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Place and City: merging our affective and social spatial dimension in the (smart) platial city

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GEO-C Place and City: merging our affective and social spatial dimension in the (smart) platial city

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*"You do not really understand something
unless you can explain it to your grandmother"
Albert Einstein*

*I dedicate this research to my late grandmother, she was the
kindest person and clever mind I have ever met.*

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ABSTRACT

We are living in (smart) cities that hold social-oriented promises but currently, most of these cities disregard the humans. Although some alternatives are appearing such as smart citizen-centric approaches, there is a lack of how promoting truly appealing perspectives toward a common good or better social synergies. Thereby, smart cities, with their associated Information and Communication Technology tools, are offering new possibilities, but, unfortunately, citizens are not fully exploiting the opportunities to empower themselves because, among other reasons, they are not aware of their common spatialities. Currently, we are not able to operationalize the spatial human-urban interactions regarding citizens' cognitions, feelings and behaviors towards city places (i.e., sense of place) and meaningful geographic human relationships (i.e., social capital). Both concepts are significant as resources for an alternative landscape based on human perception and organization of social interactions fostered through the geographic place(s). In this research, we highlight the need to understand and operationalize social concepts spatial dimension for a better understanding of a smart citizen-centric approach which is mainly dependent on our capability to understand spatial urban dynamics. We conceptualized a (spatial) conceptual framework for sense of place and social capital at the individual level to study their spatial relationship in the urban context. We developed a web map-based survey based on the literature to spatialize, characterize and measure sense of place, social capital and civic engagement. Using the spatial data collected, we validated our framework and demonstrated the importance to encompass the spatial dimension of social concepts (i.e., sense of place and social capital) as pivotal aspect (1) to understand the spatial urban dynamics; (2) to provide useful social-spatial data to city processes (e.g. civic engagement); and (3) to reveal the potential to include them in social theory and structural equation models. Furthermore, we highlighted the crucial role of Geographic Information Science (GISc) techniques to gather the spatial dimension of those social concepts. Although in this

research we focus on the spatial relationship between sense of place and social capital on civic engagement, the possibilities to relate our framework and methodology to other city based-notions can bring to light new platial urban dynamics. This research wants to open up the agenda for further research into exploratory place-based geography studies and, simultaneously, sets up a common social ground to build other socially-oriented conceptualizations or applications on top of it.

Keywords: sense of place, social capital, spatial dimension, platial urban dynamic, urban intelligence, civic engagement

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LISTINGS

GLOSSARY

citizen-centric smart city approach	It bases on the human-environment interactions which are mainly dependent on our capability to understand patial urban dynamics.
civic engagement	It explains associations or ways in which citizens have a common purpose to preserve and promote public goods (Son and Lin, 2008).
geographical perspective	It is the spatial dimension/imprint/footprint that concepts acquire.
individuals' spatialities	Individuals or collectives practices related to their geographical location that reflects their spatial actions and interactions (Lussault, 2007).
patial	It is concerned about the space-based geography that is focused on human discourses, social values and human-space interactions (Roche, 2016 , p. 4).
sense of place	It explains the cognitive, affective and behavioral dimensions of the relation that an individual has towards a certain geographical area (Jorgensen and Stedman, 2001).
smart patial city	It is the smart city conceptualization from a citizen-centric smart city approach .
social capital	It analyzes the value of social relationships and networks to societies and individuals (Holt, 2008) and it is conceptualized based on Perkins and Long (2002) ; Perkins et al. (2002) .

GLOSSARY

spatial dimension/imprint/footprint	It is the geographical definition on a map of the area that covers the feelings, thoughts and acts toward an object represented through geographic primitives.
spatialize/spatialization	It is to transfer the non-spatial knowledge on concepts to the geographical domain through GISc techniques.
urban intelligence	It is related to our capability to understand urban dynamics which are dependent on the spatial organization of place (Roche, 2016).

ACRONYMS

CEE	Collective Efficacy/Empowerment.
CP	Citizen Participation.
GCE	Geographical Civic Engagement.
GIS	Geographic information Systems.
GISc	Geographic information Science.
GSC	Geographical Social Capital.
GSoP	Geographical Sense of Place.
N	Neighboring.
PA	Place Attachment.
PD	Place Dependence.
PI	Place Identity.
SC	Socia Capital.
SEM	Structural equation models.
SoC	Sense of Community.
SoP	Sense of Place.
SQ1	Search Query 1.
SQ2	Search Query 2.
UNDP	United Nations Development Programme.

INTRODUCTION

1.1 A disclaimer before reading this research

Before to start, a disclaimer is necessary against a possible misunderstanding over the simplification and reduction that this research is exposing, but not fall into itself. It is not the purpose to elucidate all the problems related to the smart city approach and all the possible benefits of a **citizen-centric smart city approach**. Nor is it the purpose to present a categorical place' understanding against of the space notion in the city realm. The aim is to highlight the benefits of a fruitful transition from our **individuals' spatialities** to place networks for the better accommodation of our social subjectivities in the citizen-centric smart city approach. This, itself, is a colossal simplicity of a tremendous complex relationship that needs, among others, the rethink of current terms and a blind faith in the methods used. As you might guess, the entire research is revolving around a geographic perspective focused on humans and their feelings, perceptions and experiences as the first step to advance on a collective and inclusive knowledge.

“A human being is a part of the whole called by us universe, a part limited in time and space. He experiences himself, his thoughts and feeling as something separated from the rest, a kind of optical delusion of his consciousness. This delusion is a kind of prison for us, restricting us to our personal desires and to affection for a few persons nearest to us. Our task must be to free ourselves from

*this prison by widening our circle of compassion to embrace all living creatures
and the whole of nature in its beauty."*

Albert Einstein

It is not the intention to make ontological claims for terms mentioned in this research. Instead, this study hooks other researchers definitions (see glossary) as significant notions for building on top of them what is coming in following chapters. These notions represent views across disciplines on relevant topics for this research. If the reader wants to meet the aims of the study, needs to be understood the explicit goal to be as simple as possible, but not simpler. I placed my two cents on the fields revised to write down the fruits of three of the best years of my life in these pages. I hope you enjoy the reading of this study as much as I did carrying out the research.

"If you can't explain it simply, you don't understand it well enough."

Albert Einstein

1.2 Problem statement

By 2050, the forecasting is that two-thirds of the world's population will be urban ([United-Nation, 2014](#)). Fortunately, the surge of information communication technology and smart cities, with their inherent geospatial capabilities in their tools (e.g., Global Positioning System (GPS), Indoor Positioning System (IPS)), allow alternatives in how to manage those new crowded urban environments. Mainly, those alternatives are based on the extraction of quantitative data from sensors, to better understand and manage city issues ([Ash et al., 2016](#)). However, current sensors and context-aware services are yet not able to completely analyze human-urban interactions such as cognitions, feelings and behaviors (i.e., attitude theory dimensions ([Ajzen and Fishbein, 1975](#); [Rosenberg, 1960](#))) toward social, geographic and material resources in the city context. Those associations, besides to shape our relationship with the urban environment ([Duff, 2011](#); [Latour, 2005](#); [Molotch, 2012](#)), build an important resource for a citizen-centric smart city approach. In turn, the [geographical perspective](#) of those human-urban interactions can enable to frame the citizen as one of the main resources in the smart city. A smart city that holds social-oriented promises but currently mostly disregards the human perspective. With this in mind, the cities technological turn is providing a sort of individual autonomy to enjoy new services as consumers or testers, but it is not promoting what is expected as a citizen-centric approach, that searches for the common good, social synergies or political benefits based on a common "right to the city" ([Harvey, 2008](#); [Lefebvre, 1991](#)).

In other words, citizens are not fully exploiting the opportunities that the smart city is offering to empower themselves. It seems that the idea of smartness is reduced to the notion of efficiency. Roughly, we are just changing our channels of communication and interaction, but the neoliberal background of a capitalist city is intact ([Cardullo and Kitchin, 2018](#)). The acceptance of this city development could outline dangerous disconnections between, for instance, the social and governmental realms.

Nowadays, cities use their hierarchical administrative boundaries to deliver their policies and actions as well as to aggregate individual information as representative. Despite some authors pointed out the need to identify new boundaries that respect the city interactions ([Foster and Hipp, 2011](#); [Gerell, 2014](#); [Grannis, 2009](#)), we are still using old boundaries to tackle contemporary social problems. In other words, we are using communal spaces framed and regulated in administrative boundaries, instead to understand citizens-interactions toward, for instance, essential places or geographically located communities. This is an example of a disconnection; governments' understanding of citizens as beings within a pre-established range (e.g., neighborhoods and parishes) with already known difficulties when dealing with social problems ([Foster and Hipp, 2011](#); [Lee et al., 2008](#)), instead of understanding citizens as individually-based ranges established on daily interactions, feelings, and social interactions (i.e., individuals' spatialities). Although citizens are spatially sticky ([Rutten et al., 2010](#); [Westlund et al., 2010](#)) and they create ties and social networks in which they carry out their daily tasks ([Lewicka, 2011b](#)), we are missing techniques to spatially define information about human-city interactions ([Lalli, 1992](#); [Stedman, 2003](#)). There is an outstanding opportunity for the integration of social science in current geographic information technologies through the formalization of place theory, that will be possibly richer than space theory ([Goodchild and Li, 2011](#)). Currently, we are not able to process the spatial dimension of human-urban interactions ([Roche, 2014](#)), to spatially understand, for instance, the existence of meaningful places with emotional connections ([Scannell and Gifford, 2016](#)) or the individuals' geographic social networks ([Rutten et al., 2010](#)) existing in the urban context. In this context, the need for new bottom-up place-based information to gather citizenship social characteristics ([Elwood et al., 2012](#); [Goodchild, 2007](#)) becomes more and more important. Therefore, it makes sense to wonder if it is possible to define auxiliary spatial grounds based on the **patial** urban dynamics to deal with city issues in another way. For instance, the low rates of participation in participatory processes in developed countries ([Aricat and Ling, 2016](#)). With this in mind, the question naturally arises: how can this **patial** city configuration be operationalized?

This research studies the individuals' spatialities regarding citizens' cognitions, feelings and behaviors toward city places (i.e., *sense of place*) and meaningful geographic human relationships (i.e., *social capital*). The *spatialize/spatialization* of those human concepts can signify an alternative landscape to build on it a new truly citizen-based social view, recognizing the human perception and organization of social interactions fostered through the geographic place(s).

1.3 Scientific background

This section encompasses all the necessary elements to understand better the progress of this research. Figure 1.1 shows the arrangement and connection of each notion required to build the research background. Each box in Figure 1.1 corresponds with a subsection, and the arrows show the sequence followed between them. This section starts with a review of the current challenges on the smart city notion (subsection 1.3.1). From that point on, this section is split into two lines; one discussing the place notion in the smart city realm (subsection 1.3.2) and the other highlighting the importance and challenges of a citizen-centric smart city approach (subsection 1.3.3). We write a brief description of the significance of place in the smart city context and in parallel, we present some perspectives in the challenge to achieve a citizen-centric smart city approach. This is followed by the explanation of the key variables of this research (i.e., *sense of place*, *social capital* and *civic engagement*) and their suitability to be conceptualized under the attitude theory (Ajzen and Fishbein, 1975; Fishbein and Ajzen, 1975; Rosenberg, 1960) (section 1.3.4). Likewise, the place notion is deeper studied under Agnew (2002, 2011) conceptualization (see subsection 1.3.5) to build a (spatial) relational ground to attempt the join of the two approaches (i.e., subsection 1.3.2 and subsection 1.3.3). We finish this section discussing the idea of spatializing social concepts (subsection 1.3.6) and an enumeration of research' assumptions (subsection 1.3.7).

1.3.1 (Smart) city

In the 90s, Lefebvre (1991) introduced the idea of a collective right to the city. He argued for understanding the city as an object of a social praxis in detriment of the tendency to emphasize economy and politics. Later, Harvey (2008) appealed to the same right as a collective empowerment to reshape the process of urbanization. Despite these two visions, the current city is mainly facing a technological model (i.e., the smart city paradigm). A complex coded city (Amin and Thrift, 2002) shaped by algorithms

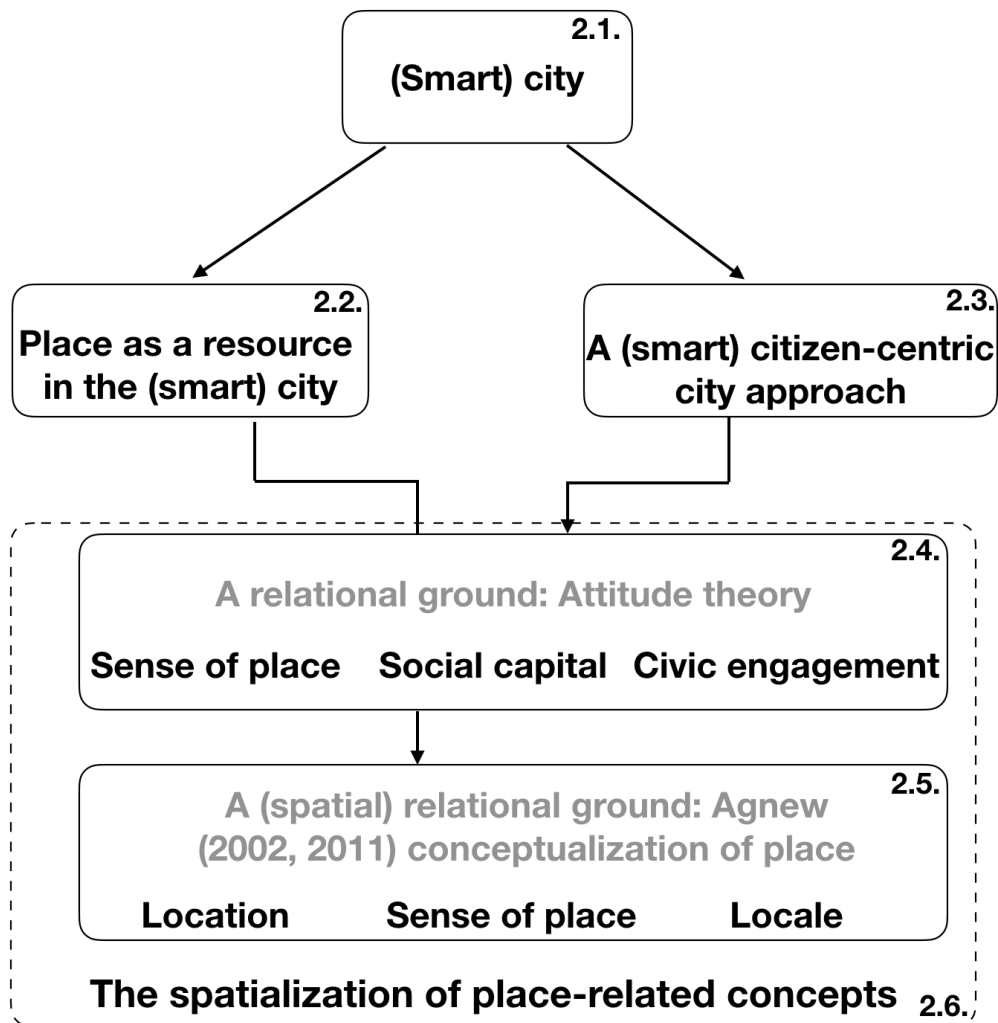


Figure 1.1: Schema of the scientific background outline

that coalesce with the Big Data era. Some authors refer to the smart city technological-paradigm in terms of information flow, infrastructure and services (Giffinger and Fertner, 2007; Nam and Pardo, 2011), whereas other authors emphasize the quality of life, education or community (Bakıcı et al., 2012; Kourtit and Nijkamp, 2012; Kourtit et al., 2012). Roche (2014) performed two exhaustive literature reviews on the smart city concept: a classical and a meta-analytical review. From the traditional one, based on multi-disciplinary academic literature, he argues for four central visions from the smart city literature: information technologies, sustainable development, civic engagement and citizen empowerment. The meta-analytical review, based on speeches by

smart city specialists, states three main key expressions: civil engineering (e.g., sensors, location-based and context-aware services), governance through open data/services and innovative citizenship participation. In fact, some researchers recognize that technology is the meta-factor in the smart city framework and could profoundly influence the other factors (Chourabi et al., 2012). The technological and algorithmic approach monitors the city and tries to reduce its complexity, but, what is the price? Most city algorithms are "black boxes" that operate in the background, outside of citizen direct control or participation. Only the state and a few empowered corporations rule in this new technological top-down form of city governance (Greenfield, 2013). In response to these critiques, some companies and cities have switched to a more 'anthropocentric' city initiatives, called 'citizen-centric' (Cardullo and Kitchin, 2018). This research understands this approach as the operationalization of human-urban interactions which are mainly dependent on cities' capabilities to understand place urban dynamics. Every place has its history (Lefebvre, 1991) and a perception from each who frequents them (Lewicka, 2011b) that make it unique (Gieryn, 2000). However, unfortunately, people and community have been neglected in the smart city perspective (Chourabi et al., 2012) and, consequently, the stakeholders of the technological city are far from recognizing their spatial dimension/imprint/footprint and to enable their spatialities (Roche, 2014) that can become crucial to offer better citizen-centric city services. How to relationally understand the different spatial dimensions, nature and imprint of the city's actors (e.g., citizens, objects, governments) is still a topic of discussion.

1.3.2 Place as a resource in the smart city

Despite the current globalization process and the ubiquitous communication, place continues to be an object of strong attachment (Lewicka, 2011b). Places can evoke feelings (Bondi, 2005) and/or lived experiences (Stedman, 2003; Tuan, 1978). Nevertheless, they are rarely settled due to their dynamic nature based on relative coordinates (Murdoch, 1998). Jordan et al. (1998) stated that place cannot simply be described as a linear location of related objects, it has to be considered by its inherent human meaning (Relph, 1976; Tuan, 1978). Place is the central piece of human experience with implications for the development of identity and belongs (Duff, 2011), thus, the key concept of both human geography and environmental psychology (Antonsich, 2010, p. 120). The study of the place needs a relational system (Harvey, 1969) where activities and objects define the geographical space (Murdoch, 1998). Most conceptualizations of place in the literature (Agnew, 2002, 2011; Canter, 1977; Cresswell, 2009; Gieryn, 2000; Stokols and

Shumaker, 1981; Williams, 2014) hold three similar dimensions: location, materiality/locale and sense of place (Cresswell, 2009). Williams (2014) explained (1) location as the meaningful places existing in physical realities and shaped by human social boundaries; (2) object construction (e.g., built and natural) as a locale for social relations, and (3) sense of place as the places' significance by individuals. Likewise, Stokols and Shumaker (1981) defined three place components: aspects of meaning, physical properties and relative activity. Agnew (2002, 2011) also described three dimensions of place: sense of place, locale and location after a review from different disciplines on the place notion (see Agnew (2011)).

Overall, a place can be understood as the unit of integration between natural and social resources in a particular environment (Patterson and Williams, 2005). Simultaneously, this union is associational with other places, weaving a network of places that depend on recurrent associations (Thrift, 1999). A place cannot be reduced to just any of its properties without losing its nature (Norberg-Schulz, 1980). Hence, the place-making process is influenced by humans and their subjective connotation. This relationship is a dynamic phenomenon (Hay, 1998) that can be either a conscious (Manzo, 2003) or an unconscious process (Seamon, 1984) shaped by positive or negative emotions (Ahrentzen, 1992).

1.3.3 A citizen-centric smart city approach

Few studies mainly focus on citizens in the smart city realm (Calzada and Cobo, 2015; Granell et al., 2018; Meijer and Bolivar, 2015). Moreover, unfortunately, there is a largely fuzzy idea of what citizen-centric means in practice at the urban context (Cardullo and Kitchin, 2018). Some researchers advocate for making operations and services truly citizen-centric (Bătăgan, 2011) or to seek an open city based on citizen-related challenges (Degbelo et al., 2016). Indeed, the main aim of the smart city approach is to increase the quality of life of their inhabitant (Bakıcı et al., 2012), thus, to improve the citizenship common good. While the citizen-centric approach is still not well-framed in the smart city, alternative ways to perceive and understand the urban context, based on citizens, can emphasize the affective and performative relationships between individuals and the city environment (Duff, 2017).

The human world is constructed and lived through emotions (Anderson and Smith, 2001). We perceive our surroundings in line with our mood and the feelings toward the targeted object. Our interaction with the environment is shaped by how emotions

manage and shape the society-space interplay. This relationship between emotions/feelings toward the city has a fluid nature; it is mobile, represents transformation across boundaries and is unstable through time (Duff, 2011; Pile, 2010). Our interactions with the city underpin the humanist concern for lived experiences and emotional lives (Pile, 2010) that draw a central issue in the study of everyday life (Thrift, 2004). This routine is actively shaped by our attachment toward places that form our daily ground (i.e., sense of place) and the social relationships that we build on them (i.e., social capital). Human geographers study the concept of sense of place as the particular relationship between an individual toward a place (Relph, 1976; Tuan, 1978). The characterization of social relationships has also been studied through the notion of "social capital" notion from many different angles (Szreter, 1998). Both (i.e., sense of place and social capital) and their spatial imprint can underpin a social arena to better comprehend social synergies in the city realm. However, to achieve this social ground an agreement and commitment from citizenship to be active and involved citizens is needed. Thus, as a transversal concept, civic engagement appears crucial to attempt a citizen-centric smart city approach through the participation of citizens in local, community and governmental affairs (Son and Lin, 2008).

1.3.4 A relational ground: Attitude theory

1.3.4.1 Sense of place

Feelings and emotions in the urban context are inevitably affected by place (Conradson, 2005) that actively shape our experiences (Duff, 2011). Sense of place appears in the literature as the feelings, beliefs and behaviors that humans associate with a place (Jorgensen and Stedman, 2001). Its nature is psychologically and socially based, thus it is changing through time and affected by political, economic and environmental influences (Chapin and Knapp, 2015). The definition of sense of place is elusive and controversial (Antonsich, 2010). Despite the different uses of sense of place as a synonym of attachment, belonging or identity, it has also been related to rooted, healthy, self and the philosophical tradition called 'phenomenology' (Relph, 1976; Tuan, 1974, 1978) in human geography. On the other hand, there are positivistic and quantitative approaches to the concept (Jorgensen and Stedman, 2001) and from social anthropology (Williams and Vaske, 2003). Table 1.1 shows a brief collection of the sense of place definitions by diverse authors and perspectives.

Sense of place can comprehend territorial based social relations as well as social interactions with the physical environment (Jorgensen, 2010). Overall, as can be seen in the

Table 1.1: Some definitions of sense of place

Some definitions of sense of place	Author
<i>“Sense of Place was defined as a multidimensional construct comprising: (1) beliefs about the relationship between self and place; (2) feelings toward the place; and (3) the behavioural exclusivity of the place in relation to alternatives”</i>	(Jorgensen and Stedman, 2001, p. 233)
<i>“[...] sense of place [...] the collection of meanings, beliefs, symbols, values, and feelings that individuals and groups associate with a particular locality”</i>	(Williams and Stewart, 1998, p. 19)
<i>“sense of place involves a personal orientation toward place, in which one’s understandings of place and one’s feelings about place become fused in the context of environmental meanings”</i>	(Hummon, 1992, p. 262)
<i>“sense of place broadly as the process by which individuals and groups derive meanings, beliefs, symbols, values, and feelings from a particular locality based on human experience, thoughts, emotions, and social relationships.”</i>	(Chapin and Knapp, 2015, p. 40)
<i>“Sense of place differs from place attachment by considering the social and geographical context of place bonds and the sensing of places, such as aesthetics and a feeling of dwelling.”</i>	(Hay, 1998, p. 5)
<i>“Sense of Place: the particular experience of a person in a particular setting (feeling stimulated, excited, joyous, expansive, and so forth).”</i>	(Steele, 1981)
<i>“individually based, but group informed, localized, personal means of relating to the world, transforming mere space into personal place”</i>	(Hay, 1988, p. 160–161)
<i>‘Sense of place is an experience created by the setting combined with what a person brings to it’</i>	(Steele, 1981, p. 9)
<i>“sense of place as an emotional bonding between people and places is created after cognition”</i>	(Najafi et al., 2011, p. 189)

Table 1.1, a three-component view of the sense of place is predominant in the literature (Stedman, 2002a). Conversely, Hummon (1992) argues two dimensions: community sentiment (i.e., satisfaction, identity and attachment) and community perspective (i.e. people routinely think about the nature and qualities of the community). Relph (1976) comprehend the tripartite based on: physical setting, human activities, and human

social and psychological processes rooted in the setting. Likewise, [Jorgensen and Stedman \(2001, 2006\)](#) conceived sense of place as a multidimensional construct based on: place attachment, place identity and place dependence. This last conceptualization was validated by [Pretty et al. \(2003\)](#) and is one of the most cited in the environmental psychology literature.

1.3.4.2 Social capital

Social resources imply relations of trust and reciprocity that can be associated with social capital ([Bourdieu, 1984](#); [Bourdieu and Wacquant, 1992](#); [Coleman, 1988](#); [Putnam, 2000](#)). Social capital, that is simultaneously an economic, sociological and political concept ([Szreter, 1998](#)), has become popular in large part because it is regarded as a solution to social problems ([Ryan et al., 2008](#)) and is formed at families, communities, firms level, and national or sub-national administrative units and other institutions ([Healy et al., 2001](#)). In general, social capital is an ambiguous and controversial concept since it has been defined differently to suit different ends ([Perkins et al., 2002](#)). The definition of social capital remains contested and mainly based on three different conceptualizations: social theory (e.g., [Bourdieu \(1984\)](#)), sociological economics (e.g., [Coleman \(1988\)](#)) and political science (e.g., [Putnam \(2000\)](#)). Table 1.2 shows a brief collection of social capital definitions by diverse authors.

We can define social capital as the variable that measures the collaboration among different human collectives and the interactions that arise as fruits of these connections through, for instance, trust, reciprocity and cooperation. People find some of their needs through the people they know ([Naughton, 2014](#)). Even, [Baerenholdt and Aarsaether \(2002\)](#) found the network aspect of social capital more determinant than trust or norms. At the collective level, social capital allows network members to perform more complex tasks ([Burt, 2005](#); [Moran, 2005](#)), although a positive attitude toward reciprocity and trust is required to achieve a confident performance ([Foster et al., 2015](#)). The first studies of social capital by psychologists ([Saegert and Winkel, 1998](#)) distinguished four measures of social capital: neighboring, perceived pro-social norms, leadership activity and basic voluntary participation. More recently, community psychologists have been paying attention to two specific constructors: empowerment and sense of community. [Perkins and Long \(2002\)](#) summarized the four dimensions of social capital at the individual level. The informal and affective dimension is defined by trust in one's neighborhood (sense of community or social bonding) and neighboring (informal behavior), while the formal dimensions are designated by collective efficacy or empowerment

Table 1.2: Some definitions of social capital

Definitions	Author
<i>"is a complex account of people's relationships and their value"[...] "the ways in which social ties can be activated to produce particular types of benefit ... [or] negative outcomes"</i>	(Field, 2003, p. 136)
<i>"the norms, networks, and mutual trust of 'civil society' facilitating cooperative action among citizens and institutions"</i>	(Perkins and Long, 2002, p. 291)
<i>"Social capital is about social relations between individuals and about what happens within these linkages"</i>	(Rutten et al., 2010, p. 3)
<i>"networks together with shared norms, values and understandings that facilitate co-operation within or among groups"</i>	(Healy et al., 2001, p. 41)
<i>"social networks and norms of reciprocity can facilitate cooperation for mutual benefit."</i>	(Putnam, 2000, p. 18)
<i>"social, non-formalized networks that are created, maintained and used by the networks' nodes/actors in order to distribute norms, values, preferences and other social attributes and characteristics, but which also emerge as a result of actors sharing some of these attributes."</i>	(Westlund, 2006)
<i>"Social capital's definition includes trust, norms of reciprocity, and social networks."</i>	(Ikeda and Richey, 2005, p. 239)
<i>"I propose that it would be more useful to conceive of social capital in a more traditionally sociological fashion: as consisting of actual or potential resources that inhere within social networks or groups for personal benefit"</i>	(Carpiano, 2006, p. 166)

(cognitive dimension) and the organized behavior; citizen participation (for other conceptualizations of social capital see (Lee and Kim, 2014; McMillan and Chavis, 1986; Sampson and Graif, 2009)).

1.3.4.3 Civic engagement

Civic engagement can be understood as a process or as an event (UNDP Evaluation Office, 2002). Both approaches explain how citizens have a common purpose of promoting public goods (Son and Lin, 2008). Table 1.3 shows a short group of definitions about civic engagement.

Table 1.3: Some definitions of civic engagement

Definitions of citizen/civic engagement	Author
<i>"Civic engagement is considered as an instrument for local governance and a foundation for empowerment of people, which engage citizens in local affairs."</i>	(Mohammadi et al., 2011, p. 215)
<i>"[P]eople participating together for deliberation and collective action within an array of interests, institutions and networks, developing civic identity, and involving people in governance processes."</i>	(Cooper, 2005, p. 534)
<i>"Civic engagement is about participation, empowerment and partnership."</i>	(Zlatareva, 2008, p. 3)
<i>"a process, not an event that closely involves people in the economic social, cultural and political processes that affect their lives."</i>	(UNDP Evaluation Office, 2002, p. 1)
<i>"citizen engagement values the right of citizens to have an informed say in the decisions that affect their lives."</i>	(Sheedy et al., 2008, p. 4)
<i>"Civic engagement describes how an active citizen participates in the life of a community in order to improve conditions for others or to help shape the community's future"</i>	(Adler and Goggin, 2005, p. 241)
<i>"citizen engagement refers to the ways in which citizens participate in the life of a community in order to improve conditions for others or to help shape the community's future."</i>	(Cegarra-Navarro et al., 2014, p. 660)

Overall, from the definitions in Table 1.3, civic engagement is a process of citizens involvement with their society and their government with the aim to address issues of public concern (Son and Lin, 2008), improving conditions of others and helping the community. In other words, the measurement of the right of citizens to have a say in the decisions that affect their lives (Sheedy et al., 2008, p. 4).

1.3.4.4 Attitude theory

Attitudes are held toward some aspect of the individuals' world (e.g., person, object, behavior or policy) and influence the pattern of our responses to the object (Ajzen and Fishbein, 1975). Attitude theory holds two main conceptualizations: unidimensional (i.e., person's location on a dimension of affect or evaluation) and multidimensional (i.e.,

commonly based on cognition, affect and behavior) (Dillon and Kumar, 1985). Rosenberg (1960) took this last approach as the basis of his study which was replicated by many other authors (Ajzen and Fishbein, 1980; Triandis, 1971; Zimbardo and Ebbesen, 1970) as well as validated by Breckler (1984).

Based on the attitude theory, Jorgensen and Stedman (2001) conceptualized sense of place as a multidimensional construct arguing that affect (i.e., place attachment), cognition (i.e., place identity) and behavior (i.e., place dependence) are three distinguishable components of the response to an (spatial) attitude object (i.e., place). Perkins and Long (2002) theorized social capital through four dimensions: sense of community, collective efficacy/empowerment and neighboring and citizen participation. Interestingly, these four dimensions can also be the target of feelings, beliefs, and acts toward individuals or groups (see chapter 2.2). Civic engagement explains associations or ways in which citizens have a common purpose to preserve and promote public goods (Son and Lin, 2008). Amnå (2012) argued that civic engagement also deals with beliefs, feelings, behaviors among others, thus can be predicted by behavioral intentions (Ajzen, 1991; Chen, 2016). Therefore, it seems that there is a common ground on attitude theory (Ajzen and Fishbein, 1975; Fishbein and Ajzen, 1975; Rosenberg, 1960) to encompass the three concepts (i.e., sense of place, social capital and civic engagement). The next step is how to fit them in the smart city realm to elucidate a better citizen-centric approach. Table 1.4 describes the relationship between the three main concepts (i.e., sense of place, social capital and civic engagement), their dimensions and the multidimensional attitude theory conceptualization. The explanation of each dimension of the Table 1.4 is showed in Table 2.1 of chapter 2.

Table 1.4: Attitude theory relation with the main concepts and dimensions of the scientific background. In bold the main concepts; in bold and italics attitude theory dimensions. Note that the conceptualization of civic engagement (Son and Lin, 2008) is a framework and cover the three dimensions of attitude theory in this research

Attitude theory (Ajzen and Fishbein, 1975)	Sense of place (Jorgensen and Stedman, 2001)	Social Capital (Perkins and Long, 2002)	Civic Engagement (Son and Lin, 2008)
<i>Affective</i>	Place attachment	Sense of community	
<i>Cognitive</i>	Place Identity	Collective efficacy (Empowerment)	
<i>Behavior</i>	Place dependence	(formal) Citizen Participation (informal) Neighboring	

1.3.5 A (spatial) relational ground: Agnew (2002, 2011) conceptualization of place

Agnew (2002, 2011) defined three dimensions of place: sense of place, locale and location. The same author described *location* in space as an activity or object located that is related to other sites as a system of mobile places within a city. Those locations influence how individuals perceive themselves (Gotham and Brumley, 2002), influence our social relations (Simms, 2008) and it has an effect on political participation (Mohan and Mohan, 2002). The material shape of spaces and objects location in places is part of the persistent mutuality of the material and the social realm (Latour, 2005). Drawing on the idea of Bruno Latour, the human body is also a tool-being in the place environment (Thrift, 2008). The study of urban context holds a social and emotional resource, as well as a focus on how artefacts shape and allow urban life (Molotch, 2012). However, there have been few studies on the material shape of spaces and objects location in contemporary place-making (Conradson, 2005).

Sense of place and *place attachment* are suitable to be measured as a spatial concept since their affective bonds are toward an area (Altman and Low, 1992; Stedman, 2003). The relationship with the specific place where one develops one's activities and has emotions draws important interest to the comprehension of the daily citizenship context. Every space was conceived for holding a particular action (Najafi et al., 2011). The experience in place can create meaning (Manzo, 2005) at different levels (e.g., neighborhood, city, country) (Hidalgo and Hernández, 2001; Scannell and Gifford, 2010). The current trend in social debates comprehends neighborhood as the ideal spatial container for the analysis of attachment and identity (Casakin et al., 2015; Cattell, 2001; Forrest and Kearns, 2001; Jorgensen, 2010). Nonetheless, some authors argue that the role of the neighborhood only relies on a quality factor (Hays and Kogl, 2007) and its preference responds to available and ordered information (Coulton et al., 2001). In the same line, Hidalgo and Hernández (2001) found that attachment to the neighborhood is the weakest affective spatial range in comparison with house and city.

Locale conceptualization by Agnew (2002, 2011) shares elements with the social capital notion. Locale refers to the settings where daily activities occur, i.e., the geosociological element of place. In this perspective, the location is not a mere position, but the transformation ruled by the social life and environment that structure the social interaction in places (Agnew, 2011). Likewise, as mentioned in subsection 1.3.4.2, social capital analyses the value of social relationships and networks to societies and individuals (Holt, 2008). Although some authors have argued that social capital is not explicitly

spatial (Forrest and Kearns, 2001) or even considered that geographical social capital is almost dead (Radcliffe, 2004), other authors claimed for the potential of understanding and reconceptualizing social capital geographically (Holt, 2008; Mohan and Mohan, 2002; Putnam, 2000; Rutten et al., 2010; Westlund et al., 2010). For instance, Westlund et al. (2010) conceptualize the space into three complex perspectives that allow different kinds of social capital at the individual level. Social capital comprehends the spatial dimension of social relationships between humans (Foster et al., 2015; Rutten et al., 2010) and can considerably vary on individual characteristics (e.g., education, culture, age) (McPherson et al., 2001). The lack of spatial context in the measurement can entail difficulty in determining and analyzing social capital (Cattell, 2001), for instance, in transnational surveys (Westlund et al., 2010).

1.3.6 The spatialization of place-related concepts

Nowadays, no one is neglecting that place and place-related concepts (i.e., sense of place, social capital and civic engagement) have a critical spatial connotation, although the problem arises on how this spatial dimension operationalizes itself. Some non-representational theorists (Dewsbury, 2003; Thrift, 2008) argue on the necessity of not emphasizing representation as the primary step to extract knowledge, but to study what is also possible beyond this representation (Cadman, 2009). In other words, they advocate the significance of that which cannot be brought into representation (Pile, 2010). Arguing the difficulty to relate abstract social phenomena to the features of a particular place in a given time (Thrift, 1983). Likewise, Duff (2011) highlighted the problematic issues of recognizing these essential places through the relevant information from an individual. Some authors argue that the current spatial configuration is inscribing a balance of multiple network positions defined on a folded and striated geography (Murdoch, 1998), rather than purposively territorial or scalar (Amin, 2004). Thus, there is a current of thought that advocates for the rejection of the idea of place aligned as a concept with boundaries (Malpas, 2012).

If we recognize the representation and spatial definition of place and place-related concepts, other problems related to precision and accuracy on its borders appear. While space is strongly related to science and its aims of replicability, i.e., its Euclidean nature based on coordinates make easier its characterization, delimitation and transfer, place, based on human interactions, conveys vague meaning characterized by context (Goodchild and Li, 2011). Place dependency on culture, linguistics, dynamism, time and scale also complicate its boundary definitions (Ballatore, 2016). Furthermore, how cultural,

human and social geographies can be represented and how their representation is being theorized is currently under debate (Anderson, 2017). As stated by (Latour, 2005, p. 184) to enable a place involves practices of scaling, spacing and contextualizing. People interact and live in places, are moving and working in places, thus they cannot be represented as a mere location of an object relative to others (Jordan et al., 1998). Moreover, unfortunately, the exchange between GISc and the humanities has been limited to introduce GIS standard capabilities into humanities projects (Bodenhamer et al., 2013).

The role of GISc, under the umbrella of Qualitative GIS, is the extension of GIS' capabilities with the integration of non-cartographic elements (Elwood and Cope, 2009; Preston and Wilson, 2014). GIS serves to simplify an enormously complex real-world (Jacquez et al., 2000). In turn, GIS has often been accused of considering a simplistic view of the complexity of many geographic ideas (Pickles, 1995). The complexity of human dynamics and the vagueness of the notion of place and place-related concepts make its successful formalization very difficult (Goodchild and Li, 2011). This spatial inaccuracy is featuring the difficulty of building a stable reference frame, although vagueness is endemic in geographic information (Goodchild, 2011). Indeed, the computational representation of place and place-related concepts is one of the critical research areas for the advancement of GISc (Ballatore, 2016, p. 1). Although some studies store place-based data without the requirement to reduce it to a defined space (Huck et al., 2014), technological advances in GISc have provided more meaning about the physical world than for mapping subjective experiences and place-related concepts (Brown and Kytta, 2014).

1.3.7 Assumptions of this research

This research enumerates some assumptions supported by the subsections above. The reason to introduce these assumptions is to better define the city environment, stakeholders and the social concepts treated in this study. These assumptions lay on the background of all the chapters of this research and form the central pillar that underlies this study.

- For a citizen in a given city:
 - There is at least one meaningful place with emotional connections (Scannell and Gifford, 2016) (i.e., sense of place)
 - There is at least one geographically based social network he/she belongs to (e.g., family, friends, social groups) (Bourdieu, 1984; Rutten et al., 2010) (i.e.,

social capital)

- The spatial dimension of those two concepts (i.e., sense of place and social capital) are aligned with the essence of (Agnew, 2002, 2011) notion of place.
- Sense of place (Jorgensen and Stedman, 2001), social capital (Perkins and Long, 2002) and civic engagement (Son and Lin, 2008) can be understood based on the attitude theory (Ajzen and Fishbein, 1975; Rosenberg, 1960), being important concepts (among others) for the conceptualization of a citizen-centric smart city approach based on the relationship of their spatial dimensions

1.4 Relevance

The citizenship place network of the cities is still hidden. Although many authors foresaw theoretically the platial structure of the city (Duff, 2011; Latour, 2005; Massey, 1994; Murdoch, 1998; Roche, 2016), its operationalization is yet a contemporary constraint in urban studies. City councils just hold their hierarchical administrative boundaries to deliver their policies and actions. We foresee the relevance to add alternative landscapes based on the spatial relationship between sense of place and social capital. Our governments are attempting to solve city social issues just knowing where we live or work. That is not that simple. It is relevant to note individuals' spatialities to better decide what actions over the city can affect to whom, instead of base this decision to a mere postal address. Our individual spatialities need to be recognized as available resources for all the city's stakeholders to set up useful alternative geographies. The comprehension of these platial dynamics and the human-urban interactions within a city offer, for instance, better performance in urban planning processes (Lewicka, 2005, 2011b; Manzo and Perkins, 2006; Perkins et al., 1996). We are proposing to contribute toward the understanding of the city in another way, where citizens' attitudes regarding social, places and participation are fostered through their spatial dimension. This spatial perspective to social concepts could be the pivotal aspect for embedding them into the urban context.

1.5 Research questions

According to the previous sections, we state five main research questions that we attempt to answer throughout the chapters of this research. Each question tries to help or extend the previous one to concatenate a common thread.

- How can the spatial relationship between sense of place and social capital be conceptualized in the urban context?

There are several types of research about people's relation to a place and their degree of attachment, but we do not know enough about where exactly these meaningful relationships and places are (Hidalgo and Hernández, 2001; Lewicka, 2011b).

- How can the spatial dimensions of sense of place, social capital and civic engagement be defined in the urban context?

We are witnessing a rise in the importance of human-city interaction, but there is a lack of tools and techniques to geographically define these associations (Brown and Kytä, 2014; Lalli, 1992; Stedman, 2003). For a citizen-centric smart city approach, based on individuals' spatialities, is crucial to gather and understand the spatial configuration of human data that draws on our attitudes toward the city and their resources.

- What is the spatial relationship between sense of place and social capital in the urban context?

Although some studies systematically demonstrate that some forms of social capital are predictors of sense of place (Mesch and Manor, 1998; Raymond et al., 2010; Scannell and Gifford, 2010), their spatial imprint in the city has not been studied and validated to date.

- How can the spatial relationship between sense of place and social capital in the urban context be related with the spatial urban dynamics and the notion of urban intelligence?

Urban intelligence is related to our capability to understand urban dynamics which are dependent on the spatial organization of place. Hence, both sense of place and social capital spatial dimensions can elucidate the spatial configuration of urban intelligence.

- What is the influence of sense of place and social capital on civic engagement when taking in consideration their spatial relationship?

The relationship between sense of place, social capital and civic engagement have been studied in the literature, but not from a geographical perspective that can embed better performance in participatory processes.

1.6 Objectives

Taking into consideration the research questions previously stated, this research has two main objectives:

- To formalize and study the spatial relationship between sense of place and social capital in the urban context.

To test whether sense of place and social capital have a **spatial dimension/imprint/footprint** and a possible shared spatial dimension in the urban context.

- To investigate the suitability of this new spatial approach (i.e., spatial relationship between sense of place and social capital) for alternative city configurations such as platial urban dynamics and other place-related concepts (e.g., civic engagement).

A non-operationalized spatial configuration is leading city processes based on the place notion. This research aims to elucidate more knowledge in the study of the network that embeds the urban dynamic of the city.

The specific objectives of the research are:

1. To perform a literature review about sense of place and social capital and their dimensions.
2. To propose a framework based on the spatial formalization between sense of place and social capital.
3. To build a tool to gather the spatial data of sense of place, social capital and civic engagement.
4. To gather and analyze the spatial data of sense of place, social capital and civic engagement.
5. To investigate their spatial relationships.
6. To study its spatial relationship and behavior toward the notion of urban intelligence and place.
7. To assess the importance of understanding their spatial dimension in the context of civic engagement.

1.7 Contributions

The contributions of this research are:

- Theoretical contributions
 - An innovative (spatial) conceptual framework for sense of place and social capital at the individual level. Researchers will dispose of a robust conceptual framework ready to build other socially-oriented conceptualizations or applications on top of it.
 - New insights into the discussion of the city spatial configuration, as well as the evaluation of our framework when is related to other concepts' spatial dimensions (e.g., civic engagement)
- Practical contributions
 - The validation of our spatial conceptual framework through spatial data gathered from our PPGIS application that merge a web map-based approach with traditional questionnaires based on SoftGIS methodology (Kahila and Kytta, 2009; Kytta and Kahila, 2011). We built an open source web map-based survey to better understand the spatial behavior of social concepts. This web map-based survey is in line with the fulfillment of the requirement of the GEO-C project¹ to contribute to the open city toolkit². This tool could be understood as a template for new products based on spatializing and measuring several kind of notions, and it is open source, therefore, replicable and reusable.
 - New findings of the spatial dimension of sense of place and social capital in the urban context, i.e., spatial variability, distribution and relationship. This understanding provides information about individuals' spatialities regarding sense of place and social capital and, simultaneously, recognize the couple as inhibitors of place-making.
 - A methodology (1) to add the spatial dimension of social concepts into statistical methods (i.e., SEM); and (2) to acquire the spatial dimension of social concepts through GISc techniques and tools. This procedure can be a valuable resource for the advance in qualitative or mixed GIS methods.

¹<http://www.geo-c.eu> [accessed on 17th of August]

²<http://www.geo-c.eu/opencitytoolkit> [accessed on 17th of August]

1.8 Research organization

This dissertation is based and organized by research articles, published, under revision or submitted to scientific journals³. Figure 1.2 shows a visual relational schema to understand the hierarchy and weight of each chapter. At a first glance, Figure 1.2 has a concentric design. It wants to emulate a fruit as a metaphor for our research. In the middle, the seed or core (chapter 2) that is covered by two layers to help, protect and extend the "roots" of our research (chapters 3 and 4). Finally, from the fruit starts to appear a new one, smaller, that can evolve in a promising area of future scholarship (chapter 5).

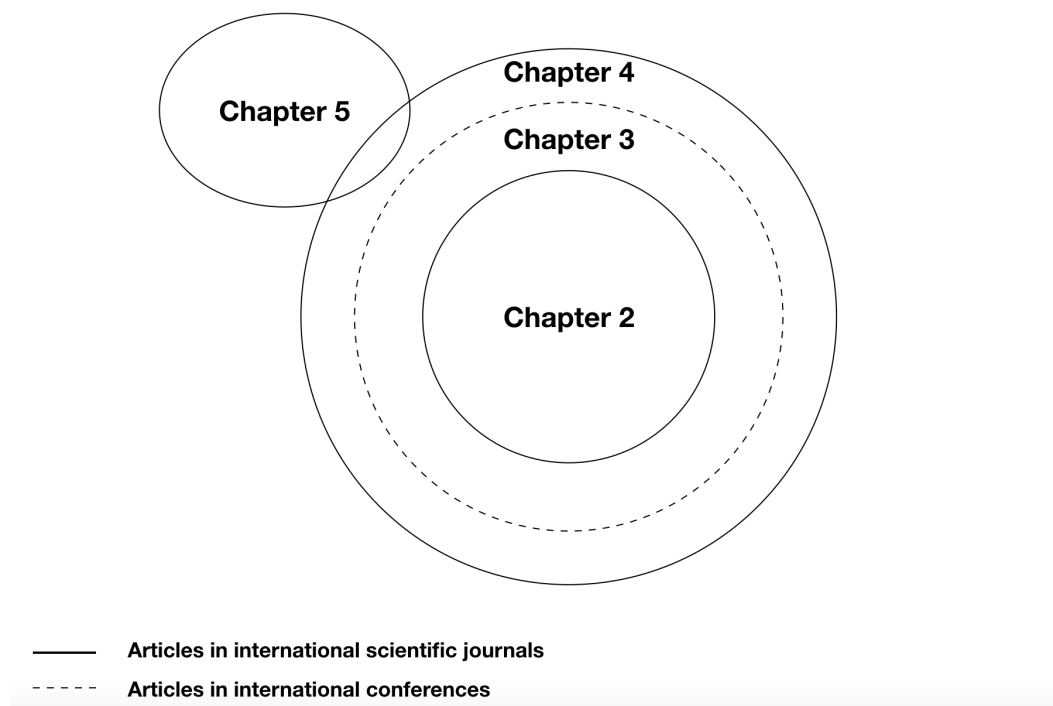


Figure 1.2: Visual schema of the research organization

The current chapter 1 stands as the introductory chapter, including the problem statement, scientific background, relevance, research questions, objectives, expected contribution of this research, as well as the outline of the document.

Chapter 2 depicts the core of the research; its foundations. It contains the formal conceptualization and initial conceptual framework (based on a systematic literature

³As a consequence of this format, the reader may find some repetition of ideas and concepts in the introductory and related work sections of each chapter. In this format, this is unavoidable.

review) which explicitly describes the relationship between sense of place and social capital, and their dimensions in a given city and from a spatial point of view. The text from this chapter has been published by [Acedo et al. \(2017b\)](#).

Chapter 3 (discontinuous line in Figure 1.2) wraps the core of the research since it is the explanation of the tool that collects the spatial data pointed in chapter 2. It presents the tool - a web map-based survey - to [spatialize/spatialization](#) subjective citizens' feelings, perceptions and experiences. The tool merges GISc framework and tools with questions and indicators from the literature about sense of place, social capital and civic engagement. The text from this chapter has been published by [Acedo et al. \(2017a\)](#).

Chapter 4 operationalizes and proves chapter 2. It describes an exploratory examination of platial urban dynamics and urban intelligence through the geographical relationship between sense of place and social capital at the collective and individual level. It forms the practical ground to build different studies on top of it. The text from this chapter has been published by [Acedo et al. \(2018a\)](#).

Chapter 5 is one evaluation of our framework. It describes the crucial (spatial) connection between sense of place and social capital to explain civic engagement. The text from this chapter is submitted to the International Journal Heliyon.

Chapter 6 portrays the main contributions, limitations, future research and the final remarks of our research.

Finally, the first three appendices contain auxiliary material to complement chapters 2, 4 and 5 and the last three appendices include three conference papers related to the future line of research. (Appendixes D, E and F).

- Appendix A to C contain Figures and Tables that supplement main chapters of the research.
 - Appendix A corresponds to the auxiliary material of chapter 2
 - Appendix B corresponds to the auxiliary material of chapter 4
 - Appendix C corresponds to the auxiliary material of chapter 5
- Appendix D describes the relationship between where people develop activities and places in which citizens have a sense of place. The text from this appendix has been published by [Acedo et al. \(2018b\)](#).
- Appendix E illustrates an exploratory study that draws an attempt on the comparison of the human attitude toward places (i.e., sense of place) and the spatial characteristics of the targeted geographical area to understand the notion of place.

- Appendix F develops the concept of “in-between” places in relation to the study of language, perceptions and memories within the broader mediation of cartography. Through three experiments, we highlight the importance of in-between places for a complete conceptualization of place. The text from this appendix has been published by [Portela et al. \(2018\)](#).

1.8.1 Publications

As stated before, the chapters 2, 4, and 5 correspond to three journal articles that have been published or are under review by international scientific journals. The chapter 3 and the appendixes D and E illustrate the conference papers. The appendix F shows the journal paper in which the author of this research has co-authored. Table 1.5 lists the full reference of the articles and relates; each scientific contribution to the corresponding research chapter and the authors contribution to each scientific paper. Note that they are presented as published by the journals with the exception of some layout changes (e.g., the bibliographic references have been harmonized in the reference section).

Table 1.5: Research chapters and corresponding publications in international scientific journals and conferences

Chapter	Reference	Author contribution ⁴
2	Acedo, A., Painho, M., and Casteleyn, S. Place and city: Operationalizing sense of place and social capital in the urban context. <i>Transactions in GIS</i> , 21(3):503–520, 6 2017b. doi:10.1111/tgis.12282 .	Conceptualization, AA, MP; Data curation, AA; Formal analysis, AA, MP; Investigation, AA; Methodology, AA, MP; Visualization, AA, MP; Writing – original draft, AA; Writing – review & editing, MP, SC.

⁴Authors’ acronyms: AA – Albert Acedo, MP – Marco Painho, SC – Sven Casteleyn, GM – German Mendoza, SR – Stéphane Roche, FS – Fernando Santa, MN – Mijail Naranjo-Zolotov, TO – Tiago Oliveira, RH – Roberto Henriques, MPT – Manuel Portela and CG – Carlos Granell

- | | | |
|---|---|--|
| 3 | <p>Acedo, A., Mendoza, G., Painho, M., and Casteleyn, S., 2017. One tool to spatialize all : sense of place , social capital and civic engagement. In: A. Bregt, T. Sarjakoski, R. Lammeren, and F. Rip, eds. <i>Societal Geo-Innovation : short papers, posters and poster abstracts of the 20th AGILE Conference on Geographic Information Science</i> Wageningen: Wageningen University and Research, 5. ISBN 978-90-816960-7-4.</p> | <p>Conceptualization, AA; Data curation, AA, GM; Investigation, AA, GM; Methodology, AA, GM; Software, AA, GM; Visualization, AA, GM; Writing – original draft, AA, GM; Writing – review & editing, MP, SC.</p> |
| 4 | <p>Acedo, A., Painho, M., Casteleyn, S., and Roche, S., 2018. Place and City: Toward Urban Intelligence. <i>ISPRS International Journal of Geo-Information</i>, 7 (9), 346. doi : 10.3390/ijgi7090346.</p> | <p>Conceptualization, AA, SR, MP; Data curation, AA; Formal analysis, AA; Investigation, AA; Methodology, AA; Software, AA; Visualization, AA; Writing – original draft, AA; Writing – review & editing, MP, SC.</p> |
| 5 | <p>Acedo, A.; Oliveira, T.; Naranjo-Zolotov, M.; Painho, M. Place and city: Toward a geography of engagement. Under review in the <i>International Journal Heliyon</i></p> | <p>Conceptualization, AA, MP; Data curation, AA; Formal analysis, AA; Investigation, AA; Methodology, AA, MN; Software, AA, MN; Visualization, AA, MN; Writing – original draft, AA, MN; Writing – review & editing, MP, TO.</p> |

Appendix D	Acedo, A., Santa, F., Painho, M., and Henriques, R., 2018. Do people develop activities at places in which citizens have a sense of place? In: Mansourian, A., Pilesjö, P., Harrie, L., and von Lammeren, R. (Eds.), 2018. Geospatial Technologies for All : short papers, posters and poster abstracts of the 21th AGILE Conference on Geographic Information Science. Lund University 12-15 June 2018, Lund, Sweden. ISBN 978-3-319-78208-9.	Conceptualization, AA, FS; Data curation, AA,FS; Formal analysis, AA, FS; Investigation, AA, FS; Methodology, AA, FS; Resources, AA, FS; Software, AA, FS; Visualization, AA, FS; Writing – original draft, AA, FS; Writing – review & editing, MP, RH.
Appendix E	Acedo, A.; Mendoza, G.; Painho, M. Finding the bridge between individuals’ perceptions and spatial features in the notion of place. (Presented at GI-forum conference)	Conceptualization, AA; Data curation, AA, GM; Formal analysis, AA, GM; Investigation, AA; Methodology, AA, GM; Software, AA, GM; Visualization, AA, GM; Writing – original draft, AA, GM; Writing – review & editing, MP.
Appendix F	Manuel Portela, Albert Acedo, and Carlos Granell-canut. Looking for “in - between” Places. <i>Media Theory</i> , 2(1):108–133, 2018	Conceptualization, MPT; Data curation, AA, MPT; Formal analysis, MPT; Investigation, MPT, AA; Methodology, AA, MPT; Software, AA; Visualization, MPT, AA; Writing – original draft, MPT; Writing – review & editing, AA, GC.

PLACE AND CITY: OPERATIONALIZING SENSE OF PLACE AND SOCIAL CAPITAL IN THE URBAN CONTEXT

Abstract¹

The academic interest in social concepts in city contexts, such as sense of place and social capital, has been growing in the last decades. We present a systematic literature review that confirms the strong relation between sense of place and social capital from a Social Sciences point of view. On the other hand, they also reveal that little attention has been paid to their spatial dimensions at the urban level, thereby missing the chance to exploit socio-spatial knowledge to improve day-to-day life and functioning in/of the city (e.g., in planning processes, citizen participation, civic engagement). We therefore examine sense of place and social capital from a Geographic Information Science (GISc) viewpoint, and present a formal conceptualization and initial theoretical framework that explicitly describes both concepts, and the relation between them, within the context of a city and from a spatial point of view.

¹The text from this chapter has been published as Acedo, A., Painho, M., and Casteleyn, S. Place and city: Operationalizing sense of place and social capital in the urban context. *Transactions in GIS*, 21(3):503–520, 6 2017b. doi:10.1111/tgis.12282.

2.1 Introduction

Sixteen years have passed since [Putnam \(2000\)](#) pointed out the potential of understanding social capital (SC) as a geographical concept. Since then, more authors have recognized the urgency of a better spatial understanding of the environmental psychological concept sense of place (SOP) ([Jorgensen and Stedman, 2011](#); [Stedman, 2003](#)). Currently, governments and cities are starting to see the importance of the ability of citizens, firms and organizations to manage and be aware of their spatial footprint in the city ([Roche, 2014](#)). On the other hand, in Geographic Information Science (GISc), the importance of place seems to have grown with the development of new concepts such as Volunteered Geographic Information (VGI) ([Goodchild, 2007](#)), geosocial applications, Geoweb 2.0 and other related concepts. Hence, interesting and potentially useful connections are emerging between social science concepts (SOP and SC) and cities from a GISc point of view, that, nowadays, we are not able to operationalize. Fortunately, the surge of smart cities, with associated Information and Communication Technology (ICT) research and tools, is allowing new approaches and ways to manage the urban environment, which enables new channels of communication. Moreover, geospatial technologies are omnipresent in these new tools, thus demonstrating the growth of interest in the spatial dimension of social concepts. Furthermore, in many cases, a smart city is considered a technological paradigm, where technological solutions are often disconnected from society's needs and aspirations ([Calzada and Cobo, 2015](#); [Vanolo, 2016](#)). The spatial inclusion of citizens' social aspects in the urban context, such as our feelings, perceptions, and behaviors, form the path toward citizen-centric models and frameworks based on a social-spatial view on a city, that is, it provides an understanding of the social domain (SOP and SC) and its spatial dimensions. Furthermore, we emphasize that GISc can help in fulfilling this pervasive lack of social-spatial analysis, by providing theoretical foundation and practical tools to represent and map subjective feelings and experiences.

Nowadays, cities use their hierarchical administrative boundaries to deliver their policies and actions. For instance, participatory processes in planning decisions or decision-making processes about communal spaces are framed and regulated in administrative boundaries. The underlying reason is the availability of census and socioeconomic data in those areas ([Dietz, 2002](#)). We are setting up participatory processes in predefined spaces without knowing whether those are the suitable places to successfully apply them. Furthermore, usually not all citizens are aware of, or identify themselves with a whole parish or neighborhood. They are linked to places that are meaningful to them for some reason, or they are settlers of geographically located communities,

but whose boundaries may or may not coincide with administrative ones. We are using administrative boundaries instead of functional ones, in other words, we are using old boundaries to tackle contemporary social problems, simply because our understanding of alternatives is limited, are not readily available, or are more complicated to implement. The formalization of the spatial relations between citizens and cities can clarify citizens' actual geographic boundaries and attachments, thus creating alternative local citizen-defined spatial clusters. Researchers have recognized the need to be able to identify new boundaries that respect the city interactions based on a socio-geographic approach for social issues (Foster and Hipp, 2011). These boundaries, for instance, can take into account geographic proximity, citizens passive and active interactions and engagement (for more information see t-communities (Grannis, 2009)). Therefore, it makes sense to wonder if our cities are considering the appropriate areas to develop local community initiatives and participatory processes, and if the low rates of participation in developed countries (Aricat and Ling, 2016) can be attributed to the use of inappropriate boundaries. In the same line, Foster and Hipp (2011) argue that administrative boundaries cannot be valid aggregate measures of neighborhoods. Our innovative method to achieve a truly citizen-based social view on a city is focused on how citizens perceive their spatial surroundings, with respect to 1) the relationship that an individual has toward a certain geographical area (i.e., SOP) (Jorgensen and Stedman, 2001) and 2) the "*social relations between individuals and about what happens within these linkages*" (Rutten et al., 2010, p. 3), for instance, trust, reciprocity, and cooperation (i.e., SC). Both concepts (SOP and SC) play an important role in citizen participation (CP) and civic engagement (Jorgensen, 2010; Mihaylov and Perkins, 2013). SOP and SC concepts and their dimensions are highly related, although little attention has been paid to their spatial aspect. Moreover, most researchers dealing with the spatialization of social concepts through GISc tools are taking the administrative boundaries of physical space as reference (Coulton et al., 2001; Foster et al., 2015), losing variability on measurement (Jorgensen, 2010). Hence, we question whether administrative boundaries are an adequate tool for covering SOP and local SC of citizens in a particular area.

There are several types of research about people relation to a place and their degree of attachment, but we don't know enough about where exactly these meaningful relationships and places are (Lewicka, 2011b). We are talking about dynamic areas that collect our feelings and perceptions as opposed to static places which researchers have already well-detected emotional relationships such as sacred sites or burial grounds. Consequently, the urban context encompasses a vast amount of information about our perceptions and feelings, yet city authorities, and smart city in general, are incapable

of processing them. For example, at the city level we are missing techniques to spatialize information about environmental psychology concepts (Stedman, 2003). Therefore, this research attempts to create citizen-defined areas in the urban domain, by embedding the spatial dimensions of citizens' SOP and SC. Simultaneously, it proposes a conceptualization and theoretical framework based on citizens' cognitions, feelings and behaviors towards city places and meaningful human relationships embedded in them. The resultant SOP and SC areas will hereby also be influenced by preconceived mental maps of the city that contain physical characteristics (paths, edges, districts, nodes and landmarks (Lynch, 1960)). The proposed framework thus recognizes the human perception and organization of social interactions fostered through geographic place(s), hereby defining citizen-defined areas that move beyond mere administrative boundaries. At the same time, we expose that GISc provides an appropriate context in which to develop suitable spatial tools and map-surveys for the spatialization of concepts from social science (SC) and environmental psychology (SOP). The article starts (section 2.2) with the review of SOP and SC concepts, and their dimensions from a non-spatial perspective. The article then covers the spatial approach to SOP and SC, building the basis of our theoretical framework and their exploration (section 2.3). This is followed by a discussion on the contributions, remaining gaps and limitations (section 2.4) of this research.

2.2 Background: the non-spatial approach

SOP and SC cover a considerable number of basic environmental and community psychological dimensions between citizens and city, respectively. To date, researchers have emphasized the classic approach, which mostly lacks an explicit spatial focus. However, place itself seems to be a central issue in place attachment (PA) and SOP (Hidalgo, 2013; Lewicka, 2011b; Scannell and Gifford, 2010) and an important dimension of SC (Jorgensen, 2010; Jorgensen and Stedman, 2011; Rutten et al., 2010). Place maintains its importance in a globalized world and it is an object of strong attachment (Lewicka, 2011b). People still identify their attachment with physical space (Westlund et al., 2010) and use space in different manners in their daily life. These uses shape how they conceive the world and their location in it (Foster et al., 2015), influencing how individuals perceive themselves (Gotham and Brumley, 2002) and influence our social relationships (Simms, 2008). Place definition, usually applied by geographers, comprises the SOP dimension. SOP explains the cognitive, affective, and behavioral dimensions of the relationship that an individual has with a certain geographical area (Jorgensen and

Stedman, 2001). This relationship can clearly also be influenced by the dwellers of target-attachment place (Bernardo and Palma-Oliveira, 2016). On the other hand, SC refers to the relationships between human collectives (social networks) and the interactions that arise as fruits of these connections through, for instance, trust, reciprocity, and cooperation. SC describes social network structures (structuralist perspective) and behaviors within these relationships (interactionist perspective) (Rutten et al., 2010). SC is essential for collaborative purposes, success within communities and civic actions (Johnson, 2016; Lewicka, 2005), while a positive SOP implies greater engagement in participation processes (Perkins et al., 1996) and can promote a better quality of life (Harris et al., 1995).

The dimensions considered for SOP and SC (Figure 2.1), crucial to understand their relationship, are based on the conceptualization of Jorgensen and Stedman (2001) and Perkins and Long (2002), respectively.

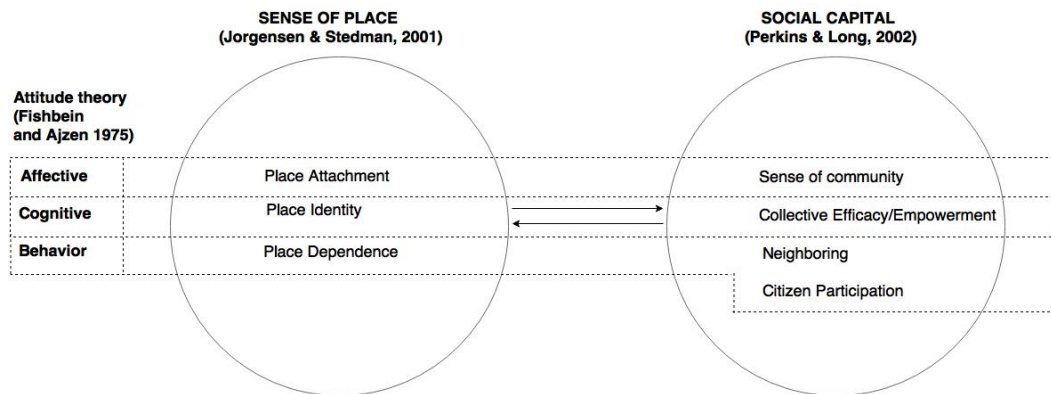


Figure 2.1: Theoretical framework that encompasses the background of this article

SOP (Jorgensen and Stedman, 2001) has its basis in the attitude theory (Fishbein and Ajzen, 1975). Jorgensen and Stedman (2001) created an analogy relating PA (feelings and emotions toward a place) with the affective perspective of the attitude theory; the cognitive approach with place identity (PI) (thoughts and beliefs according to a place) and behavioral attitude with place dependence (PD) (acts and behaves toward a place). Furthermore, this article contributes to the field applying the attitude theory (Fishbein and Ajzen, 1975) also for Perkins and Long (2002) conceptualization of SC dimensions. Our relationships can also be the target of feelings, beliefs, and acts. Hence, sense of community (SOC) can be encompassed as a feeling or emotion toward groups to which you belong, collective efficacy/empowerment (CE/E) as the belief and thought of the potentiality of acting together and, finally, both neighboring (N) and CP enclose

the actions and behaviors of citizens to a group or society. Place and people can be understood as an object that covers an attitude, following an evaluative approach in which their dimensions are attitudinal expressions toward objects or people. Thereby, in the same line of our conceptualization of a citizen-centric social city approach, the main concepts of this research, SOP and SC, are based on citizens, especially on attitudes, perceptions, and behaviors related to places and people, respectively. The different dimensions and related definitions encompassed in both main concepts (SOP and SC) show the holistic view that this article embraces. We are dealing with several human interactions in the urban context to define a new perspective of and for citizens. Table 2.1 shows the definitions of each dimension to better understand the magnitude and scope of both concepts: SC and SOP.

An elaborate explanation of these dimensions (Table 2.1) is beyond of the scope of this article. However, their interaction and relationships are critical to understand 1) their possible connection in the non-spatial approach and 2) their feasible spatial relationship and footprint in the geographical domain. In turn, to be able to explain these two points, we performed a systematic literature review with two queries. Figures 2.2 and 2.3 summarize the relationships between the main concepts (SOP and SC) and their relationships based on the systematic literature review. This review only considers articles that were published or indexed after 2001 and before May 2016. The former year was selected since the conceptualization of SOP (Jorgensen and Stedman, 2001), presents in this research, was first proposed. The latter date is the period in which the procedure for selecting the studies for this review was conducted. Figure A.1 of the Appendix A shows the methodology followed for the systematic literature review. Two search queries were used on a set of academic databases, and the same procedure was performed on the output of both queries:

1. *Search query 1 (SQ1)* — We started by searching all dimensions and main concepts by pairs, based on the initial conceptualization articles of SOP (Jorgensen and Stedman, 2001) and SC (Perkins and Long, 2002), in the title in two academic databases (Science Direct and ISI Web of knowledge), which resulted in 296 publications. Subsequently, the results from the two databases were merged, and duplicate studies were removed. This left us with 234 publications. Then, we manually went through the titles of the remaining studies, removing those articles not relevant to our goal. This reduced the number of potential studies to 108. The following step was to scan the abstracts manually for relevance, which reduced the number of studies to 47. Finally, we went through the full-text of the studies,

Table 2.1: Definitions of the dimensions for social capital and sense of place

Dimensions (SC/SOP)	Definition
Sense of community (SOC)	is the feeling of membership or belongingness to a group, containing possible emotional connection on a shared history, common interests, or concerns (Perkins and Long, 2002).
Collective efficacy/Empowerment (CE/E)	<i>“or trust in the effectiveness of organized community action, is closest to the concept of empowerment among all the social capital dimensions and their predictors.”</i> (Perkins and Long, 2002, p. 295)
Neighboring (N)	<i>“Neighboring is the help we informally provide, and receive from, neighbors.”</i> (Mihaylov and Perkins, 2013, p. 69), or the ordinary social interactions with neighbors (Perkins et al., 2002).
Citizen Participation (CP)	<i>“Individual and community participation in grassroots voluntary associations (e.g., civic and faith-based organizations, local environmental groups) and other mediating structures is determined by both residents’ capacity to respond to environmental hazards individually and collectively and local institutions’ capacity for responding to those affected and involving them in making decisions.”</i> (Mihaylov and Perkins, 2013, p. 69)
Place Attachment (PA)	<i>“place attachment means emotional bonds which people develop with various places”</i> (Lewicka, 2011b, p. 219).
Place Dependence (PD)	refers to the useful value (services, aesthetic) that a place has in comparison to other places to satisfy an individual’s specific goals and desired activities (Stedman, 2002b).
Place Identity (PI)	<i>“physical world socialization of the self”</i> (Proshansky et al., 1983, p. 57) such as <i>“this place is part of my identity [...] this place is part of how I want to others to think of me”</i> (Trentelman, 2009, p. 200).

applying the following rule (a): we only consider an article if it explicitly connects or relates one dimension (PA,PD,PI,SOC,N,CE/E,CP) or main concept (SOP,SC) to another. This resulted in 8 studies.

2. *Search query 2 (SQ2)* — We performed an identical procedure as previous one. SQ2 searches for all matches between dimensions and main concepts AND the following words: “mapping”, “spatial dimension” and “spatializing” in the same academic databases. We obtained 54 none-duplicate results (from 68 articles). Then, we manually proceed through the titles, reducing the amount to 7 articles, before to manually scan the abstracts: obtaining 4 articles. Finally, we revised full-text of the remaining studies, applying the rule (a), resulting in 1 study.

Afterward, we performed an expansion step checking if any reference in the 9 obtained studies follows rule (a). Duplicates were eliminated. We obtained eight articles that fulfill rule (a), hence they were included in the final set. Concretely, from SQ1, [Talò et al. \(2014\)](#) is a meta-analytic review that offered five suitable articles, and the article from [Lewicka \(2005\)](#) cited a research conducted by [Mesch and Manor \(1998\)](#) that also adheres to rule (a). Finally, from the considered study resulting from SQ2 ([Brown et al., 2015](#)) we also consider two articles referenced in it. The final set of 18 articles (including the SC conceptualization from [Perkins and Long \(2002\)](#), which complies with rule (a); [Jorgensen and Stedman \(2001\)](#) is not included as it does not comply with rule (a)) are described in Table A.1 (see Appendix A). Figure 2.2 show the relational dimensions for each main concept (SOP and SC) that summarize and generalize the connections between the dimensions for SOP and SC. It is clear that PA and SOC (Figure 2.2) are the most significant and related dimensions for SOP and SC, respectively. CP is the main response dimension of SC while there is no relationship between N and E, in accordance with [Perkins and Long \(2002\)](#). CP is in all of the cases a responsive dimension, except with collective efficacy/empowerment (CE/E) that is, simultaneously, a cause and an effect (Figure 2.2). SOC stands out as being the central dimension of SC as it can affect the other dimensions. Indeed, the connection between SOC and CP is the relationship most often cited in the related literature (see Figure 2.2), highlighting the important role of SOC in participatory processes (for more information please see ([Talò et al., 2014](#))). On the other hand, Figure 2.3 depicts the connections found between the dimensions of SC and SOP.

Figure 2.3 summarizes the relationship between SOP and SC as extracted from the literature review. We highlight that not all authors notice the relationships between

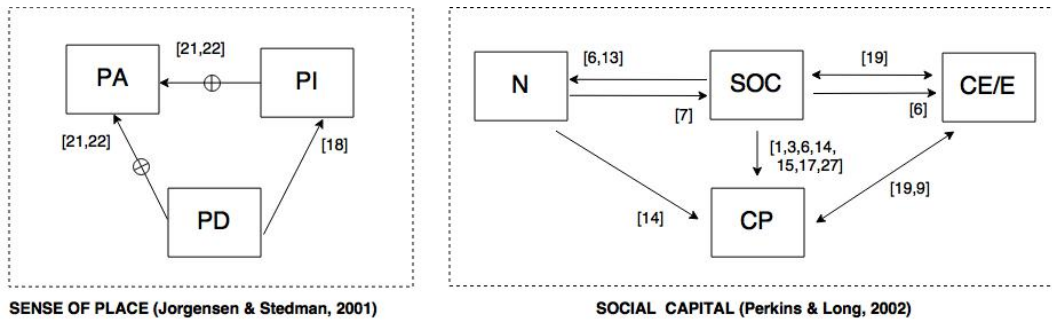


Figure 2a

Figure 2b

Legend

- ←⊕ Dimension relation
- ← Relationship
- [#] Source on the literature (see Table 3)

- | | | |
|---------------------------------|--|--|
| PA Place Attachment | PD Place Dependence | SOC Sense of community |
| PI Place Identity | CE/E Collective Efficacy Empowerment | N Neighboring |
| CP Citizen Participation | Main concept | Dimension |

Figure 2.2: Relational schema of the dimensions for each concept: sense of place and social capital. Each relation (arrow) is supported by the literature, the respective references indicated by numbers are listed in Table A.1 of the Appendix A

the concepts of this research. The analysis of Figure 2.3 shows the relationships between the main concepts of this research based on the aforementioned citations and depicts literature-based evidence that SOP and SC are strongly related. Overall, the PA dimension of SOP is the dimension most related with all the dimensions of SC. Furthermore, almost all the dimensions of SOP (PA and PI) are also pointing to CP and CE/E. Therefore, based on the literature reviewed, in the non-spatial perspective both concepts (SOP and SC) show a strong connection between them and their dimensions. Our conceptualization of SOP and SC based on Jorgensen and Stedman (2001) and Perkins et al. (2002), respectively, and founded on attitude theory ((Fishbein and Ajzen, 1975); Figure 2.1), creates a suitable environment to relate the concepts in both the theoretical and geographical domain. While the theoretical relationships between the SC and SOP dimensions are well documented and studied, the spatial relationship – or even just spatialization – of each concept remains unclear. Few attempts to explicitly gather theoretical knowledge of the spatialization of SOP and SC have been undertaken. That is, to transfer the non-spatial knowledge on SOP and SC to the geographical domain. We argue for the importance of understanding and knowing where these areas are at the city level for creating an alternative to administrative boundaries, for instance, in

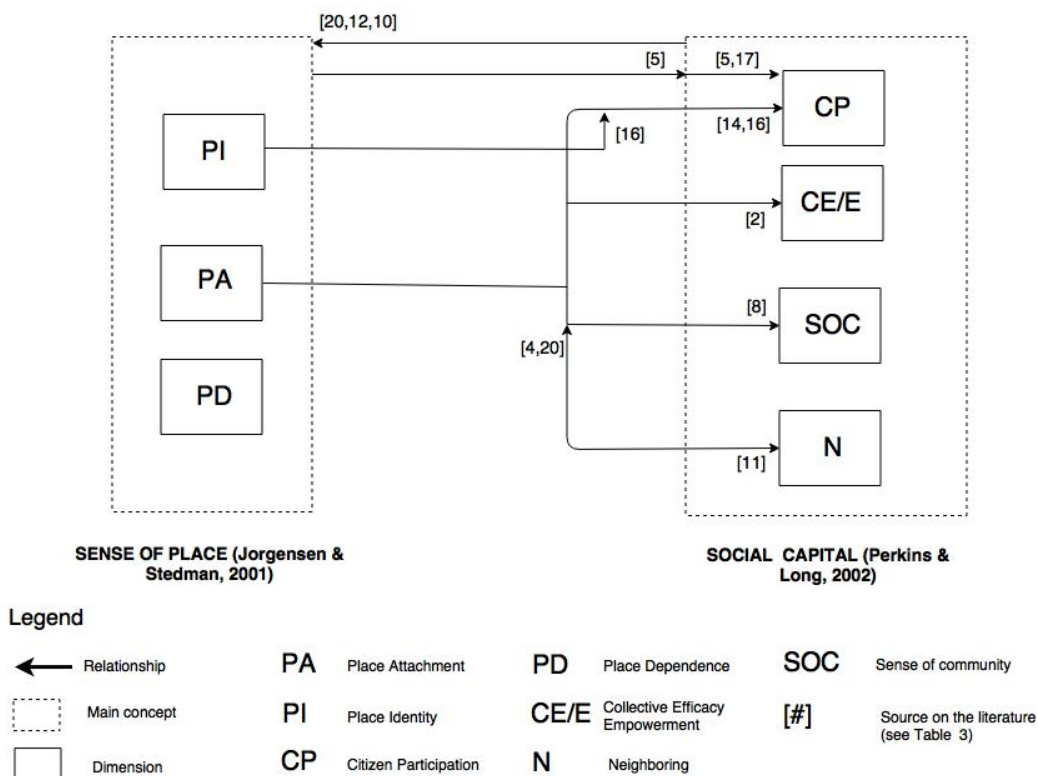


Figure 2.3: Schema showing the relationships between sense of place and social capital dimensions. Each relationship (arrow) is supported by the literature, the respective references indicated by numbers and listed in Table A.1 of the Appendix A

participatory processes. Simultaneously, these new areas are the arena for the first step to achieve a citizen-based social environment in the urban context.

2.3 Reasoning for a spatial approach

In the non-spatial perspective (Figure 2.1), both concepts (SOP and SC) have a strong connection between them and their dimensions (Figures 2.2 and 2.3). However, to the best of our knowledge, this is the first study attempting to analyse SOP and SC's spatial relationship considering them as independent spatial dimensions at the individual level. There are distinct approaches to measure SOP. Map-based methodologies for measuring landscape values and SOP for scales larger than a neighborhood have been developed by Brown and his colleagues (Brown and Raymond, 2007; Brown et al., 2015; Raymond and Brown, 2007; Raymond et al., 2010). Furthermore, there have been some

attempts to draw cognitive and affective (Brown et al., 2015; Syme et al., 2002) maps. Recently, Jenkins et al. (2016a) merged twitter data using social networks analysis (SNA) and volunteered geographic information (VGI) from Wikipedia to spatialize a collective SOP, being the first research merging SNA and VGI to define SOP. On the other hand, the spatial measurement of SC is related to the spatial delimitation of geographical based social networks from a structuralist perspective (Rutten et al., 2010). There are distinct approaches to measure the spatial dimension of SC. The SC spatial dimension can be embedded in the cognitive neighborhood (Foster et al., 2015) or extracted from SNA (Andris, 2016; Valenzuela et al., 2009) from a structuralist point of view. There are some methodologies that are potentially common for both concepts. The empirical model “attitude-based evaluative mapping” (Jorgensen, 2010), attempts to spatialize SC through SOP (Jorgensen and Stedman, 2011). Brown et al. (2015) performed the first research on mapping PA through an Internet-based Public Participatory Geographic Information System (PPGIS) application. This study can be extended to SOP and SC. Brown and his colleagues measure the spatial dimension of PA based on the idea of home range in ecology (Powell and Mitchell, 2012). While there are some attempts to directly map SOP or PA through spatial methods, the spatial measurement of SC was always performed using its dimensions or using a moderator. On the other hand, we propose to explicitly and directly spatialize social capital (structuralist perspective) using GISc techniques and conceptualizations. Currently, the surge of ICT is allowing new ways for interactions to gather both SOP and SC spatial dimensions, encouraging researchers to develop new spatial techniques and tools based on web and mobile environments. We are currently witnessing an increase of interest in the categorization of social relationships, people’s perceptions and feelings toward places. The combination of ICT with a GISc framework and analytical tools are enabling new possibilities to gather psychological and social concepts from a geographical perspective. However, one of our contemporary hurdles, in this issue, resides in the few and limited tools and guidelines to explicitly spatialize our affective/cognitive/behavior attitudes toward both a place (SOP) and our geographical based social networks (SC). Moreover, the GISc-based online tools and techniques to spatialize social concepts are at a very early stage of development.

SOP is suitable to be measured as a spatial concept since its affective bonds, cognitive perceptions and behaviors are toward an area (Altman and Low, 1992; Stedman, 2003). Likewise, SC inherits the spatial dimension of social relationships between humans (Rutten et al., 2010). However, their explicit spatial relationship is still unknown. Due to the nature of the concepts, their possible spatial relationships should follow the

research of [Egenhofer et al. \(1994\)](#), who defined eight topological relationships between two regions with connected boundaries. Figure 2.4 applies these relationships to the concepts of SOP and SC.

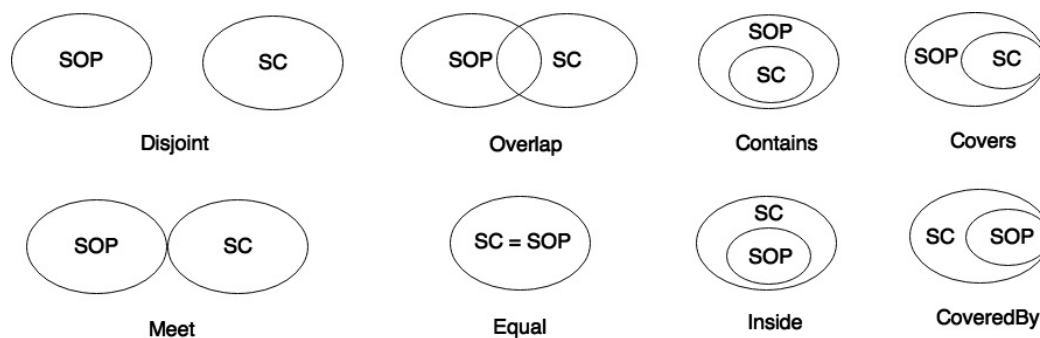


Figure 2.4: The eight topological relationships between two regions with connected boundaries, adapted from [Egenhofer et al. \(1994\)](#). This figure encompasses either a non-existing relationship (disjoint) or an existing spatial relationship (meet, overlap, equal, contains, inside, covers, and covered by) between the two concepts (SOP and SC)

2.3.1 Building the foundations for the spatial relationship of sense of place and social capital

Citizens are spatially sticky ([Westlund et al., 2010](#)) and they create ties and social networks in which they carry out their daily tasks ([Lewicka, 2011b](#)) in the city context. The relationship with the place where one develops one's activities and the interaction with one's social networks draws important interest to the comprehension of the daily citizenship context. This article relies on the social aspect of the urban context and presents a novel perspective for a more citizen-centric social view on a city assuming that:

- For each citizen, at least one meaningful place with emotional connections exists ([Scannell and Gifford, 2016](#)) in a given city; and
- For each citizen, there is at least one geographically based social network he/she belongs to in a given city. A citizen is intrinsically a social creature ([Toole et al., 2015](#)) with associated social networks ([Rutten et al., 2010](#)).

In the geographical domain, let X be the surface of a given city and C the set formed by its citizens $s c_i$. Furthermore, we define geographical sense of place ($GSOP_i$) and geographical social capital (GSC_i) as the spatial dimension of SOP and SC for a citizen

c_i , respectively. Then, we claim that for each citizen there exists a set of individual SOP and SC areas being both subsets of the city surface:

$$\forall c_i : \exists GSOP_i \subseteq X \wedge GSC_i \subseteq X \quad (2.1)$$

Where:

$$GSOP_i = \bigcup_{j=1}^N GSOP_{ij} \quad (2.2)$$

$$GSC_i = \bigcup_{k=1}^M GSC_{ik} \quad (2.3)$$

and c_i is a citizen;

i is an integer number between 1 and n , and n the total number of citizens of a given city;

N and M are positive integers, representing the total number of SOP and SC areas, respectively, for a citizen c_i ;

$GSOP_i$ is the union of all individual Geographical Sense of Place(s) ($GSOP_{ij}$) for a citizen c_i ;

GSC_i is the union of all individual Geographical Social Capital(s) (GSC_{ik}) for a citizen c_i ; and finally,

X is the surface of a given city.

We are seeking to define the spatial dimensions of meaningful places (SOP) and social networks spatially situated (SC) for citizens through an approach that will allow the addition of a spatial dimension to SOP and SC. Place maintains its importance in a globalized world and people typically identify their attachment with a physical space (Lewicka, 2011b). The manner in which individuals perceive themselves depends on how they make use of their daily places Gotham and Brumley (2002), influencing, simultaneously, their social relationships. Social networks within a place can be an important source of place meanings, and vice-versa (Jorgensen, 2010). Hence, SOP can be understood as a concept related to SC, in which place is a catalyst for both. Therefore, we claim that, for each citizen c_i , there is a spatial relation between the spatial dimension of SOP and SC at the city level:

$$GSOP_i \cap GSC_i \neq \emptyset \quad (2.4)$$

There are areas that encompass citizens' meaningful places and geographically based social networks (Statement 2.4) where some authors argue that our communities dwell

(Baerenholdt and Aarsaether, 2002; Foster et al., 2015). There are areas that can facilitate SOP and SC, or in other words, areas defined by meaningful places and fruitful relationships at the individual level, and a potential environment of cooperation, participation, empowerment and collaboration at the community level.

2.3.2 Exploring the foundations

We study the spatial relationship between SOP and SC concepts based on statements in the literature to attempt an independent spatialization of SOP and SC for each citizen. Then we claim the existence of a spatial relationship between them (Statement 2.4). All the SOP and SC zones from a citizen create two sets of areas; Geographical SOP (GSOP) and Geographical SC (GSC). Both sets are defining the meaningful areas and fruitful geographical social networks for a citizen in a given city, respectively (Figure 2.5).

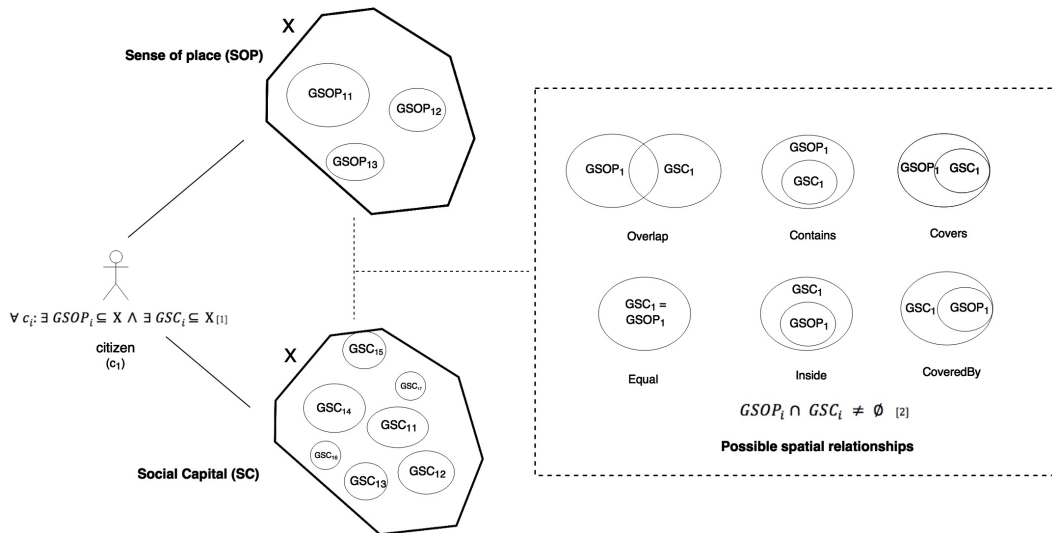


Figure 2.5: Overview of article schema. The example shows possible $GSOP_{ij}$ and GSC_{ik} areas in a given city X and the right part represents all the possible spatial relationships based on Statement 2.4

where:

c_i is a citizen;

i is an integer number between 1 and n , and n the total number of citizens of a given city;

$GSOP_i$ is the union of individual Geographical Sense of Place ($GSOP_{ij}$) for a citizen c_i ;

$IGSC_i$ is the union of individual Geographical Social Capital ($iGSP_{ik}$) for a citizen c_i ; and finally,

X is the surface of a given city.

To support the Statements 2.1 and 2.4 of this article, some current GISc methods can be applied. The main methodological restriction of this article is to gather SOP and SC measurements and spatial dimensions from the same citizen. The use of a map-based survey assures that both essential sources of data are answered by the same citizen. Through an Internet map-based technique (Brown et al., 2015) based on Public Participation Geographic Information Systems (PPGIS) (Sieber, 2006), or a geo-questionnaire (Jankowski et al., 2016) it is possible to obtain: (1) the measurement of SOP and SC dimensions, providing a multicomponent analysis of the different dimensions and, simultaneously, proving the multidimensional nature of primary concepts (SOP and SC); and (2) to gather the spatial dimension about SOP and SC directly. Here, our approach intersects with “attitude-based evaluative mapping” methodology (Jorgensen and Stedman, 2011), defining beforehand SOP and SC geographic areas to measure their dimensions within. Due to the nature of the data collected, this article is aligned with the SoftGIS methodology (Rantanen and Kahila, 2009), as we assemble environmental psychology data, local experiences and everyday behavior (Kahila and Kytta, 2009). In consequence, information obtained via GISc tools can be used to determine new geospatial citizen-defined areas based on the spatial relationship between SOP and SC, providing an ideal environment to achieve familiar and recognizable areas that elucidate important social phenomena.

2.4 Discussion

This research attempts a conceptualization and first formalization of the spatial relationship between SOP and SC, embedded in the urban context. This opens the door to better understanding the city’s social realm through the spatialization of individual SOP and SC. In the literature, the former has been extensively studied and related with engagement and CP as well as environmental protection actions, while the latter mainly became popular because it is operationalized as a solution for social problems, being the “glue” that holds us together (Johnson, 2016). However, despite this extensive and enriching research, we currently do not fully realize the potential of being aware of SOP and SC associations because, to some extent, the places that embed these individuals’ SOP and SC perspectives are unknown. The few attempts to spatialize both (SOP and SC) highlight the long way to go and the possibilities for new studies. Researchers

have tended to focus on measuring and conceptualizing SOP and place attachment, rather than to spatialize it (Lewicka, 2011b). Moreover, the spatial dimension of SC has received little attention in the literature so far. Recently researchers have identified the importance of the SC spatial dimension that Putnam (2000) foresaw. In psychological and social disciplines, researchers have studied quite extensively how and how much interaction regarding SOP and SC occurs, but relatively little about where these interactions are occurring. Therefore, despite the growing interest in SC and SOP conceptualization and correlation with other concepts, few attempts to explicitly spatialize this theoretical knowledge have been undertaken, that is, to transfer the non-spatial knowledge on SOP and SC to the geographical domain. Even more, to the best of our knowledge, no research so far has attempted to merge or relate the spatial dimensions of individual SOP and SC. Although some authors point out the spatial relationship between the concepts Jorgensen (2010), a previous independent spatialization to relate the two concepts has not been attempted, nor a study of their spatial connections and similarities. The omission of this important spatial information reduces our understanding of different important social synergies in the city. This spatial perspective to social concepts might be the pivotal aspect to embed them into the urban context.

Furthermore, current research and tools overvalue the importance of administrative boundaries (e.g., neighborhoods, parishes) to encompass SOP and SC. Most researchers use these spatial administrative containers to measure SOP and SC. However, we can wonder if the whole administrative boundary covers the SOP and SC of all its dwellers or, conversely, if citizens' SOP and SC are enclosed in dynamic, fuzzy areas at a given space and time. This article advocates omitting the mention of political-administrative areas for the measuring of SC and SOP individual spatial dimension, since, to some extent, this can bias the expected outcomes. We argue throughout the article for the better understanding of the spatial relationship between SOP and SC. It seems reasonable to assume a central role of place in both SOP and social networks territorial-based SC and, a high correlation when they share the same geographic domain.

By examining how GISc can offer a unique perspective for a better understanding of SOP and SC spatial relations, we are signifying, simultaneously, the suitability of GISc tools to study the spatial components of social science (e.g., SC) and environmental psychology (e.g., SOP) concepts. However, researchers are waiting for proper mechanisms to carry out spatial measurements of these processes. Moreover, many authors directly relate the SOP and SC with surrounding areas to "home" (Foster et al., 2015; Perkins and Long, 2002). Yet in a globalized world and a society in constant movement, it seems too restrictive to encompass citizen SOP and SC in only those areas. The knowledge

and management of areas that contain our SOP and SC create a milestone providing: (1) fruitful social spatial data for a better citizen-centric social view on the city; (2) rendering space as a subjective place that covers the people's feelings toward places and relationships; (3) setting up a new precious ground to tackle city social issues; and (4) creating a suitable environment for better cooperation and collaborative synergies between people who share more than just a space. Regarding the last point, this research can be understood as the starting point to achieve a community of place, considering our commonalities regarding relationships and place perceptions as assets to achieve a sense of community.

This research argues for the importance of recognizing the spatialization of SOP and SC in the urban context. We identify the spatial dimension of SC explicitly, that is, to spatialize where individuals forge meaningful social bonds. Likewise, we contend its relationship with other spatial dimensions (SOP) and how their operationalization can create a suitable environment of citizen-based areas in the city. Furthermore, acknowledging this spatial relationship can lead to the discovery of new approaches to deal with current lines of study about hierarchy and levels of SC (Westlund et al., 2010) and different types and predictors of SOP (Lewicka, 2011a). In this line, there is a long way to go to identify and characterize the relations between individuals and their social networks, i.e. in weak and strong ties, that is, bridging and bonding SC, respectively. It is interesting to learn where the strongest and weakest social places are for citizens at the city level, and foresee emerging social hotspots at the community level. As was mentioned, this is the first step to achieve those common areas of engagement based on the appropriation and understanding of our meaningful surrounding, thereby increasing the awareness of our commonalities with our fellow citizens. Hence, we can wonder how to take advantage of those new areas for a common benefit, and how the performance of participatory processes in those new areas of social interaction will be.

Transferring these areas of interaction (SC) and environmental perception (SOP) to the urban domain, we are setting up new meaningful areas of contact between all the stakeholders in the city and, simultaneously, creating a comprehensible social layer that the city, nowadays, lacks. Indeed, we are currently not able to recognize our common spatial footprint in the social (SC) and psychological (SOP) domains, and thus, the spatial social layer that exists and where citizens are the central pillar is omitted. There is a lack of free spatialization methods and tools for psychological and social concepts that are deemed to be relevant for citizens' daily tasks and interactions, such as participation in decision-making processes. Consequently, we use administrative boundaries instead of more functional ones for city issues, disregarding natural social processes and

mechanisms that might not be contained in the former ones. In this sense, this article highlights the role of GISc and its related tools in taking another step forward to satisfy this pervasive demand for citizen social information. Therefore, the joint study of SOP and SC can contribute a better understanding of social synergies in the urban context and their spatialization can transfer their information to other areas of knowledge. This article contributes through GISc and its related tools to satisfy the pervasive demand of citizen social information at the city level, postulating the first formalization of the spatial relationship between SOP and SC at the individual level.

2.5 Roadmap for future research

This is the first article in a line of research that aims to describe, conceptualize, formalize and study the spatial dimension of social concepts (SOP and SC) in a city (Figure 2.6). This first work explores the field through a comprehensive systematic literature review, and subsequently focuses on the first theoretical cornerstone of our research: spatializing and formalizing SOP (Jorgensen and Stedman, 2001) and SC (Perkins and Long, 2002) at an individual level, and the spatial relations between them. The next step in our research agenda is to better understand the spatial relations between social concepts, by studying how bonding and bridging social capital (Putnam, 2000) and civic engagement fits in our proposed spatial framework (Statements 2.1 and 2.4). Once a spatial theoretical framework for SOP and SC at the individual level is established, researchers will dispose of a robust theoretical framework ready to build other socially-oriented conceptualizations or applications on top of it. Furthermore, and as a second future research avenue, the framework serves as a basis to explore community level interactions as well as to identify communities of place. Through the definition of suitable experiments, and real-world gathered citizens' data, the theoretical framework can be used to spatially explain or predict social behavior in cities, and be employed to better understand and guide social processes, such as citizen participation, planning processes or citizen engagement. We also expect that our theoretical foundations for the spatialization of social concepts in cities, both at individual and community level, will promote their understanding, and may spark various other research avenues, e.g., in relation to crime, poverty, social inclusion/exclusion, etc.

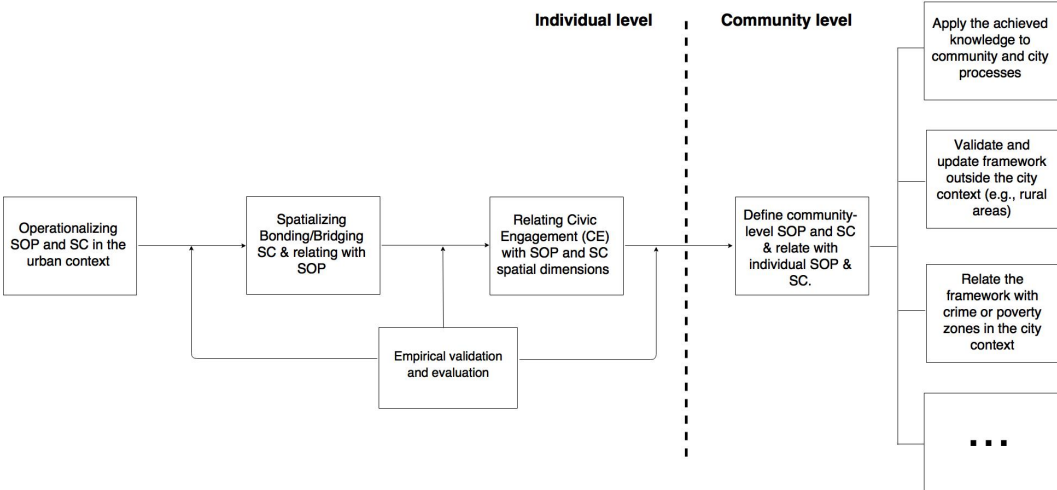


Figure 2.6: The schema for future research. Each box symbolizes a step in our research. The first box on the left is the current article, followed by the intended steps for our future line of research

ONE TOOL TO SPATIALIZE ALL: SENSE OF PLACE, SOCIAL CAPITAL AND CIVIC ENGAGEMENT

Abstract¹

The spatialization of social concepts in to the city context is becoming a need. However, currently, there are few tools to directly spatialize environmental psychology concepts, such as sense of place, or social and participatory concepts, such as social capital and civic engagement. Furthermore, most existing tools are not taking full advantage of Geographical Information Science (GISc) capabilities mixed with online possibilities. This article presents a tool - an internet map-based application with an intuitive user interface - to deal with the pervasive lack of spatializing subjective citizens' feeling, perceptions and experiences. Our approach successfully merges GISc framework and tools with questions and indicators from literature in social concepts. As such, the tool allows to identify and spatialize sense of place, social capital (discerning between bonding and bridging) and civic engagement of citizens, and attach meaningful information to them. It is a first step towards understanding and studying the social-spatial layer which undeniably ties a city and its citizens together.

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Keywords: internet map-based application, sense of place, social capital, civic engagement

3.1 Introduction

The relation with the place where we develop our activities and interact with our social networks draws important interest to the comprehension of the daily citizenship context. Different places satisfy different needs, becoming targets of attachment or meaning for different reasons, even in globalized world (Lewicka, 2011b). A person is not 'located' in an environment, conversely, a person constructs a position in that environment.

Furthermore, this relationship can clearly also be influenced by the dwellers of target-attachment place (Bernardo and Palma-Oliveira, 2016) and social relationships. Therefore the attitudes, feelings and behaviors towards a certain geographical area (sense of place) (Jorgensen and Stedman, 2001) and to human collectives (social capital) are defining, to some extent, the form of how citizens understand the urban context.

A positive sense of place (SOP) has been linked to an improved life quality (Harris et al., 1995), and to engaging more citizens into participatory processes. In turn, social capital (SC) is a building block of collaboration, community's cohesion and civility (Lewicka, 2005). Psychological factors explain what motivates to participate and how to maintain that participation (Perkins et al., 2002). Therefore, SOP and SC are important factors for civic engagement (CE), which underlies how citizens are related to issues of public concern. SOP, SC and CE cover a vast amount of basic environmental and community psychological dimensions between citizens and cities, respectively. SC can also be conceptualized as bonding SC – strong ties - (within a community or place-based social interactions) and bridging SC – weak ties - (horizontal links among heterogeneous actors). There are several types of research about who and how much is attached to a place, but we know little about where these meaningful relationships and places are (Lewicka, 2011b). There are few, limited tools and guidelines to explicitly spatialize SOP and SC. For example, the SC spatial dimension can be embedded in the cognitive neighborhood (Foster et al., 2015) or extracted from social network analysis (Andris, 2016; Valenzuela et al., 2009) from a structuralist point of view.

Recently, Jenkins et al. (2016a) merged twitter data and Wikipedia geolocated data to spatialize a collective SOP, being the first research merging social network analysis and volunteered geographic information (VGI) to define SOP. Brown and his colleagues focused on measuring landscape values and SOP for scales larger than a neighborhood, including the first research on mapping place attachment through an Internet-based

Public Participatory Geographic Information System (PPGIS) application (Brown et al., 2015). Currently, the surge of Information and Communications Technologies (ICT) is allowing new ways for interactions to gather SOP and SC spatial dimensions. Furthermore, the combination of ICT technologies with Geographic Information Science (GISc) framework and tools are offering new possibilities to gather psychological and social concepts from a geographical perspective. However, GISc-based online tools and techniques to spatialize social concepts are at a very early stage.

This article presents a tool to render space as a subjective place that covers the people's feeling toward places and human relationships. We present a new approach 1) to spatialize SOP, SC and CE; 2) to investigate the predictors of the former and; 3) to discern between bonding and bridging SC. This article wants to highlight the role of GISc and its related tools in satisfying this pervasive demand of citizen social information, fulfilling the lack of a social-spatial layer in the city context, by mapping subjective citizens' feeling and experiences.

3.2 Fishing with a net: spatializing sense of place, social capital and civic engagement

Our work aims at directly obtaining the spatial dimension of SOP, SC and CE. Previous works have addressed similar goals using Internet map-based techniques (Brown et al., 2015) for place attachment spatial dimension, geoquestionnaires (Jankowski et al., 2016) for land use planning and Jorgensen and Stedman (2011) studies the spatial variation on SC and SOP as matching spatial dimensions. Furthermore, social scientists who are commonly working on related topics use traditional techniques such as personal interviews, hand-written surveys, which are not easily scaled up. Our approach take advantage from GISc, online technologies and platforms to create a novel tool to identify and spatialize sense of place, social capital and civic engagement of citizens that can be harnessed by other social research topic and use at any scale.

Our tool is provided as a web-based application that guides the user through three processes. Each process gathers relevant data for SOP, SC and CE determination, respectively. In this methodology, the first step is to define the SOP and SC geographic areas to be characterized, and later the attention of the user is focused in the previously created area. Our approach responds to the "SoftGIS" methodology (Rantanen and Kahila, 2009), because our collected data assembles environmental psychology data, local experiences and everyday behavior (Kahila and Kyttä, 2009). Our novel interface

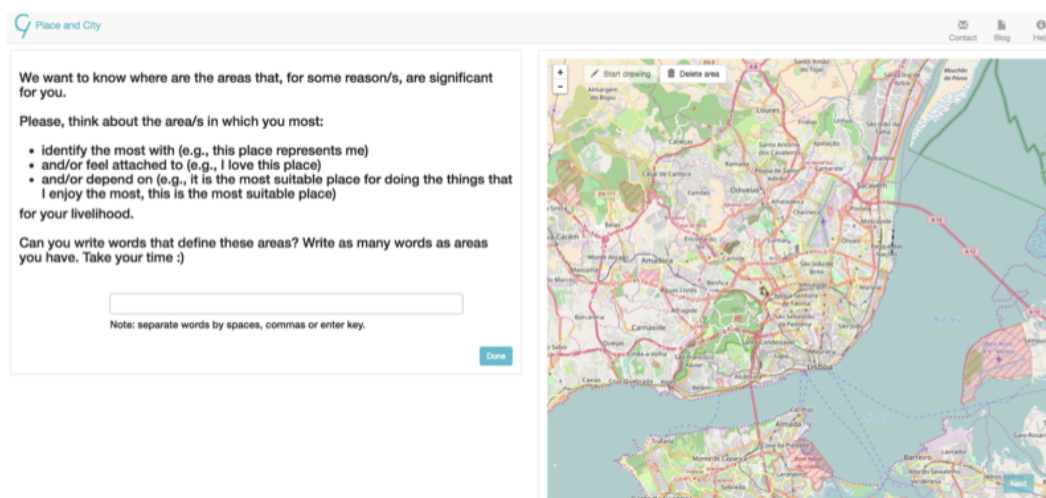


Figure 3.1: General tool interface

design (Figure 3.1) immerses users in a spatial environment, dividing the application layout in instructions and questions (left side) and the map representation with spatial tools (right side). The tool can work both on desktop and mobile environment, but the drawing part performs easier in the former. By splitting the interface design in two parts, we are always showing the area about which the users are being asked about. Simultaneously, users always have a spatial representation available related with their SOP, SC or CE.

Figure 3.2 presents an outlook of our tool software organization. A thin Html/JavaScript client rendered by a web server presents the user with responsive and intuitive interfaces. The map operations are implemented using Leaflet². The data provided by the users is sent to a java-based web service and stored in a MongoDB database. Additionally, the client communicates with the Overpass API³ in order to gather relevant place indicators for the areas defined in each process (SOP, SC and CE). The data gathered from Overpass can later be used for comparing with areas characterization done by citizens.

3.2.1 Sense of place, social capital and civic engagement: the gathering

SOP explains the cognitive, affective and behavioral dimensions of the relation that an individual has towards a certain geographical area [Jorgensen and Stedman \(2001\)](#).

²<http://leafletjs.com> visited on 03/02/2017

³http://wiki.openstreetmap.org/wiki/Overpass_API visited on 03/02/2017

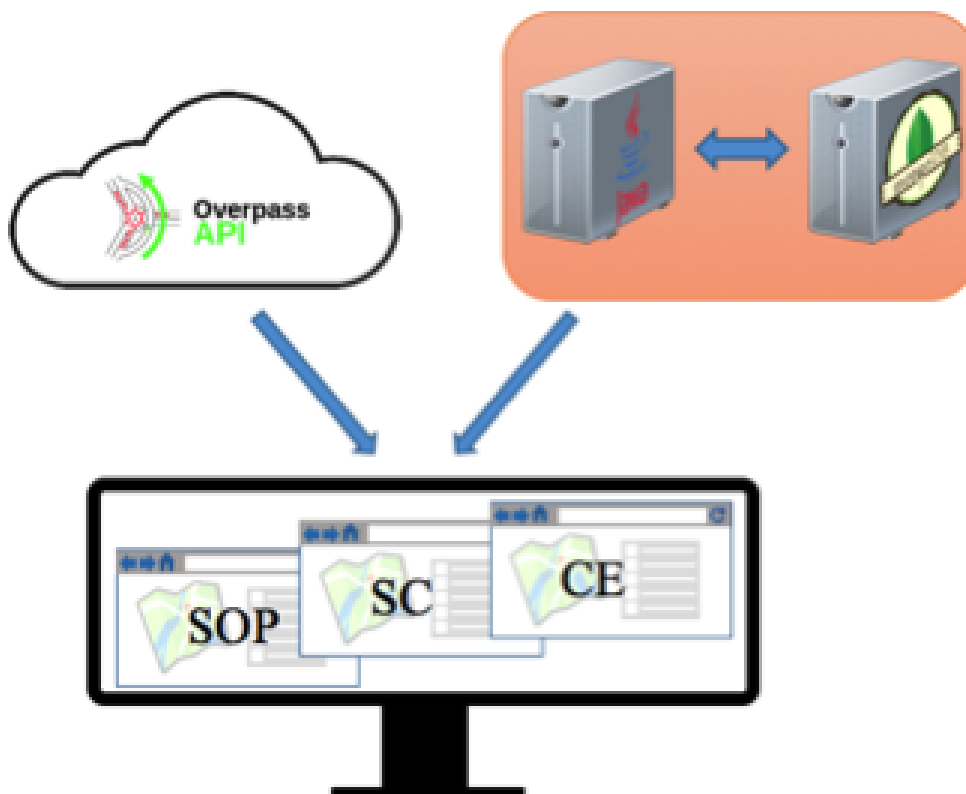


Figure 3.2: Our tool's software organization

The first approach to define the individuals' SOP is to map their significant areas. This article uses the conceptualization from [Jorgensen and Stedman \(2001\)](#) to create the instruction for drawing citizens' significant areas. The user is guided by the statements presented in Figure 3.1.

The second step is to characterize and assess the structure and intensity perception of these areas by citizens. We use nonspatial measures to evaluate and characterize each area. This characterization of SOP's areas are based on [Cilliers and Timmermans \(2014\)](#) research. They took the four key attributes from the organization Project for Public Spaces (PPS)⁴. They argue that there are four key attributes connected with intangibles and tangibles variables for describing the nature of a place. Thus, we define these four indicators (see Figure 3.3). A user can then define the intensity of each index related to the area that is shown in the application interface.

SC refers to the relations between human collectives and the interactions that arise

⁴<https://www.pps.org/reference/grplacefeat/> visited on 03/02/2017.

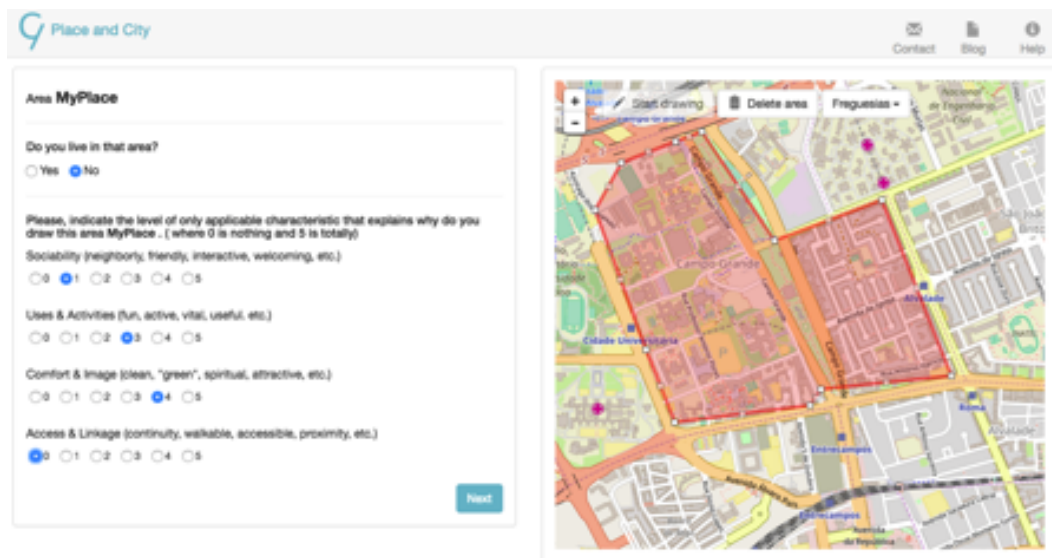


Figure 3.3: SOP representation and characterization with questions based on [Cilliers and Timmermans \(2014\)](#)

as fruits of these connections through, for instance, trust, reciprocity and cooperation.

The spatialization of SC follows a methodology similar to the SOP. Our approach to spatialize SC is based on the structuralist perspective that highlights the connection that an individual has to others (social networks). Therefore, we want to spatialize the meaningful groups or organizations, network or associations to which a citizen belongs. These could be formally organized groups (religious groups, familiar groups, sports teams, workplace groups, etc.) or just groups of people who get together on a regular basis to do an activity or just chat. Due to the clear network nature, it is possible to draw different areas for each group, thus achieving a network of places that shape the SC of a given group. The novel approach that our application introduces to the social domain is the possibility to characterize each citizen's group as bonding or bridging SC. Therefore, our application presents the opportunity to spatialize people meaningful relationships and characterize them into weak and strong ties (see Table 3.1).

CE is a process of citizens' involvement with their society and their government to address issues of public concern, improve conditions of others and help the community.

Our approach to measure and spatialize civic engagement is twofold. On one hand, we want to know the citizen level of participation in city participatory processes and on the other hand, we ask to draw the areas where the citizen wants to be involved in participatory and collaborative practices. [Brown et al. \(2015\)](#) highlight the need to differentiate between those places where we have an attachment and those where

3.2. FISHING WITH A NET: SPATIALIZING SENSE OF PLACE, SOCIAL CAPITAL AND CIVIC ENGAGEMENT

Table 3.1: Questions about bonding and bridging social capital. Source: Adapted from Williams (2006)

Bonding social capital:
The people I interact in that group would put their reputation on the line for me.
The people I interact in that group would share their last coin with me.
I know people in that group well enough to get them to do anything important.
Bridging social capital:
Interacting with people in that group makes me interested in what people unlike me are thinking.
Interacting with people in that group makes me feel connected to the bigger picture.
Interacting with people in that group gives me new people to talk to.

we would volunteer or work to improve their conditions. Although there is literature connecting SOP and SC with the CE concept, our application tries to spatialize each concept independently to allow the study of the spatial relations of each concept from individual or block level.

3.2.2 Engaging the citizen

The last part of the application gives feedback to the citizen, by visualizing the citizen's different areas of SOP, SC and CE (Figure 3.4), as well as showing what other citizens have mapped. Newman et al. (2010) discovered that the volunteers who used their application wanted to communicate with each other. In our case, we show what the community is drawing and represent spatial intersections (see Figure 3.3), to foster people's interests in public participation and collaboration. We want to create a kind of community sense of place, in which citizens are aware of their commonalities and shared areas of SOP, SC and CE. Through this visualization we want (1) to engage citizens in following the application aim, (2) let them know where their feelings and interest are shared, (3) foster their interest in contacting other people, and (4) increase participation. The latter is considered because participation is likely to occur in small-group situations, where participants know each other (Rydin and Pennington, 2011).

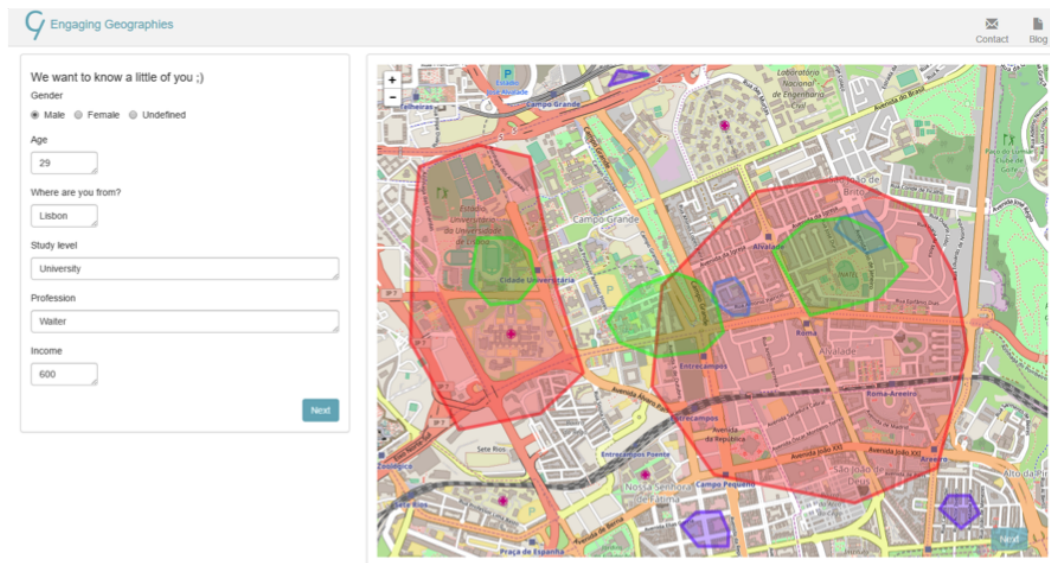


Figure 3.4: Presenting the areas that the user has provided. Red color is related to SOP, green to CE, violet to bridging SC and pale blue to bonding SC

3.3 Discussion

This paper presents an application to spatialize SOP, SC and CE. To the best of our knowledge, this is the first application that attempts to spatialize the spatial dimensions of these three concepts using an internet-based platform and GIS techniques. Furthermore, it is also the first methodology to explicitly and directly spatialize social capital, without using a moderator or dimensions to measure it. The outcomes from our application can help to clarify current issues that researchers are trying to tackle. For example, the spatialization of SC can intersect with the research from [Westlund et al. \(2010\)](#). In that paper, they emphasize two problems in the conceptualization of SC in a spatial perspective: the level-dependence subjected to the scale of study (bridging in local scale can become bonding in the city context) and the spatial level the respondents refer to when they answer questions about social capital dimensions. Our application deals with both problems assessing the leveldependence nature of the areas through data gathered from Overpass and always asking the questions pointing to an area defined beforehand. Although the application follows an intuitive flow, we will test (1) the application's usability and 2) if the abstract concepts embedded in the map-web survey are fully understood with the current questions formulation.

For city councils and governments, our application can give useful data, because it allows them to understand the city in terms of meaningful areas for their citizens, and

where the social interactions take place, in general, in the city context. Besides, our application introduces an interesting perspective by directly asking citizens in which places they want to be involved in participatory processes. This simple spatial question can give valuable information to know how and where people want to be involved in participatory processes. This investigation also contributes to the emerging movement of spatializing environmental and social psychological concepts. Insights into how to spatialize the SOP and SC concepts can offer a unique qualitative perspective for a better understanding of their spatial relation and, simultaneously, how they are spatially related with potential areas of CE. Future research will focus on understanding the spatial relation between SOP, SC and CE at the individual level, attempting to find new communities of place and new areas of interaction. Therefore, we claim that GISc provides an appropriate conceptual framework to develop suitable spatial tools and map-based surveys (PPGIS) for the spatialization of concepts from social science (SC) and environmental psychology (SOP).

PLACE AND CITY: TOWARD URBAN INTELLIGENCE

Abstract¹

Place, as a concept, is subject to a lively, ongoing discussion involving different disciplines. However, most of these discussions approach the issue without a geographic perspective, which is the natural habitat of a place. This study contributes to this discourse through the exploratory examination of urban intelligence utilizing the geographical relationship between sense of place and social capital at the collective and individual level. Using spatial data collected through a web map-based survey, we perform an exhaustive examination of the spatial relationship between sense of place and social capital. We found a significant association between sense of place and social capital from a spatial point of view. Sense of place and social capital spatial dimensions obtain a non-disjoint relationship for approximately half of the participants and a spatial clustering when they are aggregated. This research offers a new exploratory perspective for place studies in the context of cities, and simultaneously attempts to depict a spatial-social network based on sense of place and social capital, which cities currently lack.

Keywords: urban intelligence; sense of place; social capital; spatial dimension

¹The text from this chapter has been published as Acedo, A., Painho, M., Casteleyn, S., and Roche, S., 2018. Place and City: Toward Urban Intelligence. *ISPRS International Journal of Geo-Information*, 7 (9), 346. doi: [10.3390/ijgi7090346](https://doi.org/10.3390/ijgi7090346)

4.1 Introduction

Over the last 40 years in geographic information science (GISc), there has been a growing interest in the idea of place in regard to its suitability compared to space for the understanding of societal dynamics (Roche, 2016). Typically, GISc has been primarily focused on quantitative and observable facts due to the readability of empirical phenomena (Warf and Sui, 2010). Nevertheless, currently, the possibility of collecting qualitative and social evidence with new data and approaches, such as volunteered geographic information (VGI) (Goodchild, 2007) and softGIS methods (Kyttä and Kahila, 2011; Rantanen and Kahila, 2009), has generated a broad interest in better understanding social synergies in the city context. Conversely, to some extent, the smart city and its mainly technological nature has hidden the opportunity of a citizen-centric approach (Calzada and Cobo, 2015) in which place acquires a central role.

The citizen-centric smart city approach bases itself on the human-environment interactions which are mainly dependent on our capability to understand *patial*² urban dynamics. Although the concept of urban dynamics can also apply to communities, governments and business, this research focuses on the citizenship at the individual level. The operationalization of those individual-environment interactions is closely related to the notion of urban intelligence. Roche (2016) describes the concept of urban intelligence as the urban stakeholders' ability to depict the connected complex urban places (i.e., *patial* urban dynamics). Hence, smart cities are not only continuous spaces crowded with quantitative data and sensors; they are also about complex place dynamics based on citizens interactions, for instance, with respect to places (sense of place (SoP)) or social relationships (social capital (SC)). However, the few studies that cover the practical exploration of place in multiple disciplines, seem to suffer (among others) from the difficulty in defining its spatial dimension. Currently, in order to understand the urban intelligence of a city, we are using the sensing part of urban engineering (i.e., sensors, location-based and context aware services), but the challenge is to go one step further and comprehend the individual spatialities³ to infer the *patial* dynamic system hidden in the smart city context. Thus, we can discern two visions to grasp the smart city environment: one based on the urban engineering and its location-based technological paradigm as (dynamic) layers along the city, and its social parallel, an

²in this research, *patial* is concerned about the space-based geography that is focused on human discourses, social values and human-space interactions (Roche, 2016, p. 4)

³Individual spatialities in this research are adapted from Lussault (2007) as the individual or collective practices related to their geographical location and to one another that reflect their spatial actions and interactions.

image of the city built on the dynamics of urban intelligence as a network of places. The latter approach highlights a scenario in which the need for new bottom-up place-based information (Elwood et al., 2012; Goodchild, 2007) becomes more and more important.

In this paper, we study the spatial relationship between SoP and SC to gain a better understanding of the city dynamics that are dependent on the spatial organization of place. We attempt to simplify the complexity of place dynamics with the spatialization of SoP and SC as a possible dynamic geographical arrangement to infer place. Despite being aware that citizens are spatially sticky (Westlund and Adam, 2010) and that they are used to creating ties where they develop their daily tasks, there is a paucity of literature on the connection of SoP and SC toward the spatial notion of place. For the inclusion of place and spatial urban dynamics into the smart city realm and its analytical use, there is a need for in-depth exploratory research on dynamic human spatiality boundaries, and therefore, a need to address their space-time distribution (Goodchild, 2011). The objectives of this exploratory study are 1) to examine citizen-defined place dynamics (i.e., urban dynamics), including the spatial dimensions of citizens' SoP and SC at the individual and collective level, in the urban domain, and 2) to provide a first definition of the spatial relationship between the SoP and SC at the individual level. This article starts with a review of place in the smart cities and the spatialization of the related place concept in terms of SoP and SC. The article then presents the methods and the results of an experiment conducted in Lisbon (Portugal) to clarify the spatial relationship between SoP and SC, and its connection with urban intelligence. This is followed by a discussion of the results, the remaining gaps and limitations, as well as the reasoning of our findings to offer new insights into the notion of urban intelligence. We finish the manuscript with a conclusion and future work.

4.1.1 Place in the smart city context

Place, which is a space endowed with meaning (Relph, 1976; Tuan, 1978), assigns context to space (Papadakis et al., 2016) and cannot be simplified into a basic concept (i.e., a spatial relationship) without losing its human connotation (Norberg-Schulz, 1980), which makes it unique in the universe (Gieryn, 2000). Most conceptualizations of place in the literature (Agnew, 2002, 2011; Canter, 1977; Cresswell, 2009; Gieryn, 2000; Stokols and Shumaker, 1981; Williams, 2014) have a shared dimension: location. However, there is a lively debate about the spatial definition of place. Some researchers characterize place as the relational nature among entities in the geographic environment rather than by coordinates and geometric properties (Winter and Freksa, 2012).

However, if we recognize the existence of place, it has to exist somewhere. Geographic information technologies have experienced challenges with the treatment of data dealing with qualitative meanings and feelings. To some extent, the latter issues are due to the spatial vagueness (Jones et al., 2008) and dynamism (Roche, 2016) of place compared to the Euclidean representation of space. In fact, Relph (1976) argued that location is not a sufficient condition of place while Cresswell (2004) supported that place is never finished; instead, it is always becoming. In turn, place is one of the shared cornerstones in human geography, social science, GISc and environmental psychology. Hence, one can wonder: how can the spatial dimension of place be operationalized to help different disciplines? Unfortunately, as Goodchild and Li (2011) assure, there has been a focus on pure spatial domain of geographic information technologies in the past few decades. In contrast, we are currently witnessing an increasing interest in the study of dynamic concepts related to places. Fortunately, the surge of smart cities, with associated information and communication technology (ICT) research and tools, allows new ways of managing and collecting information about the urban environment. Currently, there are new approaches to understanding citizens' interaction with the urban environment. For example, in user-generated content in general, and crowdsensing in particular, citizens are considered sensors (Goodchild, 2007) that supply a huge amount of geographical data with or without consent (See et al., 2016). This (sometimes) invasive approach can evolve into a more cooperative process to gather and measure real sensing in the human-urban interaction.

Nowadays, there is an optimal environment and set of tools to create a comprehensive bridge between disciplines (e.g., human geography, environmental psychology, social science and GISc), where the cornerstone is the shared spatial dimension of place. In turn, the combination of social concepts (e.g., SC and SoP) and GISc methods can play a crucial role in merging (1) the human uniqueness in social science (e.g., citizen perceptions and feelings), (2) the interaction and structure of human behavior (e.g., social networks, relationships, and social events) and (3) the context specifications of location (e.g., landmarks (Quesnot and Roche, 2014) and spatial dependence). Although people's experiences with their environment are becoming more mediated (Sui and Goodchild, 2011), researchers have focused on the measurement and conceptualization of place concepts, rather than its spatialization (Hidalgo and Hernández, 2001; Lewicka, 2011b). There is a need to understand how dwellers perceive their spatial surroundings (i.e., individual' spatialities) to learn the multifunctional facet of the smart city based on the spatial organization of place (i.e., platial urban dynamics). This can bring to light urban platial dynamics allowing their awareness by city stakeholders (i.e., urban intelligence).

This sequence based on place provides a more citizen-centric smart city approach, i.e., to explore the dynamic platial-social network that is nowadays lacking in the smart city. Thus, the attempt to spatialize place-related social and environmental psychology concepts (i.e., SC and SoP, respectively) might give an opportunity to enable the city's social synergies spatially. Figure 4.1 shows an overview of the layout that embeds all of the main concepts of this research. From this discussion, the question naturally arises: how can place-related concepts be spatially defined through GIS techniques?

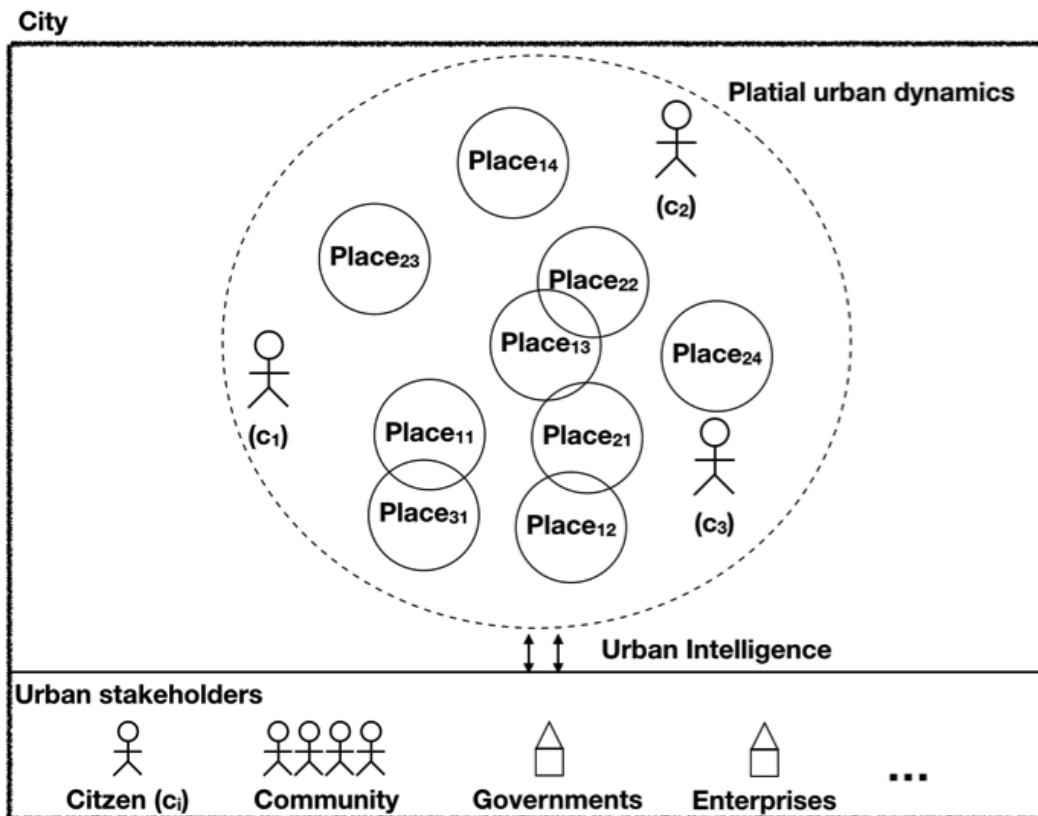


Figure 4.1: A relational basic schema that shows the main concepts described in the research. Continuous circles define different locations of places by each citizen in a given city. At the individual level, the sum of all of these geographical areas creates the individual spatialities for each citizen. At the collective level, the total of these places in a given city forms the platial urban dynamic of a city (discontinuous line). The awareness and operationalization of this platial urban dynamics by the city stakeholders set the urban intelligence of a given city

4.1.2 The spatial dimension of place-related concepts: sense of place and social capital

There is a need for additional research in the acquisition of psychological and social data through practical applications (Jorgensen and Stedman, 2011; Lowery and Morse, 2013) in order to gather the individual's dynamics (Hay, 1998) and emotions (Jorgensen and Stedman, 2001) toward places. The critical implications of the process of mapping through GIS methodologies (see Elwood (2006)) and the inherent dynamism and boundary vagueness of rich concepts such as place, SoP and SC seems to be crucial reasons why these concepts are not operationalized. Massey (1994) has already defined the inherent problems of conceptualizing boundaries for the place notion, as it is a process of social interactions. Furthermore, the representation of complex and multifaceted concepts (i.e. place, SoP, SC) with geographic primitives (e.g., discrete points and/or polygons) can imply several difficulties and information loss (Huck et al., 2014). Nevertheless, Massey (1994) also asserts that for certain kinds of studies boundaries of place are needed. Therefore, our study simulates and allows participants to define their SoP and SC's spatial dimensions into geographic primitives (i.e., discrete polygons). This approach is also used in previous studies (Brown et al., 2015) that present polygons as the representation of people's perceptions toward a place (e.g., place attachment). The ease of implementation of "standard" drawing tools to define polygons and users' familiarity with that type of approach with respect to fuzzy designs (Huck et al., 2014) are an advantage, but it also implies limitations. The representation of vague concepts (i.e., place) through geographic primitives can presuppose a questionable accuracy and precision to define the spatial dimension of place-related concepts. Hence, this study introduces alternative analyses to anticipate different boundary natures on the capture of the spatial behavior of SoP and SC at a given time (see section 4.2.2).

Most of the studies that measure SoP and SC are using and assuming a positive spatial relationship to pre-established administrative boundaries (i.e. neighborhood, parish, city, etc.). Yet, the residents' perception of neighborhood boundaries, for instance, can spatially differ from the administrative and regulated neighborhoods (Coulton et al., 2001; Montello et al., 2003; Waters and Evans, 2003). Indeed, this contradistinction is also highlighting the different views of perceiving the city: as static administrative boundaries (i.e., space), or dynamic and fuzzy geographical areas based on citizens (i.e., place) (Acedo et al., 2017b). In this paper, we aim to overcome this issue by studying the explicit spatial relationship between SoP and SC as independent concepts. This exploratory approach can add relevant subjective information about the

endowed meaning of spaces, hereby contributing to the understanding of the urban intelligence based on place structure. At the same time, this information provides us with the capability to study how citizens comprehend and represent part of their place dynamics regarding SoP and SC.

4.1.2.1 Sense of Place

Sense of place (SoP) refers to the individual, not the place (Vanclay, 2008). SoP is one of the three dimensions of Agnew (2002, 2011) place conceptualization, and human geographers acknowledged it as a place dimension (Beidler and Morrison, 2016). SoP is a complex and multidimensional concept (Lowery and Morse, 2013) shaped by the feelings, beliefs and behaviors that humans associate with a place (Jorgensen and Stedman, 2001). Measuring SoP is a complex task, especially when there is a need to measure it spatially. In any case, SoP and other place-related concepts, such as place attachment, place dependence and place identity, are suitable to be spatially measured since their affective bonds are toward a geographical area (Low and Altman, 1992; Stedman, 2003). For instance, Brown and his colleagues developed map-based methodologies to gather landscape values and place-related concepts (i.e., place attachment) for scales larger than a neighborhood (Brown and Raymond, 2007; Brown et al., 2015; Raymond and Brown, 2007; Raymond et al., 2010). The first attempt at measuring and mapping the notion of place attachment was conducted by Brown et al. (2015). They based their approach on home range conceptualization (Powell and Mitchell, 2012) and used an internet-based public participatory geographic Information system (PPGIS) to gather all the required information. In another study, Jorgensen and Stedman (2011) measured the spatial component of sense of place by integrating the spatial and physical features of places with attitude and behavioral variables using structural equation techniques. Recently, Jenkins et al. (2016a) merged Twitter data using social network analysis (SNA) and volunteered geographic information (VGI) from Wikipedia to spatialize a collective SoP.

Our research defines SoP as the cognitive, affective, and behavioral dimensions of the relationship that an individual has with a certain geographical area (Jorgensen and Stedman, 2001). This conceptualization exhibits three dimensions (place attachment, place identity and place dependence) based on the attitude theory (Ajzen and Fishbein, 1975) and proven by Pretty et al. (2003). Place attachment covers the affective perspective toward a place (Altman and Low, 1992; Lewicka, 2013; Manzo, 2005), while place identity relates the place and one's personal identity (Trentelman, 2009). Finally, place

dependence comprises the acts and behaviors toward a place that meets the necessities of an individual with respect to other places (Jorgensen and Stedman, 2001).

4.1.2.2 Social Capital

Social capital (SC) analyzes the value of social relationships and networks to societies and individuals (Holt, 2008) from two perspectives: structuralism (Bourdieu, 1984; Bourdieu and Wacquant, 1992) and interactionism (Coleman, 1988). Roughly, the former is defined as the connection between nodes and links, while the latter focuses on the links that are built on top of these connections based on an individuals' norms, preferences and attitudes (Westlund, 2006). SC is simultaneously an economic, sociological and political (Szreter, 1998) and psychological concept (Perkins et al., 2002). Geographers have been skeptical in the spatial envisioning of SC and have lost the opportunity to add the concept to the open dialogue in the social sciences (Holt, 2008). Specifically, some authors consider that geographical SC is almost dead (Radcliffe, 2004), while other authors who argue for the potential of understanding and reconceptualizing SC geographically (Holt, 2008; Putnam, 2000; Rutten et al., 2010; Westlund et al., 2010). For instance, Foster et al. (2015) measured the spatial dimension of SC encompassed in the cognitive neighborhood, while other researchers have extracted it from SNA (Andris, 2016; Valenzuela et al., 2009). In our research, SC refers to the relationships between human collectives (Holt, 2008) and the analysis of their values to individuals from a structuralist perspective.

4.2 Methodology

The methodology of this paper focuses on understanding the explicit spatial relationship between SoP and SC using different methods (see section 4.2.2) in order to contribute to the body of knowledge regarding platial urban dynamics, and thus, urban intelligence. Hence, for this study, we define three types of spatial information for each citizen (c_i):

1. Geometry(-ies) that represent a participant's Geographical SoP ($GSoP_{ij}$ or $GSoP$) and their spatial union(s) ($GSoP_i$ or $uGSoP$) (a)
2. Geometry(-ies) that illustrate a participant's Geographical SC (GSC_{ij} or GSC) and their spatial union(s) (GSC_i or $uGSC$) (b)
3. A point that illustrates a participant's home (hi)

$$GSOP_i = \bigcup_{j=1}^N GSOP_{ij} \quad (4.1)$$

$$GSC_i = \bigcup_{k=1}^M GSC_{ik} \quad (4.2)$$

where:

c_i is a citizen;

i is an integer number between 1 and n , where n is the total number of citizens in a given city;

N and M are positive integers, representing the total number of SoP and SC areas, respectively, for a citizen c_i ;

$GSOP_i$ represents the union of all of the individual geographical sense of place(s) ($GSOP_{ij}$) for a citizen c_i ;

GSC_i represents the union of all of the individual geographical social capital(s) (GSC_{ik}) for a citizen c_i

4.2.1 Data collection: the spatialization of sense of place and social capital

The method we present uses a public participation geographic information system (PPGIS) (Acedo et al., 2017a) based on the softGIS methodology (Kahila and Kytta, 2009; Kytta and Kahila, 2011) to collect the spatial dimensions of citizens' SoP and SC. We centered our methodology around a PPGIS application for three main reasons. Firstly, our principal data (i.e., geometries representing SoP and SC) is spatial, and as such, a PPGIS approach provides a useful tool to gather that geographical information. Secondly, the nature of a PPGIS methodology to broadening public involvement in policymaking (Sieber, 2006), reveal its bottom-up possibilities and provide qualitative knowledge essence (Jankowski et al., 2016). Finally, its mainly online oriented approach enables surveys to take place more rapidly and to reach more people (Brown and Kytta, 2014). Furthermore, as was mentioned above, the most similar study to ours (Brown et al., 2015) also applied a PPGIS to gather the spatial dimension of place attachment. However, although despite the fact that Brown and Pullar (2012) favored the use of points instead of polygons in PPGIS applications, our approach (and that of Brown et al. (2015) as well) uses polygons to better accommodate the possible different spatial scales of the studied concepts (SoP and SC).

The PPGIS application used in this research combines the web-mapping activity with a series of questions related to the defined spatial features⁴. This tool is open source, and therefore replicable and reusable⁵. We defined a meticulous sequence of actions to guide participants to specify the user through attempting the definition of their GSoP and GSC spatial dimensions. The tool shows an explanation of the two concepts (i.e., SoP and SC), and requests the participants to think about their own places and social groups that comprise these two concepts, respectively. The definition of SoP is consistent with the place attachment, place identity and place dependence conceptualization (Jorgensen and Stedman, 2001; Pretty et al., 2003), while SC is surveyed based on Grootaert et al. (2004) (see both questions in Appendix B). Once participants had considered what constitutes their SoP and SC, some instructions guided the participant to name, spatialize, and characterize the respective areas related to their SoP and SC (as many as needed) through spatial drawing tools (draw polygons button⁶) on a base map centered on Lisbon city without any restrictions in terms of scale and location (for more information see Acedo et al. (2017a)). The tool also provided a space for participants' sociodemographic information (age, gender, profession, income and nationality).

4.2.2 Studying the spatial relationship between sense of place and social capital

As mentioned before, it is a challenge to define the boundaries of complex related place concepts through geographic primitives (see section 4.1.2). In this study, we address the analysis of those geographic primitives gathered from three different analyses: point-based, area-based and distance-based. We introduce alternative analyses that can complement each other to elucidate the suitability of different analytical levels (i.e., individual and collective) and anticipate different boundary natures (i.e., fuzzy and sharp). Sharp boundaries are geographic primitives (i.e., discrete polygons) to define, through the aforementioned PPGIS application, both GSoP and GSC. Fuzzy or vague boundaries, in this study, indicate a lack of a clear definition of boundaries, i.e., the interpretation of geographic boundaries without a clear definition of where or what they are (Huck et al., 2014). We achieve those fuzzy boundaries with the estimation of the frequency of occurrence of GSoP and GSC (i.e., kernel density function) that illustrate

⁴<https://placeandcity.com> accessed on 26th of June

⁵<https://github.com/aacedo/placeandcity-backend>
<https://github.com/aacedo/placeandcity-frontend> accessed on 26th of June

⁶<http://leaflet.github.io/Leaflet.draw/docs/leaflet-draw-latest.html#1-draw-polygon> accessed on 26th of June

collective fuzzy or vague spatial relationships. We handled the entire computational process with the database driver `psycpg2`⁷ (PostgreSQL + Python); the collected data were stored in a relational geodatabase managed by PostgreSQL/PostGis and visualized in QGIS. Furthermore, we conducted some of the statistical analysis with R⁸.

4.2.2.1 Point-based analysis

We calculated the centroids of GSoP and GSC and performed a spatial analysis of them based on spatial point patterns (Diggle, 2013). The simplification of GSoP and GSC to centroids answer the necessity of understanding at the collective level the distribution of those geographical areas. Although the centroids imply inaccuracy on the area extension, we treated them as primary elements to achieve fuzzy or vague geographical areas (see section 4.3.2). We evaluated the spatial independent hypothesis for both types (SoP and SC) (Baddeley et al., 2015). We also determined the intensity functions through the kernel density estimation (Baddeley et al., 2015; Batty et al., 2012; Diggle, 2013). Furthermore, we studied the univariate spatial distribution of each pattern (SoP and SC) with Ripley's K function and judged the hypothesis of complete spatial randomness. Finally, we used the cross-type K-function to investigate the possible spatial autocorrelation between the two concepts (SoP and SC) (Baddeley et al., 2015; Diggle, 2013).

4.2.2.2 Distance-based analysis

We present two linear thresholds to study participants' home and uGSoP-uGSC linear specific spatial relationships (Smith et al., 2009), respectively. The calculation of the Euclidean distance is always from the nearest point from uGSOP or uGSC to the participants' home. We determine the following two linear thresholds (d1 and d2):

- d1: the first linear threshold is defined by the Hasanzadeh et al. (2017) study. This article performed a literature review regarding the suitable spatial delimitation for defining home neighborhoods. Accordingly, 500 m is the most commonly used spatial delimitation.
- d2: the second linear threshold is acquired by the tendency of individuals to travel the same distance (1500 m) in similar periods of time (24 h, 48 h, 72 h) (González et al., 2008). Several studies in human mobility refer to these results as a typical

⁷<http://initd.org/psycpg/docs/> accessed on 26th of June

⁸<https://www.r-project.org> accessed on 26th of June

threshold for human mobility studies ([Giannotti et al., 2012](#); [Karamshuk et al., 2011](#); [Pirozmand et al., 2014](#); [Toole et al., 2015](#)).

4.2.2.3 Area-based analysis

We calculated the area of each GSoP and GSC to better understand the frequency distribution based on area. The areas of all of the participants were spatially intersected for each type (SoP and SC) to better understand locations with more SoP and SC, respectively. We combined all of the participants' areas per type and counted the overlapping times between them. We also analyzed the explicit topological relation between the areas ([Egenhofer et al., 1994](#)), and concretely, between the parishes and each uGSoP and uGSC.

4.2.3 Study area

The capital of Portugal, Lisbon, extends over an area of 100 square kilometers and supports a population of over 500,000 people. In 2012, Lisbon suffered an important administrative restructuring, moving from 53 to 24 parishes ([Figure 4.2](#)). This adjustment considerably transformed Lisbon's autonomous governments (*freguesias*) by changing their spatial distribution, names, and structures. Lisbon's participatory department watches over participatory processes and tries to engage citizens in the different events in of the 24 parishes. Our exploratory research is focused on Lisbon citizenship that has participated in these participatory processes from the different parishes. The survey was sent to the Lisbon participatory budgeting email database, which represents a sample of the general adult public that has participated (at least once) in Lisbon participatory processes using email. We applied a non-probabilistic sampling, specifically, a convenience sampling ([Etikan, 2016](#)). The Lisbon city council contacted the participants by email and requested them to answer the map-based web survey during a three-week period (12th June to 2nd July 2017).

4.3 Results

All 373 participants drew at least one SoP area. For this study, we were only interested in areas defined within the Lisbon city boundary mapped by Lisbon citizens. Consequently, we obtained a dataset (n=311), from which our primary concern was citizens that had defined both areas (SoP and SC) (n=163). [Table 4.1](#) shows their demographics.



Figure 4.2: Lisbon parishes distribution (study area)

There is a considerable variability in the size of both participants' SoP and SC areas. For instance, just one participant identified one of his/her GSoP larger than a quarter of Lisbon extension (about 10,000 ha), while 107 of the areas established were less than a hectare. Indeed, 50% of the GSoP were smaller than 12 hectares. SC areas also had a high variability, although participants' GSC were smaller in size than GSoP; about 50% of them were smaller than 8 ha.

4.3.1 Collective level: fuzzy understanding of place urban dynamics

Studied participants ($n=163$) defined areas of SoP and SC throughout the city of Lisbon. Collectively, all of the polygons of each type were combined, and we counted the number of overlapping between them. The maximum number of overlapping polygons for SoP was 83, while in the case of SC, the number was 45. Figure 4.3 shows the fuzzy or vague boundaries of these overlapped areas after applying a Kernel density function.

From visual inspection, the spatial overlapping of both SoP and SC is mainly geographically situated in the city center of Lisbon (south), with clearly more intensity in

Table 4.1: Demographics of the sample for this study

Demographic characteristics (n = 163)	Respondents	%
Age (years)		
Less than 35	57	34.97
Between 35 and 50	58	35.58
More than 50	48	29.45
Gender		
Female	75	46.01
Male	88	53.99
Household monthly income (euros)		
Less than 1000	14	8.59
1000 - 1499	27	16.56
1500 - 1999	28	17.18
2000 - 2999	41	25.15
3000 - 4999	14	8.59
More than 5000	13	7.98
N/A	26	15.95
Profession		
Employed worker	89	54.60
Freelance	24	14.72
Retired	18	11.04
Student	12	7.36
Other	12	7.36
Unemployed	8	4.91

the case of SoP. Indeed, the overlapping SoP areas are mainly in the city center. Conversely, concurrence areas (overlap) of where SC is concentrated are rather situated in the surroundings of the city center. To study the distribution of SoP and SC, and their possible spatial clustering in the city of Lisbon, we calculated the Kernel density function, their univariate spatial behavior and the bivariate spatial pattern between both. Figure 4.4 shows the distribution of the centroids for both. While the GSoP are more located around the city center, the GSC areas are more dispersed around the city. To analyze the spatial distribution of each pattern (SoP and SC), we performed two statistical point pattern analyses. Figure 4.5 shows the plots of Ripley's K function of each and the cross-type Ripley's function. The x-axis describes the different geographical scales in which the analysis was performed in meters, while the y-axis represents the estimated value for Ripley's K function and the Cross-type Ripley's function, respectively. We identified that both series of events (SoP and SC) exhibit spatial clustering in all of the scales. The bivariate spatial analysis for testing the hypothesis of non-spatial



Figure 4.3: Representation of areas of overlapping (a) sense of place (SoP) and (b) social capital (SC) using a Kernel density function

interaction between them (a cross-type Ripley's function) also shows a schema of spatial aggregation at all of the scales.



Figure 4.4: Sense of place (a) and social capital (b) hotspots in Lisbon using Kernel density function with bandwidth = 500m and grid cell = 30m

4.3.2 Individual level: sharp understanding of place urban dynamics

We can discern between two groups of participants: those whose spatial relationship between uGSoP and uGSC was non-disjoint ($n=87$), and those who exhibited a disjoint relationship ($n=76$). At the individual level, we performed two analyses: *closeness and localness*. The study of closeness relates the minimum Euclidean distance between home and both areas (SoP and SC) based on the thresholds defined in section 4.2.2.2. Figure 4.6 presents several SoP and SC hotspots in certain zones: besides the city center, the

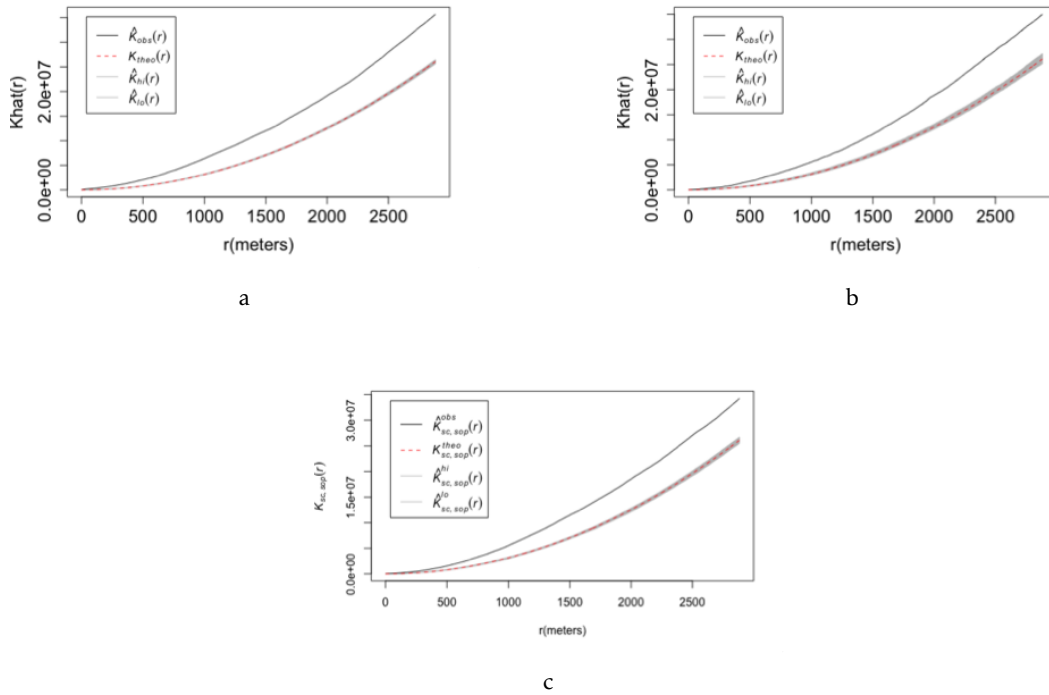


Figure 4.5: Ripley’s K function for sense of place (a), social capital (b) and Cross-type Ripley’s K function (c)

Gulbenkian Foundation and the area surrounding José Alvalade Stadium. The former is an environmentally cultural place, while the latter is a football stadium. Both hold citizens’ personal attachments and meaningful social relations. For the relation between home and uGSC, the largest number of participants falls in the largest threshold (35%, large red circle), followed by the shortest threshold (33%, small red circle) and the threshold between d1 and d2 (32%, medium red circle), respectively. The similarity in the classification denotes that further investigations are needed to differentiate participants better. Regarding uGSoP, the shortest threshold is slightly higher (38%, smallest blue circle), the remaining groups (d1 – d2 (medium blue circle) and >d2 (large blue circle)) have the same percentage of participants (31%). Again, the similarity between the classification groups does not allow for any conclusion. This behavior in the two concepts can denote a spatial linear similarity from participants’ homes and their SoP and SC, i.e., significant places for participants (i.e., SoP) are “equally” spatially related to home as their meaningful relationships (i.e., SC). Further investigations are needed to better differentiate participants regarding the spatial relationship between their home

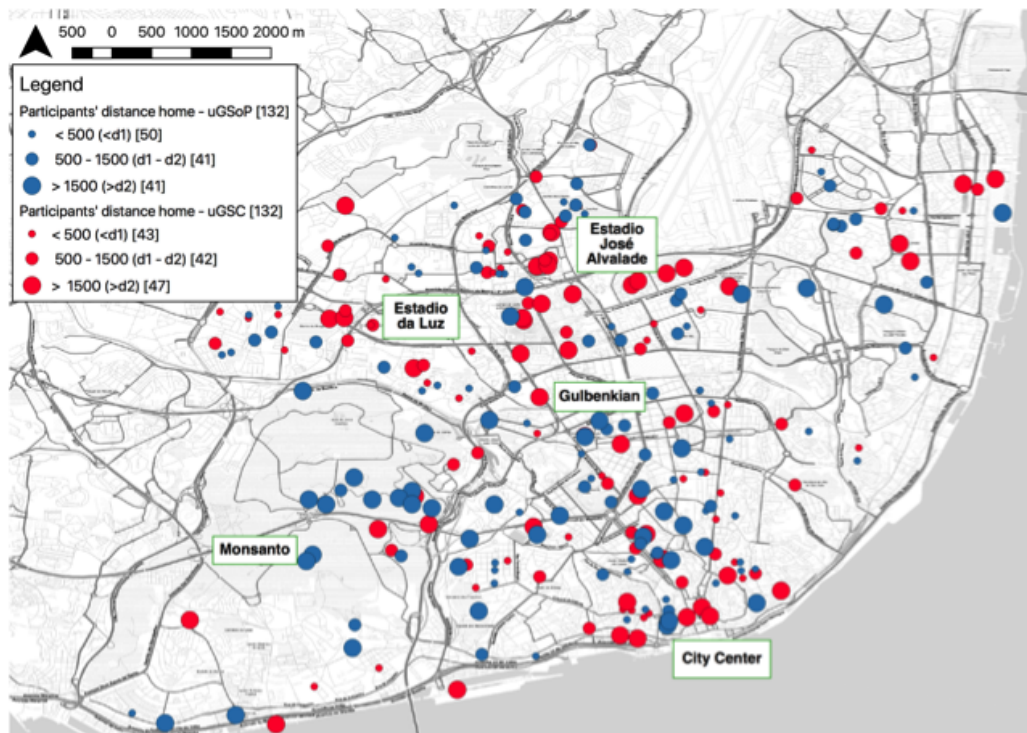


Figure 4.6: Distribution along the city of Lisbon of participants. Notes: (1) just 132 participants wanted to accurately spatially define their home, (2) it is represented as the centroid of the areas, but the Euclidean distance is related to the closest point between participants' homes and the targeted area

and SoP/SC, respectively. However, there is something to say about the distribution of the areas. For instance, an important number of large blue points (SoP area $> d2$ (1500m)) are located in the zone of Monsanto park. This is a big park (around 1000 ha) that is situated in the southwest of Lisbon city. Participants obviously don't live in the park, but, based on the map, they have an attachment toward this green zone. Another interesting appreciation is the cluster of both the smallest blue and red points in the second ring of the city (between the Gulbenkian and Estadio Jose Alvalade labels). Participants that live in this zone also have some of their social relationships and attachment close to home.

For the study of participants' localness regarding their areas of uGSoP and uGSC, we use the spatial boundaries of parishes to distinguish between citizens that have all of the GSOP and GSC areas inside a parish and those that do not (Table 4.2). Furthermore, we differentiate between the home parish and the other parishes. Lisbon is structured into 24 parishes, which all possess administrative power.

Table 4.2: Distribution of Geographical sense of place (GSoP) and Geographical social capital (GSC) regarding the home parish

Areas' distributions	Specific areas' distributions	Group A + B				uGSoP and uGSC
		uGSoP	uGSC	uGSoP	uGSC	
All citizens' areas within same parish	Home parish	57 (35%)	60 (37%)	61 (37%)	92 (56%)	35 (21%)
	Other parishes	4 (2%)	32 (20%)			
Citizens' areas outside and within parishes	All areas outside home parish	19 (12%)	54 (33%)	102 (63%)	71 (44%)	128 (79%)
	Others	83 (51%)	17 (10%)			
Total citizens	Total citizens	163	163	163	163	163

It is important to highlight the attachment toward the home parish in this study. Only 12% of participants defined all of the GSoP outside of their home parish. In contrast, participants indicated that the uGSC is more spread: 37% was within and 33% was outside of the home parish, and the rest had both within and outside the home parish (30%). However, it is relevant to underline that approximately 56% of participants identified their GSC areas inside the same parish. This means that more than half of the participants belong to social groups in a single parish, which denotes the localness of their social relations. When we combine both sets of areas (uGSoP and uGSC) only 21% of the participants identify them in the same parish.

Participants with a non-disjoint sharp spatial relationship between uGSoP and uGSC mainly have this concurrency in the city center (see Figure 4.7). There are also intersected areas in Belém and Parque das Nações. Those areas represent historical (Belém) and recent symbolic places (Parque das Nações) where citizens experience a SoP and, according to the results, they also encounter their social networks (SC). In turn, there are small isolated areas in the second ring of the city and several citizen-based areas based on SoP and SC in the surroundings of the football stadium (José Alvalade Stadium) and other outskirt zones (see Figure 4.7). The percentages shown in Figure 4.8 correspond to the area of overlapping with respect to the union of corresponding uGSoP and uGSC. About 25% of the participants hold more than 10% overlap between their non-disjoint uGSoP and uGSC. Furthermore, we also studied the kind of spatial relationship. From the total non-disjoint relationships (87), six participants defined their uGSoP within



Figure 4.7: Group A - defined areas embedding the spatial dimensions of SoP and SC of participants

their uGSC and 13 participants defined the relationship in the other way around. The remaining participants (68) followed an overlap topological relationship.

4.4 Discussion

We can understand any city as a landmark connected in a dynamic and functional global network. Likewise, at the city level, the same structure is repeated based on the local perspective; dynamic and functional network of places. The current challenge within the city context, is to understand the citizens' spatialities that shape this spatial reasoning. Currently, we confront a dichotomy between understanding (1) citizens as beings within a pre-established range (e.g., neighborhoods and parishes), with difficulties when dealing with social problems due to objective administrative boundary delimitation (Foster and Hipp, 2011; Lee et al., 2008) and (2) citizens as individually-based ranges established on daily interactions, feelings and social interactions (i.e., individual *spatialities*). Our research focuses on the second conceptualization by providing a better command

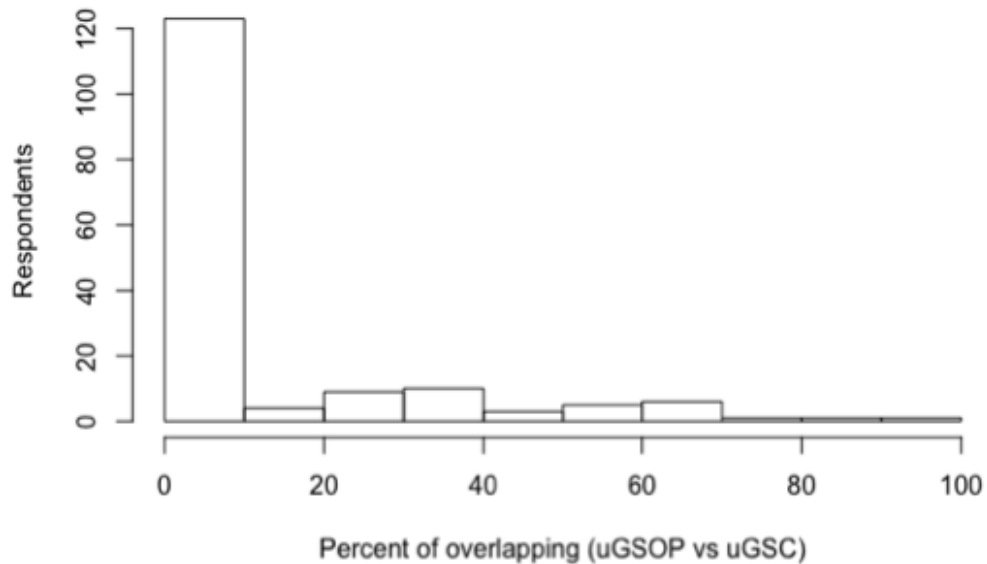


Figure 4.8: Frequency distribution of overlapping between sense of place and social capital areas

of the urban intelligence notion through the operationalization of citizen's significant areas (GSoP) and meaningful social relations (GSC).

We found notable spatial variability in the direct mapping of SoP and SC using PPGIS methods. We expected this finding since, for instance, SoP can encompass a wide range of spatial scales, (from an armchair to the whole earth (Tuan, 1978, p. 149)). However, in this study participants defined their areas of SoP and SC "locally"; only one area exceeds 25 km² (1/4 of Lisbon city area). The methodology followed in this study shapes the interpretation of place dynamics from two different perspectives: fuzzy and sharp. This dual approach allows the study of place dynamics through fuzzy or vague boundaries at the city level and attempts to elucidate the individual-place based areas by sharp boundaries at the individual level. Although the spatial data is the same for both perspectives, the combination of the three different analyses which that were used provides a better comprehension of the platial urban dynamics based on SoP and SC at both levels (i.e., individual and collective):

- At the collective level, GSoP exhibits more spatial concurrence (overlap) than GSC,

since participants defined more GSoP than GSC. In turn, the spatial point pattern analysis of the GSoP and GSC centroids that was performed shows that both the univariate and bivariate analysis have a spatial clustering in all of the scales. This means that it is very likely that an area of SoP occurs close to other areas of the same type. This statement is also true for SC and for the analyses of both together (bivariate analyses). Thus, the aggregated areas of SoP and SC within Lisbon show similarly located spatial distributions (see Figure 4.4) and are spatially clustered in all of the studied scales. Based on our study case, GSoP has more intensity in the city center, and GSC is more spread along the city.

- At the individual level, closeness was calculated based on the linear spatial relationship between home and the two studied concepts (SoP and SC). We did not obtain any significant dissimilarity between the groups formed based on d1 and d2. This finding can be related to the spatial autocorrelation (spatial clustering) that we found at the collective level for all concepts in all of the scales. Concurrently, a strong influence of participants' home location over their SoP and SC areas is also shown. Closeness analysis also discloses that green zones and parks are areas of strong attachment, although they are not close to home ($>d2$). Locality was calculated with the addition of parish boundaries to the study. Results show that (1) the meaningful social relationships of participants are locally situated: more than half of the participants belong to social groups in a single parish; (2) participants are attached toward part or parts of their home parish as it was already pointed out in Lewicka (2011b) study.

Our presupposition that uGSoP and uGSC follow an important non-disjoint spatial relationship at the individual level (based on Acedo et al. (2017b)) was generally supported by the results of this study. All participants' areas for each type (SoP and SC) almost entirely cover Lisbon; thus, the concurrence areas at the aggregated level follow the same spatial behavior. At the individual level, the non-disjoint spatial relationship between uGSoP and uGSC was about 53% (see Figure 4.8), although it is important to highlight that this percentage is influenced by the method for defining both bounding areas (uGSoP and uGSC). Our method to generate both areas uses the Union GIS technique⁹, while other similar studies used methods such as minimum convex polygon (MCP) (Brown et al., 2015; Hasanzadeh et al., 2017) to determine place attachment and neighborhood home range, respectively. The comparison between the

⁹<http://desktop.arcgis.com/en/arcmap/10.3/tools/analysis-toolbox/union.htm> accessed on 26th of June

two techniques can hide a higher spatial concurrence by the latter. Concurrently, the use of MCP also can imply the aggregation of insignificant places for an individual in the computational process. Having said that, we speculate that our approach achieves a better spatial accuracy on citizens' spatialities and grants an extra value to our non-disjoint spatial relationship percentage between uGSoP and uGSC (53%). This percentage is in consonance with (1) some authors that systematically demonstrate that SC in the form of local contacts (neighbors, family, friends living nearby) are a consistent predictor of place attachment (SoP's dimension (Jorgensen and Stedman, 2001)) (Mesch and Manor, 1998), (2) others include social contacts as a separate dimension of place attachment (Raymond et al., 2010) or (3) as a prominence element that explains part of the place dimension of place attachment (Scannell and Gifford, 2010). However, although some authors have argued that '*the social capital rarely appears in literature dealing with place attachment*' (Lewicka, 2011b, p. 211), the spatial pattern SoP's and SC's imprint in the city has not been studied and validated to date.

Some researchers have identified the need for new boundaries that recognize the city interactions based on a socio-geographic approach for social issues (Foster and Hipp, 2011). Our exploratory study goes further, as it deals with the notion of urban intelligence, which is mainly dependent on our capability to understand platial urban dynamics. Hence, we are not just trying to rethink the current administrative boundaries, we are also trying to understand the city from another perspective, as other authors have already highlighted (Castells, 2010; Massey, 1994; Roche, 2016), namely by studying the network that embeds the platial urban dynamics of the city. While there has been considerable academic writing on place network dynamics, its practical application beyond the hypothetical has been minimal. In part, the spatialization of place, or related complex and multifaceted concepts (i.e., SoP and SC), entails a difficulty of reducing them to geographic primitives (Huck et al., 2014) because they are the product of social interaction processes (Massey, 1994). We are aware of this constraint, as well as alternative "vague" methods in other studies (Huck et al., 2014). However, we attempt to spatialize SoP and SC through a PPGIS application based on the definition of polygons. We do not deny the social dynamism of the studied concepts, but we required "*a spatial picture*" of them in a given time (12th June to 2nd July 2017 for this study) in order to evaluate their sharp and fuzzy spatial relationships. We are dealing with dynamic, time-dependent and scale variable concepts. Citizens' spatialities that embed SoP and SC may change over an individuals' lifetime, highlighting the requisite for longitudinal time-series studies and a dynamic collection of social data. The authors of this study acknowledge this point as a limitation of this kind of study and methodology.

We elucidate throughout the paper that mapping SoP and SC and analyzing their spatial relationship illustrates an alternative for the operationalization of place, urban dynamics, and urban intelligence. The definition of place as a situated social process implies the continuous redefinition based on the social relations of individuals (SC in this study) and the individual-space interaction (SoP in this study) in space and time (Cristoforetti et al., 2011). The theoretical conceptualization and alignment of a network based on the structure of place has been extensively studied (Castells, 2010; Massey, 1994; Roche, 2016); however, to the best of our knowledge, this is the first exploratory study to partly try to visualize the spatial definition of the imprint of that urban intelligence. Hence, there were few clues to guide the methodology of this article. As a consequence, we analyze the collected areas through three analyses relating the collective (fuzzy boundaries) and individual (sharp boundaries) levels. Based on that, we achieve a sharp participants-based area that embeds SoP and SC spatial dimension at the individual level (Figure 4.7). All of the areas depicted in Figure 4.7 harmonize the participants' network of places that are defined by important places and fruitful relationships. However, as was mentioned above, the identification of place with geographical primitives when place nature follows a dynamic social process is not the most suitable representation. Figure 4.9 shows the Kernel density function of Figure 4.7 (based on centroids), which that can be understood as the fuzzy representation of those participants-based areas that embed SoP and SC.

We speculate that those fuzzy or vague areas (Figure 4.9) have potential similarities with the notion of place established by Agnew (2002, 2011) for each involved participant. He defines three dimensions of place: SoP, locale, and location. The latter is implicitly the spatial dimension where place exists, that is, where the other two appear. Locale refers to the settings where daily activities occur (Agnew, 2011), i.e., the geo-sociological element of place. Those locales can be workplaces, homes, and shopping malls (Agnew, 2011). From this perspective, our SC conceptualization (values of social relationships and networks to societies and individuals) can share elements with locale. Furthermore, the significantly narrow spatial relationship between SoP and SC (argued in this article) emphasizes and accommodates the idea of treating SC and locale as similar concepts, which presents a potential topic for future research. Therefore, the spatial alignment of Figure 4.8 attempts to partially represent the spatial dynamics for an urban intelligence based on individuals' spatialities of SoP and SC in a given time. Those vague locations form a spatial system throughout the city in accordance with the city's conceptualization as a dynamic network of connected urban places (Castells, 2010; Roche, 2016) instead of a continuous and homogeneous space.

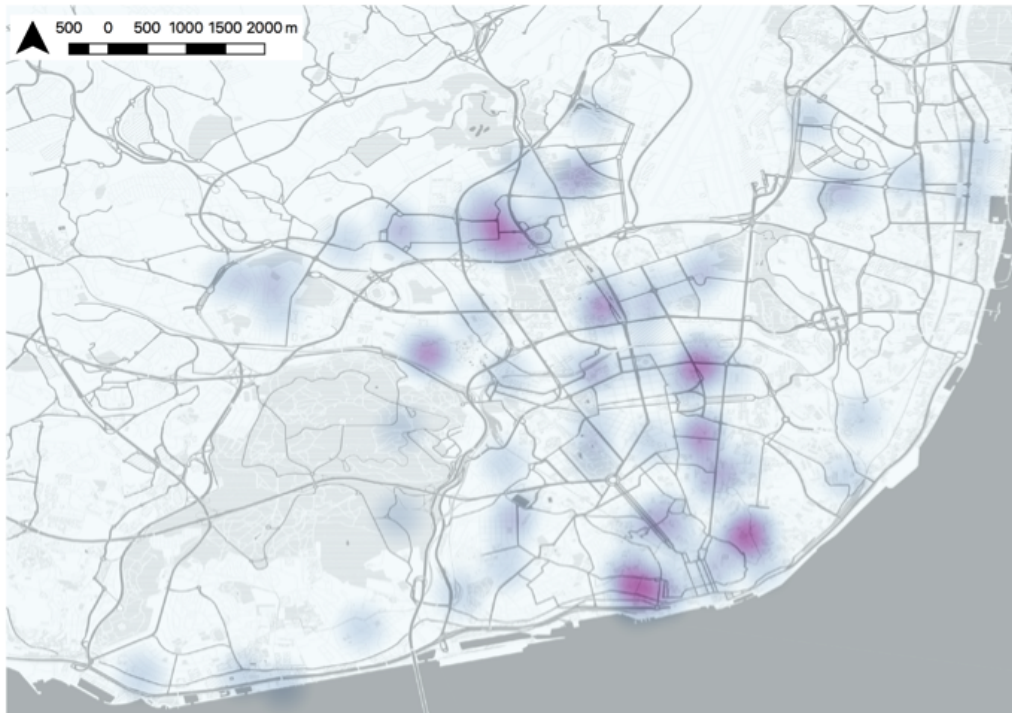


Figure 4.9: Fuzzy representation of participants-based area that embed SoP and SC based on Kernel density estimation function

4.5 Conclusions and future work

We foresee a big potential of spatially defining the city's urban spatial dynamics in different areas of knowledge such as planning. However, this exploratory study is just a first step of a long way to go in the meaningful operationalization of the urban intelligence on a map. Until this process is normalized and dynamically updated, it will not be able to influence other areas of knowledge such as land-use planning and decision support. Therefore, this study aims to open up the agenda for further research into exploratory place-based geography studies. Currently, there is an optimal environment within the smart city realm to "digitalize" our spatialities for achieving a more understandable city. Fortunately, the abyss between digital technology, social science, and digital data is becoming smaller. If they finally coalesce, the concept of place will clearly occupy a central position (Goodchild, 2011). Having said that, this study has proved the significant non-disjoint spatial relationship between SoP and SC spatial dimensions at the individual level and a schema of spatial clustering at the collective level. We also reasoned about the suitability of understanding SoP and SC as inhibitors of place-making and their

spatialization as an alternative way to elucidate the platial urban dynamics in the city toward urban intelligence. Future work will be in the line of better understanding the nature of those places that form the platial urban dynamic network and comprehending the interrelation between them. This last point is only possible with the perspective based on a collective platial network, i.e., not just to add individual-based areas to the network, but also understand the synergies between the collective to create potential environments for cooperation, participation and collaboration at the community level. This is only possible with the connection of these unique individual-based places with a commonplace that represents each individual, and in turn, it does not lose its shared nature to become new arenas of contact for all of the stakeholders of the smart city.

PLACE AND CITY: TOWARD A GEOGRAPHY OF ENGAGEMENT

Abstract¹

The relationship between sense of place, social capital and civic engagement has been studied in different disciplines. However, their association has been less examined, and their spatial relationship has been analyzed even less. This study contributes to the better understanding of the relationship between these three concepts (i.e., sense of place, social capital and civic engagement). Furthermore, we analyze the crucial role that the spatial relationship between them plays. Using spatial data collected through a web map-based application, we adopt structural equation modeling (SEM) techniques to assess the repercussion that sense of place has on social capital and how the latter affects civic engagement. We find that sense of place is significant and positively correlated with social capital, while the latter also significantly explains civic engagement at the individual level. Furthermore, we observe a better statistical performance in almost all the cases when a spatial relationship between the three constructors exists. Our research leverages SEM techniques, Geographic Information Science (GISc) methods, and participatory methodology to show the spatial connection between sense of place

¹The text from this chapter has been submitted as Acedo, A.; Oliveira, T.; Naranjo-Zolotov, M.; Painho, M. Place and city: Toward a geography of engagement to the international journal *Heliyon*

and social capital to explain civic engagement. Deriving and quantifying such meaning allows us to highlight the importance of their spatial dimension in city processes such as participation.

Keywords: sense of place; social capital; civic engagement; spatial dimension; geographies of engagement

5.1 Introduction

The importance of encouraging people to act as participative citizens in issues of public concern is essential for a functioning democracy, particularly when researchers are observing that civic engagement (CE) is diminishing in developed countries (Aricat and Ling, 2016). In turn, the relationship that individuals have toward a certain geographical area (i.e., sense of place (SoP)) or their significant social relationships (i.e., social capital (SC)) embedded within an area can play a crucial role on the engagement of a citizen (Perkins et al., 1996). Researchers have revised the connection between individuals' place attachment and many forms of CE, such as civic activity (Lewicka, 2005), community participation and planning (Manzo and Perkins, 2006) or pro-environmental behavior (Buta et al., 2014). All these studies register the importance of relationships between citizens and their meaningful places, in which they can have significant relationships, to citizens' engagement. However, the association between participation, place and space has received little attention (Haywood, 2014). Hence, the study of individuals' spatialities (i.e., individuals or collectives practices related to their geographical location that reflects their spatial actions and interactions (Lussault, 2007)) regarding SoP and SC in the city context can offer an alternative to better understand and foster participatory processes (i.e., CE). Our approach has its roots in the understanding of cities as place networks (Acedo et al., 2018a; Massey, 1994; Roche, 2016) and how we can comprehend a relational space based on networks of actions and actors (e.g. humans, objects) (Duff, 2011; Latour, 2005; Murdoch, 1998). Based on that, the main objective of this study is the research of the (spatial) relationship among SoP, SC and CE to assess the spatial importance of the first two (i.e., SoP and SC) in the socio-spatial practices of CE (e.g., participatory processes). Our study aims to exalt the spatial dimension (i.e., in this study, the geographical definition on a map of the area that covers the feelings, thoughts and acts toward an object represented through geographic primitives) of individuals' spatialities regarding SoP and SC as an important aspect to better understand CE in the urban context.

This study performs a theoretical literature review to assess the relationship between

SoP, SC and CE and their dimensions from a non-spatial perspective. Based on that, we attempt a revision of the same concepts from a spatial point-of-view. In this research, a spatial perspective means to study (1) the spatial imprint of a concept defined by its location and (2) the relative location versus other concepts (i.e., proximity, density). We gather the spatial dimension of SoP, SC and CE from a web map-based survey. We merge a web map-based approach with traditional questionnaires based on softGIS methodology (Kahila and Kyttä, 2009; Kyttä and Kahila, 2011). We analyze the answers using partial least squares structural equation modeling (SEM) techniques (Hair et al., 2014) to illustrate their quantitative relationship and assess the potential of considering the spatial dimension of the social concepts (i.e., SoP and SC) to better understand CE in the city context. Our methodology is eminently based on citizens' spatialities associated with the SoP, SC, and CE; i.e., the entire methodology is revolving around a geographic perspective with a practical focus on studying the social-spatial practices of CE such as participatory processes in local or community affairs in the city context.

We assume that there is a difficulty to switch current participatory geographies (i.e., the spaces where the governments are setting up participatory processes) based on administrative boundaries to one based on common citizens' spatialities. The underlying reason to use those administrative boundaries is to find out the percentage of the participatory results upon census and socioeconomic data in those specific areas. However, the understanding of the spatial relationship between SoP, SC and CE establishes novel spatial scenes based on human-city interactions. These possible geographies can embrace a commitment to place (SoP), meaningful social groups (SC) and spaces of participation (CE) for a citizen. Therefore, those new spatial contexts can operate shared geographies of engagement that can underpin collaboration, cooperation and interaction between citizens engaged with these specific geographic areas in, for instance, local affairs, social issues or planning decision-making processes. This paper materializes the first step towards these new "*geographies of engagement*" (1) performing a theoretical literature review between SoP, SC and CE and their dimensions, and (2) studying and assessing the influence of SoP on SC and the latter on CE with special focus on when it occurs their spatial relationship in a proposed model. This article starts with a review of the SoP, SC, and CE conceptualizations and dimensions. From there, it is reasoned the suitability of understanding those concepts from a spatial point-of-view with the declaration of some hypotheses. The article then presents the methods and the results of an experiment conducted in Lisbon (Portugal) to clarify the importance of the spatial dimensions of SoP, SC, and CE to explain their relationship. This explanation is followed by a discussion of the results, the remaining gaps, the limitations, and finally the conclusions of this

research.

5.2 Theoretical background and hypotheses

A city can be understood under a relational nature between actions and actors (e.g. humans, objects) (see actor-network theory (Latour, 2005; Law, 2008). Murdoch (1998) specified the characteristics of that city-space arguing a folded and striated geography in which all action is relational and reflects both the diversity of materials used in construction and the relations between elements. Drawing in the same line, Duff (2011) mentioned three needed resources (i.e., social, affective and material) to enable and define places. The relationship between the three aspects forms networks and flows that configure the city environment. The same author describes the social resource as social capital, the affective resources mean feeling states and action-potential, and the material resource covers the physical aspect of place as well as services and information. Recently, Acedo et al. (2018a) also put in value the understanding of a city by spatial urban dynamics, arguing the potentiality to conceptualize SoP and SC as inhibitors of place notion based on Agnew (2002, 2011). Those mentioned conceptualizations can apply to any city, the challenge resides on how to operationalize those arrangements in the city context to better understand the urban synergies.

SoP refers to the feelings, beliefs and behaviors that humans associate with a place (Jorgensen and Stedman, 2001). The same authors argue explicitly for the positivistic research in the SoP notion and propose three dimensions (place attachment, place identity and place dependence). Place attachment is usually defined as an emotional bond that connects people to places (Altman and Low, 1992; Lewicka, 2013; Manzo, 2005), while place identity refers to the relation between a place and one's personal identity (Proshansky et al., 1983; Trentelman, 2009). Finally, place dependence is the potential of a place to meet the necessities of an individual or group with respect to other places (Jorgensen and Stedman, 2001).

SC analyzes the value of social relationships and networks to societies and individuals (Holt, 2008), and it can be analyzed by four dimensions: sense of community, collective efficacy or empowerment, neighboring and citizen participation (Perkins and Long, 2002; Perkins et al., 2002). Sense of community is the feeling of membership to a group (Perkins and Long, 2002), while collective efficacy/empowerment is the belief and thought of the potentiality of acting together. Neighboring encloses the informal actions and behaviors of citizens to a group or society (Acedo et al., 2017b) that essentially occurs in localities (Mahmoudi Farahani, 2016), and citizen participation describes the

change from passive to active involvement in the local activities and decisions (Adler and Goggin, 2005) and electronic participation (Naranjo Zolotov et al., 2018).

CE explains associations or ways in which citizens have a common purpose to preserve and promote public goods (Son and Lin, 2008), to improve conditions for others (Cegarra-Navarro et al., 2014), community (Putnam, 2000) or collective benefit (Moro, 2010). Many times CE is conceptualized as a process rather than an event (UNDP Evaluation Office, 2002), as a measurement of the right of citizens to have a say in the decisions that affect their lives (Sheedy et al., 2008, p. 4).

5.2.1 Relating sense of place, social capital, and civic engagement

A commitment to place motivates SC (Jorgensen, 2010) and neighborhood ties (Lewicka, 2005). Processes of collective action (dimension of SC) perform better when there are emotional ties to places (Manzo and Perkins, 2006). In the same line, emotional and behavioral attachment is related to a sense of community (Pretty et al., 2003). There are studies that systematically demonstrate the existence of a relationship between SoP and SC (Jorgensen, 2010; Mesch and Manor, 1998; Raymond et al., 2010). For instance, Acedo et al. (2017b) performed a systematic literature review with more than 20 references showing the strong relationships between SoP and SC and their dimensions (based on attitude theory (Ajzen and Fishbein, 1975; Fishbein and Ajzen, 1975; Rosenberg, 1960)). Figure 5.1 depicts the connections found between the dimensions of SC and SOP towards CE after to perform a theoretical literature review.

Figure 5.1 summarizes the relationship between SoP and SC toward CE found out on the theoretical literature review. The analysis of Figure 5.1 shows the relationships between the central concepts and their dimensions of this research and depicts literature-based evidence that SoP and SC are strongly related to CE. Overall, the PA dimension of SoP is the dimension most related with CE while when is about main concepts SC is the most associated with CE. Therefore, based on the literature reviewed, in the non-spatial perspective, both concepts (SoP and SC) and their dimensions show a plausible connection with CE.

CE can encompass place-based activities (Adler and Goggin, 2005) and involve more direct forms of citizens' participation (Zlatareva, 2008). Chen (2016) distinguishes different forms of CE such as civic, electoral or political activities. In the same line, Son and Lin (2008) understand CE as a conceptual framework that contains a multitude of elements and measurements. For instance, membership in voluntary organizations, religious participation or membership in civic associations. Both CE and SC incorporate

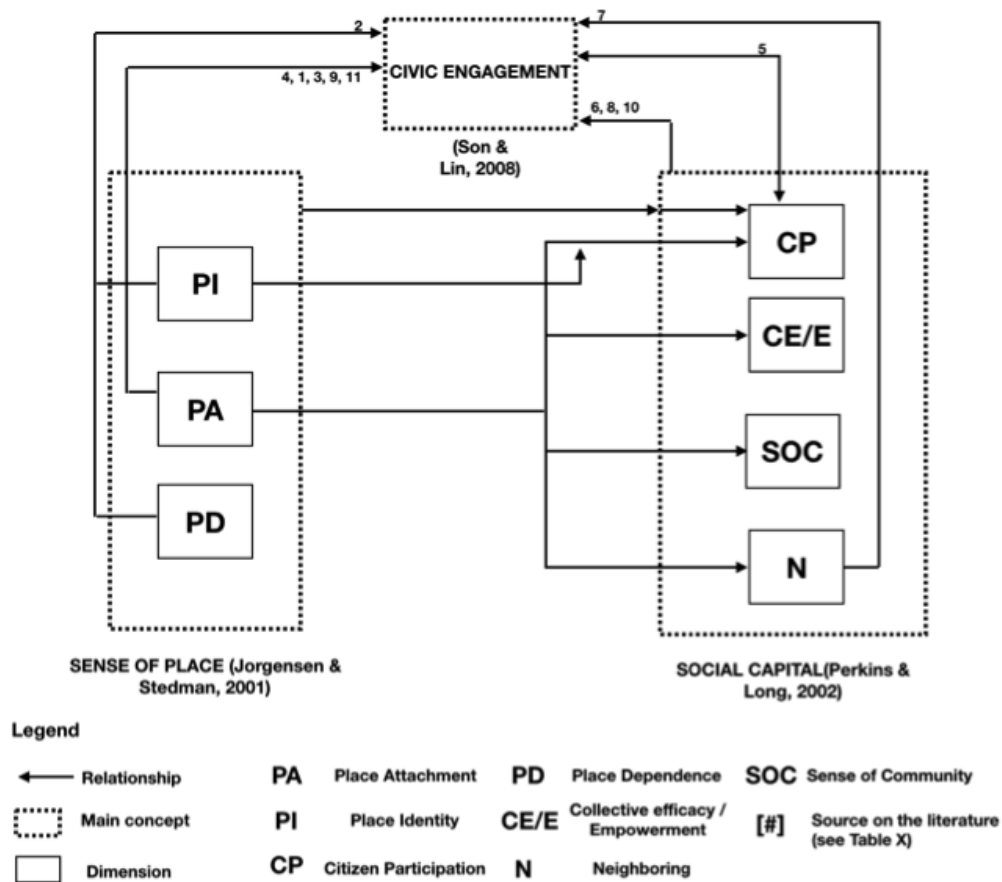


Figure 5.1: Schema showing the relationships between sense of place and social capital dimensions toward civic engagement. Figure adapted from [Acedo et al. \(2017b\)](#), numbers in the arrows are references listed in Table C.2 in Appendix C.

mutual obligation and responsibility for action ([Putnam, 2000](#)). In turn, a precondition for CE is the existence of SC ([Zlatareva, 2008](#)), since highly attached people are more willing to work collectively to reach a desired goal ([Brown et al., 2002](#)). Interestingly, [Haywood \(2014\)](#) positioned sense of place scholarship as a crucial resource to the better understanding of public participation in scientific research. In turn, [Lewicka \(2005\)](#) proves that it is neighborhood ties (SC dimension) and not place attachment (SoP dimension) that predicts civic involvement. Later, the same author [2011b](#) underlines the inconsistent pattern of relationships between affective bonds toward places and place-focused actions such as participation or planning. Therefore, based on the statements in this section and the citations shown in Figure 5.1, we state two research hypotheses in Table 5.1:

Table 5.1: Research hypotheses regarding the relationship between sense of place, social capital and civic engagement

Hypotheses number	Hypotheses
H_1	Citizens' sense of place (SoP) has a positive effect on social capital (SC).
H_2	Citizens' social capital (SC) has a positive effect on their civic engagement (CE).

A recurrent issue studied in the literature is the integration of GISc capabilities in the humanities scholarship (see [Bodenhamer et al. \(2010\)](#)). This synergy is allowing new concepts such as hybrid geographies that are forging creative connections within geographies (e.g., physical and human perspectives) ([Sui and DeLyser, 2012](#)). Indeed, this merge highlights the epistemological and social/political meanings inherent in maps and mapping ([DeLyser and Sui, 2014](#)) that reinforce the better understanding of how mapping emerge between geographers and social scientists ([Kitchin et al., 2013](#)). Conversely, non-representational theorists (e.g., [Dewsbury \(2003\)](#); [Thrift \(2008\)](#)) advocate to not represent the study target as the primary step to extract knowledge ([Cadman, 2009](#)) and put the attention on what cannot be represented ([Pile, 2010](#)). In the same line, [Massey \(1991\)](#) highlights the problem of recurrently trying to draw boundaries to the conception of place and place-related concepts that, inherently, distinguishes between an inside (e.g., us) and an outside (e.g., them). She also supports that there is no need to conceptualize boundaries in order to define place, advocating that place is a process of social interactions. But she asserts that those boundaries may be necessary for certain studies. It is in this line that our study falls in: we attempt to spatially contextualize SoP, SC and CE, to analyze the importance of their spatial relationship and their association. Thus, we don't deny the social dynamism of the studied concepts, but we need to spatially define individuals' spatial dimensions about significant places (i.e., SoP), meaningful social relationships (i.e., SC) and their spaces of engagement (i.e., CE) in a given time to evaluate their relationship.

The studies attempting to connect CE with environmental psychology (e.g., SoP) and/or social concepts (e.g., SC) have underestimated the geographical perspective that these concepts own, i.e., the spatial imprint that they acquire in the city context. Most of the studies that measure SoP (or related places concepts, e.g., place attachment (PA)) and SC are using pre-established administrative boundaries (i.e., neighborhood, parish, city, region, country) or individual-vague boundaries (i.e., home) as continuous and

homogeneous containers (Hidalgo and Hernández, 2001; Mesch and Manor, 1998; Westlund et al., 2010). However, the citizens' perception of pre-established administrative boundaries can differ from the "real" one (Coulton et al., 2001; Montello et al., 2003) and, consequently, whole administrative boundaries might not cover the SoP, SC and CE of all its dwellers. Hence, although studies systematically demonstrate that the sense of community (SC's dimension in Perkins and Long (2002)) is significant, positive and moderately strong related to forms of participation (Talò and Mannarini, 2015, p. 1) and some forms of SC are predictors of SoP (Mesch and Manor, 1998; Raymond et al., 2010); the positive spatial dimension and relationship of the three concepts (SoP, SC, and CE) has been briefly studied in the literature. In part, it is because the gap of applications and methodologies to spatialize social concepts (Stedman, 2003). When we refer to spatialize a concept, we are meaning to transfer the non-spatial knowledge on SoP and SC to the geographical domain through GISc techniques.

The studied concepts (SoP, SC and CE) can be related to a human subjective meaning to a geographic area. Among the three concepts discussed in this study, SoP is the one in which the spatial dimension has been more thoroughly studied since its affective bonds are toward an area (Altman and Low, 1992). The spatial dimension of social capital has also been analyzed (Foster et al., 2015; Rutten et al., 2010; Westlund et al., 2010), advocating for the potential of understanding and conceptualizing SC geographically (Holt, 2008; Putnam, 2000). However, some authors consider that geographical SC is 'almost dead' (see Radcliffe (2004)). Finally, CE and participation are inherently spatial (Pain and Kindon, 2007) and, consequently, influenced by social relations, time and space. The spatial dimension of CE (e.g., planning decisions or decision-making processes about communal spaces) has been established in administrative boundaries because of the availability of census and socioeconomic data in those areas (Dietz, 2002). However, this approach has probably hidden the spatial nature of CE associated with space, place and locality - essential characteristics to determine who is interested in the participatory processes and why (Carver, 2001). SoP and SC are strongly related in the non-spatial approach, as well as in the spatial one (Acedo et al., 2017b; Jorgensen, 2010; Jorgensen and Stedman, 2011), and the combination of both in a geographical area may well be the most meaningful places for a citizen (Lewicka, 2011b). On the other hand, CE occurs within a particular spatial environment where an individual has informal cooperation ties and strong horizontal linkages, that is, SC (Zlatareva, 2008). Therefore, the inclusion of the spatial dimension and relationship in our study can offer a better performance in the association between SoP-SC and SC-CE. Hence, we state the two spatial hypotheses in Table 5.2:

Table 5.2: Research hypotheses regarding the spatial relationship between sense of place, social capital and civic engagement

Hypotheses number	Spatial hypotheses
Hs ₁	A non-disjoint spatial relationship between SoP and SC spatial dimensions increases the influence of SoP on SC.
Hs ₂	A non-disjoint spatial relationship between SC and CE spatial dimensions increases the influence of SC on CE.

5.3 Methodology

This methodology studies the effect of individuals' spatialities (i.e., SoP and SC) on CE behavior when it occurs a spatial relationship between them. Thus, we establish a twofold methodology; firstly, to gather the spatial dimension of the three concepts mentioned above and, secondly, to evaluate their association through a geographical perspective using SEM.

5.3.1 Experimental design

In spite of all the critical implications that are related to mapping through GIS methodologies (see [Elwood \(2006\)](#)) and the inherent digital divide that this kind of methodologies represent ([Cruz-Jesus et al., 2012](#)), we use a web map-based survey to gather all the (spatial) data of complex notions (SoP, SC and CE). Thus studied concepts derived from environmental, social and participatory fields are artificially forced into geographic primitives (e.g., discrete points and/or polygons). Regarding this issue, [Brown and Pullar \(2012\)](#) compared studies with the two types of features, and recommended the use of points instead of polygons in participatory GIS applications. Conversely, our approach uses polygons due to (1) the ease of implementation of "standard" drawing tools to define polygons and users' familiarity with that type of approach respect fuzzy designs ([Huck et al., 2014](#)); (2) the better encompass of highly range of spatial scales, (from an armchair to the whole earth ([Tuan, 1978](#), p. 149)) and; (3) the better performance of polygon features when there is a limited spatial dataset ([Brown and Pullar, 2012](#)). Moreover, in the most recent and similar research to ours, [Brown et al. \(2015\)](#) use a Public Participation Geographic Information System (PPGIS) application to measure and mapping place attachment. They also define place attachment with polygon features from the minimum convex polygon of (at least) three points. However, the representation of geographically vague concepts (i.e., SoP, SC and CE) through geographic primitives answer the need to classify the spatial relationship between them as

positive or negative (i.e., whether there is a non-disjoint topological relationship or not, respectively).

The data were collected by applying a web map-based survey ([Acedo et al., 2017a](#))². All the data gathered are referenced to a singular geographical geometry along the Lisbon city. The primary goal of this web map-based survey is to catch the spatial dimension of SoP, SC and CE and measure their dimensions for a citizen in the city context. When we refer to the spatial dimension of a notion in this research is the geographical definition on a map of the area that covers the feelings, thoughts and acts towards a place (i.e., SoP) a social group (i.e., SC) or engagement (i.e., CE). We introduced the three concepts (SoP, SC and CE) and requested to the participants to think about their own places, social groups and spaces that comprise these three concepts, respectively. Each step of the survey has the same structure; an introduction to spatially define the constructors (i.e., SoP, SC or CE) on a base map centred in Lisbon city and the questions, applied to the research model, pointing to that geometry. Participants first had to think of an ‘area’ and named since places need to be named ([Gieryn, 2000](#)). Then, they need to draw this area on a map and rate it according to different criteria. Finally, they choose the most important one and answer the respective questions (see [Table C.1](#) in [Appendix C](#)). Each of the questions comprised in the tool were adapted from the literature. We tried to precisely guide the respondents throughout the application to improve the accuracy of the mapping activity ([Brown and Pullar, 2012](#)). At the end of the entire process, we gathered a spatial data (i.e., polygon) with qualitative information that attempts to ‘translate’ participants’ rich socio-spatial understandings of SoP/SC and socio-spatial practices of CE. Some of them (i.e., the chosen as the most important by the participant) had qualitative information analyzed in an ordinal scale about the dimensions of SoP and SC. That ordinal information applies to measure the first-order dimensions of the model (see sub-section [5.5.1](#)). We represented each variable through three questions; thus, SoP with three dimensions (i.e., PA, PI and PD) needed nine questions, and SC (i.e., SoC, CEE, N and CP) required twelve. All these questions are crucial to build the first-order dimensions that nourish the second-order reflective-formative constructs and, thus, the model. [Figure 5.2](#) shows all the sequence of steps that encompass the survey. Participants were also requested to contribute their sociodemographic information (age, gender, profession, income and nationality). The survey was sent by the municipality of Lisbon to a database that contains a group of people engaged in the participatory processes in Lisbon; 373 people replied to the questionnaire in approximately two weeks period (i.e., 12 June to 2 July 2017 for this study).

²<https://placeandcity.com> [accessed on 25th of August 2018]

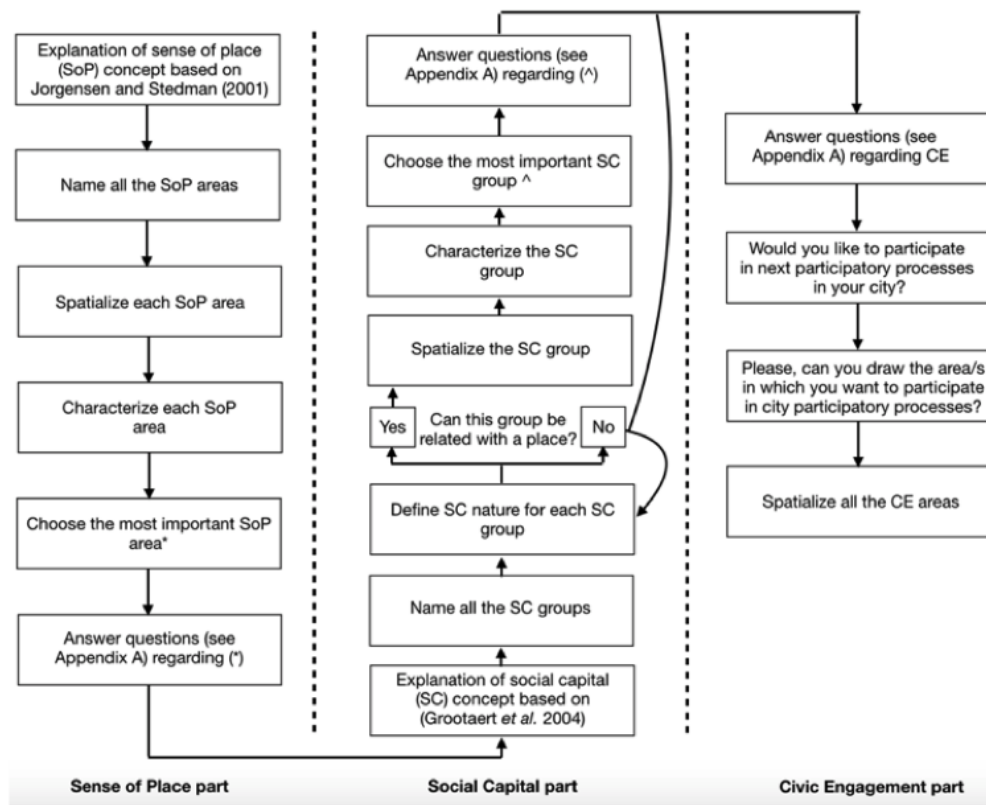


Figure 5.2: Schema of the application flow

5.4 Research model

This study integrates the SoP (Jorgensen and Stedman, 2001) and SC (Perkins and Long, 2002; Perkins et al., 2002) conceptualizations as predictors of CE (Son and Lin, 2008). SoP is integrated in the research model as a second-order reflective-formative construct determined by its three first-order dimensions: place attachment (PA), place identity (PI), and place dependence (PD). SC is another second-order reflective-formative construct determined by four first-order variables: sense of community (SoC), collective efficacy (CEE), neighboring (N), and citizen participation (CP). CE is the dependent constructor of our model. Age and gender are included in the model as control variables on SC and CE. Figure 5.3 shows the research model.

We use partial least squares structural equation modeling (SEM) (Hair et al., 2014) to evaluate the model since it is suitable for predictive analysis to test the hypotheses using empirical data (Hair et al., 2011). The measurement and structural model are

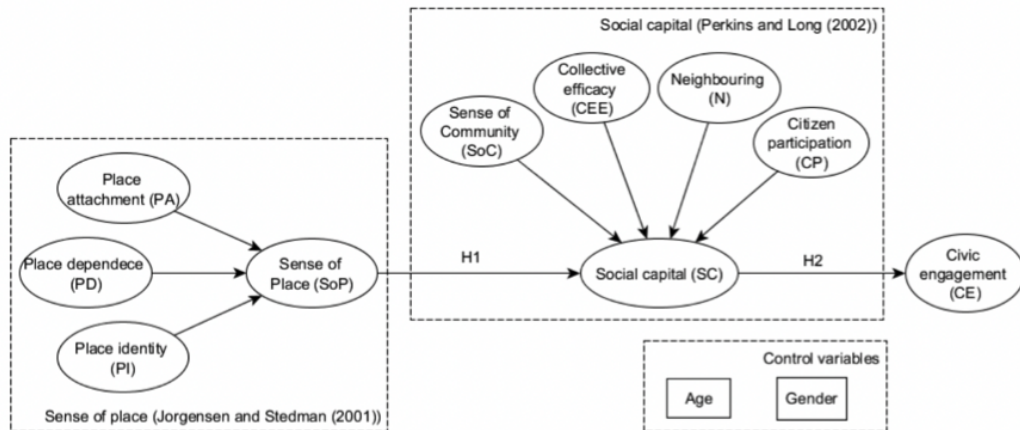


Figure 5.3: Research model

estimated with SmartPLS 3.0 software (Ringle et al., 2015).

5.4.1 Introducing the spatial perspective in the research model

As mentioned above, SoP, SC, and CE exhibit spatial dimensions that can influence their mutual connections. Therefore, does the SoP, SC, and CE spatial relationship affect their association? Is there a spatial behavior between those concepts that can better explain their non-spatial association? To answer these questions, this study analyzes the proposed research model (Figure 5.3) for different subsets of respondents based on the diverse spatial relationship configurations that follow its constructors (SoP, SC and CE) for each citizen. This subsection wants to emphasize and operationalize the spatial dimension of the studied concepts (i.e., SoP, SC and CE) in order to study them in the research model (Figure 5.3). The spatial characterization of the citizens' participants' subsets is based on Egenhofer et al. (1994) research, which defined eight topological relationship types between two regions (polygons in this study) with connected boundaries (i.e., disjoint, meet, contains, covers, equal, overlap, inside and covered by). Seven of these spatial relationships follow a non-disjoint spatial behavior (coded as 1 for this study), that is assumed as the basis for classifying positive topological spatial relationships for SoP-SC, SC-CE and their own non-disjoint relationship. Figure 5.4 summarizes both the different spatial relationships between the different constructors (SoP, SC and CE) and the resulting spatial subsets according to our model for each citizen (c_i) in the city context (X).

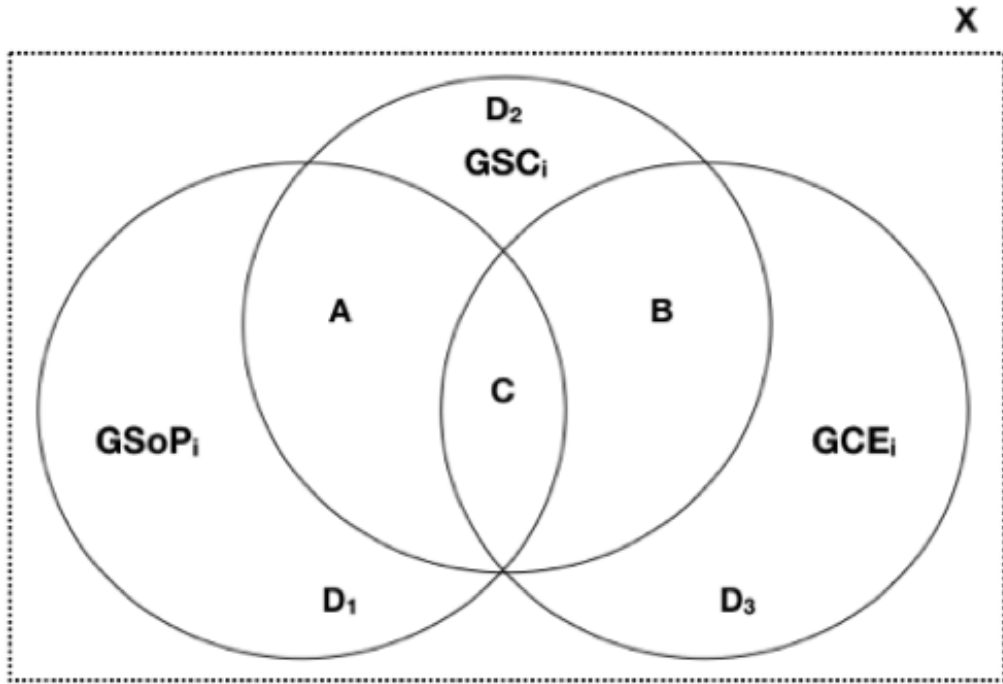


Figure 5.4: The spatial relationships between the three constructors: sense of place, social capital and civic engagement. Subset A represents the positive spatial relationship between GSoP and GSC, and B between GSC and GCE. The overlapping between the three constructors is defined by the subset C. Finally, the last subset (D) is composed by those citizens without any positive spatial relationship between GSoP-GSC and GSC-GCE. Note: to make the document easier to read, we will treat $GSoP_i$ as GSoP, GSC_i as GSC and GCE_i as GCE.

- A:

$$GSoP_i \cap GSC_i \neq \phi \quad (5.1)$$

- B:

$$GSC_i \cap GCE_i \neq \phi \quad (5.2)$$

- C:

$$GSoP_i \cap GSC_i \neq \phi \wedge GSC_i \cap GCE_i \neq \phi \quad (5.3)$$

- D:

$$GSoP_i \cap GSC_i = \phi \wedge GSC_i \cap GCE_i = \phi \quad (5.4)$$

where:

$$GSOP_i = \bigcup_{j=1}^N GSOP_{ij} \quad (5.5)$$

$$GSC_i = \bigcup_{k=1}^M GSC_{ik} \quad (5.6)$$

$$GCE_i = \bigcup_{l=1}^O GCE_{il} \quad (5.7)$$

c_i is a citizen

i is an integer number between 1 and n , and n is the total number of citizens of a given city

N , M and O are positive integers, representing the total number of SoP, SC and CE areas, respectively, for a citizen c_i

$GSOP_i$ is the union of all individual Geographical Sense of Place(s) ($GSOP_{ij}$) for a citizen c_i

GSC_i is the union of all individual Geographical Social Capital(s) (GSC_{ik}) for a citizen c_i

GCE_i is the union of all individual Geographical Civic Engagement(s) (GCE_{il}) for a citizen c_i

X is the surface of a given city

We run the SEM using the four different datasets (i.e., A, B, C and D) based on the disjoint and non-disjoint spatial relation of the citizens' geometries regarding SoP-SC and SC-CE (see Figure 5.4).

5.5 Results

5.5.1 Data collection and measurement model

All 373 participants drew at least a GSoP, but only 119 participants defined (at least) one area of each SoP, SC and CE. Therefore, a total of 119 citizens offered valid responses to conduct this study. Table 5.3 shows their demographics.

The measurement model is evaluated using the full sample size ($N = 119$). SoP and SC are second-order reflective-formative constructs. CE is a first-order construct and the dependent variable in the model. We assess the measurement model following the approach of [Hair et al. \(2014\)](#) to evaluate that our measurement model is reliable.

Table 5.3: Demographics of the sample for this study

Demographic characteristics (N = 119)	Respondents	%	
Age (years)			
	Less than 35	32	38.08
	Between 35 and 50	51	60.69
	More than 50	36	42.84
Gender			
	Female	63	74.97
	Male	56	66.64
Household monthly income (euros)			
	Less than 1000	23	27.37
	1000 - 1499	17	20.23
	1500 - 1999	10	11.9
	2000 - 2999	30	35.7
	3000 - 4999	10	11.9
	More than 5000	12	14.28
	N/A	17	20.23
Profession			
	Employed worker	72	85.68
	Freelance	17	20.23
	Retired	11	13.09
	Student	11	13.09
	Other	4	4.76
	Unemployed	4	4.76

Table C.1 in Appendix C shows that all the loadings are above 0.7. Table 5.4 presents the quality assessment of the measurement model. For formative constructs, SoP and SC, we assess multicollinearity (Table 5.5). Both tables show the goodness of fit of our model.

Table 5.4: Quality assessment (square root of AVE in bold)

Constructs	CA	CR	AVE	1	2	3	4	5	6	7	8
1. Place attachment	0.88	0.93	0.81	0.90							
2. Place dependence	0.86	0.91	0.78	0.73	0.88						
3. Place identity	0.86	0.91	0.78	0.78	0.66	0.88					
4. Sense of community	0.94	0.96	0.90	0.34	0.32	0.32	0.95				
5. Collective efficacy	0.84	0.90	0.76	0.26	0.17	0.18	0.26	0.87			
6. Neighboring	0.89	0.93	0.82	0.27	0.20	0.20	0.48	0.36	0.90		
7. Citizen participation	0.88	0.92	0.80	0.12	0.04	0.13	0.35	0.27	0.46	0.90	
8. Civic engagement	0.92	0.95	0.86	-0.08	-0.19	-0.11	0.01	0.39	0.11	0.21	0.93

Notes: CA = Cronbach's Alpha, CR = Composite Reliability, AVE = Average Variance Extracted

Table 5.5: Higher-order formative constructs. Inner VIF values (N=119)

Second-order formative constructs	First-order reflective constructs	VIF	Weights
Social capital (SC)	Sense of community	1.460	0.367 ***
	Collective efficacy	1.200	0.292 ***
	Neighboring	1.589	0.377 ***
	Citizen participation	1.332	0.336 ***
Sense of place (SoP)	Place attachment	3.177	0.398 ***
	Place dependence	2.210	0.348 ***
	Place identity	2.646	0.361 ***

5.5.2 Structural Model

The structural model is evaluated for the coefficient of determination (R^2) and the path coefficients (β). R^2 is a measure of the model’s predictive power. Both SC and CE obtained R^2 values below the threshold of 0.25 (Figure 5.5), which is described as weak predictive power (Hair et al., 2014; Henseler et al., 2009). The model path coefficients (β), its sign, and the statistical significance was assessed using the bootstrapping technique (Hair et al., 2014) with 5000 iterations. Age and gender were found not statistically significant on SC and CE.

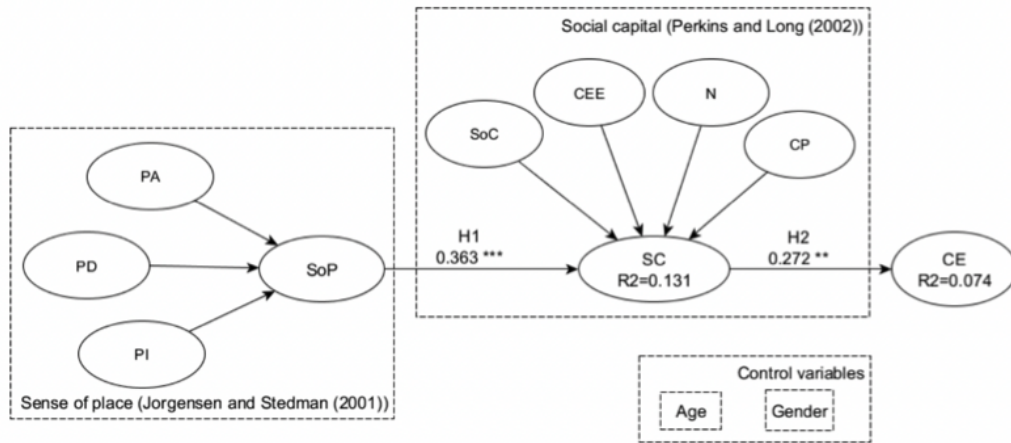


Figure 5.5: Structural model results

Results of the structural model evaluation with the full sample size (N = 119) provide evidence to support the model (see Figure 5.5). The results reveal that the three SoP variables (i.e., place attachment (PA), dependence (PD) and identity (PI)) significantly explain the construct. Hence, this study validates the conceptualization of SoP

by Jorgensen and Stedman (2001) as it was performed by Pretty et al. (2003). The calculated model also provides evidence on that the four first-order variables (i.e., sense of community (SoC), collective efficacy (CEE) neighboring (N) and citizen participation (CP)) significantly explain SC, supporting Perkins and his colleagues' (Perkins and Long, 2002; Perkins et al., 2002) conceptualization of SC. Finally, the results from the structural model (Figure 5.5) disclose that SoP has a positive effect on SC (H_1) and, in turn, SC has a positive effect on CE (H_2). The next subsection will analyze the acceptance of hypotheses H_{s1} and H_{s2} based on H_1 and H_2 , respectively, for the subsets derived from the spatial relationship between SoP, SC, and CE.

5.5.3 A geographical evaluation of the structural model

As mentioned in previous discussions, one of the main goals of this study is the inclusion and analysis of the spatial relationship between GSoP, GSC and GCE in our model to prove the importance of the spatial dimension of studied concepts in the urban processes and dynamics. Based on the data gathered and methodology followed we obtained the following spatial subsets:

- A:

$$GSoP_i \cap GSC_i \neq \phi (N = 57) \quad (5.8)$$

- B:

$$GSC_i \cap GCE_i \neq \phi (N = 76) \quad (5.9)$$

- C:

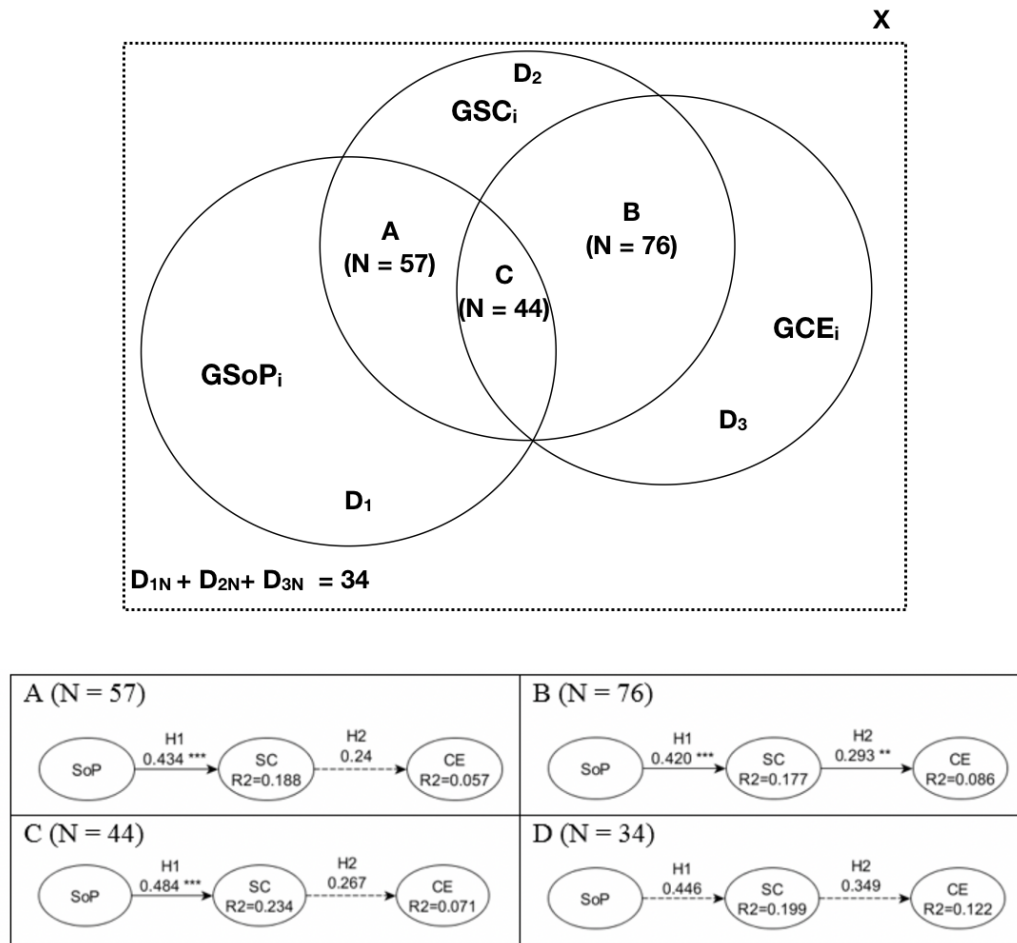
$$GSoP_i \cap GSC_i \neq \phi \wedge GSC_i \cap GCE_i \neq \phi (N = 44) \quad (5.10)$$

- the disjoint one D:

$$GSoP_i \cap GSC_i = \phi \wedge GSC_i \cap GCE_i = \phi (N = 34) \quad (5.11)$$

Figure 5.6 illustrates the schema of the resulting datasets derived from our model (Figure 5.3) and the different structural model results for the non-disjoint and disjoint subsets (A, B, C and D). Table 5.6 and Table 5.7 provide β and R^2 results, respectively, for the four spatial datasets.

Hypothesis H_1 is fully supported for all the three datasets where a non-disjoint relationship exists (i.e., A, B and C) but is not statistically significant for the disjoint subset (i.e., D) (see Table 5.6). H_2 is just supported for one of the three datasets with non-disjoint spatial behavior (i.e., B). For the A and C datasets, H_2 is not statistically



Notes: Significant at *10%; **5%; ***1%.

Figure 5.6: The spatial relationships between the three constructors according to our model and their respective results in the structural model. Discontinue lines mean statistically not significant.

significant, therefore not supported. In the cases where H_1 and H_2 are statistically significant, the influence of SoP on SC and SC on CE is stronger than the dataset with all the observations (see Table 5.6). The indirect effect of SoP on CE is also statistically significant for one of the three geographical related datasets (i.e., B). Subset D represents the citizens who defined their geometries regarding SoP-SC and SC-CE as being disjoint. For this group (i.e., D), none of the path coefficients were statistically significant. Table 5.8 shows a summary about the supported and rejected hypotheses of this study.

Therefore, the better results for the H_1 and H_2 path coefficients values (Table 5.6)

Table 5.6: Structural model evaluation (β values) for the sample and related subsets

Path	All obs. (119)	Spatial related subsets (# observations)			
		A - (57)	B - (76)	C - (44)	D - (34)
SOP \rightarrow SC (H_1)	0.363 ***	0.434 ***	0.42 ***	0.484 ***	0.446
SC \rightarrow CE (H_2)	0.272 **	0.24	0.293 **	0.267	0.349
Indirect effect (SOP \rightarrow CE)	0.099 *	0.104	0.123 **	0.129	0.156

Notes: Significant at *10%; **5%; ***1%

Table 5.7: R^2 square values for the sample and related subsets

Dataset	R^2 (SC)	R^2 (CE)
All obs. (119)	0.131	0.074
A (57)	0.188	0.057
B (76)	0.177	0.086
C (44)	0.234	0.071
D (34)	0.199	0.122

Table 5.8: Summary about supported (y) and rejected (n) hypothesis

Hypothesis	All observations	Non-disjoint subsets			Disjoint subset
		A	B	C	D
H_1	y	y	y	y	n
H_2	y	n	y	n	n

and associated R^2 (Table 5.7) in relation to the subsets A (GSOP and GSC non-disjoint relationship) and B (GSC and GCE non-disjoint relationship), respectively (see bold results in Table 5.7), allow us to support H_{s1} and H_{s2} . This finding provides evidence that the geographical component plays a critical role for the statistical significance of the path coefficients in the prediction of CE, i.e., the influence on SoP to SC and SC on CE are statistically better explained when there is a non-disjoint spatial relationship between them.

5.6 Discussion

This research attempts to validate the importance of SoP and SC spatial relationships to explain CE at the individual level. These spatial interactions define new approaches to better understanding the city's social realm from the geographic study of social concepts. We highlight the suitability of these social concepts to encapsulate human notions that can be rendered on a map and we elucidate connections with already understanding of cities as place networks (Acedo et al., 2018a; Massey, 1994; Roche, 2016). Bridging

(spatial) scholarship within social theory and environmental psychology through a participatory methodology using GISc techniques in a continually shifting city network environment (Duff, 2011; Latour, 2005; Murdoch, 1998), expands the participatory research agenda and embraces two general areas (i.e., GISc and humanities) that, unfortunately, has been rarely analyzed together in deep (Bodenhamer et al., 2010). Surely, this carelessness has been mainly due to the dynamism and the vague nature of those rich socio-spatial concepts (i.e., SoP, SC and CE) and the considerable difficulty of GISc techniques to embed their fuzzy perseverance (Coulton et al., 2001; Huck et al., 2014).

The results of our model shows low R^2 values for both SC and CE in all models (Table 5.7) are in line with other studies that have reported similar R^2 values; for instance, in the study of civic activity (Lewicka, 2005) and pro-environmental CE (Buta et al., 2014), the R^2 values found were smaller than 0.16 and less than 0.33, respectively. Thus, this study introduces the spatial component as part of the analysis to try to overcome this issue and to obtain better explanatory models. Our findings show that when there is a non-disjoint spatial relationship between the studied concepts (SoP, SC, and CE), the corresponding model performs a better statistical description of their associations.

SoP and SC display the most consistent relationship of the model. This relationship is statistically significant for all the subsets except D. Furthermore, SC is better explained by SoP when there is a non-disjoint relationship between both concepts' spatial dimensions (i.e., GSoP and GSC). The results of this study are in line with the conceptualizations of Acedo et al. (2017b) advocating for the strong spatial relationship of these two concepts and Jorgensen (2010), who assures the mutual spatial behavior between the two concepts. Independently of their spatial nature, it is clear from the findings of our study that the non-disjoint relationship between SoP and SC strengthens the explanation of SC by SoP. Surprisingly, the other positive geographical related spatial subsets (i.e., B and C) also show significant and better values than the entire dataset, showing that H_1 performs better when a positive (non-disjoint) spatial interaction occurs in the model. Only for the subset D (disjoint subset) is the relationship from SoP to SC not statistically significant. Regarding the method to statistically evaluate the different subsets (i.e., SEM), it is worthy to say that, to the best of our knowledge, this is the first study to add the spatial relationship between constructs into a model. Jorgensen and Stedman (2011) integrate the spatial and physical features of places with attitude and behavioral variables in this type of models, but the specific study of the spatial dimension of model' constructs has been never investigated to date.

Overall, the relationship between SC and CE is not as strong as that between SoP and SC. Interestingly, the only geographical subset that has statistical significance is B (i.e.,

when there is a positive spatial relationship between SC and CE for a citizen). Thus, to explain how SC influences CE, it is interesting to highlight that its association is stronger when there is a non-disjoint relationship between their geographical areas. This finding is in consonance, in part, with studies assuring that participation is likely to occur in small-group situations (Rydin and Pennington, 2011), where the citizen has a higher identification and satisfaction with the group (Bernardo and Palma-Oliveira, 2016). In this line, this research contributes by highlighting the importance of these group's relationships (SC) being located in the same place where for instance, the participatory or planning process is taking place to have better CE's performance. The other two subsets (i.e., A and C) and the subset D do not show statistical significance in the relationship between SC and CE.

The sample size to perform this study ($N = 119$) and the derived smaller subsets based on the constructs' geographical behavior could represent a limitation to conduct the study. Ideally, larger sample sizes lead to more accurate results. Other approaches to gather SoP (Jenkins et al., 2016a) and SC (Antoci et al., 2015) data through social network analysis are appearing in the last years. Unlike our approach, perhaps, these techniques can provide a quick approach to the concept as well as to gather a massive related dataset. However, it remains unclear how these techniques can infer the specific spatial area (polygon) for citizens' SoP or to measure the dimensions of SC from social network analysis to relate both pieces of information for a single citizen. Conversely, our approach goes straight to the point with the spatial representation and measurement of SoP, SC and CE at the individual level. Some non-representational theorists have defended the necessity of not emphasizing representation as the primary step to extract knowledge (Dewsbury, 2003; Thrift, 2008), especially in social theory, attending to the constantly relational nature of actors' interaction. We do not deny this nature, but our study needs of a "spatial picture" of the individuals' spatialities in a given time (e.g., 12 June to 2 July 2017 for this study) in order to evaluate their spatial relationship in socio-spatial processes such as participatory processes. In turn, the authors of this study acknowledge the dynamism, time-dependent, and scale variability of studied concepts (i.e., SoP, SC and CE) as a limitation of this study, highlighting the need for longitudinal time-series studies and a dynamic collection of social data for a better comprehension of the phenomena. In the same line, the mapping activity using polygons can also exhibit either spatial and/or scalar ambiguity (Huck et al., 2014). Moreover, we already argued about the relative accuracy in defining the spatial dimension through polygons for concepts such as SoP, SC and CE. Thereby, our approach can be understood as an attempt to study the spatial dimension of those concepts and their spatial relationships.

However, based on the results of this paper, the mapping activity through polygons performs better goodness of fit in the model (Figure 5.3) when there is a positive spatial relationship. Therefore, our approach to mapping the spatial dimension of those concepts (i.e., SoP, SC and CE) substantially cover their spatial association and trace a possible valid path to operationalize their spatial imprint, and possibly other social concepts, in the city context.

5.7 Conclusions

This paper is connecting citizens' areas of significant interactions (i.e., SC), environmental positive attitude towards places (i.e., SoP) and engagement to participate in community, society, planning and governmental issues (i.e., CE). The spatial data gathered from the web map-based application allows us to attempt the spatialization of citizens' SoP, SC and CE, psychological, social and participatory concepts that are critical in citizens' daily tasks and interactions. The findings of this study demonstrate spatiality of and spatial relationships among SoP, SC and CE, based on a GIS-based analysis of data collected through a participatory methodology. The knowledge and management of these interactions, and where their spatial relationships occur, creates an occasion that provides fruitful social-spatial data for other areas of knowledge such as planning or participation. To some extent, we are setting up the foundations of new *geographies of engagement* for all the stakeholders of a city. Furthermore, the rainbow of applications that may profit from such an understanding of space is wide, extending from location-based services to community detection and even citizen science processes (Haywood, 2014; Newman et al., 2016). This article highlights the role of the geographical perspective in taking another step forward to better understand citizens' social synergies in the urban context. Specifically, how GIS techniques can be used to attempt the operationalization of rich-complex human based concepts such as SoP, SC and CE. On the other hand, the use of SEM to explore the impact of spatial components in combination with non-spatial variables has been rarely used in the literature (Jorgensen and Stedman, 2011). The method used in this research discloses the potential of introducing spatial perspectives in SEM models. Future work can be in line to add the relevant features enclosed in the spatial dimension of studied concepts into the research model to investigate how and what physical space is valued and influence the studied concepts (i.e., SoC, SC and CE).

5.7.1 Notes to advance in the spatial acquisition of social concepts

We foresee a significant potential to appreciate the spatial dimension of social concepts as truly spatial, i.e., to make a step further, recognizing and operationalizing the crucial matter of the spatial domain in social theory. This is not just to discuss or embed results in administrative boundaries, but to really assign the spatial dimension of social concepts in the studies' methodology section. Unfortunately, this research is one of the few studies of a long way to go in the meaningful operationalization of the social concepts spatial dimension in the urban context. Once this process is normalized and dynamically updated, we will be able to disclose the suitability of including the geographical perspective in, for instance, social, planning and participatory studies. There is a shortage of empirical research on the interactions between people and places. Therefore, this study calls for efforts that bridge multiple academic communities to open innovative avenues for understanding social-spatial behaviors, the outcomes of such encounters, and their addition in city' procedures such as participatory processes. The spatial understanding of that synergy highlights a promising area of future scholarship.

CONCLUSIONS AND FUTURE WORK

6.1 Conclusions

We are inhabitants that develop our everyday activities in places that can foster a sense of place, and we are members of social groups that form our social capital. In turn, we experience different perceptions of a shared space which is utilized for several reasons. However, city stakeholders have not considered their spatial footprint in human-urban interactions. The carelessness to readily appreciate or be fully aware of our spatial dimension regarding sense of place and social capital is hindering the recognition of a non-operationalized spatial configuration based on the place notion in which citizens are the central pillar. This research draws on three mainstays: a citizen-centric smart city approach, place and individuals' spatialities (regarding sense of place and social capital). We conceptualized an innovative (spatial) conceptual framework for sense of place and social capital at the individual level based on a systematic literature review (see section 2.2). Founded on that, we attempted the study of their spatial relationship (Acedo et al., 2017b). We developed a web map-based survey based on literature to spatialize, characterize and measure sense of place, social capital and civic engagement (Acedo et al., 2017a). Using the spatial data collected, we operationalized and validated the framework mentioned-above at the city context (Acedo et al., 2018a). We obtained a significant non-disjoint spatial relationship between sense of place and social capital, as well as a (spatial) characterization of both in Lisbon city. We also demonstrated the

importance to encompass the spatial dimension of social concepts (i.e., sense of place and social capital) for the better understanding of city processes (e.g. civic engagement) Acedo et al. (submitted). Adopting SEM techniques, we introduced the spatial dimension of studied concepts (i.e., sense of place, social capital and civic engagement) to confirm their value in explaining civic engagement.

6.1.1 Main results and contributions

We framed, operationalized, evaluated and proved the importance of understanding spatial citizens' subjectivities regarding citizens' cognitions, feelings and behaviors toward city places (i.e., sense of place) and meaningful geographic human relationships (i.e., social capital) regarding city processes such as participatory processes. We formalized and established a robust (spatial) conceptual framework (regarding sense of place and social capital) ready to build other socially-oriented conceptualizations or applications on top of it. We discerned the suitability of the Egenhofer et al. (1994) topological relationships between two regions with connected boundaries to encompass their spatial dimensions (i.e., sense of place and social capital). The operationalization and transference of citizens' social spatialities to the urban domain is deemed to be relevant as an alternative to administrative boundaries for social city issues as is proved in this research (see section 5). This research also highlighted the role of GISc and its related tools in taking another step forward to satisfy the pervasive demand for citizen social-spatial information at the city level. In this line, this research contributes to the task with a web map-based survey¹ as a method to identify, measure and spatialize social concepts (Acedo et al., 2017a). Currently, it is oriented to study the concepts of sense of place, social capital and civic engagement based on questions from the literature, but it is open source², i.e., replicable and reusable to sound out other notions. Furthermore, considering the output of the chapter 5 (see section 5.6), the GIS-based methodology to spatialize the studied concepts seems to be a real alternative.

We found that home parish and parks are areas of a strong sense of place for the participants, while their social relationships are mainly situated within a single parish. In the spatial relationship between sense of place and social capital, we proved the significant non-disjoint spatial relationship between them at the individual level (posit on Acedo et al. (2017b)). This finding is even more critical considering the notable spatial variability of them plus the remarkable spatial accuracy of our approach when

¹<https://placeandcity.com> [accessed on 17th of August]

²<https://github.com/acedo/placeandcity-backend>
<https://github.com/acedo/placeandcity-frontend> [accessed on 17th of August]

spatializing the studied concepts (i.e., sense of place and social capital)(see section 4.4). We also noticed that the conceptualization of sense of place, social capital and civic engagement under the attitude theory (Ajzen and Fishbein, 1975; Fishbein and Ajzen, 1975; Rosenberg, 1960) allow their spatial reasoning which has potential similarities with the notion of place established by Agnew (2002, 2011) (see section 4.4). Based on that, we found a positive correlation between sense of place and social capital to explain civic engagement as well as a better statistical performance when a spatial relationship between them appear Acedo et al. (submitted).

We saw the suitability of understanding the non-disjoint relationship between sense of place and social capital as inhibitors of place-making at the individual level and their fuzzy or vague spatial association in the alignment toward the notion of platial urban dynamics and urban intelligence at the collective level (Acedo et al., 2018a). This can be understood as the first step to the operationalization of alternative geographies available for all the the city's stakeholders, with a special mention to city governments and the possible new approaches for managing the city. In turn, we proved the value of their (i.e., sense of place and social capital) spatial relationship in explaining the socio-spatial practices of civic engagement. This discovery also reflects the potential to include the constructs' spatial dimension in SEM models in the study of social concepts. Thereby, if we recognize the places that encompass a sense of place and social capital for a citizen, we also can anticipate the geographical areas in which a citizen civic engagement performs better and vice-versa. This important finding provide a useful new spatial knowledge about the studies that proved the importance of sense of place and/or social capital in processes of collective action (e.g., civic engagement) (Lewicka, 2005, 2011b; Manzo and Perkins, 2006; Perkins et al., 1996). This finding is just one example that denotes the importance to spatially understand the social concepts and, simultaneously, the need to achieve a standardized methodology to define their spatial dimension.

6.1.2 Limitations and future research

Similar to any other attempt to capture the spatial dimension of individuals' subjectivities, their spatial dynamism represent a hindrance to collect them through common GIS tools. Although we justified our research as "a spatial picture" in a given time (12th June to 2nd July 2017) (see sections 4.4 and 5.6), this study dealt with dynamic, time-dependent and scale variable concepts, thus, it is needed to seriously confront

longitudinal time-series and dynamic research in the acquisition of social data in future investigations. The increasing concern in the spatial comprehension of human dynamics also confronts problems related to the precision and accuracy of their borders, since individual social spatialities accommodate vague geographical areas. This study introduced alternative methods for the spatial computation of studied concepts (see subsection 4.2.2). However, a better comprehension of the possible spatial bias and the accuracy with using geographic primitives (e.g., polygons), as well as a comparison with other methods, would enrich the discussion when dealing with complex and multi-faceted social concepts. Thus, further work is required to improve the static methodology presented in this research with dynamic methods to gather individuals' social characteristics. The combination of social media data (e.g., Twitter, Foursquare) and text mining methods can contribute to dynamically update individual-urban interactions, as well as to provide the urban context related to them. Indeed, we have developed a little in these news future lines of research; (1) we showed the positive relationship between where people perform their social media activities (e.g., Twitter) and places in which citizens have a sense of place [Acedo et al. \(2018b\)](#) (see appendix D), and (2) we disclosed the considerable relationship between the citizens' subjective attachment to a place and the spatial features that it contains (see appendix E). These last studies also discern the suitability for linking this research with practical resources. There is a wide variety of applications and services that can be built on top of our framework to offer, for instance, better citizen-centric city services or location-based services rooted in individuals' spatialities. This is the first research in a line of investigation toward a comprehensive collective spatial understanding of the smart city context. It is worthy to note that almost all the findings shown in this research are at the individual level, focus on the spatial perspective and framed in Lisbon city. The next step in our research agenda is (1) to explore the collective level, i.e., to understand the human-urban interactions between fellow citizens and their sociodemographic data, and (2) to replicate our method in other cities and attempt to generalize it with the use of survey sampling techniques.

6.1.3 Final remarks

This research aimed at evaluating the importance of individuals' spatialities regarding the sense of place and social capital in the urban context for embedding them as a resource in the smart city context. Having said that, the potentiality of this research findings are unmeasurable, rather than just apply to the participatory realm (chapter 5),

the possibilities to relate our framework and methodology to other city-based notions can bring to light other platial urban dynamics based on, for instance, environmental awareness, crime or poverty. The study of those (spatial) associations can signify a milestone in the acquisition of empowerment by all the city's stakeholders and, thus, an improvement in the conceptualization of the citizen-centric smart city approach. The transformation of space as a subjective place environment that covers the people's feelings toward places and human relationships pose the conceptualization of a city which is dependent on the spatial organization of place and our capability to understand the platial urban dynamics. This new city spatial configuration helps in the answer of the already theoretical assumption of understanding the city as place networks or fluids (Duff, 2011; Latour, 2005; Massey, 1994; Murdoch, 1998; Roche, 2016; Thrift, 1999), instead of a simple continuous spatial container ruled by the Euclidean space. Therefore, this study wants to open up the agenda for further research into exploratory place-based geography studies and incite related researchers to experiment with the practical aspect of the place realm for achieving a *smart platial city*.

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APPENDIX OF CHAPTER 2

Table A.1: Relationship between numbers in Figures 2.2 and 2.3 and authors

Number in Figures 2.2 and 2.3	Citation	Author
1	<i>"The results showed that the SoC-participation relationship is significant, positive and moderately strong for forms of participation in the adult population and specific cultural contexts."</i>	(Talò et al., 2014, p. 1)
2	<i>"the literature suggests that processes of collective action work better when emotional ties to places and their inhabitants are cultivated."</i>	(Manzo and Perkins, 2006, p. 347)
3	<i>"The findings through survey questionnaire showed that there are significant relation between sense of community and level of participation for local tourism development."</i>	(Aref, 2011, p. 20)

- 4 *"Finally, it is important to notice that despite the already existent plethora of studies on place attachment and its correlates or predictors,[...]. Scale of place, type or size of housing, length of residence or even strength of neighborhood relations are predictors [...]."* (Lewicka, 2010, p. 49)
- 5 *"a commitment to places [...] motivates civic participation [...] and social capital"* (Jorgensen, 2010, p. 565)
- 6 *"Sense of Community emerged as the strongest and most consistent predictor (at both levels) of the other dimensions of Social Capital [...] having higher individual sense of community [...] was related to more collective efficacy, more neighboring, and more participation in block organizations."* (Perkins and Long, 2002, p. 308)
- 7 *"The strongest predictor of sense of community is neighborhood relations, although years of residence, being married, group participation, and area of residence are also significant factors."* (Prezza et al., 2001, p. 29)
- 8 *"We suggest that attachment (emotional and behavioral commitment) is related to having a sense of community (cognitions of affiliation and belonging within the community)."* (Pretty et al., 2003, p. 226)
- 9 *"At the individual level, empowerment predicts participation, thus creating a mutually reinforcing change process."* (Perkins et al., 2002, p. 39)

-
- 10 *"To the extent that trusted social relationships, and the shared norms that regulate these relationships, underpin valued place meanings, attachments and behavioural commitments to a place, they can contribute to a sense of place, and one might well expect members of the same social network to share conceptions of place"* (Jorgensen, 2010, p. 564)
- 11 *"It is otherwise known that place attachment and neighborhood ties show consistent positive links."* (Lewicka, 2005, p. 384)
- 12 *"It seems reasonable to assume that the development of social networks and social capital are important sources of place meanings."* (Jorgensen, 2010, p. 565)
- 13 *"that people with SOC (sense of community) are more likely to help their neighbors".* (Perkins and Long, 2002, p. 312)
- 14 *"This review suggests that feeling a sense of community, attachment to community and neighbouring relationships can increase the feeling of [...] civic participation [...]"*
- 15 *"Sense of Community is positively correlated with social participation in all three samples"* (Cicognani et al., 2008, p. 97)
- 16 *"Consequently, place attachment, place identity, and sense of community can provide a greater understanding [...] or improve their community and participate in local planning processes."* (Manzo and Perkins, 2006, p. 347)
- 17 *"Social capital and sense of community are very important in predicting elderly participation in community improvement activities..."* (Liu and Besser, 2003, p. 343)

- 18 *"Analysis reveals that place identity can best be predicted by [...] and their level of place dependence."* (Moore and Graefe, 1994)
- 19 *"At the individual level, psychological empowerment was most strongly related to individuals' participation levels, sense of community, and perceptions of a positive organizational climate."* (McMillan et al., 1995, p. 699)
- 20 *"The higher the number of close friends and neighbors that are known and live nearby, the higher the attachment to the neighborhood"* (Mesch and Manor, 1998, p. 504)
- 21 *"the two dimensions of place attachment, dependence and place identity"* (Williams and Vaske, 2003, p. 838)
- 22 *"Our spatial measure of place attachment included a symbolic component of place identity and a functional component of place dependence."* (Brown et al., 2015, p. 43)
-

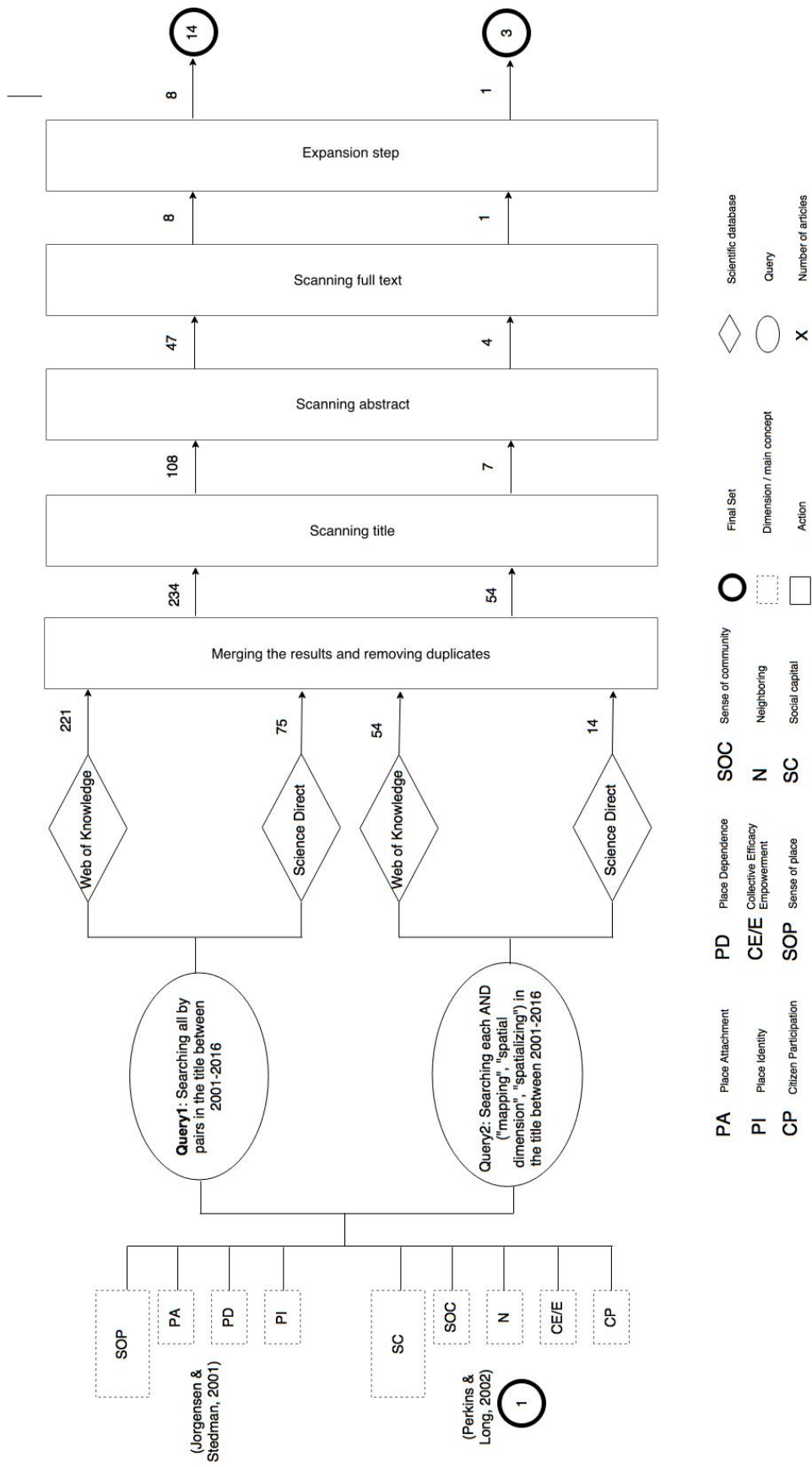


Figure A.1: Systematic literature review procedure for identifying the final set of studies in order to create Figures 2.2 and 2.3

APPENDIX OF CHAPTER 4

Table B.1: Questions from the web map-based survey to present sense of place and social capital for their spatialization

Concept	Question	Adapted from
Sense of place (SoP)	We want to know where are the areas that, for some reason/s, are significant for you. Please, think about the area/s which you: identify the most with (e.g., this place represents me) and/or feel attached to (e.g., I love this place) and/or depend on (e.g., it is the most suitable place for doing the things that I enjoy the most)	(Jorgensen and Stedman, 2001)
Social Capital (SC)	We would also like to ask you about the groups of people or organizations, networks, associations to which you belong. These could be formally organized groups (religious groups, familiar groups, sports teams, workplace groups...) or just groups of people who get together regularly to do an activity or talk about things.	(Grootaert et al., 2004)



APPENDIX OF CHAPTER 5

Table C.1: Questions from the web map-based application

Construct	Question	Loading	Adapted from
	<u>Place attachment</u>		
	I feel relaxed when I'm at this area (Y)	0.90	
	I feel happiest when I'm at this area (Y)	0.93	
	This area (Y) is my favourite place to be	0.87	
	<u>Place dependence</u>		
Sense of place (SoP)	This area (Y) is the best place for doing the things that I enjoy most	0.93	(Jorgensen and Stedman, 2001)
	For doing the things that I enjoy most, no other place can compare to this area (Y).	0.82	
	This area (Y) is a good place to do the things I most like to do	0.89	
	<u>Place identity</u>		

	Everything about this area (Y) is a reflection of me	0.82	
	I feel that I can really be myself at this area (Y)	0.91	
	This area (Y) reflects the type of person I am	0.92	
	<u>Sense of community</u>		
	I feel like a member of the group Y	0.95	
	I belong to the group Y	0.96	(Peterson et al., 2008)
	I feel connected to the group Y	0.93	
	<u>Collective efficacy/Empowerment</u>		
	I think that a collective action from this group (Y) will increase chances of the local government changing their plans	0.91	(van Zomeren et al., 2008)
Social capital (SC)	I think that together (group (Y) members) we can change an issue	0.91	
	I think that it is important to get people in the group (Y) to help each other more	0.78	(Perkins and Long, 2002)
	<u>Citizen participation</u>		
	Have you attended a group (Y) meeting in the last 12 months?	0.91	(Ingrams, 2015)
	How often do you participate in the activities of the group (Y) in the last 12 months?	0.88	(Grootaert et al., 2004)
	To what extent did you participate in group (Y) decision-making in the last 12 months?	0.89	
	<u>Neighbouring</u>		

	Help a group (Y) member in an emergency	0.88	(Perkins and Long, 2002)
	Offer an advice on a personal problem of a group (Y) member	0.91	
	Discuss a problem with a group (Y) member	0.92	
Civic engagement (CE)	In the last 12 months, have you joined together with other people to address a community, local authority or governmental organization problems?	0.93	(Grootaert et al., 2004)
	In the last 12 months, have you talked with a community, local authority, or governmental organization about common problems?	0.93	
	In the last 12 months, have you worked with a community, local authority, or governmental, organization about common problems?	0.93	

Table C.2: Relationship between numbers in Figures 5.1 and authors

Number in Figure 5.1	Citation	Author
1	<i>“Such attachment (attachment to place) motivated interviewees to participate in campaigns against developments that they perceived would threaten these place-based values.”</i>	(Lin and Lockwood, 2014, p. 80)

- 2 *"It was therefore predicted that people who protested would have higher levels of place attachment; a prediction confirmed by the significant correlations between protesting and both place identity and place dependence in this study."* (Anton and Hons, 2016, p. 151)
- 3 *"From this we can conclude that while people with strong place attachment [...] it is those who also have positive attitudes about the value and importance of pro-testing, who perceive civic action as the norm amongst their friends and family, and who perceive that they have control over their actions that may be more likely to actively oppose place change."* (Anton and Hons, 2016, p. 20)
- 4 *"Specifically, people who were more attached to a place were more likely to express behavioral intentions to engage in place-based planning actions."* (Kil et al., 2014, p. 486)
- 5 *"Although, people participation is affected by civic engagement, but people participation also plays a crucial role in promoting civic engagement, [...]"* (Mohammadi et al., 2011, p. 212)
- 6 *"individual social capital was the consistent and significant predictor of both expressive and instrumental civic actions."* (Son and Lin, 2008, p. 341)
- 7 *"As the model reported here shows, it is neighborhood ties and not place attachment that predicted civic involvement."* (Lewicka, 2005, p. 392)
- 8 *"civic virtue is most powerful when embedded in a dense network or reciprocal social relations"* (Putnam, 2000)

-
- 9 *“Both community attachment and park related place attachment played a role in predicting citizens’ levels of pro-environmental civic engagement beliefs.”* (Buta et al., 2014, p. 1)
- 10 *“the connections among individuals such that, over time, a social network is created in which people come to expect mutual support and trust. This leads to: (a) potential increases in each individual’s physical health and social–emotional well-being, as well as (b) potential increases in civic engagement and employment in the community of which they are a part, both contributing to a healthier and more effectively functioning society.”* (Hunter, 2016, p. 200)
- 11 *“According to the structural model, the influence of place meanings on participatory planning intentions was significant. Specifically, people who were more attached to a place were more likely to express behavioral intentions to engage in place-based planning actions.”* (Kil et al., 2014, p. 486)
-



DO PEOPLE DEVELOP ACTIVITIES AT PLACES IN WHICH CITIZENS HAVE A SENSE OF PLACE?

Abstract¹

The understanding of human behaviour is central in the social and geographical realms. The study of citizens' perceptions towards a place and the geographic area where human activities occur can offer a better comprehension of human nature and behaviour. In this research, we aimed to assess the existence of a potential spatial association between the areas identified with a sense of place by dwellers, and the locations of social media activity, for the specific case of Lisbon, Portugal. We collected information about the spatial sense of place through a web map-based survey and the locations where were registered social media activity on Twitter. Based on the analysis of the results, we identified a schema of spatial clustering and spatial dependence between both phenomena.

Keywords: sense of place, social media data, bivariate point pattern, cross-type K -function

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D.1 Introduction

The surge of social media has opened a new approach for the research of citizens' behaviours and mobility along the city. Concretely, the adoption of location-based social networks (LBSN) by dwellers can act as a proxy for the study of human activities. A citizen is intrinsically a social creature (Toole et al., 2015) with associated social networks (Rutten et al., 2010). Furthermore, each of the places, where citizens develop their daily tasks, are also subject to become a meaningful place to them with emotional connections (Scannell and Gifford, 2016). However, the study of the correlation between concurrent places of human activity and the perceptions of these places by citizens has been not widely explored. The present paper draws on the better comprehension of the relationship between the locations of citizens' activities and the significant places for them from a geographical perspective. Specifically, our main goal is to understand the spatial behaviour and confluence of the two concepts reviewed in this study: the sense of place and human activity. Our research combines two different methodologies. We contrast the locations registered on a dataset of Twitter with the perceptions of sense of place and social capital collected through a map-based web survey (Acedo et al., 2017a) during the same period in the city of Lisbon, Portugal. We expect to find correlations between the areas with a sense of place for citizens and the most common places where people develop their activities.

D.2 Related work

D.2.1 Location-based social networks

Social media is conceived as Internet applications which allow creating, obtaining, and exchanging ubiquitous user-generated content (Kaplan and Haenlein, 2010) about events and facts that occur in the real world (Ferrari et al., 2011). Thus, social media data reflects human behaviour, prompting new alternatives to understand individuals, groups, and society (Batinca and Treleaven, 2014). LBSN can be a crucial tool in understanding city social processes due to its crowd-data nature and continuous use (Frias-Martinez et al., 2012; Silva et al., 2013).

LBSN data has been used, for instance, in urban planning (Frias-Martinez et al., 2012; Wakamiya et al., 2011; Zheng et al., 2014), modelling urban dynamics and human activity (Celikten et al., 2017; França et al., 2015), extracting urban patterns (Ferrari et al., 2011), and discovering places (Ostermann and Granell, 2015). Also, Jenkins et al. (2016a) studied ways to relate user-generated content (e.g. social media feeds and

Wikipedia contributions) with the shared meaning of place. The authors observed the emergence of unique thematic social media feeds that characterize different locations and, simultaneously, the sense that people assign to specific spaces.

D.2.2 Sense of place

The sense of place notion has been intensely studied in the last 40 years. It reflects human experiences, emotions, thoughts (Stedman, 2003), and meanings, values, and feelings associated with a place (Chapin and Knapp, 2015). Jorgensen and Stedman (2001) define the sense of place as the cognitive, affective and behavioural dimensions of the relationship that an individual has towards a specific geographical area. Human activities that imply movement within the city have been questioned as an enhanced or diminished of the attachment towards a particular area (Lewicka, 2013). However, place maintains its importance in a globalised world, and it is an object of intense affection (Lewicka, 2011b). Citizens are moving in the city because of combining periodic movements (geographically limited) and some others related to their social networks (Cho et al., 2011). Therefore, it is relevant to gather the subjective components of the human–environment relationship, such as the sense of place, as well as where human activities are happening since both are potential inhibitors to endow meaning to spaces and singularise them into personal and unique places (Acedo et al., 2017b).

D.3 Methodology

D.3.1 Data collection

Two parts compose the data collection: (1) gathering of geolocated tweets and (2) collection of sense of place of Lisbon citizens. We run both procedures in the same period; between June 12th and July 2nd, 2017. The citizens who answered the questionnaire are not necessarily the same people whose tweets were gathered for this study. It is certain that all participants of the map–based survey are living in Lisbon. Hence, we are gathering a global sense of place composed of Lisbon citizens. However, the users who created the geo–tweets are not necessarily city inhabitants.

D.3.1.1 Social media data

We use the `tweet2r` (Aragó and Juan., 2016) package from R software to obtain geolocated tweets through a connection to a Twitter API from the Lisbon metropolitan area. The process produced files in GeoJSON format which we transformed into a table with

the location (longitude and latitude) of each tweet. The analysis of the information ruled out the events registered outside of the boundary of the city.

D.3.1.2 Map-based web survey

The data to spatially study the sense of place was collected by applying a map-based web survey application (Acedo et al., 2017a). The survey was sent to the Lisbon participatory budgeting database. 373 Lisbon citizens replied to the questionnaire. Participants were invited to define their geographic dimension of their sense of place areas (based on Jorgensen and Stedman (2001) conceptualization of sense of place) on a base map using a set of spatial tools. Each participant could specify more than one geographical area of sense of place. We used QGIS geometry tools for obtaining the centroids of each area and build a spatial database with those locations. The reason to extract the centroid from the sense of place areas is the suitability of this shape to compare with the twitter geolocated data.

D.3.2 Data analysis

We conduct an observational study due to two main reasons. First, Twitter streaming API gives a small portion of all generated tweets and besides only a part of them are geolocated. Second, the web-map survey was a voluntary participation process where we invited many dwellers to answer the questionnaire without conducting a probabilistic sampling technique.

Our strategy of analysis considers locations of social media activity and centroids of the sense of place as a pair of spatial point patterns (Diggle, 2013). We evaluate the null hypothesis that states both types of locations are independent spatial point processes (Baddeley et al., 2015). Initially, we determine the intensity functions through the kernel density estimation (Baddeley et al., 2015; Batty et al., 2012; Diggle, 2013) utilising Scott's criterion to select the bandwidth (Scott, 2015). We study the univariate spatial distribution of each pattern with Ripley's K function and judge the hypothesis of complete spatial randomness (CSR) with Monte Carlo simulations. Finally, we use the cross-type K -function for testing our supposition of spatial interaction of the patterns (Baddeley et al., 2015; Diggle, 2013; Illian et al., 2008). We finally compare the percentage of both type of events in green recreational places and city point of interests (see (see Table D.1)) using spatial analysis tools.

D.4 Results and Discussion

We collect 8987 tweets located within Lisbon, none of them correspond to a retweet, of which 1633 belong to a unique position (non-repeated). From the web-map survey, we obtain 237 participants who define 520 geometries of the sense of place. Figure D.1 shows the map with the distribution of these events along the city. We get 1.93×10^{-5} tweets and 6.13×10^{-6} centroids of sense of place per square metre, respectively. This latter means that geolocated tweets are denser than centroids of sense of place. We add over the maps with letters, from A to G, relevant areas of the city (*see Table D.1*) with aiming to facilitate analysis and discussion of results.

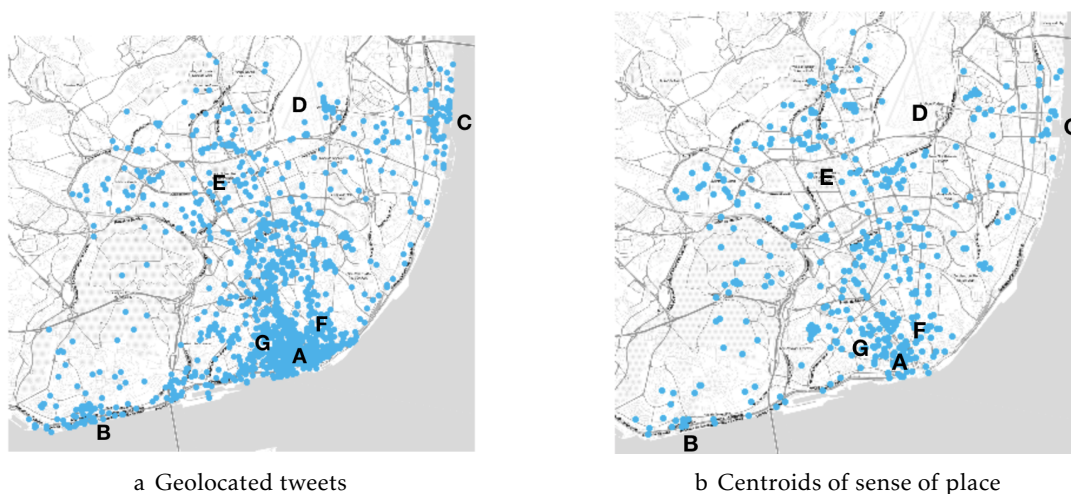


Figure D.1: Locations of events

We apply Scott's method that returns values of 624m and 823m for both bandwidths; the geolocated tweets and the sense of place centroids, respectively. We use kernel quartic and the previous values to estimate the spatial intensity. Figure D.2 presents the map of both spatial kernel smoothing estimates after standardising to a common grey-scale 0 (black) to 1 (white) (Diggle, 2013), both kinds of events are clustered and coincident in some places in the city. However, the schema of clustering is different, locations where social media activity occurs are concentrated in three areas: Belem, City Centre, and Expo'98 area, while sense of place comprises more parts of the city.

Figure D.3 shows the plots of Ripley's K function of each pattern, and we do 199 Monte Carlo simulations to build the envelopes for judging the null hypothesis of CSR. We identify that both series of events exhibit spatial clustering in all scales.

We perform the cross-type K function and simulate 199 bivariate point patterns (*see*

APPENDIX D. DO PEOPLE DEVELOP ACTIVITIES AT PLACES IN WHICH CITIZENS HAVE A SENSE OF PLACE?

Table D.1: Studied zones in Lisbon, Portugal

Key	Region
A	City centre
B	Belém
C	Exposition centre (Expo'98)
D	Airport
E	Stadiums
F	Castel
G	Bairro alto

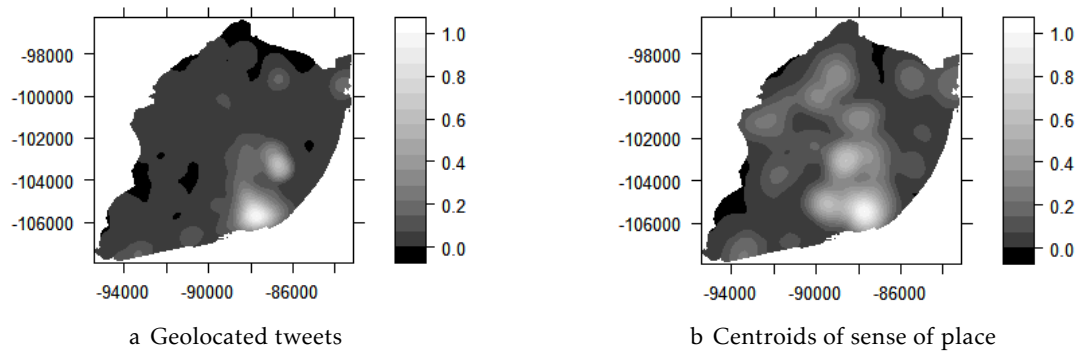


Figure D.2: Intensity functions of the two events

Figure D.4) for testing the hypothesis of non-spatial interaction. The results show that the empirical estimation of the function (black line) for all distances is over the region defined by the envelopes, this means that there is a schema of spatial aggregation in both types of events in all scales.

Finally, we also make a comparison between the percentage of each type of cases (geolocated tweets and sense of place centroids) in some general and specific kind of areas (see Figure D.5). After the study of both cases, we find that only the 5.51% of tweets analysed are inside gardens, parks, or some green spaces. On the other hand, almost a third of the sense of place examined are within that kinds of areas. If we focus on examples of functional, recreational and emblematic places to study the behaviour of the tweets and sense of place distribution across the city of Lisbon.

The airport holds a few areas of sense of place since, as a transport infrastructure,

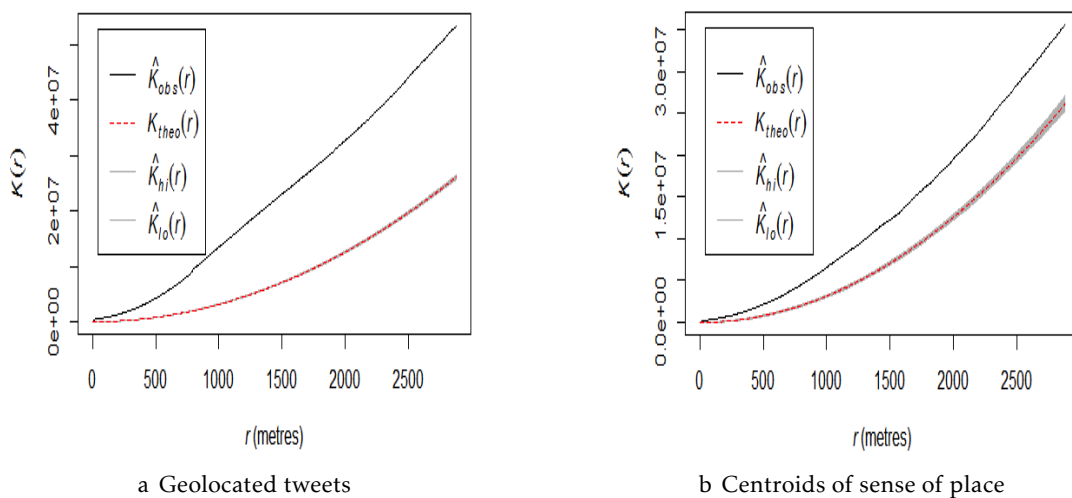


Figure D.3: Ripley's K function for the two events

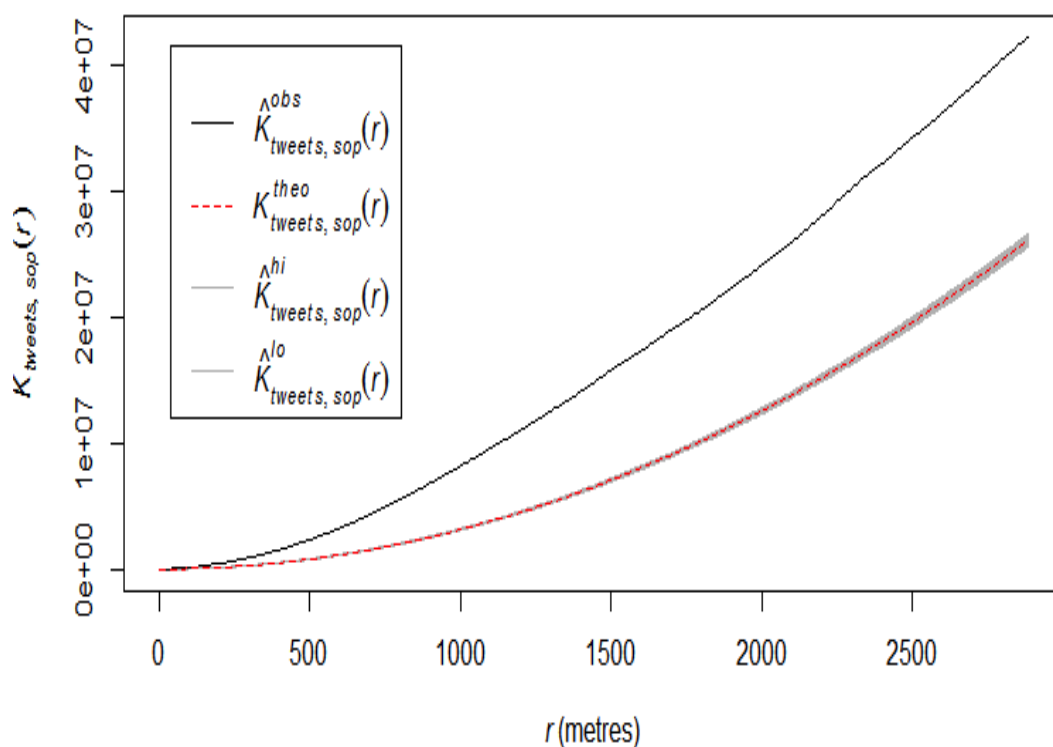


Figure D.4: Cross-type Ripley's K function

this space is more related with transport activities than, it seems, to be significant a place for Lisbon's citizens. As it was expected, the city centre comprehends a considerable

APPENDIX D. DO PEOPLE DEVELOP ACTIVITIES AT PLACES IN WHICH CITIZENS HAVE A SENSE OF PLACE?

amount of both sense of place geometries and geolocated tweets. Two emblematic zones such as Belém area and Expo'98 area follow similar behaviour with, approximately, the same attachment and human activity. Surprisingly, castle zones and football stadiums hold neither intense human activity nor a citizen's sense of place. This can be related to the no occurrence of a football game or castle-related event during the days of the experiment.

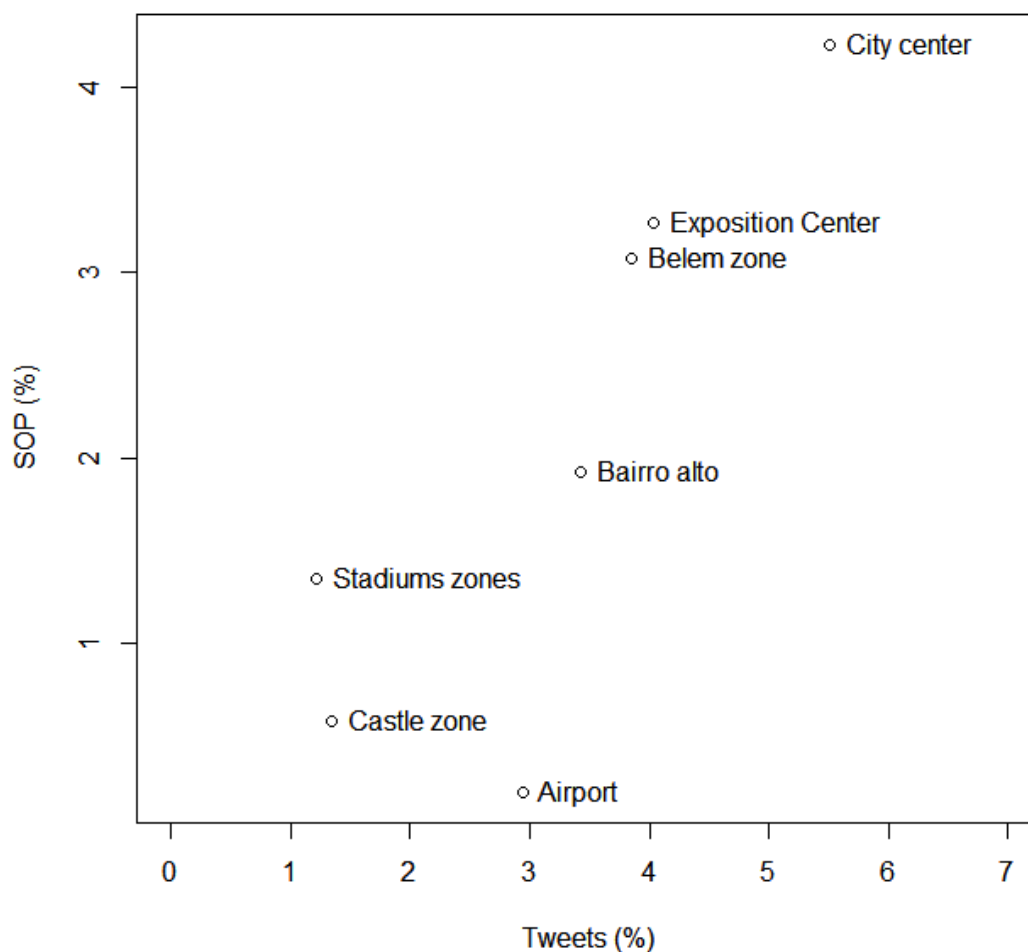


Figure D.5: Relation between sense of place centroids and geolocated tweets

D.5 Conclusions

The results show that recreational places such as parks, gardens or forests are tightly connected with the sense of place of Lisbon citizens. Furthermore, for specific locations

mixing residential, green zones, and important city landmarks (city centre, Belém and Expo'98) the quantity of citizens' attachment and people activities are similar.

We conclude that there are coincidences between the places of attachment of citizens and the sites where people perform their social media activities, e.g., Twitter. Although, the sense of place by the inhabitants has a broader range of spatial variation, i.e. covers a larger area along the city than the gathered social media activity. The analysis performed in this study allows us to consider the existence of spatial dependence between both phenomena; those locations where people do their activities correspond to places with the sense of place for citizens. This association can be crucial in urban participatory and planning processes for two reasons. First, social media data becomes a proxy for defining the sense of place spatial dimension with the characteristic that it is faster and cheaper than conventionally survey sample techniques. Second, our approach denotes a good performance for monitoring possible spatial conflicts related to the increase of the space use. Therefore, a comparison between two different sources for two distinct concepts (human activity and sense of place) provides an approach to detect those locations of most activity and attachment for the citizenship. Future work can be in line with (1) considering the whole spatial dimension of sense of place areas instead of their centroid to approach a more extensive comprehension of individual-spatial context in comparison with human activities and, (2) to perform a text mining over the content of geolocated tweets.

FINDING THE BRIDGE BETWEEN INDIVIDUALS'
PERCEPTIONS AND SPATIAL FEATURES IN THE
NOTION OF PLACE

Abstract

The relationship between an individual, space, and place has been studied intensely over the last forty years. Fortunately, the surge of Information and Communication Technology (ICT) research and tools, allows new ways to study this triple connection. This paper is an exploratory study that draws an attempt on the comparison of the human attitude towards places (i.e., sense of place) and the spatial characteristics of the targeted geographical area to understand the notion of place. Using spatial data (i.e., geometries and related questions) collected through a web map-based survey, we performed an exhaustive examination of human attachment towards places and, subsequently, we extracted all the relevant spatial features from the defined geometries. We found that the characteristics of the humanplace connection are related to the nature and character of the geographical area that embraces the relationship. This research offers a new approach for place studies, comparing two different characteristics (i.e., individuals' perceptions and the material shape of spaces and objects location) that a place can feature.

Keywords: place, space and sense of place

E.1 Introduction

Place is a space endowed with meaning (Altman and Low, 1992; Tuan, 1978). This, together with "meaningful location", is one of the most simplistic definitions of the place notion (Lewicka, 2011b). Any definition of place has at least two components: the human-place link that makes a place unique in the universe for someone (Gieryn, 2000), and the geographic area that embraces this connection. Hence, the symbiosis that occurs between social individuals and spaces is what allows the appearance of the place. Fortunately, the surge of Information and Communication Technology (ICT) research and tools, allows different approaches to the study of place. This research wants to inquire two different approaches to understand place nature and characteristics better. Concretely, the main aim of this research is to study the relationship between (1) the human-perception towards a certain place (sense of place) and (2) the material shape of spaces and objects location in those places. This approach can bring light on the question to what degree material artefacts may also shape perception. We expect to find the match between the reason for a citizen' attachment towards a specific geographical area and what is located within this spatial boundary.

E.1.1 Places and individuals' sense of place

Place is based on social interactions (Tuan, 1978) and sense of place is based on symbolic meanings attributed to the setting (Hummon, 1992). The value given to a space by an individual is the trigger that converts a space into a place (Tuan, 1978), successively, it is possible for a single space to embed multiple places. Thus, places are humans' social constructions based on meanings given by the particularity of human culture and variations in experiences (Stedman, 2003). Furthermore, the already built physical environment in urban contexts affects our interaction with the city and our sense of place (Stedman, 2003). There is a bidirectional relationship between our social construction in the city environment (i.e., place) and the physical environment features (i.e., spaces and objects) that the city owns. The sense of place is the cognitive, affective and behavioural dimensions of the relationship that an individual has towards a specific geographical area (Jorgensen and Stedman, 2001). Currently, it is possible to gather data of interest for the study of place or cities through the new possibilities that ICT brings to us. For instance, Gao et al. (2017) studied functional regions from points of interest and human activities. Also, Wikipedia becomes an important source for studies of places and cities; by extracting central places from its link structure (Keßler, 2017) or combining its information with Tweeter data to crowdsource a collective sense of place

(Jenkins et al., 2016a).

E.2 Methodology

The methodology of this paper is structured into two parts: the subjective perception of place from the sense of place notion and the characterisation of those places through derived objects and spatial features gathered from two place data API services. We perform an analytical comparison of both approaches at the individual level and we use Cohen's Kappa coefficient (Cohen, 1960) to analyse the inter-rater agreement between the two categorical approaches. For this pilot study, we use a limited sample because (1) we used a manual tagging procedure that was unaffordable for a larger area and (2) by focusing on a small sample, we could explore the different places that may cover the same local space. We applied a map-based web survey [name deleted to maintain the integrity of the review process] to the Lisbon participatory budgeting database. From 377 people that drew at least one sense of place area, we selected a sample that described citizens' (n=13) sense of place in the Alvalade parish (Lisbon) through 18 geometries.

E.2.1 Characterisation of citizens' sense of places

The web survey used to collect the sense of place guides the user through three steps. Firstly, they are invited to define a word or sentence for each sense of place area since a place has to be discovered and named (Gieryn, 2000). Secondly, a base map appears with geo-tools to spatially define the named place. Finally, Cilliers and Timmermans (2014) classification is used to characterise the nature of each area. This categorisation is based on an executed planning activity in the Baltimore City Department of Planning to append the notion of place into the planning process. They use four categories (i.e., sociability, access & linkages, uses & activities, and comfort & image) to distribute and measure the key place-making elements. We use this classification to develop our categorisation for both the human-environment and the spatial features (see Table E.2).

E.2.2 Characterisation of area's spatial features

We quantitatively characterise an area by considering the places of interest it contains. To find the places information, we used Google Places¹ and Overpass² services. As seen in Figure E.1a, the sample areas cover much of the neighbourhood of Alvalade,

¹<https://developers.google.com/places/web-service/search> [accessed on 26th of January]

²https://wiki.openstreetmap.org/wiki/Overpass_API [accessed on 26th of January]

and many of them overlay over one another. Clearly, Google Places provided more information for the selected areas than Overpass (see Figure E.1b).



Figure E.1: (a) all areas, (b) data gathered, where blue is from Google Places API and red is from Overpass API

The information returned by the services provided information to infer a tag for each retrieved spatial element. This collected information is the spatial elements that conform to the city environment within the studied citizens' urban sense of place areas. To unify the place categories and reduce the number of tags, we devised eight distinct tags, which are shown in Table E.1 along with examples of the kind of places that are assigned to them. We followed a manual tagging procedure, which we considered appropriate given the number of places and the diverse nature of the categorical information from the services.

The relevance of each tag for each user was explored computing, for each area, the percentages of places that had a tag for a given area, which are shown in Figure E.2. Results from Google Places and Overpass are not merged because of the big gap in the number of place results (Google Places provided ten times more places data than Overpass). In addition, notice that the tags influence computed for them is different. Therefore, we decided to use only the Google Places for our next analyses.

E.3 Results and Discussion

We study the relationship between the attachment of meaning to places by individuals (Subjective) and the material shape of spaces and objects location in those spaces (Spatial features). For this goal, we use (1) the sense of place area name defined by citizens, (2) the subjective information that characterises the area's nature (S1-S4) and (3) the spatial

Table E.1: Relation between tags and spatial elements

TAG	Examples
Social	Bars, Restaurants, Bakeries
Culture	Theaters, Cinemas, Cultural Associations, Book Stores
Environment	Parks, Gardens, Lakes
Studies	Kindergartens, Schools, Faculties
Services	Government, Health, Stations, Beauty Salons
Sports	Gyms, Stadiums
Transpot	Bus stops, Train stations, Metro stations
Shops	Small shops, Markets, Malls

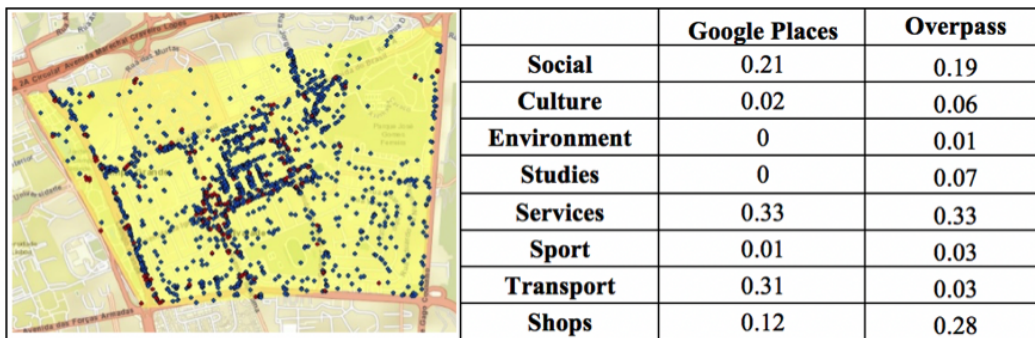


Figure E.2: Ratios of the spatial elements extracted from both data sources for an area

elements located within each area. Table E.2 presents a measuring unit (dimensions M1-4) that explains the two categorisations (spatial features and subjective). The “Spatial features (*sf*)” column presents how the dimension values were computed for each area using the tag influence data. The “Subjective (*sb*)” column shows the nature values directly supplied by the web-map survey tool based on [Cilliers and Timmermans \(2014\)](#).

Figure E.3 presents the chosen dimension values, computed as presented in Table E.2 and also provides the area names gathered through the web-map survey tool, which holds great subjective significance. Indeed, the area name is one of the most important subjective values for this study. We divided the analysis into three groups:

- Group A: contains areas whose names can be easily connected with spatial elements (n=6).

APPENDIX E. FINDING THE BRIDGE BETWEEN INDIVIDUALS' PERCEPTIONS AND SPATIAL FEATURES

Table E.2: Relational table with the dimensions and their spatial features and subjective meaning based on [Cilliers and Timmermans \(2014\)](#)

Dimension	Features	Spatial features (sf)	Subjective (sb)
Mobility (M1)	Neighbourly, friendly, interactive, welcoming	Social + Shops	S1
Uses & Activities (M2)	Fun, active, vital, useful, etc.	Culture/2 + Studies + Services + Sport	S2
Comfort & Image (M3)	Clean, "green", spiritual, attractive, etc.	Environment + Culture/2	S3
Access & Linkage (M4)	Continuity, walkable, accessible, etc.	Transport	S4

- Group B: for which no significant relations could be established between their name and geolocated data (n=8).
- Group C: those areas that are defined using toponyms related with a geographical area (n=3).

Four of the six areas (1,2,6,14) in group A have a matching, i.e., the most prominent *sb* and *sf* dimension agrees with the name of the area (green values). One of them is an area with the name "paddle" that is totally explained by $M2_{sf}$ since our spatial definition is located in a recreational place, while in the subjective perception the highest dimensions are shared by $M1_{sb}$, $M2_{sb}$ and $M3_{sb}$. Most of the areas belong to group B. This group contains areas whose name is neither possible to relate to spatial element nor their dimensions (M). In the case of Area 5, the name "Infancia" (childhood) can be related to the $M2_{sf}$ dimension, as it is, spatially, educational and recreational places. Surprisingly, areas 7 and 12 have the same name "Livre" (free), despite they come from different citizens. Their highest spatial features values are $M2_{sf}$ and $M3_{sb}$, while *sb* values are not conclusive. Regarding the other areas in this group, the relations between the values of their *sf* and *sb* dimensions are not clear. Group C is composed of areas that are referring to a concrete named place. The name of Area 9 is "Av. Igreja" (an avenue), which suggests that the places that are typically found in avenues (restaurants, bars and shops) are relevant for this citizen, agrees with its highest valued dimension (M1). The name of Areas 8 and 10, which are "Campo Grande" (a natural area) and "Estadio Iero

maio" (a stadium), respectively, clearly agree with their most valuable spatial features dimension M2.

The interesting point of group C is that all its areas pertain to the same citizen. Hence, we can characterise the most valuable sense of place of this individual ($M1_{sf}$ and $M2_{sf}$) towards their significant places in this parish. This citizen feels attached to Alvalade mainly because of its sociability and the activities that he/she can develop there. We calculated Cohen's kappa coefficient (k) to analyse the inter-rater agreement between the two categorical perspectives (M_{sf} and M_{sb}). The resulting coefficient ($k=0.73$ (CI: 0.46 – 0.99)) is considered as substantial or fair to good by Landis and Koch (1977) and Fleiss et al. (1996), respectively. The results of this exploratory study are limited based on the sort of data gathered from both processes. We comprise that there are more social and physical synergies in the construction of individuals sense of place than studied here, but this paper helps to understand this process with the study of the objects located in those places.

E.4 Conclusion

This paper studies the notion of place through sense of place comparing both subjective perception and spatial features located in a certain area. Firstly, we found that when the individual named the significant area with a name based on physical features or social activities the matching between the subjective and spatial feature dimensions of this study are high. Secondly, we discovered that our subjective measures are limited when studying the place nature. Conversely, the spatial features approach shows more variability within the area dimensions. When we compare the consensus of both approaches, we obtain a substantial concordance between the four measurement units ($M1-4_{sf-sb}$) from both perspectives, highlighting the considerable relationship between the citizens' subjective attachment to a place and the spatial features that it contains. Future work will be devoted to discern between the different physical appearances of aggregated elements as well as to take into account urban processes that can influence perceptions of sense of place.

APPENDIX E. FINDING THE BRIDGE BETWEEN INDIVIDUALS' PERCEPTIONS AND SPATIAL FEATURES

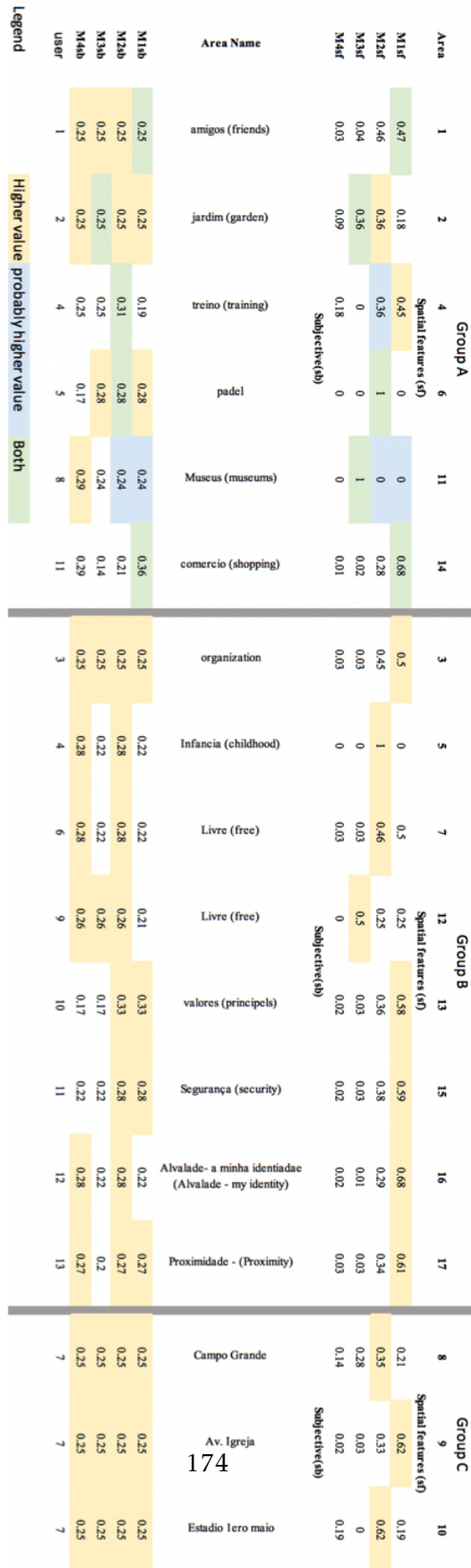


Figure E.3: Description of qualitative and quantitative dimensions for each group of areas



LOOKING FOR “IN-BETWEEN” PLACES

Abstract¹

This article develops the concept of “in-between” places in relation to the study of language, perceptions and memories within the broader mediation of cartography. We held an empirical qualitative study in the city of Lisbon, Portugal, where a group of participants (1) performed a web map-survey to identify the spatial dimensions of their sense of place, (2) had a joint discussion about the representations and memories associated with their chosen places, and, finally, (3) took a go-along walk to obtain a deeper definition and characterization of them. Results suggest that analog and digital maps generate different virtual images of space, while the navigational use of digital maps in particular generates multiple representations of the territory. The mediation of different narrations and the description of encounters within the Person-Place-Process triad helped us to establish the importance of in-between places for a complete conceptualization of place.

Keywords: place, sense of place, cartography, mediation, in-between places, spatial memories

Introduction

Places are too often represented by cartographic technologies with excessive attention

¹The text from this chapter is published as Portela, M., Acedo, A., and Granell-canut, C., 2018. Looking for “in-between” Places. *Media Theory*, 2 (1), 108–133.

put on the Person-Place relation. We have therefore focused our work on studying how maps can further benefit from inquiry into the Process of place attachment.

Though Process has been scarcely studied (Lewicka, 2011b), it has been taken up by Scannell and Gifford (2010), who proposed a model in which place attachment is organized in a Person–Process–Place (PPP) framework. Process refers to three main aspects of experience: Affect, Cognition and Behaviour. In the following, we use this framework to study daily life activities, noting that such activities unveil much of the meaning of places. Granted, it is known that daily activities are resistant to being represented by rational models, and indeed that 95% of our daily life behaviour is not allocated in our consciousness (Thrift, 2008). In this vein, we take a non-representational approach because it focuses on the procedural and performative aspects of life, with the potential to develop a speculative topography from embodied emergent experiences (McCormack, 2003).

As a conceptual departure for identifying spaces that emerge in embodied experience, we supplement our analysis with recent work from Miller (2016), who emphasises the liminality of spaces, identified also as “in-between.” Borrowing from Eric Prieto’s version of the concept, they write that “in-between” spaces tend to run the risk of falling between categories, of being misunderstood, and of having their importance ignored. This is because:

[Their] spatial (physical and/or conceptual) position implies both integration of and resistance to whatever is either side of or outside of the in-between. [...] One cannot occupy an in-between space or exist (in-)between two binary states without a resultant tension and/or mobility between both elements of the binary, which resist but also merge with the middle in-between (Miller, 2016, p. 3).

Consequently, “in-between” spaces are at times difficult to define and describe, because the procedural attributes that those spaces present were key to our analysis.

We carried out an experiment based on three different methods oriented to capture in-between spaces with a special focus on the PPP triad. The diversity of methods allowed us to link lived experiences and enacted memories in order to understand multiple and overlapping experiences of places. Furthermore, collaborative discussions and walking activities helped to redefine both individual and shared experiences of place. By doing so, the notion of the “in-between” helped us to understand the complexity of place as constituted, shared and represented, resulting in the acknowledgement of a sense of place as simultaneously enacted, performed and re-imagined.

This article is structured in four parts. First, we briefly review previous work related to the definition of place and the mediation of maps. Second, we describe the experiment, and the suitability of the proposed methods to capture and analyse sense of place. Third, we describe our findings to provide an understanding of “in-between” places. Fourth, we discuss the role of new media and technologies for cultivating, enhancing and engaging new places.

Understanding the definition of place

Place and space are intrinsic and complex components of any city, and have been studied from diverse disciplines such as Human Geography (November et al., 2010), Environmental Psychology (Gifford, 2014; Manzo, 2005), and Sociology (Law, 2008). Urban spaces can be configured by different social groups or individuals according to their lifestyle, common places, intentions and choreographies, leading to a continuous multiplicity of publics (Jenkins et al., 2016b; Sheller, 2004). Place can be defined as “a particular space which is covered with meanings and values by the users” (Najafi et al., 2011, p. 187) and plays a significant role in human behaviour and mental health (McAndrew, 1993).

Norberg-Schulz refers to the *Genius Loci* as “the concrete reality man has to face and come to terms with in his daily life” (Norberg-Schulz, 1980, p. 5). Placelessness, or the lack of sense of place, can lead to frustration and lack of character or monotony (Casey, 2001; Lynch, 1960; Relph, 2016). “Non-place” was famously described by (Augé, 1995, p. 77) as a space that “cannot be defined as relational, or historical, or concerned with identity”. Additionally, Edward Relph argued that a paradoxical relation exists in which places cannot be permanently designated along the spectrum between “place” and “non-place,” but are rather enacted and relational with respect to these terms (Relph, 2016).

Our attachment to place is another important factor, as something that is often framed in emotional terms (Najafi et al., 2011). According to Gifford (2014), for example, place attachment can provide us with a sense of security, belongingness, continuity, and it also fosters restoration and facilitates the successful pursuit of one’s goals.

A sense of place is psychological but also interactional and physical. It “influences attitudes and behaviour beyond itself” (Gifford, 2014, p. 562). As (Najafi et al., 2011, p. 189) point out, “sense of place as an emotional bonding between people and places is created after cognition”, which implies that there are social, cultural and personal motivations that exist both before and after our direct affection with it.

Places and the in-between

Lewicka (2011b) found that there are only a few studies that correlate place attachment to the scale of a place, arguing that neighbourhood scale in particular is rarely related to place attachment. However, the notion of place has undoubtedly undergone many changes together with the transformation of cities.

Duff (2010) distinction of “place” as “thick” or “thin” only further enriches our argument. While these concepts appear to resemble the distinction between places and non-places, the former pair is unique in that it takes affect as a point of departure. This means that the construction of place does not reside in the place itself but in the relational force between places and bodies. For Duff, thick places can be cultivated by local appropriations. Thickness relates the importance of intimacy to practices and encounters that occur in a place to determine the construction of meaning and belonging to that place, and thus leads to diverse affective atmospheres. Affective atmospheres capture the “emotional feel of place, as well as the store of action-potential, the dispositions and agencies, potentially enactable in that place” (Duff, 2010, p. 881). To put it another way, the concept of affective atmospheres helps to enact the cultivation of thick places, and to induce sensations in our body. Taking Norberg-Schulz’s approach into consideration, affect emerges in the act of dwelling; it is what gathers people.

Mediations of the map

Maps are never static, objective or simply utilitarian. They rather dictate how we see the world, and, as such, they are epistemological and ontological devices (Dodge et al., 2009). A performative perspective on representations of the world would suggest that both the epistemological and ontological dimensions of the map are enacted simultaneously (Law, 2008, p. 13). Leszczynski (2015), for instance, suggests that space “is instead ontogenetic — a material and social reality that is constantly brought into being through embodied socio-technical practices, such as enrolments and deployments of spatial media in the practices and spaces of the every-day” (Leszczynski, 2015, p. 6).

Latour (2011) observed that maps are not only mobile but also immutable, presentable, readable and combinable with one another. He writes that “mappings are rarely unfolded in isolation, but are embedded within wider discursive fields and forms of praxis” (Kitchin et al., 2013, p. 15). Consequently, as Gerlach (2014) points out, distinctions between ontology and epistemology disappear in the performativity of maps, because it is not that representations coincide with the territory, so much as it is the territory that fits onto the map (Paraskevopoulou et al., 2008).

However, maps are also spatial stories (De Certeau, 1984) and the very process of generating, translating and distributing these stories, destroys the past context, including its relation to other parts of the story, in which the foundation was made and only the narrative remains. Stories thus “carry out a labour that constantly transforms places into spaces, or spaces into places” (De Certeau, 2002, p. 75). The act in which the narrative is taking part transforms the map in a tool for legitimated coercion and coercive actions.

The meanings of inscriptions are also created during the act of using them. Liberman (2014a) argues that the interpretation of maps refers less to the act of reading them as it does to the way maps organize both knowledge and the senses, and therefore in how maps are made evident to those who are reading them. Recent works show similar results in the interaction mediated by digital and mobile maps (Bouvin et al., 2006; Laurier et al., 2016), with the understanding that walking is never “merely walking.”

Leszczynski (2015) considers spatial media, including digital maps, “as a basis from which to grapple with the socio-spatial effects and significance of these technological phenomena through opening up the possibilities for engaging them in terms of ontological conditions of mediation” (3). She therefore introduces the always-mediated reality and the necessity to discuss the articulation between the virtual and the physical in relative terms, and avoids treating them as divergent spaces. But in terms of emotions, feelings and affects, working with such liminality also entails working with that emergence (McCormack, 2003). Thus, the virtual is in the realm of potentiality. It is in this aspect that Gerlach (2014) introduces the idea of vernacular maps, in which legending is to consider affect, the virtual and the performative, and to introduce “reimaginings, affect, events and becomings” into the process (3).

In this paper, we demonstrate a multi-layered approach to understand the emergence of in-between places, and argue that the relation between ontological, utilitarian and navigational definitions of place are mutually tied together in the use of maps.

Description of the experiment

The capital of Portugal, Lisbon, is currently occupied by a swarm of tourists, students and inhabitants, and draws a fascinating place to conduct our experiment. In 2012, Lisbon suffered an important administrative restructuring, moving from 53 to 24 parishes. This adjustment led to a considerable transformation of Lisbon’s autonomous governments (freguesias) by changing their names, boundaries and political administrations. During the last two years, the city is also subject to a gentrification that is having

a huge impact on its culture, economy and landscape. This conversion became another starting point for thinking about the sense of place of Lisbon’s inhabitants.

We carried out an experiment to grasp the emergence of the in-between by using different methods. We recruited 10 students from our University and divided them into two groups regarding their availability for the meetings. The first group was composed of three females and one male, while the second group was composed of three females and three males. All of them were between 20 and 33 years old. The experiment was designed in three stages (Figure F.1), with each being conducted with different settings, as described below. Both groups accomplished the entire experiment successfully.



Figure F.1: Representation of the three stages

Online map-survey (stage 1)

Participants were asked to fill in an online map-survey (Acedo et al., 2017a). The ad-hoc survey was meant to understand and spatialize participants’ sense of place and social capital in the geographical region of Lisbon. Participants were asked to draw areas of interest regarding (A) the places they belong (i.e. where they fit in), and the relations that they have towards the geographical area, (B) the groups that they belong to, and the places where those relations between human collectives and interactions arise as fruits of trust, reciprocity and cooperation, and (C) the places where they are willing to participate in civic activities.

Everyday mapping activities of citizens through platforms such as Google Maps and OpenStreetMaps answer the need to define a route or mark a location that is related with a geometrical perception of space rather than an individual perception of a singular place (Roche, 2016). Sui and Sui and Goodchild (2011) already noted that Geographic Information Systems (GIS) can be considered as media, since they allow to interact between virtual and physical territories. Nevertheless, it should be noted that

“spatial media intrinsically do not conform to systems metaphors that underwrote myriad definitions of GIS” (Leszczynski, 2015, p. 3). The goal of this web map-based survey was to situate citizens’ significant places and to mark precisely where their meaningful relationships take place. By drawing these areas of interest and giving them a name, the participants valued those places independently and, simultaneously, they reached a better understanding of urban spaces.

Workshop (stage 2)

After completing the online map-survey, we invited both groups to join and work with their feelings and emotions as triggers. The activity was set in a room with a shared map on top of a table, and a camera hanging from the ceiling to record the interactions and the use of the provided tools. Two of the authors took the role of facilitating the process in Stages 2 and 3, taking notes, providing guidance and taking part of the discussion. The duration was one hour, structured in five parts or phases:

(Part A) We gave participants a sheet where they could list important, meaningful or significant places (see Duff (2010)) along with their feelings and emotions regarding each place. The proposed questions were: Which places do you recognize that are yours in the daily life? Which activities do you carry and take place there? What are the feelings that you have got when you think of such places? What is the intensity of those feelings?

(Part B) After completing the list, they were asked to value them in the Affective Appraisal of Environment marker (Russell and Lanius, 1984). The affective appraisal theory assumes that people can judge the ability of a place to alter feelings, in that sense, the marker is a two-dimensional graph (pleasantness and arousal) that allows to categorize places. In our case, we wanted to use it, not to effectively judge the places, but as an exercise to promote deeper thinking about individual feelings related to a place, before explaining it to the group.

(Part C) Next, each participant was asked to mention (one at a time) the places that he/she had in the list, locate it on the map, and explain to other participants why he/she selected that place, what intensities and emotions brought to him/her, and how these distinguished from other emotions. After doing so, participants were required to rank the place before continuing with the next on the list. This constituted the main part of the workshop activity since meaningful discussions appeared on it.

(Part D) After the main part, participants were required to think whether they

wanted to share another place that was not on their list, and might be related to familial relations, social relations, or would even represent to some extent the city.

(Part E) Finally, we asked participants if they wanted to change the ranking they have chosen for the places, if they wanted to change the appraisal of the place, and if they felt that they would change the geographical areas that they have marked in the Map-Survey (stage 1).

Go-along walk (stage 3)

A go-along walk is an in-depth qualitative interview method that is useful “for exploring – and subsequently improving understanding of – people’s experiences of their local residential context” (Carpiano, 2009, p. 3). It facilitates the analysis of everyday practices in place, the relations with other agents, and to keep sensitive to the affective dimension of place-making activities (Duff, 2010).

After selecting an arbitrary point of departure, some participants of each group performed a walking exercise. From each group, we selected three participants to be part of the activity, while two of them were the guides of the walking tour and the other one was who held an action camera with a head-mount. We asked participants to meet in a metro station as a point of departure, and the guides took the group to the places mentioned in the previous workshop session (stage 2). The main intention was to differentiate the places that they have pointed to in the map and how they relate them to vivid spaces, what comes up and how others relate their own experiences. Because we did not want to evaluate their map-reading skills, we did avoid the use of maps during the walking and let the guides choose the path to follow.

The walking activity was oriented to understand the affective dimension, but also to understand how places pointed out in the previous stages are enacted, omitted, mentioned and re-created in practice. For that reason, our guidance and interventions were focused on remarking and inquiring the group about such places. As outputs, we got GPS tracking points and paths, field notes and video recordings, which were analysed after, in comparison with the other materials.

The multi-layer approach

The experiment, which was made up of three different stages, led to a complex map of how places are built, and the virtualities and imaginaries that work between the qualitative, quantitative and performative methods.

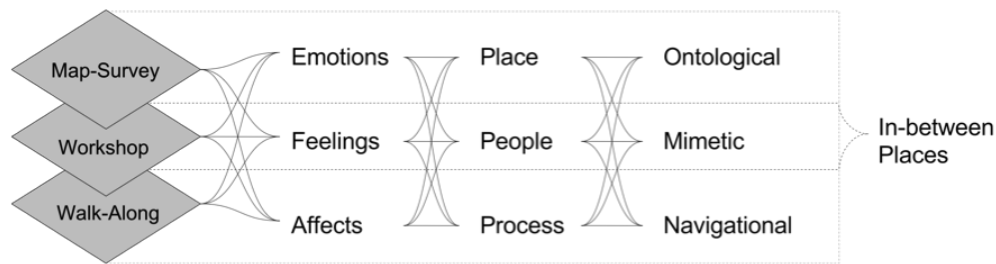


Figure F.2: Layers to relate the three triads and methods helped to find In-between places

Figure F.2 shows three scopes (columns) of analysis for each of the stages; layers of analysis are seen per each row. For example, the first scope contains the emotions, feelings and affects layers. The combination of layers within scopes allowed us to observe the phenomenon differently. For clarity in the explanation, the division between scopes and layers is not so rigid as it may appear, because, in practice, we might have used all layers for any of the stages. Nevertheless, we found that specific combinations of scopes-layers eased the development of certain stages and clarified the search for in-between places. In that sense, we used a holistic approach to detect the best combination given the following empirical analysis. Working as filters, each combination of scope-layer led us to reconstruct our findings to identify and determine in-between places. It was a relational exercise of using different means and strategies to develop our experimental activities, involving different layers of knowledge, states and skills. We suggest that in-between places can be unveiled working in the interweaving of what is represented and what is not.

For the analysis, we transcribed the conversations from Stages 2 and 3 by using Jefferson's transcription system (Jefferson, 2004). As Gene Lerner explained:

Understanding turn-taking for conversation and other forms of talk-in-interaction is key to understanding human conduct, because most actions carried out through talking are shaped by the organization of that talk into speaking turns: it shapes how speakers compose their contributions, it shapes where they position those contributions in the ongoing interaction, and it shapes when they get to participate (Lerner, 2004, p. 4).

We then analysed the video recordings by means of the noticing method (Laurier,

2014). This allowed us to pay attention to gestures and negotiation of meaning, by repeating the recordings many times.

We used cartography as a complementary tool and as an excuse to participants to talk about their places. To analyse them, we overlapped the data resulting from the Stages onto an ArcGIS map to explore them together to find correlations between what was said in the meetings with what was effectively marked. Besides, to make sense of the entire process, we reviewed the resulting material several times, reading it through different scopes and layers, searching for clues of in-between places.

Findings

During the experiment, we noticed that the knowledge of the territory and its relation to the cartography was different between participants. One of them was very keen on finding places, and helped others on this activity. He expressed his interest in the city and easily related the space to the map. But strolling around the city alone does not suffice to fully develop such skills. Other participants who stated they liked walking around had more difficulties to determine where the places were, and used the relational method explained above. As such, we argue that there are different types of *spatial memories*, which are also enacted by different types of mediations.

In the following we use the three proposed scopes to analyse the results of the experiment to better understand how each method unveils different aspects of participants' *spatial memories*.

Ontological, mimetic and navigational results

The *mimetic* representation of the territory is not directly mapped to how it is reproduced in our virtual images of space (November et al., 2010), losing the correlation between what we experience and what we can say about places. This was obvious in the experiment when people tried to mark, describe and orient others in the workshop. Moreover, more than once in the exercise, the provided maps generated confusion regarding the place they wanted to show. This situation forced participants to abandon the map as a representation and describe the place by its physical characteristics, activities and personal feelings.

Places are personal appropriations of spaces, and by sharing them to others, participants had to try to imagine what were the perceived characteristics of the place being shared. Having said that, when a participant shared a place, the starting point was

always easily recognised by others, such a metro station, a shopping centre or a stadium. While the other participants recovered the virtual image of the place, the participant who was describing the place changed the description to focus on the place that he/she wanted to share. This misunderstanding or ambiguity is manifested in the following description where a participant mentions a station (Santa Apolonia) trying to orient others, but without success:

“Ohh! Actually, I don’t know much about this place but I’ve been visited through outside the station. There is some traditional market as well the street market. And I found it very interesting. I used to do photography over there. And Santa Apolonia is also one of my favourite places to visit, because there is differentiation. I’m the kind of person who always loves to travel, so I can be anywhere.”

The group, then, tried to recalibrate their thoughts to understand what the participant said, but not without producing moments of confusion during which some participants got lost:

“That market was a kind of street market in the traditional way. I mean street harbour like this, they have the cars and there are in the gardens on the road side. They are having new products, second hand, maybe, or some traditional. And then sometimes you find some very good articles over there”

There were moments of reflexivity when someone could name or generate a consensus about what people were talking about. In the following, “A” (one of the authors), tried to share with the group that he realized which place the participant was talking about. However, the others took some time to catch it. We can notice that on the transcription made in Jefferson’s system (Figure F.3)

Additionally, we observed in the transcriptions that not only the perception and values of place were represented, but also the participant’s personality. Therefore, the ontological feature of maps is taken by each participant as he/she uses it to express his/her identity and vision, while others can access to that vision to understand the participant’s vision.

Assistive or complement lectures

Such recalibrations and stabilizations are common in group discussions. However, maps mediate in the process in different ways. In one of the groups, after looking for

A: [So did nobody knows other name
 3: [I- i- think::
 (0.1)
 2: No, that is
 3: [I don't know the name
 A: [Feria de ladra
 3: Sorry?
 A: Feria da ladra
 3: yes, that is
 2: [Ah is that
 1: [heh
 4: [heh
 A: I know and you don't know ()
 2: Yes, feria de ladra
 3: You know eh- >what is the problem with< this eh: I have seen
 so many places here in Lisbon but I- I () pronounce the name
 and I never do to call them=
 A: [yeah]
 3: =memorize em, but I just know brought () the area: this is=
 4: [(h)m]
 3: =why I just interpreted:
 A: [Ok

Figure F.3: Transcription in Jefferson system

specific places in the analog map, because it lacked street labels and other references, participants were lost. We decided to use a complementary digital map based on the OpenStreetMaps service, which was projected on the wall of the room. Then, participants tried to match the digital reference to the analog one. While it took time to find the right places, it was necessary an intermediary reference to localize the area in which the place was related to, and then, look for the specific place.

Digital artefacts, media and information devices surrounding our daily life activities are interconnected both in terms of their functions and meanings creating physical and digital ecologies (Fuller, 2005; Jung et al., 2008). Platforms like Google Maps and OSM enable us to reimagine our location and to develop a relational perspective. They are publicly accessible mapping platforms that open new ways to locate information and wayfinding practices. For that reason, we forced participants to think outside their own

practices of understanding the territory, making them amplify the scope of digital maps to solve their situation and to learn from it.

For historical or touristic purposes, only relevant places are marked to quickly find them, but usually these maps lack other common references or places, like fast food chains, banks, or buildings that foreigners can easily recognize. Once a tourist gets lost, he/she then tries to match the references on the map with the place where she is, and the absence of common references may make the navigational task difficult (Ishikawa and Takahashi, 2013). In our case, the multiple references to metro stations, fast food chains and other commonly known places, helped to mediate the locations. By doing so, participants unveiled also activities that they used to practice in these places but were not included in the list of places of preference.

The mediation of such places unveils in-between places, revealing a set of practices that are not conscious and, possibly hidden from the rationale of the group. This is where the intersection between the representational and non-representational is found useful.

Place, people and process

During the walking activity of the first group, one of the participants led the group to her special place. We found that she had difficulty to put a name and to give a concrete description of the place. For that reason, the participant complemented it by gestures and specific descriptions, references and negotiations until the group realized what she was trying to communicate.

Because it was a common space for two of the participants, we decided to do the go-along walk around Telherias station, the starting point of two of the mentioned places. When the participant started to guide us to the place, she explained that she found the place (Point C, in Figure F.4) by chance, while she was heading to a meeting with her supervisor in the supermarket “Continente” (Point B). We reproduced that path to understand where and under which circumstances affects raised on that activity. The place that she found so special appeared in contrast between two crowded places, as an oasis, with the characteristics that she preferred (peaceful, relaxing).

We found that during the workshop, she only could mention the metro station (Telherias) near the place, but since she could not describe it in more detail, she gave up on explaining more about that place. Neither could she point it on the map, she only realized where the place was when other participants named the station.

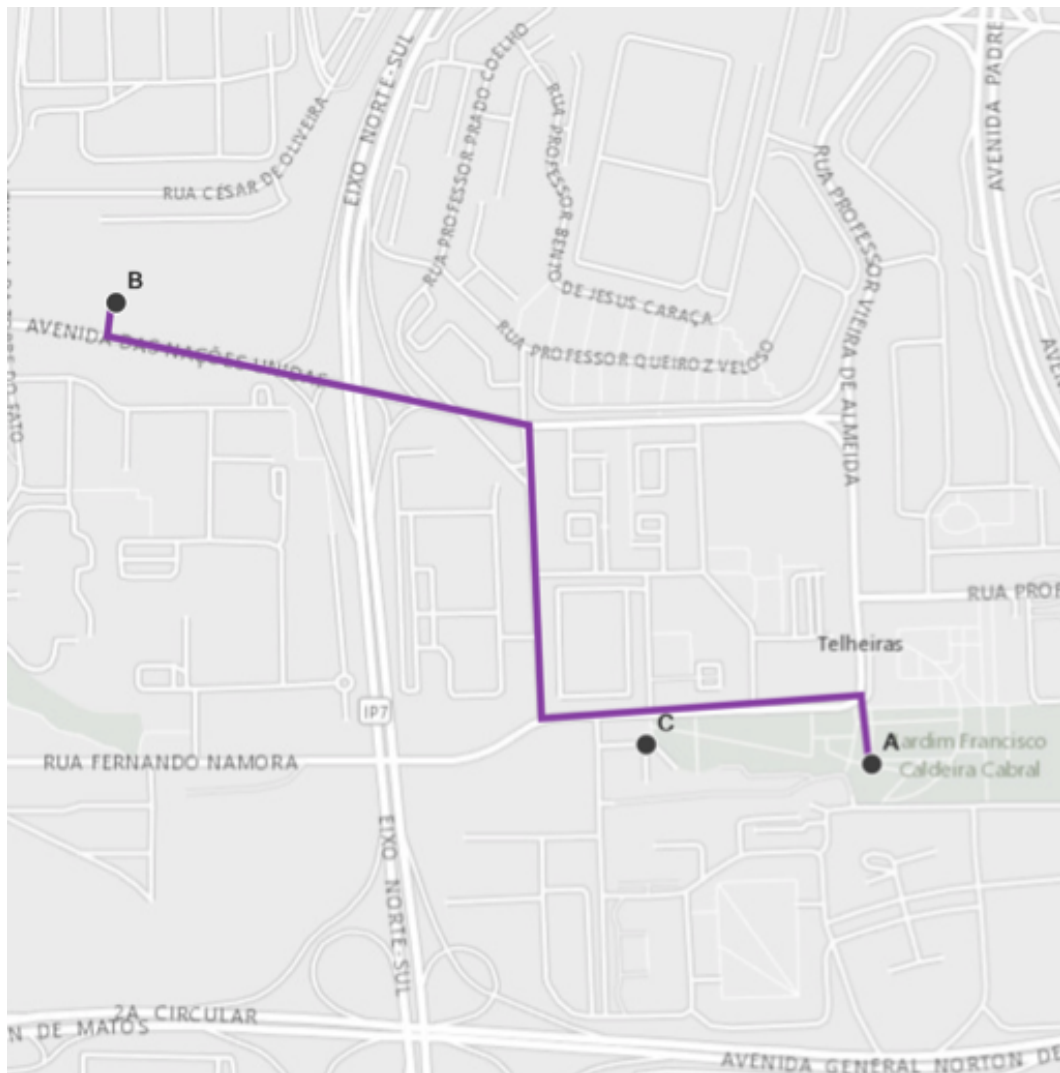


Figure F.4: Path followed in the walking activity with the first group

“And going out of metro, it was a new place for me [...] During my whole walk, I found it very pleasant. Very peaceful. Something positive. I mean, you are walking towards the Continent from your metro station that there is a long walk. And I found it very peaceful and I was doing, I have a brainstorming during there so I have very positive thoughts. I found that. I mean, I’ve been going there after that two or three times, just for. Because of my thesis.”

Edensor (2012) argued that affects are always anticipated, having a social, cultural and personal background. In this case, the participant’s intention to find a place that

brought affect was clear. She prefers pleasant, quiet places, with natural elements, in which one can enjoy certain activities such as reading or studying. But the fact of sharing it with others turned to be a difficult task to accomplish. In the walking, she resorted some words such as magical place or by referring to fictional scenarios. The group accommodated their understanding of the meaning of what she was saying:

“I know that the place is very common, but the ambience, the entrance is... and, I sit on that desk and... that entrance, that entrance. The green one. The entrance of... Like a fairy tale, Alice in the wonderland, or Scotland.”

The participant also expressed the importance of repetition as an act of affirmation of her feelings: *“It really makes me happy. I have been there. Eh, I’ve been coming here for more than three times. So, whenever I came here I use to sit here. At least for thirty or forty minutes.”* She then reaffirms the feeling when explaining how it works, and in which situation she found it: *“But it appears that, if I would sit here, the magic will remain there.”*

Regarding this last case, we understand that the activity of mapping is not just a construction of symbolic reference, but that it is activated in time. As Liberman put in words, “a map does not provide for those practices prior to an occasion—instead, it is the occasion that affords the map its coherency, a coherency not of ideas but of a collection of practices” (Liberman, 2014b, p. 47). But at the same time, the different activities allowed us to complete the *virtual* aspect of the place, only by the mediation of several cartographies, verbal descriptions, physical gestures, negotiation between participants and our own ideas, feelings and emotions. What grouped all those mediations together was the contagion of affects (Thrift, 2008), which made us react in such a way that we felt the importance of such place. It was that specific moment of being in the place, after a sequence of synchronous and asynchronous activities and choreographies that permitted us to arrive a moment of reflexivity and understanding. We can argue that in-between places are special, hard to communicate and represent, but often necessitating and/or leading to unique moments of common understanding within a group.

The process of reconstructing spatial memories

Activity groups are embedded in a negotiation of meaning and personal exposure. In a Wittgensteinian view, given the lack of necessary landmarks and contextual clues in conversations, Liberman (2012) affirms that “the meaning of a word is naturally unstable over the course of a conversation” [p. 263], and, for that reason, “meanings do not reside in people’s heads but in the world” [p. 266]. Participants in both groups

re-arranged their places to follow the conversation and the general meaning of the experiment. The importance of places, then, are entangled to the utterances of other participants.

During the workshop, the first group spotted publicly known places that may be of interest to tourists, including sites of natural or cultural heritage. Because of that, organizers had to force the conversation to go to personal places. However, in the second group, because most of them knew each other before, they mentioned places that are common to most of them. In both cases, personal places came in the second or third attempt of describing places. Lewicka (2011b), by comparing other studies, found that participants tend to prefer places by environmental features and characteristics of place than by social ones (family/friends). In their personal lists of places, we can corroborate Lewicka’s findings, given that at least half of the participants put the University and Arco do Cego (the main square where they used to meet) in the top of their lists. Nevertheless, comparing to the maps from stage 1, with the exception for one participant, none of those places were marked as important regarding social capital or place attachment. Here, places like Belem (the most popular touristic place of the city) just came up in the group activity. Consequently, in-between places are also mediated by popular images, common assumptions and knowledge.

Feelings, emotions and affects

Looking at the words used by participants to describe their emotions in relation to places, we found that many of them did not describe emotions but activities or relationships with these places. For example, in the second group, one participant pointed to a square where he socializes with his friends and university colleagues; when we asked him for emotions, he only answered “hangout.” What we understood is that multiple emotions came up at the same time, making the explanation confusing. Therefore, there is not a single rational aspect, emotion or feeling pertinent to a place, but multiple and mixed as participants remember them. Considering that emotions are “constituted categories in relation to which the felt intensity of experience is articulated” (McCormack, 2003, p. 495), we realized that some are not yet established, but are becoming in the course of the discussion.

In some cases, for representing what they feel about, participants decided to describe the place first, then what they used to do there, and why they liked it. Because of the difficulty to assign a word to emotions and feelings, a place is represented as a set of descriptions and gestures that altogether try to transmit the felt attunement (Edensor,

2012). Besides, we perceived the unsuitability of some tools, such as digital and analog maps to describe some emotions. In the analysis of what they have drawn, we observed that, in a first instance, participants avoided these places in favour of more common places, and only after a prudent time, they were able to communicate more personal places that were not on the list.

On the other hand, the places that were top-ranked sometimes fit with specific feelings or emotions. For example, one participant mentioned reiteratively pleasant and quiet places, as something that she was expected for her selected places, and in fact she thought it was a common expectation.

For the use of the Appraisal Marker most participants chose merely pleasant places, and very few thought of unpleasant places. More interestingly, we asked later if they wanted to move one marker to another position. Despite the fact that few participants made changes, one case was paradigmatic. The chosen place was the childhood house of one of the participants. Since the neighbourhood (Chelas) has a bad reputation, the discussion shifted from his description of individual concern to a more public debate regarding insecurity and other social consequences. Though it was the participant who mentioned the bad reputation of the neighbourhood, he probably did so with the intention to differentiate its public reputation of that space from his own experience and appreciation: *“The area where my grandparents live was not problematic. It’s a fine place,”* he confessed. Then, another participant (who knew him) commented on her feeling of safety: *“Sometimes it can be a scary place but nothing bad happened to me there,”* she said. As a second witness, she helped to build a stronger argument, saving his negotiation between a personal and a public definition of the place. Consequently, the first participant decided to move the marker to a more pleasant position (Figure F.5), most probably because of the negotiation that took place.

On the scale of places

Participants of both groups recognized Parque das Nações as a public space, but it was referenced to different activities. The place is a parish that was built for a World Fair in 1998 with a series of venues, such as a shopping mall, a riverside, restaurants and a concert hall. It is well-known for leisure activities, tourism and shopping. There is also a set of residential buildings that were built after the fair, and one of the participants lived there since her childhood.

For her, the place has a different value than that of the rest of participants. Although the descriptions made during the walking were levelled down to a more historical

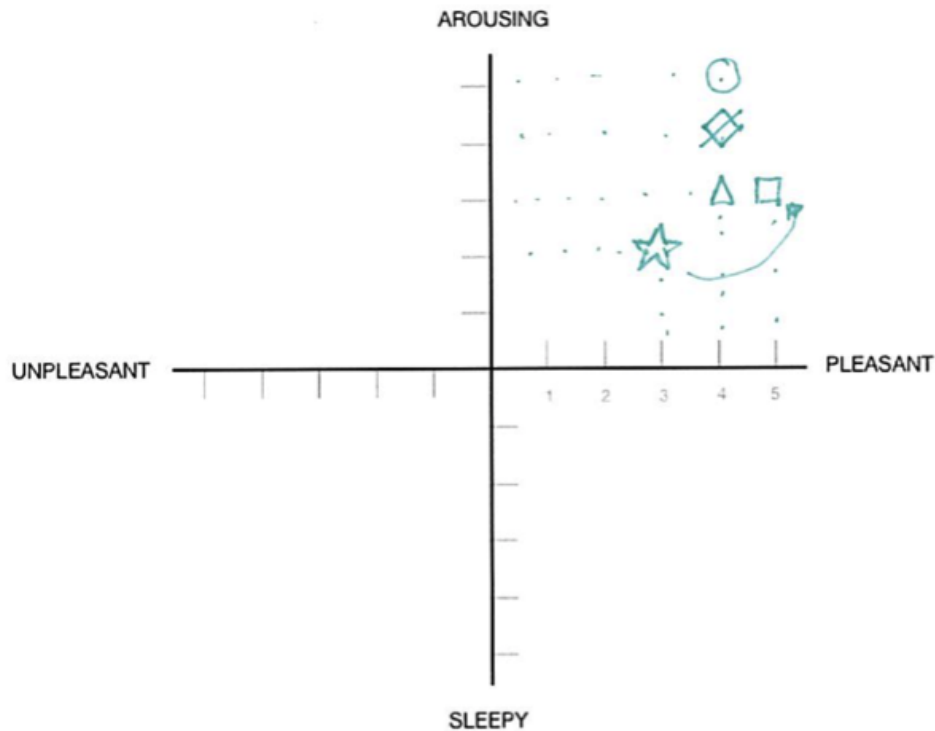


Figure F.5: Appraisal Marker where the place in Chelas was changed by the participant

narration, when we analysed the data we found that she has selected all the areas of the parish, while others only selected a specific sector of it. We can assume that she has more attachment to the entire parish area and knows many places that she can be related to, while others only referenced few places and, consequently, felt less attached to that place.

Exercises through distinct means and tools required participants to point to places differently. In the first stage, we asked them to define areas of influence, regarding sense of place or attachment, while the tool also forced them to do so in a specific manner. In the second stage, we gave them symbols to represent places, which allowed participants to point to a specific place, and not an entire area. For example, inside Parque das Nações, people placed marks at different venues, while they selected the entire area when using the digital tool. In some cases, participants, by freehand drawing, also used the symbols to fit an entire area. Therefore, they adapted the given tools to fit their intentions, and defined the scale to which they wanted to show their space appropriation. Without the practical opportunity to work remotely, the appropriateness of analog tools fits much better into the level and scale of representation of places.

Conclusion

In this paper, we put in perspective the development of representational systems for communicating what people consider a place. With the adoption of digital platforms, the meaning of what a private or public space changed, as well as individual and group relationships with space (de Waal, 2014). Our relationship with the urban space is also changing due to the use of software enabled devices (Kitchin and Dodge, 2011).

The notion of place, that has been discussed for decades is in constant transformation. As Duff pointed out, we should not try to force it and understand that levelled down places are also opportunities to generate new personal, appropriated spaces. For that reason, we consider that, using new available technologies we can look at new ways of narrating and communicating those places. Thrift (2008) said that new possibilities of visualizing maps by interactive means are an opportunity to also capture such changes on affect. And our call here was to critically face the use of media to represent what is harder to represent, rather than continuously to reproduce the same ambiguity between common spaces and places.

None of these developments are thought to raise, share and contribute any personal value of space. As we saw in our exercises, in-between places are commonly unknown spaces, which are only shared between participants when enough confidence among them exists. Beyond any place that has been pointed during the activity, it remains to be understood why some places that participants have put on the list were not mentioned during the group discussion. Omitted and absent places are also significant. As Gerlach (2014) writes in connection with Gilles Deleuze's manifold cartographies, it is in the multiple 'and, and, and...' (Gerlach, 2014) of descriptions, embodiments and processes that we can find these in-between places.

Much more understanding is needed on how in-between places can be part of everyday life, and what the difficulty of capture and discuss its meaning implies for future technological developments. In this paper, we have examined spatial mediation and spatial memories as part of the constitution of places, as a collective knowledge, and that this may help to delineate new methods to create, share and capture them with or without digital artefacts.

Given the proposed framework in Figure F.2, we account that some methods were more suitable regarding specific layers. For example, the go-along walk provoked circulation of affect and, at the same time, the focus on the Process for the constitution of meaning. The workshop helped us to discuss emotions, while the circulation of affect

was also spotted in the discussion. However, the use of the map as navigational device offered a focus on Places and Process. We encourage ourselves to continue researching on relating scopes and layers in further experiments. However, a situated reflexivity on the discussions and mediations is hard to reproduce. Therefore, we expect that more studies will focus on the Process of creating places and the mediation of cartography.



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