-urbanizing the city to solve its problems caused by its overpopulation.

Mexico City is one of the world's largest cities (UN, 2014); is the main destiny of the Foreign Direct Investment in the country; and it occupies the first place in National Competitiveness (IMCO, 2014), as well as in the Innovation, Technology and Science National Ranking (Dutrénit *et al.*, 2014). Moreover, it is one of the main world´s tourist destinations. As a result of this, Mexico City contributes with almost the sixth part of the national tourism Gross Domestic Product (INEGI, 2012).

Therefore, the GDF has a priority to encourage, promote and consolidate some types of tourism, such as: the health, ecotourism, the cultural and the business ones, respectively which, according to Ashworth and Page (2011) and UNWTO (2012), it implicitly refers to urban tourism since this offers a variety in its products and services, allowing urban tourist to perform a wide range of touristic activities within a city. This way, urban tourism can be inserted in the development of the DSKC so that the GDF can achieve its objectives, and as a result, reach similar benefits to the ones in Spanish cities, which have led Spain to be first place in the Travel and Tourism Competitiveness Ranking (WEF, 2015), and become urban tourism a priority strategy for the country (EXCELTUR, 2012).

This research is based on a diagnosis which shows the current role of urban tourism in the DSKC of Mexico City, under the systems thinking approach. For the development of the diagnosis, the first three stages of the Soft Systems Methodology (SSM) by Checkland (1981) were applied, which are: i) the problem situation unstructured, ii) the problem situation expressed and, iii) root definitions of the relevant systems. It is worth mentioning that for the development of the second stage, existing normativity regarding the city and tourism, as well as local and federal government reports and contents on websites were used to stablish the links. Moreover, the Social Network Analysis (SNA) was used to express "a group of nodes socially relevant linked by one or more interactions" (Marin y Wellman, 2011:11); besides visualizing and understanding in a better way the links between the elements and agents which conform the system, and detecting as well as highlighting the conflict situations. The Strategic-Management Model (SMM) by David (1989) was also used in parallel and complementary way, focusing on the development of the first stages which are: i) the mission statement; ii) the performance of the external audit, where the opportunities and threats were expressed in the External Factor Evaluation Matrix (EFEM); the performance of the internal audit, where the strengths and weakness were expressed in the Internal Factor Evaluation Matrix (IFEM) and; iv) the generation of strategies.

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CURRENT SITUATION OF THE URBAN TOURISM ROLE IN THE DSKC OF MEXICO CITY

The problem situation unstructured

In the development of the first stage of the SSM, it was found that the GDF lacks a document which explicitly expresses what the DSKC is and, that urban tourism is not completely perceived by the GDF. Therefore, through a review of the existing literature in the digital, the smart, and the knowledge subjects, as well as in urban tourism (Table 1), we propose: i) to defined the DSKC and, ii) an approach to the urban tourism role in this city's model.

Table 1. Urban tourism in the Digital, in the Smart and in the Knowledge Cities.

Element	Digital City	Smart City	Knowledge City
Iconic Cities	Cleveland, 80´s Amsterdam, 1993 Shanghai, 1999	Copenhagen, 1989 Helsinki, 1995 Dubai, 1999 Barcelona, 2000 Malta, 2007	Silicon Valley,
Objective	To provide digital services to citizens, such as: free Wi-Fi access, open access to government information through websites, ease of doing paperwork and, citizens participation in decision making.	To provide solutions to the problems caused by overpopulation, such as: traffic congestion, drinking water shortage, low school offer, increasing of garbage, among others; through accessibility and mobility implementations, IoT architecture, use of ICT and Living Labs.	To generate and share economic value through the collaboration between the agents and elements of the system, the knowledge generation, and the use of ICT; to strengthen sustainability; to occupy human talent; to improve social and economic conditions of citizens and visitors; to catalyze creativity and innovation management which led city to become a competitive node. It is develop in Science Parks.
Environment	Web 2.0 Social Networks	IoT and IoE Applications	Web 2.0 and IoT architecture
Agents involved	Government, Entrepreneurs, Citizens	Government, Entrepreneurs, Citizens	Government, Organisms, Investors, Academicians, Citizens and Tourists, all of them organized and linked.
Beneficiaries	Government, Entrepreneurs and Citizens	Government, Entrepreneurs, Citizens and Tourists	All agents and elements involved
Tourists Interaction level	Low	Medium	High
Products and Services Offered to Tourists	Restricted Wi-Fi access. Local touristic webpages. Virtual tours from home devices. Recommendations and	A wide free Wi-Fi Access. Local touristic webpages and applications. Better mobility and security in the city. Tours in the	Knowledge generation through the contents of the touristic places.

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Element	Digital City	Smart City	Knowledge City
	opinions about touristic places and services.	destiny using virtual and augmented reality to entertain, and provide information and guidance.	

Source: Own elaboration based on what is reported by: (Ergazakis *et al*., 2011), (Musser and O´Reilly, 2006), (Witker, 2009); (Anthopoulos and Vakali, 2012), (Cosgrave *et al.*, 2013), (Harrison and Abbott, 2011), (Jin *et al.*, 2014), (Srivastava and Vakali, 2012), (Zanella *et al.*, 2014); (Cabrero and Orihuela, 2012), (Glaeser *et al.,* 1992), (González, 2005), (Mellander *et al.*, 2011) and; (Ashworth and Page, 2011), (Bramwell, 1998), (Holloway, 1994), (UNWTO, 2012).

Thus, on the one hand, the DSKC is defined as: the dynamic urban space which is conformed by the interrelation among the digital, the smart, and the knowledge elements under an organized society structure formed by the active participation of the government, enterprises, universities, organism, citizens, and visitors who make use of the different kinds of services, products and offered spaces, in an accessible, sustainable and maintainable environment and, with the incorporation of the ICT, in order to give creative and innovative solutions (based on knowledge generation) to the problems in the city, to generate well-being for society, and develop a competitive space at worldwide level.

On the other hand, the urban tourism role in this city's model should be: as a facilitator of information, providing it in real time and truthfully about the touristic places to be visited in the city; as a designer and supplier of a diversified and innovative touristic offer, through the use of existing elements in the city but at the same using the ICT, in order to meet the current needs of urban tourists and; as a knowledge generator, with the aim of causing a positive effect within the visited place as well as in the residence of the urban tourist. In this sense, urban tourism in the DSKC must offer: i) products, such as interpretative tours within the destiny with the help of virtual and augmented reality, video mappings, and holograms; ii) spaces, which have to be safe, accessible, passable, sustainable and maintainable, with a sustainable touristic plant which applies environmentally friendly measures such as solar cells, re-use of blankets in catering facilities, wastewater treatment plants, among others and; iii) services, such as free Wi-Fi access, online booking, local mobile applications, service providers professionalization, as well as cultural, social and environmental protection training for the citizens, substantial content in landmarks using the heritage interpretation tool, which will generate knowledge and, at the same time, meaningful and transcendental experiences for the one who access it. All these under the active participation of all agents and elements of the system.

This way, theoretical bases were stablished to develop the steps of the SSM to make the diagnosis. In the first stage (Figure 1), each element, agent, as well as the environment of the study system is shown in order to give every product, space and service mentioned above.
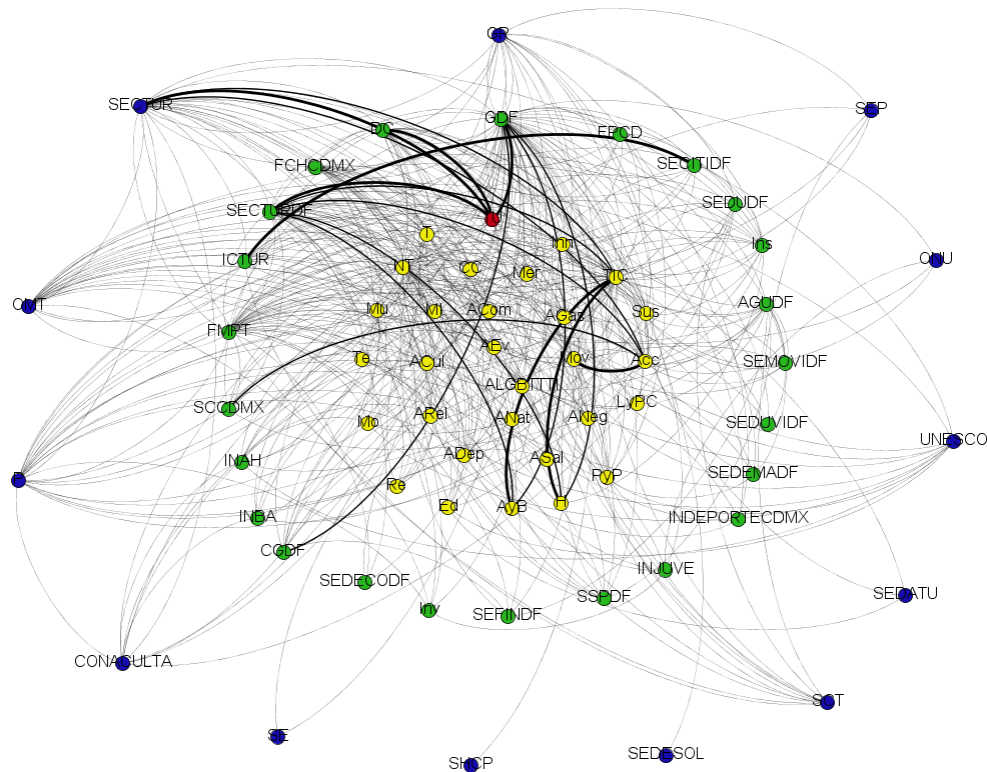
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Figure 1. Elements and agents of urban tourism in the DSKC of Mexico City.

In this stage, a description of the context was made, covering spatial (location), temporal (historical events), and information (researches carried out over the study system) aspects.

In the spatial context, Mexico City is located in the Metropolitan Area of the Valley of Mexico (MAVM), and it is conformed by 16 municipalities, being Cuauhtémoc one of the most important. This municipality is considered to be the seventh National Economy because of its infrastructure; commercial, cultural, financial and political activities; as well as its urban corridors specialized on tertiary activities. Regarding tourism, the municipality works on the promotion of 7 local tourism zones. From these zones, Zone 1 (Historical Downtown) and Zone 2 (Alameda, Garibaldi and Bellas Artes) are the most visited, only after Zone 7 (Torre Mayor y Zona Rosa) (Administración Pública del Distrito Federal, 2011; Secretaría de Turismo del Distrito Federal, 2014).

In the temporal context, Mexico City was founded as a lakeside settlement in 1325. In 1930, the downtown, Moneda Street and some historical buildings were protected through several decrees. Then, "Centro Histórico" was declared as a Historic Monument Zone fifty years later. In 1987, this zone was declared as Cultural Heritage by UNESCO. Since then, Mexico City has won different recognized prizes for its historical and architectural significance.

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In the information-cultural context, this city, as the capital of the country, has been subject of several studies, mainly of its Zones 1 and 2, covering architectural, sustainability, tourism, technology, and innovation issues, among others. These researches have been developed by public institutions such as: UACM, UNAM, UAM, IPN, the Mexico City´s Living Lab, as well as by private and international organisms.

In the past few years, the GDF established the management and shaping of the city into Digital and of Knowledge (Administración Pública del Distrito Federal, 2012). However, at the beginning of the year 2013, the current head of the GDF, Miguel Ángel Mancera, took up the idea, made some changes to it, and as a result it was the Digital, Smart, and Knowledge City project, which is the one that is being developed and showing significant progress in the digital and the smart areas. Although current progresses in this project are shown, there are not still researches on urban tourism, nor urban tourism in the DSKC of Mexico City, and even more, researches carried out under the systems approach.

Once the system is designed with all the elements and agents it must work, we proceed with the second stage.

The problem situation expressed

Figure 2. The conflict situations in the Rich Vision of the study system.

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In Figure 2, the links among the elements and agents which conform the system were stablished, and the conflict situations were detected in the Rich Vision. This way, in the conflict situations we could detect: i) the links with interrelation conflicts (shown in semi-thick lines), and ii) the non-existent links (thick lines) which, because of their condition, were catalogued within this kind of situations; some of them were:

- The GDF lacks a document which explicitly expresses what the DSKC is. There is only a version of the governmental management in the year 2006-2012, related to the digital and Knowledge City. (*non-existing link*)

- Cuauhtémoc municipality, Tourism Secretaries, and the GDF perceive only part of everything the urban tourism is about. (*non-existing link*)

- The Science, Technology and Innovation Secretary (SECITIDF in Spanish) and the Touristic Competitiveness Institute (ICTUR in Spanish) are not linked; even if they both handle aspects such as innovation and the ICT, which are substantial aspects to be considered in the development of urban tourism and the DSKC. (*non-existing link*)

- The Local Tourism Secretary (SECTURDF) and the Federal Tourism Secretary (SECTUR) have a poor implementation of the ICT. (*link with interrelation conflict*)

- Tourism business, such as bed and breakfast establishments, along with the GDF and SECTURDF, have not made use of the ICT to generate information about consumption tendencies as well as satisfaction levels of tourists and any who makes use of the city services are given. (*link with interrelation conflict*)

- In regards to Accessibility, only some of the disabilities related to the mobility of the people within the city, by the implementation of ramps, have been assisted. Therefore, it is necessary the incorporation of elements which assist the rest of disabilities and vulnerable people; besides focalizing the attention in reducing the communication barriers (contents), through the use of the heritage interpretation tool. (*link with interrelation conflict*)

- SECTUR, SECTURDF and the Cultural Secretary (SCDF), lack of quality and design in their contents of the touristic places in the city. (*link with interrelation conflict*)

According to the conflict situations among the elements and agents which conform the system detected and highlighted, the EFEM and IFEM tools from the SMM were used to corroborate the weakness and threats found in the Rich Vision, as well as the strengths and opportunities which, within the Rich Vision, cannot be easily perceived.

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External and internal audit of the study system

Based on the development of the SMM, it was necessary to make the mission statement of the study system before the construction of the EFEM. This way, the mission proposed is:

Mission: To become a competitive and innovative city at the local, national and global level, in providing digital, smart, and knowledge touristic spaces, products and services, through the results of the links among elements, agents and sectors which conform the study system, in order to generate meaningful and transcendental experiences to urban tourists, and thus this triggers to create systemic value.

As a result of this, we continued with the performance of the external audit, in which the opportunities and threats that affect the study system were identified through the building of the EFEM (Table 2).

Table 2. External Factor Evaluation Matrix for urban tourism in the DSKC.

No.	Key External Factors	Weight	Rating	Weighted scored
Opportunities				
1	ICT and Internet in contemporary societies	0.10	4	0.40
2	Cities' models based on ICT and Innovation, at national and international level	0.11	4	0.44
3	National Digital Strategy in Mexico	0.09	4	0.36
4	National Infrastructure Programme 2013-2018 and Structural Reforms	0.09	3	0.27
5	Touristic spaces, products and services on offer	0.09	4	0.36
6	Urban tourism in international cities	0.11	4	0.44
7	Updating of software and hardware cost	0.07	3	0.21
8	Regionalization of touristic destinies	0.08	3	0.24
Threats				
9	Perception of insecurity, drug trafficking, corruption, social movements and spread of epidemics	0.09	1	0.09
10	Continuity and following to six-year government plans and programs	0.09	2	0.18
11	Seasonality of tourism	0.08	2	0.16
Total =		**1.00**		**3.15**

The total weighted score in the EFEM is above the average, **3.15**; this means, the study system's environment is highly competitive and dynamic, where the system can participate and be inserted with ICT and touristic offer issues, among others. At the same

time, the system can minimize the effects caused by the threats, such as insecurity, updating of Hardware and Software, seasonality of tourism.

Regarding the performance of the internal audit, the strengths and weakness were identified through the building of the IFEM (Table 3)

Table 3. Internal Factor Evaluation Matrix for urban tourism in the DSKC.

No.	Key Internal Factors	Weight	Rating	Weighted score
Strengths				
1	GDF programs	0.16	4	0.64
2	Human talent	0.11	4	0.44
3	Natural and cultural resources	0.10	3	0.30
4	Tourist Priority Norm in Mexico city	0.11	4	0.44
5	Touristic model of the city	0.08	3	0.24
6	Cuauhtémoc municipality and the DSKC	0.14	4	0.56
Weakness				
7	Insecurity and corruption	0.09	2	0.18
8	Hotel occupancy at weekends	0.09	2	0.18
9	Link among actors and elements of the study system	0.12	1	0.12
Total =		**1.00**		**3.10**

The total weighted score in the IFEM was above the average, **3.1**, so, on the one hand, the characteristics and strategies of the study system can take advantage of it and placed in the competitive global environment in order to shape the city according to the new trends of current societies and become a competitive and innovative city. On the other hand, it allows the GDF to know its weaknesses, such as the disarticulation among actors and elements, among others, in order to improve them and become them into strengths.

As a result of the above, the EFEM and IFEM contributed to enrich the first two stages of the SSM in such a way that they provided the necessary elements to have a holistic vision about the study system. This way, after the mission statement, the identification of the opportunities and threats, as well as the strengths and weaknesses; the SWOT matrix was built with the success and the failure key factors of the EFEM and IFEM. This matrix helped us structure the necessary strategies, which could be feasible to implement in the short term, in order to accomplish the system's mission.

Generation, evaluation and selection of strategies

To generate the strategies, the success and the failure key factors of the EFEM and IFEM were used to build the SWOT matrix. Through this matrix, 13 strategies were generated; some of them were chosen and some others were integrated to other strategies because of their similitude among each other. Finally, they were hierarchized according to their

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feasibility to be implemented in the short term, in order to accomplish the system's mission. (Table 4). As a result of this process, there were only five strategies:

Table 4. Selection y Prioritization of strategies

| SWOT Strategies	Prioritization	Feasible strategy to implement in the short term
E4	1	To reinforce the sense of belonging and cultural identity, and reduce the digital gap in citizens through social, transparency and accountability programs of the GDF. It is necessary that in every project, the citizen be consulted in order to take part of the decision making.
E1	2	To insert urban tourism as a focal sector for GDF. Through this diagnosis it has been shown that Mexico City in prepared to insert this type of tourism to its new city's model in order to be benefited from it.
E5, E6, y E11	3	To diminish the seasonality of tourism and increase the hotel occupancy by encouraging the stay of local and nearby tourism (MAVM), through the implementation of new products and services which can be offered through urban tourism with the intervention of agents and elements of the system.
E3	4	To boost the clustering of destinations in the central region, in order to create circuits and tours which take advantage of close destinations with natural and cultural attractions, through the active participation of different actors and sectors which conform the region.
E10 y E13	5	To digitally back up the plans and programs of the GDF and its municipalities, as well as to upload them to different websites of the government with the collaboration of different sectors and agents, so as to monitor the follow-up and continuity of those which are having a positive impact in society, as well as to modify the ones which present a high level of failure in order to reduce corruption and promote citizenship, country and international credibility among citizens within the country and at international level.

According to the strategies given by the prioritization process, the third stage of the SSM was developed. In this stage, the relevant systems were established in order to build a conceptual construct which, along with the five strategies, will lead to the accomplishment of the system's mission.

Relevant Systems

Based on the elements which conform the CATOWE, the agents were identified in each one:

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- **Customer:** GDF

    Investors (entrepreneurs, sponsors), Citizens, Tourists

- **Actors:** Academician, Professionals

    ICTUR (Decentralized body of SECTUR)

- **Transformation process:**

Systemic value generation
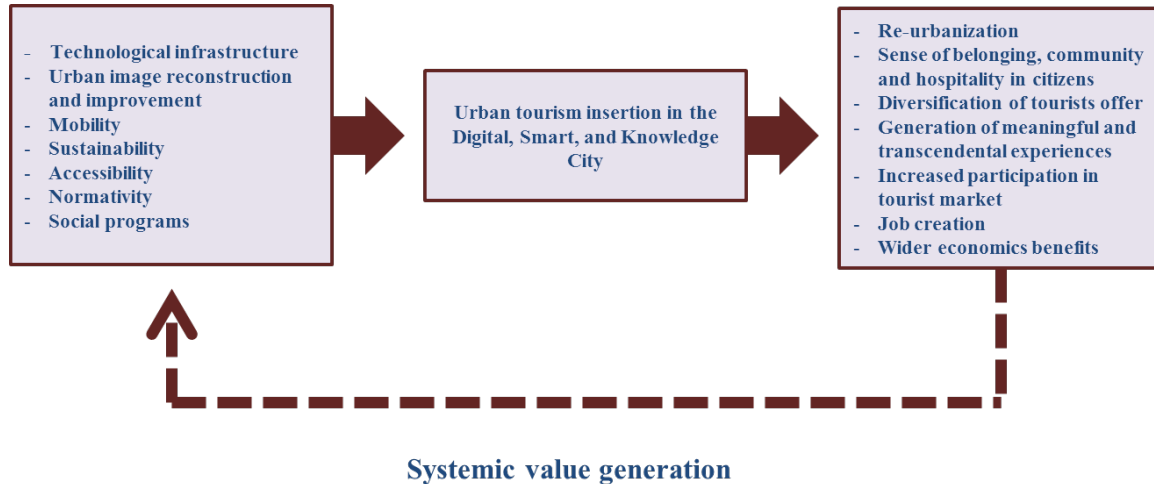
Figure 3. Transformation process from inputs to outputs

- **Owner:** ICTUR

- *Weltanschauung*:

Positive outlook	Negative outlook
Accessibility, innovation, among others are considered as important elements for the viability of the study system.	The cities' models are perceived separately. This way, key actors lack a system perspective.

- **Environmental constraints:** Trends- ubiquitous cities (Anthopoulos and Fitsilis, 2013), ICT, Normativity, Government Policy.

DISCUSSION

Through the development of the diagnosis, it was found: i) the GDF lacks a document which explicitly expresses what the DSKC is, ii) its project does not consider urban tourism and, iii) in the touristic sector the DSKC is not presented. As a result of this, we made two proposals in order to understand the DSKC and urban tourism complexity and

thus, made the diagnosis in Mexico City. The results showed that there is a strong disarticulation between both parts. Therefore, neither of them is taking advantage of the elements they offer for mutual benefit or development.

In addition to the above, it was detected that there are not clear indicators which establish what a digital, a smart, and a knowledge city are. In Mexican cities, it causes that governors state that they are developing any of these cities' models. However, when the cities are subject of studies it is noticed that they do not fulfill with the requirements to be those types of cities. It also occurs in the urban tourism area; the indicators are so wide and complex that makes its measurement complicated. This idea is supported by the mention of the UNWTO (2014), made in the 3rd Global Summit on City Tourism, carried out in Barcelona, Spain, where it was emphasized the necessity of researches which allow professionals to measure it in an adequate way, as well as its impact and trends.

Regarding the elements given by the EFEM, spatial study limits on Historical Downtown-Alameda zones could be stablished. The demarcation was done based on one of the requirements for urban tourism development; that is, to rely on the existing elements in the city (Ashworth and Page, 2011) which show considerable advances on the development of the DSKC since an already intervened zone is more profitable in the short term than one which is not; moreover, as for technologies implementation, Historical Downtown-Alameda have been more benefited with the ICT's incorporation such as: free Wi-Fi access, events to reduce the digital gap, among others. In concern to urban image reconstruction, there is the recovery of spaces such as pocket parks (small green areas). This way, 8,125 users downtown, and some other 1,857 in the Alameda Park have been benefited by being simultaneously connected via the free Wi-Fi service (GDF, 2014).

CONCLUSSIONS

Human beings have modified their environment without taking into account some important aspects, such as territorial planning and population growth management. However, they have also been the ones who have proposed different recovery measurements environmental alternatives in order to diminish the damages they have caused. In this sense, new practices such as: sustainability, mobility, accessibility, among others, have been incorporated to the cities' new re-urbanization models, mainly in European ones.

Thus, by taking advantage of the changes in human beings behaviors, as well as the elements provided by cities' new models, the development of urban tourism becomes relevant because it needs from the same elements to improve its practice. This way, it is necessary that urban tourism be inserted in the DSKC of Mexico City, in order to generate meaningful and transcendental experiences to urban tourists, which lead to the cause of positive effects within the visited place as well as in the residence of the people who perform the touristic practice; such effects could be the improvement of the urban environment and the formation of better human beings.

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Through this research, it is stressed the importance of studying the DSKC and urban tourism as elements to be addressed from the systems approach, this is because many of the conflict situation detected in the diagnosis made were caused by a limited perspective and addressed in isolation. Besides the above, it is necessary to stand out the advantages of combining both tools, the SSM and the SMM, because it was found a significant correlation among the conflict situations evidenced with the SSM and the scenarios of threats and weaknesses identified in the EFEM and IFEM. Furthermore, the favoured situations were also detected which, within the Rich Vision they could not be easily perceived.

Finally, we conclude by mentioning that this paper shows the first part of a complete research which is about the urban tourism insertion in the DSKC Project of Mexico City. In the second part, a conceptual model is proposed, based on this diagnosis and applying the remaining stages of the SSM. Once the model is constructed, it was validated through the Viable Systems Model (VSM). As a result, this model will allow us to insert and link each of the urban tourism components in the DSKC in order to give spaces, products and services proposals in which government authorities, entrepreneurs, professionals, among other agents involved in urban tourism and the DSKC invest, link, create plans to help to solve the city problems, generate meaningful and differentiating experiences, innovate and become competitive; all this, in order to lead to systemic value generation.

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