Smart Cities and Design Thinking: sustainable development from the citizen's perspective

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ABSTRACT

Smart cities are innovative urban ecosystems, characterized mainly by the widespread use of information and communication technologies (ICTs) in the management of their resources, and are distinguished from other cities mainly by their performance in the field of innovation. In essence, the idea of smart city is based on the connection between human and social capital and technological infrastructure toward the generation of development and improvement of citizen's quality of life. It is an ecosystem where physical and digital infrastructure systemically co-exist with human capital. However, in order to connect the citizens, it is necessary to find new forms of participation and understanding. One of the possibilities is through the design thinking approach. Design thinking is an analytical and creative approach that focuses on the concerns, interests and values of the user - in city's case, the citizen. The present study aims to investigate the application of the design thinking process in the development of smart cities. For this research, we used the qualitative method through literature review. As a result, we found that design thinking can be used for the development of each of the six typical dimensions of an smart city (people, economy, governance, environment, mobility and lifestyle), at micro or macro level. It can be applied to some aspect of a community, a neighborhood or the city as a whole. In addition, its use can be adopted on at least two crucial aspects in an innovative urban ecosystem: in the technological sphere, involving the still unexplored potential of new customized services to the citizen; and in concern to the needs and interests of the citizens which can be solved with frugal technology or no technology at all, but which can still transform their quality of life.

Keywords: *Cocreation. Design Thinking. Human driven. Participation. Smart cities.*

INTRODUCTION

Design thinking is often synonymous with creativity or way of making people think more creatively [1]. It can be defined as an analytical and creative process that involves a person in opportunities to experiment, create and prototype, as well as gain feedback and redesign [2].

In a report to UNDP Global Center for Public Service Excellence, Allio (2014) mentions the role of Design Thinking in giving voice to the end users of a product or service and engaging them in decision making, and presents it as a great support tool for governments to deal with current challenges, such as the lack of public confidence in government actions, diffused and interconnected social and economic issues, complex problems and fuzzy governance [3].

If the greatest challenges related to life in large metropolises are highly complex, in the sense that they are embedded in the complex system that is the city and have a multidisciplinary character, the answer to these questions must also be able to encompass such complexity and be multidisciplinary. The current implementation of smart cities driven by technology is in the right direction, but it leaves something to be desired in the human dimension [4]. Human Smart Cities are the new generation of smart cities, which balances the hard technological infrastructure with soft factors such as social engagement, citizen empowerment, and people's interaction in physical and virtual environments [5].

One of the greatest challenges related to the so-called smart cities is precisely its consolidation, and thus its more human side, together with design thinking, begin to present itself as a possible way to find solutions in a creative, viable and interesting process in a knowledge society Increasingly dynamic and technological.

From a review of the literature available on the subject, it was observed that few scientific studies satisfactorily address the relationship between these two constructs, so that the material already produced is not thorough and there are still many aspects and approaches to be explored. The research carried out with the terms *"design thinking" AND "smart cit*"* in the Scopus database, for example, returned only 7 results. Also, much of the research related to design thinking is directed to other areas such as management, education and innovation, but not in relation to the urban context and the improvement of the citizen's life.

The purpose of this article is to observe how design thinking, such as mindset, approach or methodology, can help to develop more humane and smart cities by changing mentalities and holding cocreation encounters to stimulate citizen participation and engagement in city life. Such involvement is essential for building a better city to work, study and have fun.

In the first section, we discuss the concepts related to smart cities and present the human-driven version [6] [4], which places the citizen as a human being at the center of the debate; the following section brings the designer's way of think, the design thinking [7] [8], and shows the connection of ideas with those presented previously. In the third section, we show some practical examples of the application of design thinking in events held in Brazil in different states, together with the Pontifical Catholic University of Rio de Janeiro and the Federal University of Santa Catarina, in 2014 and 2016. In the end, we summarize the discussion presenting the main points of convergence between the themes and final conclusions.

The Human Smart Cities vision (HSC)

Cities are complex systems that interconnect large numbers of citizens, businesses, services, utilities and communication networks, which eventually lead to a series of technical, social, economic and even organizational problems that compromise the sustainability of urban life [9]. Larger and denser cities can be more productive and innovative [10] but, on the other hand, managers face the challenge of planning increasingly complex systems [11].

As the planet becomes more urbanized, they need to become smarter and find new ways to manage their increasing complexity [12]. In this context, with the need to present new approaches to ensure the future viability and prosperity of urban areas, solutions based on new technologies have begun to emerge [9].

The term *smart city* emerged in the late 1990s to classify a movement that advocated new policies for growth and urban planning. However, after just over a decade, it was adopted by technology companies such as IBM and Siemens to nominate the application of information systems to the operation and integration of urban infrastructure and services [10]. This concept was developed as a strategy, highlighting the importance of ICTs to improve the competitive profile of a city [11].

The definition of a smart city is directly linked to innovation, so it is possible to say that what distinguishes one smart city from the others is its better performance in this domain [13]. It is a concept of urban development where connectivity is a source of progress and the use of network infrastructure is directed to the social, cultural, economic and urban development of cities [11].

Current society is based on networks of digital technologies, which transcend borders and interact in global networks of social organization. However, it is not technology that determines society, but society itself shapes the technology according to the needs, values and interests of the people who use it. Information and communication technologies that have begun to take shape in recent decades and have spread unevenly throughout the world play a prominent role in social transformation [14]. To empower individuals, it is necessary to ensure access to information, which can occur on the basis of technological advances and flexible and intelligent information systems that are available to everyone [15].

However, in spite of its diverse applications, for Neirotti et al (2014) ICT-based solutions are only one of several resources to improve the development and increase the sustainability of the several dimensions of a city. So, cities better equipped with ICT systems are not necessarily smarter or better cities to live in.

A project run by the Vienna University of Technology with a ranking of seventy European cities identifies six main axes or dimensions to make a smart city: economy, people, governance, mobility, environment and lifestyle. These dimensions and their twenty-eight characteristics can be developed from a combination of actions and conscious citizens [16].

The dimensions are based mainly on competitive economics, regional transport and ICT, natural resources, human and social capital, quality of life and active participation of society, characteristics that make up the structure of indicators to evaluate the performance of a city as intelligent [16].

From this perspective, it is possible to understand that the ideal of a smart city goes beyond being a digital and connected city. With the advancement of the knowledge society, more significant than just receiving and sharing information, it has become necessary to use them to promote the effective improvement of the citizens' quality of life. Cities should pursue sustainable and productive global growth, stimulating healthy competitiveness and cooperation, the rediscovering of their socio-cultural identity, greater social integration and the advancement of creative economy and innovation [17].

Cities are human and smart when they make the most of the human capital of their citizens, create innovation ecosystems where a dynamics of wealth and job creation occur and promote new forms of participatory governance [4]. Cities should be places where people can find opportunities to explore their potential, lifestyle and live more creatively [18]. Therefore, the human smart city vision conceives the city as an ecosystem where the physical and digital infrastructure coexist in a systemic relation with the city's human capital [5].

In a human smart city, people - not technology - are the true actors of urban intelligence [4]. This concept presents a citizen-centered approach with greater human involvement in the co-design, development and production of the next generation of services for smart cities [19]. The participation of citizens and other actors in the ideation, creation and management of services facilitates access to the creativity of communities, but also provides new skills to people, new employment opportunities and creates service options more coherent with citizens' real needs, consequently improving their quality of life in the long term [6].

The transformation of a city that seeks to be smarter must start from the premise of integration with the current and potential wishes, interests and needs (WIN methodology [20]) of its citizens [19] - interests and needs that may or may not involve technological infrastructure. Technology should be a facilitator for connecting and engaging government and citizens, stimulating and supporting collaborative activities that lead to increased social welfare.

Individuals belong to social groups and are social beings, so having an active voice is an important aspect of community life, enhancing cohesion. Digital inclusion and the use of information and communication technologies contribute to the sense of belonging to the community, which is central to creating meaning and value in individuals' lives. Studies have shown that even the perception of justice and legitimacy in government and public administration processes depends to a large extent on the nature of individuals' participation in these processes [21].

Citizen engagement is defined by individual and collective actions on issues of public interest and refers to how citizens participate in community life in order to improve their conditions or help shape their future [22]. In this sense, empowering citizens is to develop their capacity to interpret and influence their environment using their own development competence and society's [23].

Citizen empowerment has an impact on the engagement in the improvement of the structure of the environment, street, neighborhood, town or city in which individuals are located. Several technologies and systems have been created to try to solve the problems of infrastructure or quality of life in specific communities, such as: online map editing, route sharing, neighborhood social network, hole reporting and street parking, crowdsourcing, among others [24].

In this perspective, the increase in the initiatives related to urban living labs and human smart city present a bridge between the micro-scale of decision, like small groups, and the total scale of the urban collectivity, through collaborative and creative environments that allow the dialogic interaction with and among citizens within a specific cultural framework. Focusing on citizens, in recent years the European Union has invested in two major research projects: MyNeighbourhood (which will be discussed later in this paper) and Periphèria. Both projects involve living labs proposals for experimenting with new forms of urban governance, public participation and co-design activities that have resulted in innovative partnerships, public challenges, and unprecedented institutional and citizen interaction [6].

Thus, the ICT infrastructure presents an untapped potential for new personalized services and possibilities for dialogue between administration and citizens, that is, as a facilitator for connection and involvement of government and population in the reconstruction or recreation of the urban community, promoting collaboration and increasing social well-being [4].

People are at the center of the city's transformation into a smarter city and are important sources of data for urban services, both on themselves and on the outside world [25]. In this sense, urban design has evolved in the contemporary context with top-down methods in the planning and development of urban spaces giving way to bottom-up methods, which involve residents and other stakeholders in the process. Even though the user's participation is considered fundamental, there is no clear consensus on how to involve them in the process. In this sense, one of the proposed approaches is design thinking, with a methodology centered on the human [26].

Thinking like a designer

Talking about in Design Thinking has been something popular in recent years, although the concept has different understandings such as methodology, approach or process. All, however, originate in the literal sense of the expression: the designer's way of thinking, something that goes back to the beginning of Design as a profession and discipline [27]. although the term gained strength in the 2000s - driven, among others by IDEO, Tim Brown's design company, and d.school, a renowned Design Institute and "hub for innovators" at Stanford University. It then came to be seen as a new paradigm to create solutions in several areas such as management, technology and engineering [28].

The designer, in an inverse mindset of the engineer or the architect, seeks to solve problems not by looking at the problem, but at the solution itself. That is to say that they have a divergent, non-convergent thinking: instead of observing an already defined set of possible answers to a question and thinking how to implement a certain solution, the designer opens the mind to think about why to implement it. With this, it ends up reaching other possibilities at the very root of the problem. According to Brown and Wyatt (2010), divergent thinking favors innovation and requires the involvement of a diverse group of people in its construction [7].

In order to provide greater clarity in this process, Biscaia (2013) talks about the three macro stages of design thinking: the first contemplates the definition of the problem, so it involves empathy and the discovery of the needs that indicate it; The second is related to the search for the solution, so it involves ideation; The third is the evaluation of the proposed solution, with the construction of prototypes and user involvement in tests, communicating with them to obtain feedback in order to refine the solution [29].
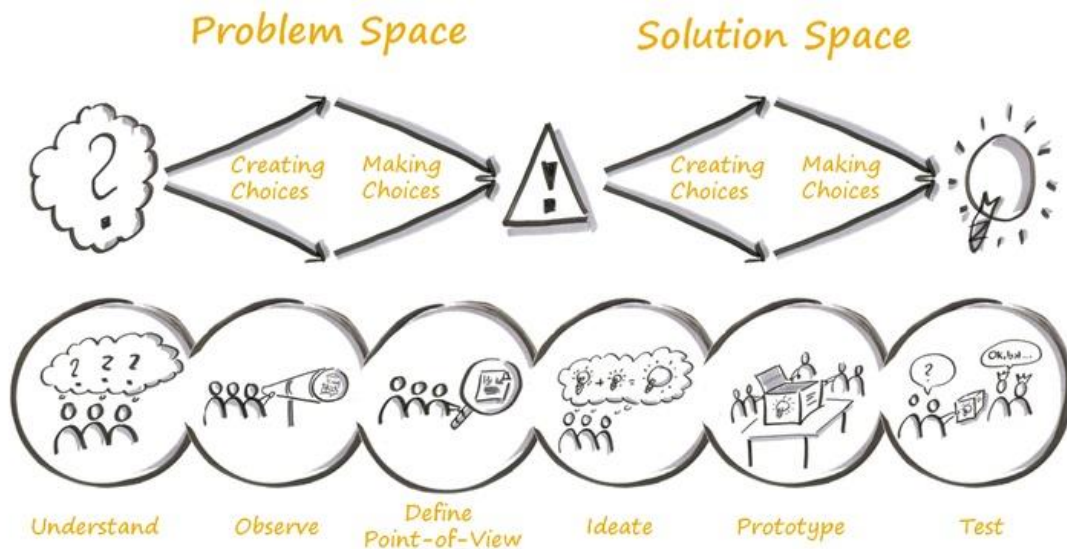
Info-Graphic of Design Thinking Steps and Mindset at SAP.
Derived from Tim Brown, IDEO & HPI/D-School, Potsdam.
Illustrated by Tobias Hildenbrand, SAP

Figure 1. Design thinking process and its phases for convergence and divergence. Source: mccourtinnovationlab.org

There follows a process called "double diamond", represented in the previous image (Figure 1), which can be seen as a guideline or method of applying Design Thinking in problem solving, although it is not linear - so its phases are often called "spaces" and not steps to follow one after another. It occurs iteratively, that is: you can move forward or backward as many times as necessary in the process, such as going back to the understanding of the context of the problem to capture a nuance that had not been captured, as well as preparing prototypes and releasing them in the market as many times as possible, since only then will it be possible to see errors and possibilities for improvement. It is a radical change from the traditional social and business stance that does not allow making mistakes, or demonstrating them. Feedback is essential for creating products and services that meet the real need and desire of users, not just customers now but co-creators.

It is in this aspect, also, that lies another great differential of the Design Thinking: the participation of the end user in all the stages in the productive development. He has been consulted several times since the beginning of the process, where he analyzes and observes his behavior, interests, preferences and values; Beyond the context in which he lives, even the environment where he lives. Everything should be considered, even what does not seem to have "importance" or connection to the problem at first sight [7].

This is the creative process that has gained strength in the business world as a way for companies to reinvent themselves and to generate innovations that are not only incremental and aesthetic in their products, but which in fact promote a change in the creative process itself as well as in people's lives. In the knowledge society in which we are entering, the emotional experience associated with a product is more and more valued, much more than having it physically; it is a culture oriented by the user experience design, by the intangible. Thus, using design thinking becomes an innovation strategy that generates competitive advantages, something that not only fashion startups do, but older companies start to implement because they have already understood the limitations of traditional ways of dealing with problems. The advent of the diffusion of ICTs that have made the world highly dynamic and changeable, inflated with information on all sides, has generated a complexity that requires such a change of thought and action.

In this sense, it is possible to see many connections in this approach with the concept of intelligent cities in its most human aspect, presented in the previous section. Next, we will see some situations in which design thinking was presented as mindset and had its associated methodology applied to experimental workshops aimed at the generation of intelligent solutions for regions delimited in two states of Brazil: Rio de Janeiro and Santa Catarina.

EXPERIMENTING DESIGN THINKING WITH SMART CITIES INITIATIVES: WORLD CASES

When talking about "new models to engage citizens and public authorities in the co-design and co-creation of services to solve their needs" [30], the MyNeighbourhood project (MyN) stands out in the application of design thinking in a "testbed" for the development of more human and smart cities. The project, partly funded by the European Commission as part of the CIP ICT PSP Program in Smart Cities, explores the vision of the HSC in four pilot cities: Aalborg (DK), Birmingham (UK), Lisbon (PT) and Milan (IT).

The aim is to launch a new look at the city through the recreation and strengthening of social ties between neighborhoods, using traditional communities' values, where people connect in a socio-spatial way. Thus, the community has at its disposal a platform to "reconnect with one another, share ideas, create new ways of interaction and help make their daily lives 'smarter' in the subject areas of: health, environment, participation, and transport, among others" [30].

Design Thinking enters the game as one of the essential methodologies to make the project work, providing support for co-design and co-creation of solutions. Along with it, practices involve Living Labs methodologies (encouraging people to move beyond the virtual community and communicate in the physical environment to share common interests and needs) and Gamification (use point and challenge system to motivate citizens to participate). The scheme below demonstrates the operation of these methodologies in the context of human smart cities, as applied in MyN.
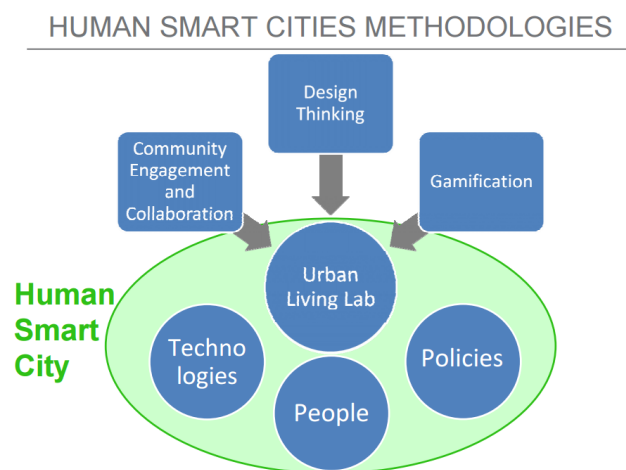

Figure 2. Human smart cities methodologies [20]

Kumar et al. (2016), in turn, presents the result of the redevelopment process developed in Srirangapatna, India, through design thinking. During one year, the residents of a favela in the city were involved in re-designing their own neighborhood and the result was greater ownership of the project chosen by the community, as well as increased willingness of the community to work with local authorities in Development. In this sense, it is possible to affirm that design thinking contributes directly to community satisfaction and can be effective in engaging stakeholders in the process of urban planning, revitalization or management [26].

Kumar et al. (2016) contributes by proposing a model for adapting design thinking to urban areas. First empathy is established with the residents to understand their challenges, interests and needs, by engaging in conversations, observations, research, and even the use of a focus group (the inspiration phase). Then proceed to the definition of the problem, generation of ideas and development of the first prototypes (corresponds to the phase of ideation). Finally, the project alternatives are selected, prototyped and tested with the users (corresponds to the prototyping phase), converging to a final, usable solution (corresponds to the implementation phase) [26].

Di Bella (2015) reinforces this position by addressing the possibility of developing an intelligent city through a bottom-up approach, in which the involvement of communities and social movements engaged in the cause is highlighted. The model used by the author is from the city of Catania, Italy, where digital city planning seeks a city more centered on the human being [31].

Çalışkan (2012) also proposes its application as a way of revitalizing traditional urban design. The author cites two experiences with design thinking for the improvement of urban areas, one in St. Petersburg, Russia, and another in São Paulo, Brazil. As a result, it has been understood that in these cases the designer's performance occurs through loops with repeated conjectures, analyzes, modeling and tests, surpassing the traditional analysis and prototyping of urban design [32].

EXPERIMENTING DESIGN THINKING WITH SMART CITIES INITIATIVES: BRAZILIAN CASES

Based on the application of design thinking in projects such as MyN, in march 2014 took place the I Workshop of the *Parque Urbano e Inteligente da Gávea* (PUIG) project in Rio de Janeiro, Brazil. The project, developed by the PUC-Rio University, the Federal University of Santa Catarina and the University of Aalto (FI), aimed at planning a set of key demonstration projects, in a limited number of areas, that could help start a movement towards the transformation of the Gavea neighborhood in Rio into the human and smart region. The PUIG appears as an urban park based on smart cities, integrating technological development and social development, to generate quality of life and well-being for society. Researchers (professors and students) from different countries and academic backgrounds were divided into five working groups (WG) to tackle the problems reported and observed by local stakeholders in the Gavea neighborhood, using design thinking tools to build solutions.

Picture 1: Participants on the I Workshop of the PUIG project during the understanding /observation phase. Source: ÁgoraLab/LabCHIS collection.

After 5 days of hard work, the working groups came up with four structuring and impacting projects on smart Mobility, Social inclusion, Development and preservation of the cultural, historical and environmental patrimony of the neighborhood and Public safety, which ended up being complementary and forming a single high-impact large project in the region.
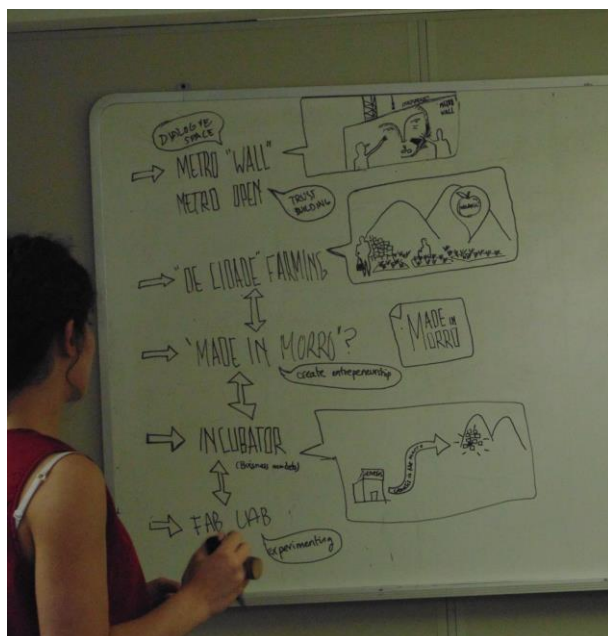

Pictures 2 and 3. Notes from the working groups at the PUIG project workshop. Source: ÁgoraLab/LabCHIS collection.

In 2014 and in the following years, the Knowledge Cities discipline of the Graduate Program in Engineering and Knowledge Management of the Federal University of Santa Catarina (UFSC), in southern Brazil, taught by prof. Eduardo Costa, was based on Rio's workshop to give the students a hands-on experience in learning about smart and knowledge cities. The high

multidiscipinary character of the graduate program, with students from diverse upbringings and previous academic backgrounds (such as Design, Architecture and Urban Design, Social Sciences, Geography), was taken into account for the success of similar workshops which occurred in different moments and regions of the island of Florianópolis. This also served as a test for the use of design thinking in various dimensions and moments of the process of development of a human smart city [33].
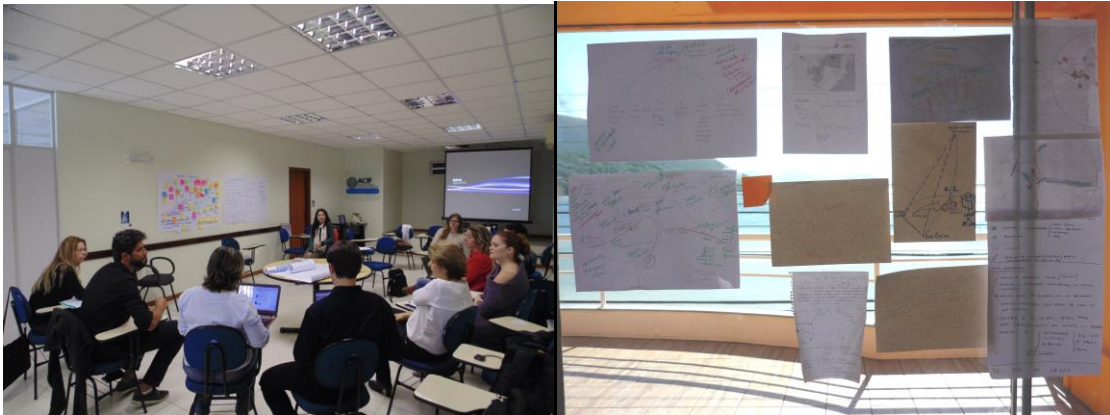
Pictures 4 and 5. Ideation during the Knowledge Cities discipline workshop at Lagoa da Conceição neighbourhood / Florianópolis– July 2014. Source: ÁgoraLab/LabCHIS collection.
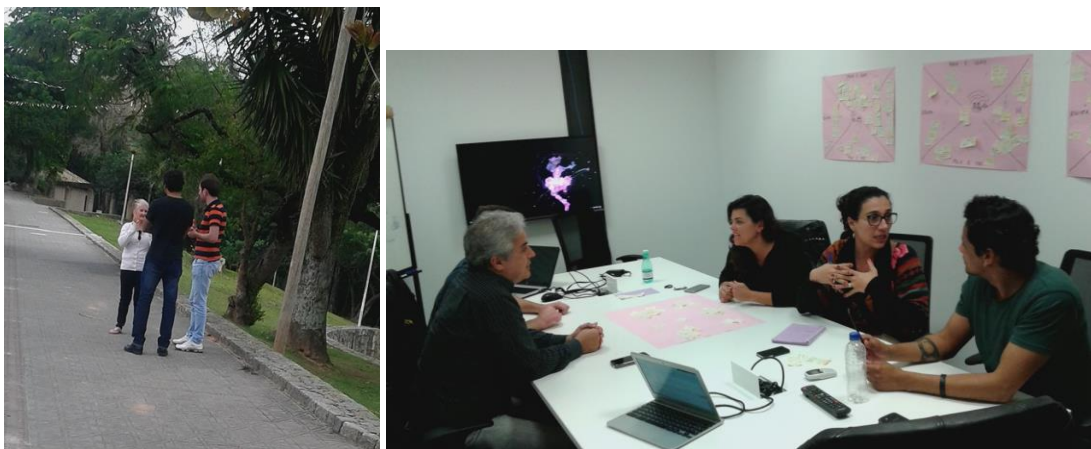
Pictures 6 and 7. Talking to locals and discussing ideas during the Knowledge Cities discipline workshop at Santo Antônio de Lisboa neighbourhood / Florianópolis – September 2015. Source: ÁgoraLab/LabCHIS collection.

In addition to those events, the VIA Estação Conhecimento group, also part of the Graduate Program in Engineering and Knowledge Management at UFSC, intends to apply co-creation inspired by Design Thinking during the activities of the Ciclo Via project in 2017.

Ciclo Via: Smart Cities & Social Innovation is an initiative created by the Via Estação Conhecimento, promoted by Endeavor's Global Entrepreneurship Network and the innovation park Sapiens Parque in 2016. The goal of this initiative is to stimulate and support the creation of solutions and proposals for improvement to the surroundings of Sapiens Parque, through the perspective of human smart cities. In this way, one of the bases for its development is the creation of an environment of interaction between the different interested actors, which can be better understood through the quadruple propeller (academia, government, business sector and civil society).

Picture 7. Talking with stakeholders during the first phase of Ciclo Via project. Source: Via Estação Conhecimento collection.

Ciclo Via starts from the sensitization and empowerment of these actors, to make possible their collaborative engagement in creating and developing improvements in their community. This process involves the change of perception and attitude about the surrounding environment (first phase), followed by a survey of the stakeholders' vision, needs and interests (second phase), which must be explained and synthesized for later consultation and unfolding). In the sequence, ideas are generated to solve the problems or gaps made explicit by the participants (fourth stage), which are grouped and selected based on the relevance of the context (fifth stage). With ideas in an environment that stimulates innovation, actors are given tools and support to develop them creatively until they evolve into innovative prototypes or projects (phase six). The projects are validated with a larger contingent of the community to verify their degree of reception and opening (seventh phase). After evaluation, the projects will be implemented by the participants (eighth phase), which will be monitored, supported and documented by the Via Estação Conhecimento (ninth phase).

RESULTS AND DISCUSSION

While design thinking, as a creative problem-solving activity, may be developed in any area or dimension of research, this "way of thinking" presents many ideological similarities to the concept of the human smart cities and, furthermore, it proves to be a tool of vital importance for the realization of initiatives aimed at smart cities - not only as a way of solving problems, but all the mindset that accompanies it and is part of the radical change in the way we relate to the city.

Horst Rittel, in the 1960s, did not use the term "design thinking" yet, but described the issues to be solved by designers as "wicked problems" - which can be understood as a "class of social system problems which are ill-formulated, where the information is confusing, where there are many clients and decisionmakers with conflicting values, and where the ramifications in the whole system are thoroughly confusing" [34]. This definition is very close to the characteristics of the problems found today in urban agglomerations, whose managers face complex challenges, including food supply, waste disposal, urban traffic, maintenance and improvement of citizens' quality of life, among other aspects [11].

In 1992, Buchanan in turn presented what would be the four broad areas of design, or where design thinking would take place:

1) symbolic and visual communications;
2) design of material objects;
3) design of activities and organized services (management);
4) design of complex systems or environments for living, working, playing, and learning [34]).

Traditionally, urban planning, architecture and systems engineering would fit into the fourth area, which is concerned with "sustaining, developing, and integrating human beings into broader ecological and cultural environments, shaping these environments when desirable and possible or adapting to them when necessary" [34]. The author does not deal with smart cities; however, we have seen earlier that the smart city goes beyond this perspective. Yet, we can still visualize it when the author presents the "doctrine of placements", which uses techniques to reposition design problems, using them to discover new possibilities to unsolved matters. "Placements" would be precisely the joining or overlapping of two or more of the broad areas of Design; for the author, innovation would occur precisely in this mixture. Thus, we can say that the vision of smart cities is still aligned with the design thinking.

Brown and Wyatt (2010), in turn, add the human factor to the subject. For them, the problem of traditional approaches to solving problems in both business and social sectors is that they are not based on customer needs, or are based on preconceived notions of this; in addition, they do not prototype the solutions or present them for feedback before implementing them, which is why they fail [7].

The human smart city is, in essence, a city that can effectively integrate the Wishes, Interests and Needs of its citizens, involving or not a technological infrastructure; during the WIN survey, it is also necessary to "read between the lines" of what the customer wants, to interpret his speech - it is not enough to ask what he wants, because often he cannot say it clearly. That is why traditional opinion or satisfaction surveys, or even focus groups, are insufficient to understand the place in order to develop a human smart city. Design thinking, on the other hand, is able to approach more closely the unmet needs of a community by observing its behavior [7].

In a report to the UNDP Global Center for Public Service Excellence, Allio (2014) reinforces the role of Design Thinking in giving voice to end users and engaging them in decision-making:

> *Design thinking is an explicit human and user-centred approach. It leads to solutions that are progressively refined through an iterative process of providing voice to end-users and engaging them in shaping decisions (professional empathy and co-creation); of considering multiple causes of and diversified perspectives to the problems at hand (scaling); and experimenting initial ideas (prototyping and testing). As such, it is most promising when innovation rather than adaptation is needed [3].*

CONCLUSIONS

Nowadays, we can say that design is no longer just a tool for the development of functional and innovative consumer products, but a process for radical change - for the development of services, systems and environments that support lifestyles and habits of Consumption. This has been observed even in experiments developed at Mälmo Living Labs, where Bjögvinsson et al (2012) revealed some of the challenges that can be tackled by design thinking [35].

The development of a human smart city can occur in a variety of ways, including through the use of frugal technology, without sophisticated or complex infrastructure, as solutions emerging from the community can be simple and creative to the point of making significant investments

[4] – meanwhile, "by working closely with the clients and consumers, design thinking allows high-impact solutions to bubble up from below rather than being imposed from the top" [7], fitting perfectly in the process and supporting social innovation.

In order to deal with social, environmental, political, and economic issues (or the wicked problems that), researchers are already beginning to apply design thinking in the areas of science, social science, and humanities, individually and across those areas. The European Union is already concerned with the new role of design in this sense, where in addition to thinking the product, the discipline encompasses the entire system [27].

In this sense, it can be concluded that design thinking can be used on at least two fronts for an innovative urban ecosystem: in the technological field, involving the still untapped potential of new personalized services to the citizen; and in the scope of the citizen's needs and interests which can be solved without or with little technology, but that can still transform their quality of life.

Although there are still few studies connecting design thinking and smart cities, the practice of design thinking in companies has already been used as a strategy of innovation and sustainable competitive advantage, as a way to constantly reinvent their business [36] and "better differentiate their brands, and bring their products and services to market faster" [7]. However, design thinking has the potential to cross sectoral barriers, being used by nonprofit organizations and, as highlighted in this paper, in the public sector, as to develop solutions to social problems [7] and providing great assistance to governments to deal with current challenges:

> *Drawing from private sector experiences, design thinking seeks to stimulate creative thinking within the decision-making process and accelerate the synthesis of increasingly effective and efficient policy solutions. (…) If implemented well, design thinking approaches help improve decision-making, contributing to a more comprehensive problem definition; reduced risks of duplications, inconsistencies or overlaps; minimized unintended consequences and more legitimized and effective decisions [3].*

However, it should be noted that, for design thinking to be sustainable, it must go beyond product development, but rather be concerned with building practices; to do more than punctual projects, but turn into an ongoing infrastructure. Besides, working with stakeholders is already a challenge in well-defined social communities and supported by stable infrastructures; but often what will be found are heterogeneous political communities, with few shared objectives, which makes the question even more complex. Thus, platforms or infrastructures are needed, "not necessarily to solve conflict, but to constructively deal with disagreements" [35]. Such concern may even define the success of projects such as MyNeighborhood.

Therefore, we conclude that the development of human smart cities could greatly benefit from – and perhaps even rely their success on - design thinking's mindset and tools, since it does not only "focus on creating products and services that are human centered, but the process itself is also deeply human" [7].

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