The Design of Interactive Services in Smart City Node

Sheng-Ming Wang
Assistant Professor, Graduate Institute of Interactive Media Design, National Taipei University of Technology (e-mail: ryan5885@mail.ntut.edu.tw)

Abstract
This research is focused on the study of establishing an interactive service node in a city with the concepts of smart city development. In today's cities, our everyday lives are increasingly shaped by various technologies and infrastructures. This research investigates this new condition and its implications for the design of interactive service in smart city node. This research begins with the literature review of smart city and city node development. Then, the servicescape of city flows is discussed. Thirdly, the research plan and methodologies based on user-centered design and service design are proposed. Furthermore, participant observation and the proposed methodology are implemented in the case study area, which is the city node located nearby the Exit 4 of ZhongXiao-Xinsheng Taipei MRT station. Finally, three design prototypes, which include The Green Trellis and Smart Bench, The Shrub Barriers for Sidewalk Safety Improvement, and The Interactive Kiosk and Digital Signage Installation are proposed and discussed. As conclude from this research that the design of an interactive service node in smart city is different from design single products or services. It is because in the social space there is an absence of a structured sequence of actions and interactions, this multiplicity of actions makes the user’s perception of the city “not sustained, but partial, fragmentary, mixed with other concerns”. Meanwhile, the use of the integration of user-centered design and service design to map experiences and then to rank attributes helped this research to emphasize that the final users are the main object of the research, and also helped to select the design ideas which appear to be most beneficial for improving the users' experiences. Thus, this research demonstrated that the methodologies proposed is valid for applying to the design of interactive service node in smart city.

Keywords: Smart City, City Node, Interactive Service, User-Centered Design, Service Design
1. Introduction

In today’s cities, our everyday lives are increasingly shaped by digital media technologies. This research is focused on investigating this new urban condition and its implications for urban information interaction in the concept of smart city development. Cities have always been about providing frameworks of information and services to improve the quality of life for residents and businesses. The social networks, mobile devices, reactive environments, cloud-based data services and public digital signage transform the experiences of living in cities in the past few years (Kohno, Masuyama, Kato, & Tobe, 2011). These new municipal infrastructures evolve to meet the needs of citizens looking for the type of real time information, configurability, and interaction they have come to expect from various applications (Memarovic, Langheinrich, & Alt, 2011). Urban life nowadays is undergoing tremendous transformation, which requires an alternative set of thinking in dealing with the complexity that result from the daily acceptance of changes brought by the new technology. There is the need of new governance mechanism for innovative urbanism, as well as the needs for smart ways of living to accommodate human necessities and natural ecology, and smart technologies to enhance the quality of human interactions in urban environment (Memarovic, et al., 2011).

Rapid developments and innovations in technology has made our living space more convenient. How to adopt smart technologies in our living space to enhance the quality of human interactions becomes an essential issue for future development of urbanism. The answer on how we can emerge the new technologies into a community and city can be found from our understanding of human cognition and affection and their implications for design. Thus, practical works, which is based on the observation of users' behavior and experience in a city, are needed. In this paper, the Exit No. 4 of Zhongxiao-Xinsheng station of Taipei MRT is used as case study area for the practical work implementation. Firstly, participant observation method is used to map activities, social interactions, space attributes and all other phenomenon which are important to measure, understand and recognize the attributes, weaknesses and particular dynamics of this urban node. Then, design process is implemented with integral creative processes to develop user scenarios of urban interaction of this urban node. There are two different perspectives been proposed in the results of this research. The first one is the sum of multiple urban interaction performed by individuals and groups of people. The other one is the spatial and cultural characteristics that make those urban interaction different and unique. The results suggest that the relation between space identity and service design offers many opportunities to improve the quality of interaction in urban node of smart city.

This paper initiates with a literature review on the development of city node and interactive information service in public spaces and how could be a good method for designing a public space or renovate it. Then followed by a description of the research methodology used for this study. Thirdly, case study is implemented based on the area been chosen and the methodology proposed in former section. Finally case study results are presented and discussed for concluding this study and proposing future studies.
2. Smart City and City Node Development

Smart City can be defined as a city in which there is a broad use of Information and Communication Technologies (ICT) in the processes of monitoring, planning and integrating different urban systems (Filipponi et al., 2010; Harrison & Donnelly, 2011). The implementation of smart city helping to create innovative services (Naphade, Banavar, Harrison, Paraszczak, & Morris, 2011), more business opportunities, better quality of life (Gibson, 2011) and efficiency in city governance (Yigitcanlar, 2008) and sustainable environment development (Caragliu, Del Bo, & Nijkamp, 2011). As conclude from above studies, the definition of smart city for this research is that "the use of ICT to collect, analyze, transmit and process difference kind of data and provide the key information service to the cities and people". Correspondent to the definition, the information service mechanism and the interactions between stakeholders, such as people, city government, private sectors, NGO groups and environment are two of the most critical issues that need to be discussed and designed in smart city development. As proposed by this research, the smart city concept and development is shown is figure 1.

As pointed out by Kevin Lynch in his book "The Image of the City", that users understood their surroundings in consistent and predictable ways with five elements: paths, edges, districts, nodes, landmarks (Lynch, 1960). The nodes in a city described by Lynch represent the focal points, intersections or loci as shown in figure 2. (Lynch, 1960). In modern urban development, nodes in a city are described areas that have compact, mix-used development that serve the surrounding areas and are often accessible by high order transit and good road networks (Brown et al., 2010; Madanipour, 1999). However, in the term of smart city development, the nodes become hubs, sensors that semantically be tagged as things from physical world items (Lombardi, Giordano, Farouh, & Yousef, 2012). The nodes are also places or installations for cyber flow (Kohno, et al., 2011; Nakanishi, 2010). The nodes in smart city, which are often installed with digital signage, are becoming a place for exposing information. They are carriers for broadcasting messages but also the way of conveying urban meanings and identity for people and places (Bauer, Dohmen, & Strauss, 2011; Memarovic, et al., 2011).
The importance of a smart city node lies on its ability of creating urban interactions between the people and the environment. A smart city node which is a public space that may be a gathering spot or part of an area within the public realm that helps promote social interaction and a sense of community(Schmidt & Németh, 2010). Christopher Alexander states that the best cities, and consequently their public spaces, are those that have been naturally created by the citizens. The “natural cities” is better than those designed “artificial cities” because of its ability of flexible and overlap activities, growing accordingly to the citizen needs(Alexander, 1965). Elizabeth and Stappers highlights the importance of participatory design to achieve a better design for the user to provide expertise, and participate in the informing, ideating, and conceptualizing activities in the early design phases(Elizabeth & Stappers, 2008). It is seen that co-creation practiced at the early front end of the design development process can have an impact with positive, long-range consequences.

3. The Servicescape of City Flows

Servicescape is a concept that was developed by Booms and Bitner to emphasize the impact of the physical environment in which a service process takes place(Bitner, 1992). They defined a servicescape as "the environment in which the service is assembled and in which the seller and customer interact, combined with tangible commodities that facilitate performance or communication of the service"(Bitner, 1992). The servicescape includes the facility's exterior (landscape, exterior design, signage, parking, surrounding environment) and interior (interior design and decor, equipment, signage, layout, air quality, temperature and ambiance). The servicescape concept, once introduced, became a key factor in many marketing studies (Kim, Bae, & Stringfellow, 2005; M. Rosenbaum & Montoya, 2007; M. S. Rosenbaum & Wong, 2007; Serra, 2010). In service design, servicescape refers to the role of physical surroundings in and how physical environments relate to service. However, the task of service design is a complex, iterative and ongoing process including understanding, thinking, generating, explaining and realizing, which are shown in figure 3.
The convergence of city information usually demands highly intensive information to expose in big city. In the ordinary course of urban senses, new kind of interactive information service infrastructure, such as digital signage is used to be set in the public places of city node (Wang & Tseng, 2012). The digital signage is not just a carrier for broadcasting messages but also a way of conveying urban meanings for some certain locations (Bauer, et al., 2011; Grobelny & Michalski, 2011).

The complicated city information help transforming a city node into the labeling of a servicescape with an access to affluent information flows which commercials matter. The research done by Wang and Tseng (Wang & Tseng, 2012), which reviews the case studies of Taipei Arena and Exit No. 4 of Zhongxiao-Xinsheng station of Taipei MRT using the fundamental of experiences design, show that in terms of urban context, there reveal something in common for the pattern of service design for city landmarks and urban nodes. Wang and Tseng (Wang & Tseng, 2012) also analyze the concepts of service design to remodel a square based on formalized observation. Then, mapping user experiences for categorizing key issues, specific situations and any possible solutions in order to develop and deploy design concepts.

4. The Research Plan and Methodology

This research is focused on investigating this new urban condition and its implications for urban information interaction in the concept of smart city development. In order to have a comprehensive understanding of the users' scenarios, behavior and experiences in the proposed smart city interactive information service, both user-centered design (UCD) and service design (SD) methods are used in this research. A city node, which locates at the ground level and immediate surroundings of Taipei Zhongxiao-Xinsheng MRT Station Exit 4 is chosen in this research as case study area. The reason for choosing the Exit 4 of this MRT station is because it is a station for two of the most crowded and busiest MRT lines in Taipei. The MRT Exit 4 is also the access to the National Taipei University of Technology (TaipeiTech), which one of its most visible characteristics is the green façade at the entrance of the campus that consist on a green wall with a metallic tree on the façade and an ecological stream that surrounds the campus. The case study area and its surrounding environment is shown in figure 4.
4.1 The User-Centered Design Approach

In terms of user-centered design (UCD), the process is a set of tasks and activities interface for designers and those experts who indeed caution if the product easy to use. Somehow, it is principally about understanding what the users’ mental models are (with task analysis, observations, interviews, and so on); or designing a conceptual model to fit the users’ mental model (interface design, iterations, validation testing, and such)(Weinschenk, 2011).

According to the theory of behavior observation, we carry out the UCD ideas in research process for observing the user in the target site to discover what issues for users are to deliver the concepts of service design. In order to contextual enquiry on site, clients and their behavior are observed and their user experiences are mapped according to the five human factors: physical, cognitive, social, cultural, and emotional. The key issues for the user behavior and experience observation in the target site based on UCD in this research are proposed in Table 1.

Table 1, The key issues for user behavior and experience observation

<table>
<thead>
<tr>
<th>NO.</th>
<th>The Key Issues of UCD Experiences</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>How the people gather?</td>
</tr>
<tr>
<td>02</td>
<td>How many kinds of users there are on site? And what are the criteria to identify?</td>
</tr>
<tr>
<td>03</td>
<td>How weather affects the actions?</td>
</tr>
<tr>
<td>04</td>
<td>How people feel using the place?</td>
</tr>
<tr>
<td>05</td>
<td>Duration and diversity for actions?</td>
</tr>
<tr>
<td>06</td>
<td>Where to take place for proper activities on site?</td>
</tr>
<tr>
<td>07</td>
<td>What are the dimensions for circulation system on site to see if help or restraint motilities?</td>
</tr>
<tr>
<td>08</td>
<td>What kind of relationship is for the users on site among near around transporting systems, such as bikes, motorcycles, cars, city bus, taxis or MRT??</td>
</tr>
<tr>
<td>09</td>
<td>What kind of information has been offered on site?</td>
</tr>
<tr>
<td>10</td>
<td>How MRT signs and traffic signs are designed and located?</td>
</tr>
<tr>
<td>11</td>
<td>What services are necessary for users on site but not available?</td>
</tr>
</tbody>
</table>
In addition to the proposal of the key issues for user behavior and experience observation shown in table 1, the flow diagram for implementing the UCD approach used in this research is shown in figure 5.

![Flow Diagram](image)

Figure 5, The flow diagram for implementing the UCD approach in this research

### 4.2 The Service Design Approach

The second method that uses in this research is the service design (SD) approach. The service design in the aspect of product design is define as “design service interfaces for intangible products that are, from the customer’s point of view, useful, profitable and desirable, while they are effective, efficient and different for the provider”(Ayers, Gordon, & Schoenbachler, 2011). So we can explain service design as an integral creative process, in which the focal point is the final user and its overall experience while using a service, rather than just focusing on the main function or aesthetics.

The way to make this process integral and holistic is by incorporating and overlapping the particular visions of all the stakeholders involved in the design, develop and future implementation of the service with the participation of service stakeholders include: users, designers, investors, researchers, technicians, policy makers, consultants and competitors. Another interesting definition says that “Service Design is the design of intangible experiences that reach people through many different touch-points”(Moggridge, 2006). Understanding the service as a complex experience that has to be designed according to the perception, expectations and needs of the user is a little of a change of paradigm for traditional designers because service design can make use of one or several products just as components of the overall user’s experience. Service design is also a permanent feedback requesting and constantly updated process, in which the response of the users are continually being observed and monitored(Holmlid, 2009).

Applying service design to the interactive information service node in a smart city is different from the traditional application to single products or services. It is because the interactive information service node is lack of a structured sequence of actions and interactions. These multiplicity of actions makes the user’s perception of the service node “not sustained, but
partial, fragmentary, mixed with other concerns” (Lynch, 1960). Actually, sometimes it is even hard to define what exactly the service is since activities arise and conclude unexpectedly and users can also perform several actions at the same time. Furthermore, some interactive information service node in public space have a very deep cultural background, a strong local identity that represents the spirit of the city and its inhabitants, a valuable asset that Alexander calls a “quality without a name” (Alexander, 1965). This local identity can play a significant role in process of creating new services and interactions in the service node.

![Figure 6, The integrated service design process used in this research](image)

This research uses the sum of multiple activities performed by individuals and groups of people when analyzing the interactive information service node in a smart city. The service design is then used to identify the most valuable attributes of the service node and then think about how these attributes can be reinforced or re-interpreted to create more vibrant and fascinating experiences. In some cases these attributes are not yet fully expressed or achieved, so the design team must perform meticulously observations in order to catch the spirit of the site and to define how this value can be built. Figure 6 shows the integrated service design process that is used in this research. The process contains five major stages in service design that includes: observation, reflection, making, socialization, and implementation. It also divide into three different phases: exploratory, generative and evaluative. Based on the integrated process, an observation plan that include the perspective of space, user, and service and their associate criteria are proposed and show in table 2.
Table 2, The observation plan for service design analysis

<table>
<thead>
<tr>
<th>Perspective</th>
<th>Criteria</th>
<th>Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I. Space</strong></td>
<td>1. Function</td>
<td>1. How spaces are connected?</td>
</tr>
<tr>
<td></td>
<td>2. Usability</td>
<td>2. How spaces are been used?</td>
</tr>
<tr>
<td></td>
<td>3. Affection</td>
<td>3. How different factor affect the use of the spaces?</td>
</tr>
<tr>
<td></td>
<td>4. Mobility</td>
<td>4. How the space help or restraint mobility?</td>
</tr>
<tr>
<td></td>
<td>5. Safety</td>
<td>5. How safe of the space?</td>
</tr>
<tr>
<td><strong>II. User</strong></td>
<td>1. Distribution</td>
<td>1. How users are grouping and gathering in the space?</td>
</tr>
<tr>
<td></td>
<td>2. Classification</td>
<td>2. How many kinds of user in the space. ?</td>
</tr>
<tr>
<td></td>
<td>3. Connection</td>
<td>3. How users are connected to the space?</td>
</tr>
<tr>
<td></td>
<td>4. Experience</td>
<td>4. How users feel about the space?</td>
</tr>
<tr>
<td></td>
<td>5. Duration</td>
<td>5. How long does users use the space?</td>
</tr>
<tr>
<td><strong>III. Service</strong></td>
<td>1. Information</td>
<td>1. How and what information service been provided?</td>
</tr>
<tr>
<td></td>
<td>2. Diversity</td>
<td>2. How many different service been provided?</td>
</tr>
<tr>
<td></td>
<td>3. Location</td>
<td>3. Where are services been provided?</td>
</tr>
<tr>
<td></td>
<td>4. Infrastructure</td>
<td>4. What kind of infrastructure used for service?</td>
</tr>
<tr>
<td></td>
<td>5. Mechanism</td>
<td>5. How the services been activated?</td>
</tr>
</tbody>
</table>

5. Case Study Results and Discussion

There are two approaches been used in this research, however both of these approaches are based on users' behavior and experience. Thus, participant observation, which is a qualitative method with the objective to help researches learn perspectives held by study population is used in this research. This method was chosen for approaching the situation without any preconceive idea and therefore to document the activities and behavior of users held on site in order to discover all potential to improve users' experience.

5.1 Mapping of Users' Behavior and Experiences Using User-Centered Design

According to the diagram of UCD approach shown in figure 5, this research observes and mappings people activities and behavior in the case study area based on the proposed key issues shown in table 1 and the five human factors. Figure 7 shows the results of the observation and the mapping the diversity of users' activities by using different color.

By analyzing the observation results shown in figure 7, researchers noticed that several user
experience have a strong connection with their behavior shown in their activity when interact with the facilities and service provided in the case study area. In line with that, this study also define several activities in relation with their emotion. The mapping and classification of users' experience and emotion is shown in figure 8.

- The users get confused and ask for their direction.
- The users seems bored while they are waiting for someone or chit-chatting with friends.
- The users interact the TaipeiTech ecological corridor.
- The users walk in a hurry to their destination.

**Figure 8, Mapping of users’ experience and emotion**

Furthermore, expanded from the results derived from the mapping of users' experience and emotion, 6 types of users and their associated interaction in the case study area are summarized and shown in figure 9. According to the illustration shown in figure 9, the users are classified as follows:

1. Users admiring the living environment.
2. Users using their own devices (cell phones, tablets, books... etc.)
3. Users talking to each other.
4. Users contemplating the urban scene.
5. Users who are performers and their audience.
6. Users obtaining information from the environment.

**Figure 9, User types and interaction in the case study area**

5.2 Using Service Design for Interactive Service Analysis

In addition to know the users’ behavior and experience, the interaction services provided in the case study areas are also needed to be analyzed. The interaction service analysis is
performed by using service design process proposed in figure 6 and the observation plan shown in table 2. Figure 10 shows the area indication of performing service design for interaction service analysis.

![Figure 10](image)

**Figure 10, The area indication of performing service design for interaction service analysis**

By using participant observation method, the research results show that the main activities in the area C, which is located at Zhongxiao East Rd. axis sidewalk that goes along the TaipeiTech green corridor, are parking bike, passing through and waiting for the bus. The presence of a dense vegetation and large number of trees contribute to provide shadow during most hours of the day and hence provides a very significant temperature reduction, especially during the hot days. The heavy traffic of both Zhongxiao East Rd. and Xinsheng South Rd. and its noise are almost permanent and increase during the rush hour. Also, when walking along Zhongxiao East Rd. towards the corner, the MRT Exit 4 creates a visual obstacle between the sidewalk and the corner square.

![Figure 11](image)

**Figure 11, The mapping of pedestrian’s traffic track and interaction**

In the area A, where most of the social activities occur, the green façade and green corridor of TaipeiTech are very attractive assets for the square. According to our observation, people like to stand staring at the pond, the metal tree, the vines, the fishes and the whole ecosystem. The sitting places provided here are being used most of the time as well, even though the height is not enough to permit elderly people to sit there comfortably. Regarding the corner square in this area, the main activities observed are waiting for people to meet, watching the pond, reading and chatting, taking or getting off from taxi, accessing to TaipeiTech and accessing the MRT Exit 4. The research also found that there is a digital signage setting in this corner but only few users really stand in front of it and watching the information displayed in it.
In the area B, according to the mapping of pedestrian’s traffic tracks and interactions shown in figure 11, this area is a by-passing area for pedestrians and not a lot of interaction occurred in this area.

During the observation, this research found that the sidewalk and the street are at the same level that allows cars and motorcycles to make an illegal parking on the sidewalk. This causes a lot of inconvenience to the users who are staying in the sidewalk. Meanwhile, this kind of design also allow cars and motorcycles to mount on the sidewalk occasionally while they turn right from Zhongxiao East Road. As shown in figure 12, this poor design causes threaten and danger, especially in rainy day with poor sight, to the pedestrians who stand around the corner and waiting for traffic light to across both Zhongxiao East Rd and Xinsheng South Rd.

![Figure 12. The threaten and danger to the pedestrians causes by the poor design of the corner](image)

The observation proposed in this research also include the user experience of the MRT station Exit 4. The user experience map illustrate in figure 13 show how the design of MRT station affect the users during rainy day. Users are used to seek for protection under the roof of the MRT Exit 4. However, this buffer space is very limited so when too many people are jammed in the narrow space will block the Exit. The same condition happened in hot sunny day since users are also seeking shelter under the roof since there is no other shelter place in the case study area. Figure 13 also shows that the MRT Exit 4 does not follow any universal design principle for users with disability. Thus, disable users on wheelchair, users with trolley or luggage, and elderly and physically impaired users cannot access Exit 4 without assistance.

The above analysis results answer the space and user perspective proposed in the observation plan shows in table 2. In the information perspective, this research found that traditional ways such as: static panels showing bus routes, signage indicating the location of disabled people entrance, warning tags, hanging banners, and street maps panel, are been used for providing information in the case study area. There is no interactive information service mechanism been provided. Meanwhile, the contents of existing information is very unfriendly, difficult to interpret, or even inexistence to foreigners and visitors. Although, there is a huge digital signage been installed in the corner, it does not provide any information related to the service node. Thus, the interactive information services are badly required in this city node.
5.2 Interactive Service Prototype Design

Based on the observation results discussed above, this research proposes the interactive service prototype design in this section. The mapping of users' experience generated from the UCD approach shows that, in the service node of this research, there are four kinds of users been identified based on their activities and emotion and there are six kinds of users been identified based on the their interaction to the environment. The results of applying service design for interactive service analysis to the service node show the diversity of social interaction, the quality scene, the green and eco-environment are the positive attribute of the service node. However, lack of interactive information service, the safety of sidewalk corner, lack of universal design implementation are the negative attributes of the service node. Thus, the design of interactive service prototype for the service node should fulfill the requirements of different users, to reinforce the positive attributes and to improve the negative attributes of the service node. The interactive service prototype proposed in this research are described as follow.

1. The Green Trellis and Smart Bench

Figure 14, The Conceptual Prototype Design of The Green Trellis and Smart Bench
Based on observation, researchers found that there are a lot of users using the facilities around the TaipeiTech Green Façade and Green Corridor. Thus the green trellis and smart bench are proposed to improve the service of current facility and provide the solution for solving the problems of lacking shelter both in sunny and rainy days in the service node. The conceptual prototype design is shown in figure 14. The green trellis is installed above existing log benches and make some additional features, such as phone charger, WiFi access point, background music speakers, to transfer exist benches become smart benches.

2. The Shrub Barriers for Sidewalk Safety Improvement

For avoiding cars and motorcycle mounting on and cutting through the sidewalk corner that threaten and endanger the pedestrians, this research propose to build a shrub barriers around the sidewalk corner. However, space and ramp should be preserved for disable users. The conceptual prototype design is shown in figure 15. The design would avoid the motorcycles and car mounting on the sidewalk. Secondly, this research also propose to continue the existing line of shrubs on the side walk on Xinsheng South Rd. to the curve and the sidewalk on Zhongxiao Rd. to create a visible barrier between the sidewalk and the street.

![Figure 15, The Conceptual Prototype Design Concept of The Shrub Barriers for Sidewalk](image)

3. The Interactive Kiosk and Digital Signage Installation

As point out by observation results that there is no interactive information service mechanism been provided in the service node. Meanwhile, the method of information providing and the contents of existing information is very unfriendly, difficult to interpret, or even inexistence to foreigners and visitors. This research firstly proposes to improve the contents of existing digital signage display and design a mechanism and dwelling time that include broadcasting various information that related to and required by the users in the service node. This proposal is currently processed by the design college of TaipeiTech. This research also proposes a prototype design of information kiosk to provide better interactive information service. Another prototype design proposed in this research is an array of interactive LED media poles that has been installed with gesture control user interface. The last two design had been implemented by the design college of TaipeiTech under the support funding by ministry of
education (MOE) and TaipeiTech. The results are shown in figure 16.

According to the observation, the kiosk and interactive LED media pole array provide users with better interaction in the service node. The various contents shown in the kiosk and media pole array, which includes interactive maps in kiosk and some gesture games and digital media in the media pole array, also deliver different user experiences to the users. However, the kiosk and interactive LED media pole array are new in the service node, better user experience and performance analysis and evaluation are required for comprehensive understanding of the prototype design development.

Figure 16, The information kiosk and interactive LED media pole array

6. Conclusion and Future Works

Cities have always been about providing frameworks of services to improve the quality of life for residents and businesses. How will interactive services provided in a smart city node transform the user experience, interaction, emotion and connection of living in the city is a new and inter-disciplinary field for exploration. What new municipal infrastructure, both in physical space and interactive information, will evolve to meet the needs of interactive service using by citizens are very important to know in the smart city development. As conclude from this research that the design of an interactive service node in smart city is different from design single products or services. It is because in the social space there is an absence of a structured sequence of actions and interactions, this multiplicity of actions makes the user’s perception of the city “not sustained, but partial, fragmentary, mixed with other concerns” (Lynch 1960). Actually, sometimes it is even hard to define what exactly the service is, because activities arise and conclude unexpectedly and users can also perform several actions at the same time. Hence, the design of an interactive service node in smart city is the identification of the most valuable attributes of that city node and then to think about how these attributes can be reinforced or re-
interpreted, in order to create more interactive service with vibrant and fascinating experiences. Meticulously observations should be preformed to catch the spirit of the site and to define how this value can be built.

The results of this research show three intervention followed by user-entered design and service design approach. It is very difficult to perform a valid evaluation of the intervention except the information kiosk and interactive LED media pole array that has been built. However, these proposals are emerged from a deep look into the users' needs and how they interact between each other and with the environment. The use of user-centered design and service design to map experiences and then to rank attributes helped this research to emphasize that the final users are the main object of the research, and also helped to select the design ideas which appear to be most beneficial for improving the users' experiences. Thus, this research demonstrated that the methods proposed is valid for applying to the design of interactive service node in smart city. This is the major contributions of this research.

There are some other prototype design that can be developed for testing in the future works. The future works will be focused on the experiments with different kinds of human to computer interaction as well as human to human interaction. The future works are expecting that the new features could help to understand better on designing simple, intuitive, innovative and interactive services node in smart city.

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