Is the mediated public open space a smart place? relationships between urban landscapes and ICT – The cost action tu 1306 CyberParks

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Abstract

The main aim of this work is to rise the challenge of relentless growth of digital technologies into our daily life. Smart phones, smart watches, tablets, etc and Internet have become common tools is several fields of human activities, connecting, guiding, informing, and in a last stance making people interconnected and informed. Public open spaces (POS) (such as, parks, gardens, squares, plazas) would greatly benefit by this growing availability of relevant geolocated information. Therefore, our aim is to unfold two main questions: how can we use digital technologies to attract people to spend more time outdoors for a more active lifestyle; and what opportunities technology opens to increase knowledge about users and uses of public open spaces? The discussion is backed by experience exchanges carried out within the Cyberparks Project and articulates around the ICT potential to enhance communication among (potential) users, transforming public open spaces production an interactive process. Such improved interactivity, on a turn, enables creative community participation, empowerment and capacity building. Besides a discussion on the mobile technology for human interaction with spaces, this paper presents an overview of the possible technological benefits for users, policy makers, practitioners and planners.

Keywords

Public Open Spaces, ICT, cyberpark, Mediated Spaces, Urban and Landscape Planning, Societal challenges

1. Introduction

More than half of world's population lives today in urban areas[1]. Human quality of life depends considerably thus on the urban environment quality. In turn, the latter depends among others on the quality of public open spaces (POS), accessible and enjoyable to all. To achieve a socio-spatial equity, the right balance between "grey", "green", social and other components has to be pondered. This makes the process of production of POS a very complex task. By

production is meant the process of planning, designing, implementing and maintaining public spaces. On the other side, Information and Communication Technologies (ICT) and mobile devices, as a key achievement of human being, profoundly affect several aspects of daily life. By influencing the space-time interaction, ICT has become a strong attraction for many people. As result the number of people using mobile devices in public spaces increases every day. On the other side, the number of available tools supporting urban development represents an unmissable opportunity for furnishing public spaces of a more "cyber" dimension. In fact, by intertwining the digital and the physical worlds, create the hybrid spaces that we - with a neologism- call

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[1]

http://www.un.org/en/development/desa/news/population/world-urbanization-prospects-2014.html

"cyberpark".

The term *cyberpark* refers to a public open space, where the use and/or embedding of ICT creates a synergy between the humans and the environment. The network of public open spaces include streets, squares, markets, community gardens, parks, playgrounds; each one playing a pivotal role in the social, cultural and economic life of communities. In a cyberpark, the mediated space brings a dynamic and hybridised aspect to the physical space (Ioannidis, Costa, Suklje-Erjavec, Menezes, & Martínez, 2015). It results as a logical continuum of the progress in our everyday life, as ICT help us in business, at home, is increasing interfering in our leisure activities.

Even if examples of public open spaces transformed into smarter-intelligent spaces by the use of relevant ICT is worldwide growing, a meaningful reflection of possible interrelations among spaces and technologies and the increased values, is still missing. It is important to note that *smart* in the context of public open spaces should to be understood as an added value towards enhancing safety, attractiveness, inclusiveness and comfort for users, and not solely in the sense of increasing control, efficiency and predictability (de Lange, 2015). Therefore, a *smart place* does not replace a real physical space. What is important to be understood is the wholeness of possibilities range offered by ICT; as it goes from analysing of big data, to supporting public involvement processes and to aid their planning and design. In cities, there are less and less natural spaces, so mainly the focus needs to be set on the improvement of existing POS, making them more usable and attractive to more people, while preserving natural and cultural identity. ICT can upgrade a public open space to the quality of cyberpark, since their contribution is twofold: on the one hand, they provide users with new instruments to enhance their experience in using and discovering a place. On the other, they represent a valuable source of information that could be used in the production of POS.

It is important to understand that, ICT are not just an "add-on" to a place, but represent a boost for planners during the design process, as well as a tool to increase management efficiency. It is very useful to include ICT from the beginning when analysing the urban territory, in order to help gathering and analysing data. Using ICT provides new possibilities for urban planners and designers, and landscape architects. Monitoring and tracking the so-called User Generated Data (UGD) represent the future pathway for observing, recording, and analysing the dynamics of our environments (i.e. cities, POS, rural areas, etc.) and, more in general, the behaviour of people who enjoy and make these spaces full of life. For that, a big challenge is posed by the use of mobile devices, which are already significantly changing the way people interact with other people and their surroundings. Mobile devices are able to sense the environment and the user's location. Indeed, a capability that is constantly being improved. The combination of sensing the environment and user locating plays a pivotal role in the mainstream of data collection.

In the following, the relations are discussed, highlighting the enhancements that a cyberpark can bring to the entire community. The main contribution of this manuscript lies in a novel paradigm on POS, featured with a bidirectional exchange of data among the space and users. This have several addressees: Visitors, who can have access to interactive experiences and, even if with little knowledge of a certain area, can naturally experience unfamiliar places; and planners, who are claimed at creating spaces that are able to satisfy the users' expectations, using the User Generated Data (UGD) to design the space itself.

This work consists of six sections, including an introduction with an overview of the operative background. Section 2 highlights some theoretical background on POS design and planning. Section 3 discusses the role of ICT in public spaces. Section 4 describes the different users which - as public open space beneficiary - might be considered in the last stance the final targeted stakeholders group by decision makers, planners and practitioners. Section 5 presents preliminary outcomes from the CyberParks Project, while concluding remarks are outlined in the last Section.

1.1 The COST Action1306 CyberParks

Cyberparks - Fostering knowledge about the relationship between Information and Communication Technologies and Public Spaces is a network of 80 experts from different working fields and scientific domains, coming from 29 different European countries and financed for four years (June 2014 – May 2018) under the COST Framework[2].

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[2] www.cost.eu/COST_Actions/tud/TU1306

The participants closely cooperate towards putting together the available knowledge on the interactions between *people* and *places,* and the role of *technology;* and this from different aspects exploring and perspectives. In order to bridge the knowledge gaps and bringing up new ideas, an emphasised interdisciplinary cooperation has been established, ensuring all possible and necessary interlinking between ICT-based devices, public open spaces and new values, lifestyles, and needs of people. The Cyberparks Project acts through an interdisciplinary network of scientists, researchers, ICT experts, urban designers, landscape architects, and stakeholders, enables a look at long-term perspective and a bigger picture of the implications, opportunities, and challenges the amalgamation of the virtual and real worlds pose. The five interdisciplinary Working Groups are related to Digital methods, Urban ethnography, Conceptual reflection, Creating cyberparks and Networking and Dissemination. The last works as a think-tank and is in charge of tailoring and organising knowledge transfer, young experts' platform, formulation of research perspectives and follow-ups. Further information about the project contents, participants, and results can be seen at its website[3].

In the next chapters, various ICT tools are discussed and a methodology, useful for both *planners* and *users,* is presented that can be adopted for the future development of a cyberpark*.*

2. The urban environment: a theoretical perspective

For the sake of this paper, the key question is how to develop and unlock the hidden potential public open spaces and the role of technology. Urban environment is a hyper-complex system made by different components (buildings, memorial monuments, trees, roads, infrastructural networks) and, above all, people. Such a system, according to (Dobrokhotov & Kalinkin 2010), can be devised into three main components: *Nature*, *Culture* and *«Geist».* As shown in Figure 1, Dobrohoto defines as:

Nature: the environment without or with low human interferences.

Culture: the fruits of human activity. They can defined as intangible (values, traditions, beliefs,

customs, hierarchy, etc.) and the tangible (materials and artefacts).

"Geist": the teleological creative, the human creative source: The "spirit" that defines human goals, objectives and lines of action to change the nature guided by culture.

Planners have an impulse for creating and this impulse has a rational character. The Russian philosopher Stepin (2009) studied the problems of methodology of science and philosophy of culture. He developed the idea of types of scientific rationality: classic, non-classic and post-non-classic. Stepin's classification is not directly linked with urban/landscape planning but they can beneficial when taken into account. First of all - the classical rationality is very direct and based on understanding systems as simply mechanical ones (i.e. formal gardens of the 19th century). Secondly, the post classical perceives objects like an organism. The planner is still isolated from the system but the dialog and iteration become part of the planning process (system approach in design, sustainable planning etc). The third type is the human point of view – where, while considering the ranges of possibilities, the planner develops a synergetic perception. The planner plays thus a self-adapting actor of system, whilst the system itself became more the compound. This game delivers a new self-developing system.

These categories set standards for reading the systems. Particularly, the level of reflection on the interaction expands the development of all the new types of system components.

Following Stepin's (2009) ideas of rationality, as planners while increase knowledge and skill, step through all the three types of the classification categories. The historical order of these types of rationality have grown over time from simple systems (classic) to more complicated ones, such a complex self-organizing system (post non classic).

POS with ICT as stated before is an example of complex self-organizing system, sensu Landscape Bionomy (Ingegnoli, 2013). The planners have to take in account interaction among components of the system (decision makers, users, spaces, cultural identity).

Conversely, adopting the synergetic approach (Nicolis & Prigogine, 1977), planners aim to promote synergy between Nature and Culture, giving only the direction of a possible way of development of the system.
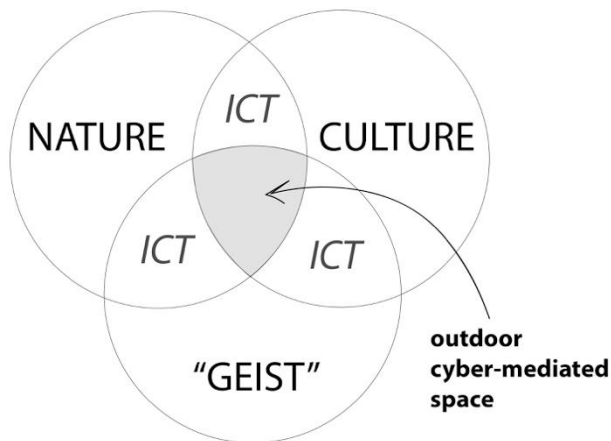
Fig. 1: The complex system and ICT as a way of interaction among components

This classification perfectly fits with landscape architects objects, which might look like three different scenarios of relation between planner and the system. The current methods of design, more commonly, follow the so-called non-classical approach. Planners aim to create a harmony with the nature, considering the needs of all components of the system. The way of interaction in non-classical model between planner and users is based on dialog (feedback). In the post-non-classical model, planner aim to boost the synergy between Nature and Culture, giving only the guidelines for possible ways for the development of the system; planers consider themselves as one of the components. In a cyberpark, the interaction between planners and users is at the core of the attention. If the first model can run without ICT, the second one is faster and easier with ICT, but is in the post-non-classic model where ICT take a major role in the whole process of space design. In recent years, the opportunities of using public open spaces are increasing and the third way of rationality is becoming more popular among the research and planners communities.

3. The role of ICT in public spaces

The term Information and Communications Technologies (ICT) refers, in this paper, to the different forms of communication by computer technology and digital devices. This includes Internet, wireless networks, tablets and smart phones, and other communication mediums. Among all possible opportunities opened by ICT, one of the most important for the CyberParks concept is the communication aspect. New ICT devices not only enable new forms of interaction,

but also strongly attract people to communicate in real-time with others. ICT also enable gather information about places in a bigger scale.

The transformation of ICT into an inherent part of society triggers the grown ICT into an important social media. It is becoming a big part of contemporary life, people more and more build and maintain their social relationships through various social media, and this affects increasingly the way they organise their everyday lives. For this reason, ICT are often studied in the context of how modern communication technologies affect the interactions between people and society (Kenna & Vassi, 2015). Relevant for understanding the interaction between ICT and public spaces is the features of ICT to allow on-demand access to content anytime and from nearly anywhere. Hence, the property to engage individual users as well as groups of people to interact and congregate online and share information, and bring them to be outdoors, are relevant aspects (Figure 2).

The *digital footprints*, left by individuals in their daily activities can be used as data for statistics, and extracting metrics about socio-spatial behaviours, directly from the source (public space users). This information are geolocated and embody numerous opportunities, as they offer the possibility of working with high spatial and temporal data, always available and always updated. The advantage of collecting digital footprints ranges among different domains: security, cities management, retail, and cultural heritage (Sobolevsky, Gódor, & Ratti, 2015) just no name some examples. One field, which can benefit from better ICT-space interaction, is urban tourism (Alvin Chua, Servillo, Marcheggiani, & Vande Moere, 2016) as it is very much related to the quality of place, on-site information and analysis of visitors' motivations and behaviour. The tourism experience is nowadays strongly related to the digital approach. In fact, people visiting a new place start their planning from the web, which offers the broader set of opportunity and makes the user's feedback the major criteria of decision (Girardin, Calabrese, Dal Fiore, Ratti, & Blat, 2008). The preparation of a trip generally starts by an online experience, with the search for information and insights; and ends posting photographs and experiences to networks of friends or other potential tourists (García-Palomares, Gutiérrez, & Mínguez, 2015). This procedure can be increasingly seen also by

public space users, as they share the in loco experiences online.

Therefore, tracking, collecting and analysing digital footprints can be a valuable source of information for users, planers and stakeholders. Users can make their decisions with more awareness about the place they are going to visit. This can result in a better local experience. While planers and stakeholders can get a wide range of user's feedback to evaluate the attractiveness and enjoyability of different places. This may result in improved quality of POS to better meet the users' needs.
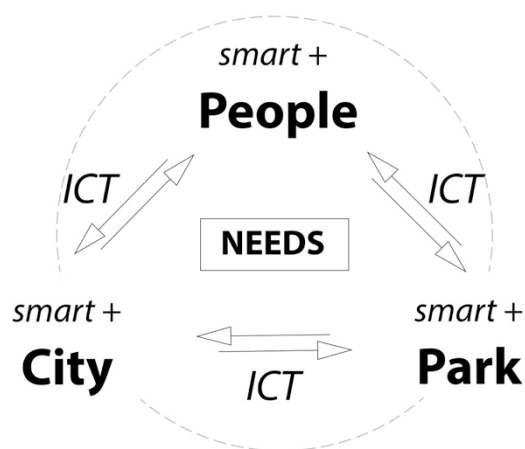

Fig. 2: The main components of the system and their relationships within a smart environment

4. Users and Planners - the main drivers in public open space planning

An important starting point for creating mediated public open spaces has been to define open spaces that have or could have a value for enabling the sharing of experiences, contributing to the public life, as places for publicness and inclusiveness. The conceptualisation of these spaces as democratic spaces is associated with "public domain", the network of spaces that belongs to the community and is freely accessible for everyone (Smaniotto Costa, Menezes, & Šuklje Erjavec, 2015). As they afford the common ground for communication and information exchange, they are the social spaces where people can meet outdoors and interact with other people, allowing the exchange between different social groups, independent of class, race and ethnicity, gender and background, as well as the exchange of people with the environment.

Public spaces, as the stage of urban life, have the capacity of embodying multiple meanings, making an immense contribution to the construction of images and urban imaginary (Menezes, Allen, & Vasconcelos, 2012). They are places to express cultural diversity, to relax or move, see and be seen or even be anonymous in a crowd (Thompson & Travlou, 2007). This brings about the symbolic character public spaces can embody as representative of the collective and of sociability (rather than individuality and privacy).

Among these several actors, two are of interest in this work: users and planners, which one with different interests on public spaces and enjoying them in different manner (Šuklje-Erjavec, Smaniotto Costa, 2015).

4.1. Users

For the purpose of this work, three groups of users are identified: *tourists*, *residents* and *researchers*, each one having different needs and demands on the spaces.

Tourists visit a cyberpark for a short period of time, in the search for new and unique experiences. Residents are those who living in the vicinity will use the place in their daily lives if it suits their needs. Researchers are those who look for specific information that place may contain (e.g. fauna, flora, geographical location or socio-cultural and spatial aspects). All three groups of users have however certain needs in common. We have defined five different categories of needs: basic (an available and safe area), emotional (an area that is pleasant for personal perception), cultural (an area that allows social interaction and contribute to the sense of belonging), spiritual (an area that offers "space" for reflection) and rational (an area that can be used for practical purposes). As such, planners are claimed at creating spaces that are able to satisfy the users' expectation.

4.2. Planners

Planners, in order to incorporate the concept of cyberpark into a planning process, need to understand new opportunities of ICT opens. If we consider the "standard" set of technologies, widely used today, some of them can be highlighted:
- Collecting information about the behaviour of people, with location apps (Ratti, Frenchman, Pulselli, & Williams, 2006);

- Using 3D reconstruction from crowd sourced images to capture the picture of the situation and analyse it thanks to the advantages of the 3D visualization;
- Making 3D models, which could be experienced in Augmented Reality and travel guides;
- Collecting feedback from users and their experience through ICT and mobile apps;
- Presenting the CyberParks concept online and collecting feedback from potential users;
- Using UAV drones for video production;
- Adopting Active Beacons for a direct interaction with the users with push and notification services.

For successful implementation and suitable balance of all above presented possibilities, new planning and design approaches have to take into account the above mentioned categories of needs and their relationships with the ICT solutions (see Table 1).

Tab. 1: Relationships between needs and ICT solutions

User's needs	The ICT solutions
BASIC	Security, navigation, access control, monitoring, positioning/ locating etc.
EMOTIONAL	Performance, lighting scenarios, music, games, etc.
CULTURAL & SPIRITUAL	Integration with existing social networks, mobile apps with place/ event/ condition driven content, smart park furniture, etc.
RATIONAL	Wi-Fi connectivity, charging stations, educational games, quests, workshops, possibility to create "own" virtual tour, etc.

## 5. Experiencing CyberParks

The interactions between digital and physical domains used to be considered as largely separate; nowadays, the increased profusion of wearable devices, mobile connectivity and interaction possibilities, profoundly influence our conception of time, space and place, social relationships, citizenship and identity. We were used to see people in urban parks relaxing with newspapers, books but nowadays phones and tablets are commonly brought along (Thomas, 2014). The digital has become part of our outdoor lives and that trend is set to continue, yet with unknown consequences. This calls for increasing the understanding of links between ICT and places and users.

The list of ICT penetration in public spaces is long and is increasing continuously. It encompasses digital displays in cities, Wi-Fi provision in parks and squares, on-the-spot tourist information, broadcasting and interactive art performances, urban games, sensory devices, etc. These examples are partly novel, and uncommon, and they are increasing. Even if they are not goal-oriented towards POS, they influence the perception and use of such spaces, adding new dimensions to their production, e. g. with inclusion new street furniture and park elements. In this context, two challenging research questions will be further analysed.

5.1. How can we make use of digital technologies to bring people to spend more time outdoors and encourage a more active lifestyle?

Digital applications should serve as a flywheel to help people in experiencing POS. Areas aiming to become smart, under the point of view of e-services offered to users, visitors and tourists, have to compulsorily tackle a key issue: understating the needs of people. This can be done by monitoring the users' fluxes – in an effective, fast and less costly ways. Moreover, once robust observational methods are implemented and the fluxes data become available, Augmented Reality (AR) is a second key technology to be put in use. AR is considered today as the most promising solution amongst the most cutting edge technologies for tourism (Pierdicca et al., 2016). AR represents a natural choice for exploring location-based information of real world objects, mainly because information can be superimposed onto the display, with the same point of view of the user. If someone is equipped with an AR-enabled mobile device, simply by framing the surroundings, one can easily access additional information about a Point of Interest (POI). This helps in enhancing the users' perception of reality and of the surrounding environment. Tourists in fact are exposed to unfamiliar environments where the fast retrieval of information is fundamental for their decision-making. Access to relevant contents through location-based services not only facilitates this process, but also changes the way destinations and places are perceived, creating more memorable and unique experiences. The worldwide adoption of mobile devices has replaced traditional orientation, guides and way-finding maps. This is mainly because built-in cameras, global positioning

system (GPS) sensors and Internet connection open the way towards a new manner of experiencing spaces. It is also true for usual visitors, thanks to contextual information. With context-awareness services, tourists and residents have access to interactive experiences and, even if with little knowledge of a certain area, they can naturally experience unfamiliar places. Within the CyberParks Project framework, several case studies have been performed, in order to understand the potential of this technology as a way to discover interesting areas or, more, in general, POS with cultural values. Toward this end, a dedicated application has been developed: the app WAY CyberParks. This application, composed by a mobile platform and a monitoring web service (Figure 3), has a twofold scope: on the one hand, it is able to track the way people use the space, and allows a user to get contextual information and to send suggestions or complains. On the other, the way people use the app in the space in real time allowing to visualized people's path, filtered by gender, age, occupation, or reasons for visiting the space.
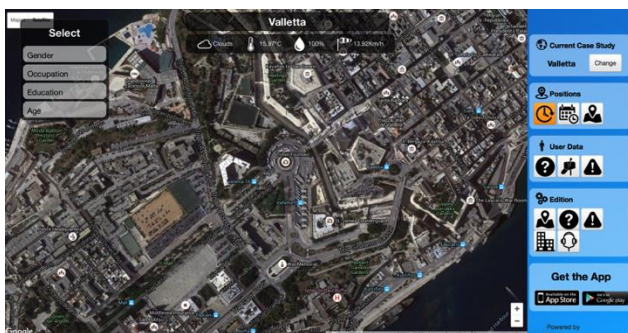

Fig. 3: The main components of the system and their relationships with a smart environment

The user can upload personal profile and share media material (images, videos, texts, etc.) depicting the content of their individual space-related experiences, while using the application in both online and offline environment. By merging digitised sensory experiences based on the location and then filtering them in terms of their relation to space, the user/visitors of a space can interact with it in an augmented way.

A case study in Malta, the area Upper Barrakka and Argotti Garden was used to test the performances of AR in outdoor environment. The stage of conceptual design served to identify domain, type of learning and outcomes. The interaction design was also taken into account, with the objective of providing a mediated

experience between the content and the real environment. Multimedia resources (e.g. commentary texts, digital images, video clips and audio tracks) were chosen and assigned to the pre-defined POI. The mobile app WAY CyberParks is based on a localisation engine to retrieve the user location, and an AR engine for the visualisation of contextual information. All the features available from the web service have been used for developing the location-based services (LBS) that provide an user with a learning experience with context based information (Pierdicca, Bonanno, Bahillo Martínez, Marcheggiani, Álvarez Franco, Malinverni, 2016). In occasion of the *iCiTy Conference* (Zammit, & Kenna, 2016), which took place in Malta as the mid-term conference of CyberParks Project, participants were asked to test the application in situ (see Figure 4). Once the users arrived in the case area, augmented contents (i.e. audio tracks, archival images, etc.) were shown in AR mode. The feedback from the panellists was positive, since this type of experience was considered very useful in outdoor scenarios and to have deeper information on the surroundings.
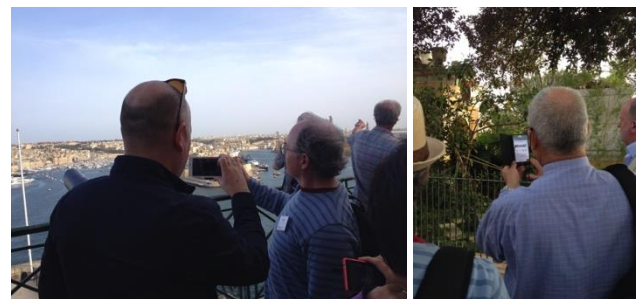
Fig. 4: The mobile tested by the users in the real environment. On the left the Upper Barrakka site, on the right the garden of Argotti Villa.

Following the same criteria and application described above, AR was also tested in Cardeto Park, an urban park in Ancona (Italy) with archaeological sites and ancient buildings of relevant cultural value. The application was designed in order to guide the visitor towards the main attractions of the park. The particular case selected for this work encompasses various cultural heritage site, including Romans relics, as well as buildings dated from XVI until XX century. By categorising all POIs, users have the possibility to follow specified trajectories in the park. Once a user is close to a cultural good, the location-based service is able to provide in-depth information on cultural objects (see Figure 5).

Fig. 5: The mobile application running during the visit of Cardeto Park. The Points of Interest are shown once the user get into the pre-defined area of influence of any attraction.

Given the case described, the following step is an upgrade of this project able to address both users and planners needs. A possible solution is described in the following section.

5.2. What opportunities technology opens to increase knowledge about users and their uses of public open spaces?

The new project consists on the use of Bluetooth beacons as sensors for investigating users' movements and for extracting statistics about the performances of a certain place. The system architecture will be composed of several smart beacons, scattered in the park and a mobile application, which enables the interaction between both.

The use of proximity technologies could help in collecting many types of information. In fact, the crowdedness of a certain attraction, patterns of flows of users and the time spent in each POI represent relevant information that can be used by planners. On the other side, users also benefit from these technologies. In fact, it is possible to offer them real time notifications with contextual information about the space they are discovering, increasing the user's experience. The localization service will allow finding attractions in a virtual map. All the attractions of the Park could be stored in a cloud service as POIs, in order to allow visitors to follow an own path. The mobile application, connected with data from the system, can drive the user to the next available attraction. It is intended to serve as a planning tool, since data can be computed a posteriori to understand

strong and weak attraction points. The information that can be obtained by the system is, for example, the number of visits, the permanence time, the creation of groups. These are useful information that public administrations can use as an effective means of evaluation. Flows, paths and services in the park will be designed according to the users' needs. Figure 6 shows an overview of the application that will be proposed in Cardeto Park.
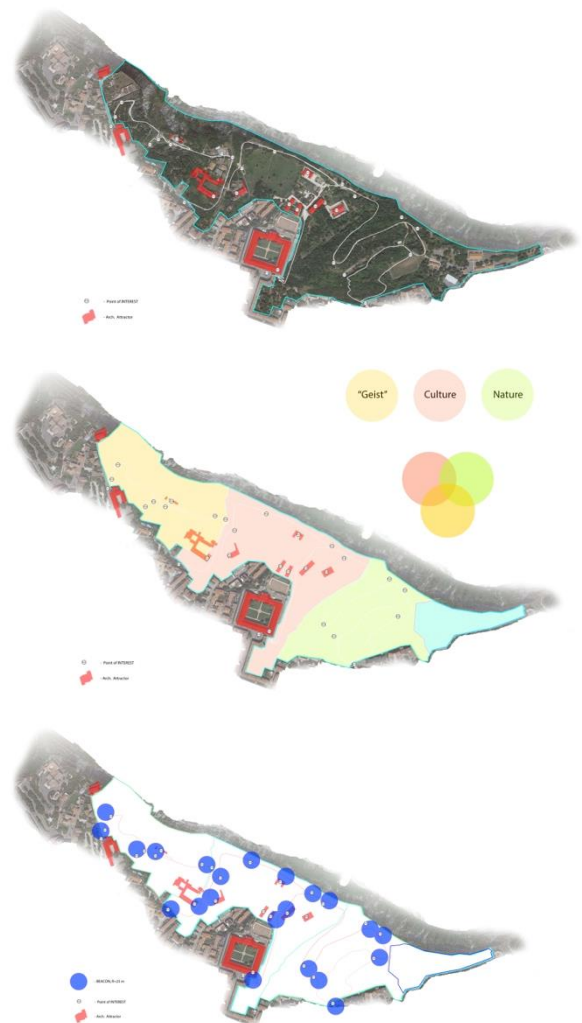
Fig. 6: The ICT System in Cardeto Park. Upper image shows the main attractions of the Park, composed of ancient buildings. Middle image shows the identification of the three main components of the system. Lower image represents the Sensor Network with the area of influence, besides the paths suggested for the users.

6. Conclusions

Improving the quality of urban and mediated public urban spaces is an endless task. The urban environment will not be sustainable and *smart* if there are not healthy and liveable places. In a

sustainable city, the adjective "public" should not be only an appendix, but a quality and a request to appreciate and recognise public spaces as places for individual and collective expression. As discussed above public spaces can provide a variety of benefits and opportunities for social interaction. The provision of quality public spaces should be a programme and a council policy, and regard aspects as safety, accessibility, quality, and design of these spaces. This makes the call not only for skilled professionals (i.e. landscape architects, urban designers) able to accept the challenge to draw up convincing ideas and inclusive spaces, but also politicians to prioritise the inclusion of quality public spaces in the urban agenda.

The challenge is how to make use of ICT to make public open space even more public and inclusive and to attract more people to live a healthier way of life. The quality of public spaces plays here a decisive role, since nobody will expend leisure time outdoors if the environment is not attractive, accessible, and safe. Digital technologies will probably induce the further development of cyberparks - the mediated public spaces. Increasing virtual world will not waive the real architecture but adds new layers in POS challenging conventions and boosting the cultural narrative. The central challenge remains how to use digital technologies to transform our cities into interactive landscapes and urban places, encouraging involvement and better social environments, supporting sustainability, responsibility, and knowledge about nature, people, and the city.

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