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Constructing *home safety* indices for strategic planning in residential real estate: A socio-technical approach

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ABSTRACT

Residential safety and perceptions thereof directly influence the daily habits of an area's residents, as well as its levels of economic activity, and the revenue generated and traded in its real estate. These variables, in turn, impact the flows of local population, and ultimately the socio-economic development of the region. Although residential safety, and its determinants in particular, have been widely studied, many of the existing contributions recorded are seen as restrictive in terms of the manner in which the evaluation criteria are identified, and the relationships between them analyzed. The current study aims to address these issues, through the integrated application of cognitive mapping techniques and the Analytic Hierarchy Process (AHP) method. Based on group sessions involving a panel of urban planners and residential safety experts, and taking on a constructivist approach, a residential safety evaluation system was created, tested and validated, revealing promising results for the identification of the safest residential areas. The advantages and limitations of the methodological proposal presented are also discussed.

1. Introduction

As the adage goes, “there are three things that matter in property: location, location, location”. The importance of location, in turn, is tightly bound with its safety. The perceived safety of a residential area plays a key role when choosing to buy or rent a property, and this is tied, among other things, to people's perceptions of the rates of crime in the area. There is good reason for this: criminal actions against third parties or property can have a significant impact on resident populations' lifestyles (Schoenenberger et al., 2014); and they also affect the profitability of the real estate market in the area. As such, adopting measures to ensure or increase resident safety can both strengthen community integration and stimulate economic activity in the real estate sector (Ferreira, 2016). It is unsurprising, then, that there has been significant interest in the issue of residential safety over the past few decades; with much of the literature focusing on the underlying causes of residential safety or lack thereof (e.g. Brown et al., 2004; Ferreira, 2016; Hur and Nasar, 2014; Latkin et al., 2007; Linton et al., 2014;

Storr et al., 2004). As noted by Idrus and Siong (2008, p. 1), “housing is a major concern for all people in every corner of the world, as the wellbeing of a country is reflected in its people enjoying a certain standard of living. Residential and neighbourhood satisfaction is an important indicator of housing quality and condition, which affects individuals' quality of life”.

Despite the importance of the issue, many of the contributions to date are considered restrictive in terms of both the methods used to determine residential safety evaluation criteria, and the (limited) analysis of the relationships and cause-and-effect links between those criteria (see Ferreira, 2016). The current study aims to address these issues, through the integrated use of cognitive mapping techniques and the Analytic Hierarchy Process (AHP) method.

Cognitive mapping techniques bring together multiple decision makers, different perspectives, conflicts of interest and uncertainty, and in this way allow complex problems to be structured (Canas et al., 2015; Mingers and Rosenhead, 2004). As a result, omitted criteria are reduced and cause-and-effect relationships between variables are able to be identified, based on the exchange of ideas and experiences between the

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stakeholders in the decision process (Eden and Ackermann, 2004; Tegarden and Sheetz, 2003). Structuring decision problems through cognitive maps not only allows for a deeper understanding and visualization of the issues underlying them, but is also likely to facilitate decision makers' ability to look into the future, and predict how these issues might evolve in the medium to long term.

The AHP/ANP, in turn, are both well-established techniques for the calculation of the weights of evaluation criteria (cf. Forman and Gass, 2001; Kauko, 2006; Saaty, 1980). Possibly the most widely known technique in the context of multiple criteria decision analysis (MCDA) (Zavadskas et al., 2014), AHP has been variously applied in many different contexts, and Analytic Network Process (ANP) represents a generalization of AHP which takes the dependence between hierarchical elements into account.

The aim is thus to combine these two methodologies (i.e. cognitive mapping and AHP) to create residential safety indices that might serve as decision support for strategic planning in the residential real estate market; and which can be adapted over time – or even ahead of time – as circumstances change. The epistemological stance adopted in doing so is constructivist in nature (Belton and Stewart, 2002); i.e. the purpose is not to obtain a single “optimal” solution, but is rather focused on the path and procedures followed, which serve as a catalyst for learning. As Bell and Morse (2013, p. 962) put it, “there is less emphasis on outputs per se and more focus on process”. With the adequate adjustments, however, the procedures followed can be replicated in other contexts and/or with other participants, with a view to creating assessment measures of residential safety. In addition, a better understanding of the determinants of residential safety and their relative weights can also facilitate projections for the future, based on predicted changes to these determinants and/or their weights.

The next section presents an overview of the relevant literature on residential safety; after which the methodological framework of the techniques applied is provided. Section four then presents the results, highlighting the practical implications of the insights obtained; and the concluding section highlights the study's contributions and limitations, as well as ideas for future research.

2. Related literature

Not all housing developments are created equal. When a housing development is situated in an area with visible urban decay, largely neglected and/or abandoned buildings (known in the literature as “blight”), high crime rates, or a propensity for illicit activities, such as drug use or trafficking, this has a significant impact on both the flow of people in and to the area, and real estate activity within it. Roncek (1981, p. 77) notes “the effects of the urban environment” as an “important interest in the urban crime and delinquency literature”; but in addition to these social costs, there are also direct and indirect economic consequences to the “urban environment” (Roncek, 1981, p. 77) and its safety in particular.

From among the characteristics of urban environments, blight is often singled out for its impact on the value of residential properties around it. Defined as “a critical stage in the functional or social depreciation of real property beyond which its existing condition or use is unacceptable to the community” (Breger, 1967, p. 372), the existence of blight affects “the outcome of investments in a dwelling”, insofar as such investments are dependent “on investments in other buildings in the neighbourhood. If one landlord or owner invests and the neighbours do not, he will lose money because the general decay of the neighbourhood will reduce the value of his property and make his investments unprofitable” (Andersen, 2003, p. 55).

According to Andersen (2003), the reasons that lead to urban decay are diverse, the most common pertaining to owners' financial inability to keep their homes. This drives price and demand speculation, and leads to a decline in house values and investments. As a result, middle-class residents will typically migrate to other areas, and lower-income

families or individuals will move into the affected neighborhoods, attracted by the more affordable housing. These processes typically also come associated with increases in crime, vandalism, and more abandoned houses. A further social issue often associated to blight is the use and trafficking of drugs in abandoned sites, which tends to lead to higher crime rates and insecurity among residents. Indeed, such are these relationships that Skogan (1990, p. 2) goes so far as to relate urban decay to social order (or the lack thereof): “disorder is evident in the widespread appearance of junk and trash in vacant lots; it is evident, too, in decaying homes, boarded-up buildings, the vandalism of public and private property, graffiti [...] What these conditions have in common is that they signal a breakdown of the social order”.

It has been argued, however, that the rehabilitation of these sites can allow such situations to be contained, reducing violence and crime, and improving the physical and mental health of the resident population (Linton et al., 2014). Taylor and Harrell (1996, p. 4), for instance, note that “physical improvements [of spaces] may reduce the signals of vulnerability and increase commitment to joint protective activities. Physical deterioration, in all probability, not only influences cognition and behavior of potential offenders but also shapes how residents behave and what they think about other residents”. From a broader perspective, high levels of crime tend to depress both domestic and foreign investment, as well as savings (Buvinic et al., 1999); such that halting or reversing such trends should help improve a region's prospects for economic development.

It seems clear, then, that the level of safety in residential environments can have a major influence on a series of factors, ranging from residents' habits and ability to freely carry out their physical exercise and other daily activities, to a host of social issues with individual, community and economic impact (for discussion, see also Vigiúé et al., 2014; Marsal-Llacuna et al., 2015). It likewise affects the assessment and value of urban areas, as well as buildings and dwellings within them. As such, it becomes important to track and measure residential safety, in order to both take preventative measures and address the problems inherent in its absence. Assessing and addressing residential safety can also be expected to impact the manner in which urban planning is conducted and to help combat declining home values. Accordingly, there have been several forays in the literature into the issue of residential safety and the development of measurement tools for its assessment in particular, some of which are presented in Table 1.

As can be seen in Table 1, the inherent subjectivity of the issue of residential safety, given that it is partly dependent on people's perceptions of that level of security, makes it difficult to define the variables which should be included in the valuation models. In practice, potentially important variables are often not considered or eliminated, which can affect the explanatory power of the models developed. Another difficulty identified in past research pertains to the attribution of weights to the identified variables and/or the calculation of trade-offs between them. Given these limitations, the current study aims to present a path to overcoming them, through the integrated use of cognitive mapping and MCDA techniques. The development of a cognitive map can provide a basis for the definition of the variables to be included in an evaluation system; and the use of MCDA techniques can help determine the weights allocated to each of these variables, as described in the next section.

3. Methodological background

As noted above, the current study is based on the MCDA approach (see Belton and Stewart, 2002), and proposes the integrated use of cognitive mapping techniques and the AHP/ANP methodology. Because MCDA “is suitable for addressing complex problems featuring high uncertainty, conflicting objectives, different forms of data and information, multi interests and perspectives, and the accounting for complex and evolving biophysical and socio-economic systems” (Wang et al., 2009, p. 2265), its techniques seem particularly suited to the complexity of the issue of home safety at hand. Furthermore, the posture assumed in the

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