

## **SERVICE DESIGN FOR SOCIAL SPACE IN SMART CITY IN CASE OF A TAIPEI MRT STATION EXIT**

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### **ABSTRACT**

The main purpose of this study is to use service design method for provoking better user experiences of social spaces in a smart city. Service design thinking and participant observation methods are used to map the user experiences and to identify user types and needs in a social space. Theoretical improvements are proposed from the perspective of architecture, urban and media design. Finally, this study concludes the most relevant attributes and conflicts in the social space, for proposing strategies to reinforce these attributes and solve the conflicts. Applying service design to public space is different from its application to single products or services. It is because there is an absence of a structured sequence of actions and interactions in the social space. The results of this study show a large scale of intervention followed by the service design results, to perform a valid evaluation is very difficult. However, these proposals are emerged from a deep look into the users' needs and how they interact between each other and with the environment. Thus, this study demonstrated that the service design approach is valid for applying to the social space design in a smart city.

*Keywords: service design, user experience design, social space, smart city, participant observation*

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## **1 INTRODUCTION**

The main purpose of this study is to use service design (SD) method for provoking better user experiences of social spaces in a smart city. In modern urban development, social space in a city are described as areas that have compact, mix-used development that serve the surrounding areas and are often accessible by high order transit and good road networks (Madanipour 1999; Brown, Derudder et al. 2010). However, in the term of smart city development, the social spaces become hubs, sensors that semantically be tagged as things from physical world items (Lombardi, Giordano et al. 2012). As point out by Lynch (Lynch 1960) and Alexander (Alexander 1979), the success or failure factors of a social space relies highly on its ability of creating interaction between the people and the environment. It is also the same as a smart city social space. Hence, a smart city social space 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 and Németh 2010).

Service design makes emphasis in creating scenarios that stimulates all the senses and makes experiences making the user the center of the design process (Zomerdijk and Voss 2010). It is an integral creative process, in which the focal point is the final users and their overall experiences while using a service, rather than just focusing on the main function or aesthetics. According to the study observations, more livable social spaces are those where social, cultural and economic exchange takes place on a daily basis, so the purpose of this work was to pursue all these assets by implementing service design on a specific space, in order to transform it into a new landmark for the city.

This study uses the social space at the square in Zhongxiao Xinsheng MRT Station Exit 4, in Taipei City, as case study area. Firstly, the study made use of service design thinking and tools, and participant observation methods to map the user experiences and to identify user types and needs in the case study area. Secondly, theoretical improvements are proposed from the perspective of architecture design, urban design and media design. Finally, this study concludes the most relevant attributes and conflicts in the case study area, for proposing strategies to reinforce these attributes and also to solve these conflicts. Since the implementation of these strategies requires major interventions in the built environment, the objective of the study was to employ service design thinking to understand user's needs in the urban space and to response to these needs using a diverse range of design ideas.

This paper is initiated with a literature review on service design, social spaces development and methods for designing an innovating social space. Then, the research design and methodology that are used in this study are described. Thirdly, case study is implemented based on the area been chosen and the methodology proposed. Finally, case study results are presented and discussed for concluding this study and proposing future studies.

## **2 LITERATURE REVIEW**

According to the definition of service design proposed by (Moritz 2005; Moggridge and Atkinson 2007), "service interfaces are designed 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". The way to make this process integral and holistic is by incorporating and overlapping the particular visions of all the stakeholders, which includes users, designers, investors, researchers, technicians, policy makers, consultants and competitors who are involved in the design, for developing and implementing the service (Zomerdijk and Voss 2010). Another definition proposed by Bill Moggridge shows that "service design is the design of intangible experiences that reach people through many different touch-points"(Moggridge and Atkinson 2007). It is a permanent feedback requesting and constantly updated process, in which the response of the users are continually being observed and monitored.

Applying service design to social space in a smart city is different from the classical application to single products or services. The Smart City can be defined as a city in which there is a broad use of information and communication technology (ICT) in the processes of monitoring, planning and integrating different urban systems, helping to create more innovating services, more business opportunities, more quality of life, more efficiency in city governance and a more sustainable environment (Naphade, Banavar et al. 2011). Another definition on smart city is that "the use of information and communication technology to sense, analyze and integrate the key information of core systems in running cities" (Harrison and Donnelly 2011). Thus, a comprehensive aspect of spatial and service interaction, user experiences analysis and service mechanism by using contemporary ICT are needed to be integrated while applying service design to social space in a smart city. It would not have

been possible to do this integration without the analysis of humans and their behavior. We can discover what objects or topics would attract people's attention, as well as the type of technology they are prepared to adopt, through the observation technique (Kuniavsky, 2010). This concern for user-centered design is a fundamental concept in service design, a discipline that "creates the tools that people use to access a service in concert with designing the service itself" (Kuniavsky, 2010). Essentially, service designers work as a bridge between two parties to develop a consistent service from client to users.

Conclude from the literature review, applying service design to social space in a smart city in an inter-discipline study. This study will begin with determining the type of users and their behavior, following by the design of the spatial and service interaction providing from the social space, then the discussion of user experience creation and finishing with the ICT implementation. However, a wider range of issues in the service provided could be addressed because of the diversity of users. Paying attention to people's movements and interaction with different objects will enable this study to pinpoint key issues, to discover the affect factor, and to brainstorm for ideas that could improve the service of social space in a smart city.

### 3 METHODOLOGY

The primary research method for the study was participant observation, which "is a qualitative method whose objective is to help researchers learn perspectives held by study population" (Wu, 2012). The team chose this method in order to approach the situation without any preconceive idea, so the task was documenting all the activities held on site, and then to discover potential opportunities to improve the user's experience. To start the observation process the team defined the boundaries of the observation area, which is the ground level and immediate surroundings of Zhongxiao Xinsheng MRT Exit 4. Figure 1 shows the boundaries of the observation area, which were established in relation to the activities being held in the corner square and following the two axes of Xinsheng South Rd. and Zhongxiao East Rd.



*Figure 1. Case Study Observation Area*

In order to document the widest possible collection of events available for this study, an observation plan, as shown in Table 1, is proposed to present the details for implementing participant observation. There are three categories that include space, people, and service that have been classified in the plan. Each category also includes the key themes, issues, and problems related to the interaction, service and user experience that will be discussed in this study.

The observation time was divided in four groups; weekday normal hour, weekday rush hour, weekend normal hour and weekend rush hour. For each visit the duration of the observation was near two hours. Along with the plan, notes and photographs were taken as well as diagrams were made, in order to locate and interpret the phenomenon observed. For each activity performed by individuals, the members of this observation team took note on its location, type of user and its physical posture, duration, existence of service touch-points and weather conditions at that moment.

*Table 1. Observation Plan used in the study*

MRT ZHONGXIAO XINSHENG STATION EXIT 4 Social Space Observation plan	
<b>Space</b>	<ul style="list-style-type: none"> <li>● How spaces are visually and functionally connected.</li> <li>● What place is underuse and why.</li> <li>● How weather affect the actions.</li> <li>● How the place help or restraint mobility.</li> <li>● Visibility and Safety.</li> </ul>
<b>People</b>	<ul style="list-style-type: none"> <li>● How people gather.</li> <li>● How many kinds of users there is and how to establish the difference between them.</li> <li>● How people feel using the place.</li> <li>● Duration and diversity of activities.</li> </ul>
<b>Service</b>	<ul style="list-style-type: none"> <li>● Study the potential “meaning” of this space for the city.</li> <li>● Urban furniture and its potential to invoke interactions and behavior.</li> <li>● Lighting design.</li> <li>● How MRT signs and traffic signs are designed and located.</li> <li>● What other service might this place offer to the public?</li> </ul>

In addition to implement the observation plan used for participation observation, the user-centered design (UCD) concept and behavior observation are also been used in this study. According to the theory of behavior observation, we carry out the UCD ideas in research process for remodeling the social space for urban interaction in the observation area, to discover what are the issues for users to deliver the concepts of service design. In order to contextual enquiry on site, users and their behavior were observed.

## 4 CASE STUDY RESULTS

### 4.1 Field Observation Results

The observation results show that along the sidewalk of Zhongxiao East Rd. in the observation area, the vegetation, a small river and a large amount of trees form the eco-campus project of the National Taipei University of Technology (NTUT), which are providing a pleasant area for people to enjoy a piece of green, forest and shadow in the social space of a smart city. However, due to lack of proper planning and accessibility to the water, the main activities in this area are for people waiting for the bus and passing through this area.

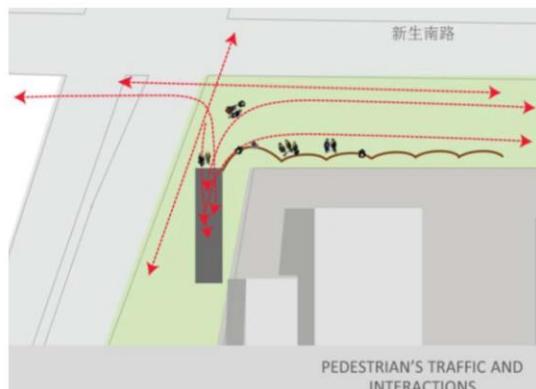
On the contrary, at the sidewalk along the Xinsheng South Rd. the landscape and the street furniture designed provide a very attractive place for people to stay. This area, which is a very classic social space in a smart city, also creates a lot of different activities, interactions, and user experiences. According to the observation of this study, people like to stand in front of the fish pond and a stream, which goes along the sidewalk. As shown in Figure 2, the bench made by real chunk of wood provides a place for people to sit for a break or waiting people, but the height of the bench is lower than in average and not suitable for elderly and disable people.

The dense vegetation, trees, stream and fish pond contributes to reduce the environmental temperature of the social space. However, the noise and air pollution generate from the heavy traffic on both Zhongxiao East Rd. and Xinsheng South Rd. increase the risk of using this social space. Meanwhile, as shown in Figure 3, the main building of the MRT Exit No. 4 creates an obstacle effect on the corner of the social space. It also blocks the possibility of extending the activities from the Xinsheng South Rd. to Zhongxiao East Rd.

The observation of this study also found another risk in the social space, is that the sidewalk and the street are at the same level. As shown in Figure 4, this kind of design allows cars and motorcycles to cut through the corner directly and endanger the pedestrians while waiting for traffic light around the corner. It also provides a place for illegal parking on the sidewalk and limits the activities and services of this social space.



*Figure 2 Street furniture installed in the sidewalk of Xinsheng South Rd.*



*Figure 3. The obstacle effect created by the MRT Exit No. 4*



*Figure 4.Cars and motorcycles cut through the sidewalk and endanger the pedestrians*

Rainy days always causes the inconvenience to the pedestrians in the city. In order to know the social space in the scenario of these special circumstances, this study also implemented an observation also during a rainy day. The observation results show that there are some problems and bad user experiences of using the social space in the rainy days, as shown on Figure 5. As described in anti-clockwise, the first and second pictures show that people are seeking for protection under the roof of the MRT Exit. However, the space under the shelter of the MRT Exit No. 4 is very small, so people start blocking the entrance. The other picture shows the inconvenience to the people caused by rain including the wet floor, lack of buffer space for umbrella operation and lack of ramp for baby car. Some of the situation is also likely to happen during hot days because of the limited space with a large volume of users in the MRT Exit No. 4.

In addition to observing the activities and user experiences in the social space, the services, especially the information service of the social space is also been recorded. The information provided to people takes many forms that include static panels showing bus routes, signage indicating disabled people entrance, LCD screens, warning tags, hanging banners, street maps, etc. Still, the location and design for this kind of information can also be reformulated in this social space. It is mainly because the information service in this social space lacks of proper design. Thus, there was observed some tourists getting lost and cannot clearly identify the service panel for locating the Guanhwa digital 3C market and the Hwa-san creativity industrial park.

#### **4.2 The Generation of User Experience Maps**

By using design thinking method on considering physical condition, this study classified the users in the social space into four main categories that include: wheel chair users, regular users, elderly and physically impaired users, and users with luggage or baby carriage. The user's map is shown in Figure 6. This study found that there is not much problem for all of the users using the sidewalk in this social

space. However, besides the regular users, the other category of users is facing the problems of entering the MRT Exit No. 4. It is because the level of the MRT Exit No. 4 is higher than the sidewalk level. But it only provides a stair for user entering the MRT station without introducing the universal design for considering the needs of disable and elderly people. By the way, the escalator in the MRT Exit No. 4 only goes up. Thus, the design blocks the wheel chair users and is unfriendly to the elderly and physically impaired people, as well as to users with luggage or baby carriage.

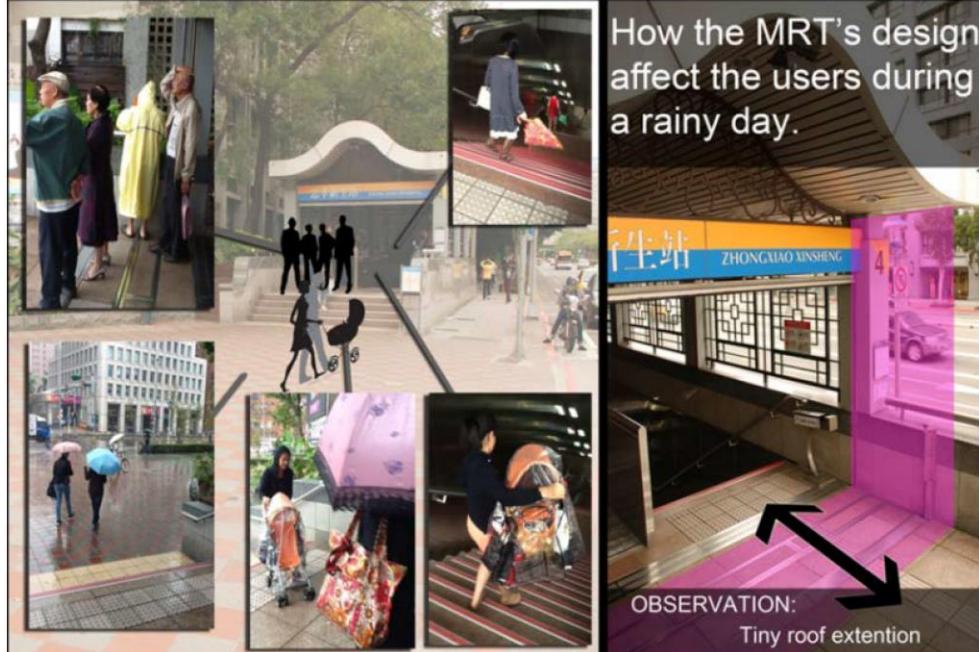


Figure 5. Map of user experience on a rainy day

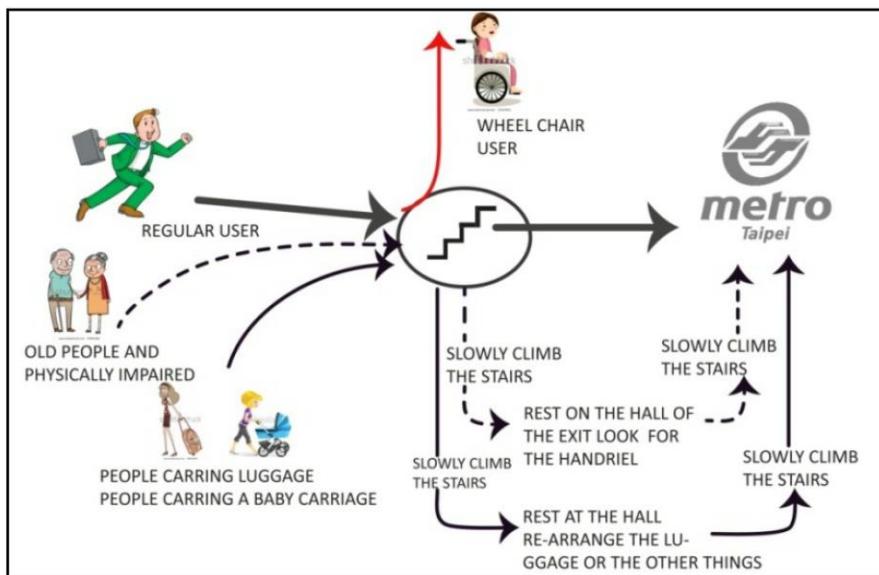


Figure 6. User experience map of different users for using MRT Exit No.4.

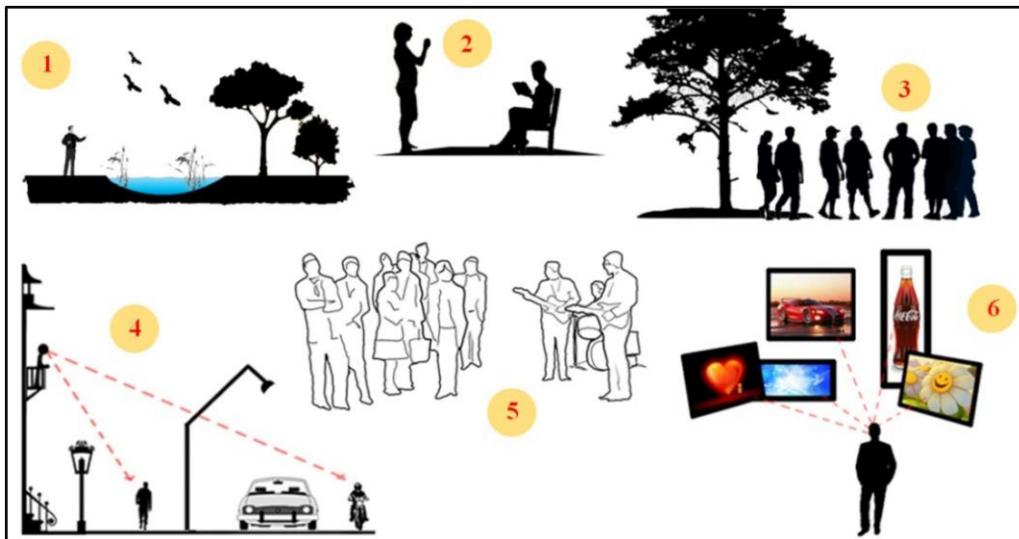
By using user-centered design method, this study further classified the users of this social space according to four different criteria: Actions (activities); Mobility (level of independence); Mean of transport (walk or vehicle) and Size of the group (number of people). Table 2 shows the results of the classification.

Corresponding to the table 2, Figure 7 summarizes the users' scenario and different types of interactions observed in the social space of the case study area. They are mainly classifying as: 1) people admiring the living environment; 2) people using their own devices (cellphones, tablets, books); 3) people talking to each other; 4) people contemplating the urban scene; 5) performer and its audience and 6) people obtaining information from the environment. These users' scenario and interactions

which was concluded from the participant observation will provide this study for proposing better services, various user experiences and appropriate user interactions for the social space in a smart city.

*Table 2. User classification using user-centered design method*

<b>Actions</b>	<b>Mobility</b>	<b>Mean of Transport</b>	<b>Size of Group</b>
Waiting	Independent	Walking	Alone
Passing	Limited	Riding Bicycle	Couple
Transferring		Motorcycle	Three
Reading,			More than three
Chatting			
Viewing information			



*Figure 7. Different types of interactions*

#### 4.3 Social Space Development

By using the service design method, this study concluded the most important positive attributes and weakness of the social space in the case study and organized it in Table 3. These positive attributes and weakness analysis are further using for proposing service improvements.

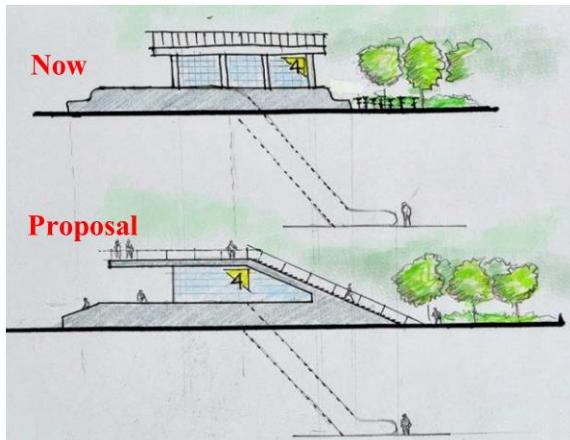
*Table 3. Positive and weaknesses attributes of the social space*

Positive Attribute	<ul style="list-style-type: none"> <li>● Diversity of social interactions.</li> <li>● Scenic qualities, green environment.</li> <li>● Digital Signage, informative LED screens.</li> </ul>	<ul style="list-style-type: none"> <li>● Rain coverage and shade.</li> <li>● Pedestrian safety.</li> <li>● Uncomfortable sitting areas.</li> <li>● Accessibility for disabled.</li> </ul>	Weakness Attribute

In accordance to the attributes shown in Table 3, this study proposed several strategies in order to improve the service, user experience, interaction of the social space.

##### **Strategy I: Roof Re-design**

In order to improve the service of the social space, this study propose a remodeling plan for the entrance of the MRT Exit No. 4 and provide sheltering to the users either in rainy days or during hot weather. The conceptual design is shown in Figure 8. The design extends the roof of the MRT Exit No. 4 and also converts it into a panoramic roof, which is accessed through a stairway from Zhongxiao East Rd. The elevated platform in this design extends until the center of the corner square, bringing shade and rain protection to those entering and coming out from MRT and also providing a new view point and socializing space for the square.



*Figure 8. Conceptual design for remodeling the MRT Exit No.4 in the social space*



*Figure 9. Conceptual design for sidewalk safety improvement*

#### **Strategy II: Sidewalk Safety Improvement**

For avoiding cars and motorcycle that cutting through the corner of the sidewalk and endanger the pedestrians, this study propose to elevate the curb and create ramps for disable people for accessing. The design would avoid the motorcycles and automobiles stepping on the sidewalk. Secondly, this study 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. The conceptual design of this strategy is shown in Figure 9.

#### **Strategy III: Digital Signage Installation**

The convergence of urban flows usually demands highly intensive information to expose in a big city. In the ordinary course of urban senses, digital signage is used to be set in the public places of city landmarks. Thus, the digital signage is not just a carrier for broadcasting messages but also a way of conveying urban meanings for some certain locations. Thus, new interactive services, business advertising and general information is proposed in this study. The conceptual design is shown in Figure 10. This design also contributes to provoke more social interaction in the social space.



*Figure 10. Conceptual diagram of the digital signage installation in the social space*

## **5 CONCLUSIONS AND FUTURE WORKS**

Applying service design to public space turned out to be in some way different from its application to 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. Meanwhile, some public spaces 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 (Alexander 1979) calls a "quality without a name". This local identity can play a significant role in process of creating new services and interactions in the social space. Thus, we can establish two different perspectives when analyzing the social space. The

first one is the sum of multiple activities performed by individuals and groups of people. The other one is the spatial and cultural characteristics that make those activities different and unique. For example, while having a cup of coffee at an urban plaza, the first perspective of user experience comes from the service provided by a coffee shop. The other is how the built environment of the plaza and its entire social context can affect the quality of the experience. Hence, the first aspect of applying service design to social spaces is the identification of the most valuable attributes of that social space and then to think about how these attributes can be reinforced or re-interpreted, in order to create more 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.

Since the results of this study show a large scale of intervention followed by the service design results, to perform a valid evaluation is very difficult. However, these proposals are emerged from a deep look into the users' needs and how they interact between each other and with the environment. Thus, this study demonstrated that the service design approach is valid for applying to the social space design in a smart city. One of the implications of this study is that user centered design could also be part of the process of designing and developing the built environment. It would be very interesting that urban designers and policy makers could use service design thinking when developing new streets, squares and neighborhoods, because the result would be the creation of social space designs which are more safe and enjoyable, especially in cities with serious problems like heavy traffic, high levels of urban noise and pollution, unsafe environments, lack of green areas and low availability of land.

Nowadays, the necessity of quality urban social spaces is more crucial than ever, because many people cannot afford living in centric areas due to the high prices of real state. A lot of people are forced to move to peripheral areas of big cities, where quality services are much less available. Thus, the design of the public space and the services provided must be extremely carefully planned and organized for obtaining the maximum benefit for its inhabitants and for the city as a whole.

The life and vitality of urban social space does not rely on one single feature but on a wide range of aspects, including architecture design, service design, local culture, weather, surrounding components like shops or public buildings, proper urban signage and safety design. By considering the fact that social space is a stage for multiple forms of interactions, as illustrated on Figure 7, this study shows that different strategies must be implemented, in order to achieve the purpose of generating a new landmark, a vibrant user's scenario where nature and technology combined could offer different types of perception of the environment and also generate rich forms of interaction between people.

The use of Service Design to map experiences and then to rank attributes helped this study to emphasize that the final users are the main object of the study, and also helped to select the design ideas which appear to be most beneficial for improving the users' experiences. The contributions of this study are concluded as follows:

1. Enhance the different kinds of interactions; people-people, people-environment.
2. Increase the pedestrian's safety by putting shrubs at the edge of the sidewalk, avoiding cars and motorcycles of stepping on the sidewalk.
3. Create more usable urban space for people's enjoyment by creating a panoramic roof for the MRT exit, where people can meet, wait and enjoy the scenery.
4. Bring more sitting and covered areas, especially in those areas more attractive for people and with more environmental attributes.
5. Help people orient and easily find information about the site, the MRT and bus routes, disabled people exits, all in a more intuitive and/or interactive way.
6. Propose more fun and interactive uses for the LCD screens, giving the opportunity for pedestrians to send media messages to the screens, sharing text, images and video.

There are some other strategies that can be developed for testing in the future studies, which are the use of LCD screens to bring new interactive contents to the social space. Since a cluster of media pole has been just installed while writing this paper (Figure 11), the future study will be focused on the experiments with different kinds of human to computer interaction as well as human to human interaction. The future study is expecting that the new features could help to understand better on designing simple, intuitive, innovative and user friendly devices and services with fun.



Figure 11. Digital media pole recently installed, new opportunities for interactive content

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