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WHAT IS A COMFORTABLE HOME? – A DEFINITION DEVELOPED FROM HOMEBUYERS' PERSPECTIVE

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ABSTRACT

Even if dwellings are supposed to offer comfortable spaces to people, the real estate literature does not often emphasize comfort as a relevant housing attribute. For instance, it is rarely mentioned as significant in the determination of housing prices. Part of the reason for this is that Comfort is not an easy concept to define and thus identifying what a Comfortable Home is a challenging task. By utilizing interviews—in which 42 people from Chile and New Zealand participated—this study explored homebuyers' view on what makes a property Comfortable. This data was lately utilized for developing a definition of Comfortable Home. Since this definition reflects how homebuyers think about Comfort in the context of housing, developing it further can have strong implications in the housing sector. For instance, this new conceptualization of comfort can become a framework for housing policy making, and a guideline for designing and selling properties in the housing market.

Keywords: comfort, indoor environmental quality, residential real estate, customer value, consumer behaviour

INTRODUCTION

Dwellings are a complex socio-material arrangement. On the one hand they are financial assets; while on the other, they are also consumption goods with functional requirements (Rodriguez and Siret, 2009; Blanchett, 2017). As a functional object, dwellings have as their ultimate goal to be comfortable. In other words, to enable occupant's health and wellbeing. In fact, recent research outlines that people tend to associate the action of purchasing a dwelling with a higher quality of living (Koklic and Vida, 2009), the aspiration for increased comfort (Dunning, 2016, p. 127), and an improved housing situation (Clark, 1993).

Despite the functional value attached to dwellings, the housing market rarely utilizes Comfort as a selling argument. For instance, elements strongly associated with Comfort, such as Indoor Environmental Quality (IEQ) attributes—e.g. Air Quality, and Thermal, Acoustic and Visual comfort—are not included in the list of recommended characteristics to include in Hedonic Regression models (Aroul, 2009; Sopranzetti, 2010; Adetiloye and Eke, 2014). On the contrary, this list is comprised of structural properties, attributes of the neighbourhood, geographical location, exterior environmental quality, contract conditions, and other potentially relevant aspects such as the view to cemeteries, *Fengshui* and "lucky" or "unlucky" address numbers (Chin and Chau, 2003; Sopranzetti, 2010; Chia *et al.*, 2016; Ferlan, Bastic and Psunder, 2017; Xiao, 2017). Despite disregarding IEQ attributes, these model often have a high predictive power (e.g. Addae-Dapaah & Chieh, 2011; Bloom et al., 2011; Hyland et al., 2013; Soriano, 2008), which suggests that said attributes are, indeed, scarcely influential of dwelling's prices.

Molina et al. (2020) posit that the reason why IEQ attributes seem incapable of affecting housing prices is not because home-searchers do not value them, but because comfort cannot be observed during the housing search process. Molina et al. (2020) further argued that IEQ attributes can be utilized to create value if they were communicated transparently and credibly. But is it possible to communicate to consumers an intrinsically subjective characteristic such as Comfort? What do they *mean by* and *expect from* a "comfortable home"? In an attempt to overcome these difficulties, this paper introduces a new definition of Comfort (specifically, Comfort related to Indoor Environmental Quality attributes). This definition—developed from 42 interviews with people from Chile and New Zealand—is precise enough to influence current practices in the housings sector. For instance, this definition can inform the design, and advertisement of dwellings.

This paper is structured as follows. First, a literature review will present the motivation of this study. Namely, that, while commonly neglected in financial assessments, plenty of evidence suggests that homebuyers do want to purchase comfortable dwellings (i.e., dwellings with a high Indoor Environmental Quality). Nonetheless, it also argues that Building Science—i.e., the science that studies Indoor Environmental Quality—has not studied what consumers *mean by* comfort deeply enough, making it impossible for real estate developers to offer comfortable homes. Then, the methods utilized to gather and analyse the data are presented, followed by an analysis that leads to a new definition of Comfort in residential contexts. This definition is precise enough to inform professional practice and policy making in the housing sector. Some examples of this are provided with the purpose of evidencing the usefulness of researching this concept, thus encouraging future Comfort research in the discipline of Real Estate.

LITERATURE REVIEW

Even if Indoor Environmental Quality is not commonly seen as relevant in the determination of prices (Chin and Chau, 2003; Sopranzetti, 2010; Chia *et al.*, 2016; Ferlan, Bastic and Psunder, 2017; Xiao, 2017), plenty of evidence suggests that people are indeed willing to pay premiums for it. Specifically, people are known to be willing to pay more for neighbourhoods that will offer a better exterior—and, consequently, interior—environmental quality. For instance, external noise is known to reduce the price of dwellings (Nelson, 1982; Huang and Palmquist, 2001; Cushing-Daniels and Murray, 2005; Jim and Chen, 2006; Julien and Lanoie, 2007; He *et al.*, 2014; Allen, Austin and Mushfiq, 2015; Swoboda, Nega and Timm, 2015; Beimer and Maennig, 2017; Del Giudice *et al.*, 2017). The same happens with air pollution (Nourse, 1967; Ridker and Henning, 1967; Komarova, 2009; Zheng *et al.*, 2014; Chen and Chen, 2017; Le Boennec and Salladarré, 2017) and land contamination (Jenkins-Smith *et al.*, 2002; Decker, Nielsen and Sindt, 2005; Simons and Saginor, 2006; Horváth and Hajnal, 2014; Torre, Balena and Ceppi, 2014). Contrary to this, the fact that several pricing models in the real estate literature have a high predicting power despite ignoring IEQ attributes (e.g. Addae-Dapaah & Chieh, 2011; Bloom et al., 2011; Hyland et al., 2013; Soriano, 2008) suggests that those attributes have a low impact on a dwelling's price at a household unit scale. Perhaps it is easier to obtain information about the environmental quality of neighbourhoods than specific dwellings, which would explain this contradiction (Molina *et al.*, 2020).

Even if homebuyers find it difficult to assess Indoor Environmental Quality during their search, the discipline of Building Science has produced a great amount of research dedicated to exactly that. Indeed, freely and commercially available software already exists for evaluating the thermal (Crawley *et al.*, 2001, 2004; Energy Systems Research Unit, 2013) and daylighting (Ward, 1994; Ward and Shakespeare, 1998; Jakubiec and Reinhart, 2011; Molina, 2018) performance of buildings. Moreover, estimating a building's performance implies the existence of indicators that represent what people want. Indeed, several metrics intend to represent the quality of daylight (Nabil and Mardaljevic, 2005; Reinhart, Mardaljevic and Rogers, 2006; IESNA, 2012; Dogan and Park, 2017) and thermal comfort (Carlucci *et al.*, 2018; Song *et al.*, 2018; Wang *et al.*, 2018).

While these indicators could arguably be used for communicating comfort to consumers, doing so is not straightforward. That is to say, the fact that these indicators are valuable for experts at design stages (Nabil and Mardaljevic, 2005; Wienold, 2009; Djongyang, Tchinda and Njomo, 2010; Carlucci et al., 2018; Kim, Schiavon and Brager, 2018) does not mean that they are useful for home-buyers. Part of the reason for this is that most of these indices represent "neutral conditions" (ASHRAE, 2010; Djongyang, Tchinda and Njomo, 2010; Bean, 2020) or the "absence of physiological nuisances" (Lawrence Race, 2006; Carlucci and Pagliano, 2012; Jakubiec and Reinhart, 2015), a concept that is known to misrepresent what people mean by Comfort. For instance, back in 1967, Gagge, Stolwijk, and Hardy (1967, p. 1) argued that "'comfort' is a recognizable state of feeling, but possesses no identifiable sense organ like the basic five senses". Similarly, de Dear et al. (2016) posits that comfort is in the mind of the beholder, and definitions of comfort that emphasize its subjectivity and psychological nature are often found in the literature (ASHRAE, 2010, p. 3; Bean, 2020). For example, Fabbri (2013, p. 3) argues that "the difficulty lies in the evaluation of Thermal Comfort, because it is a judgment that depends not only on the energy exchanges with the body-environment, but also includes the psychological, emotional, cultural and social aspects of people". Hansen (1991, p. 2.4) explains that "temperature sensation is a rational experience that can be described as being directed towards an objective world in terms of 'cold' and 'warm'. Thermal comfort, on the other hand, is an emotional experience which can be characterized in terms of 'pleasant' or 'unpleasant'".

In summary, evidence suggests that home-buyers do value comfort (understood as Indoor Environmental Quality) but they cannot assess it during their search (Molina *et al.*, 2020). While this could arguably be solved by using Building Science's tools—which can predict IEQ at a household-unit scale—the understanding of comfort behind said tools does not match what people mean by Comfort. Therefore, an exploration of what people *mean by* and *expect from* comfortable homes is required. The following section explains how such exploration was carried out.

METHOD

Semi-structured interviews were used to explore "comfortable dwellings" because it is an intrinsically qualitative and subjective concept. Respondents were asked to describe a comfortable home and these descriptions were analysed using Thematic Analysis (Braun and Clarke, 2006, 2012), which lead to a new definition of Comfort for residential contexts.

This research targeted people with no expertise in architecture, building science or real estate, and who also complied with two other inclusion requirements. First, to have recently gone through the process of searching for a new home for living themselves (i.e., excluding investors and people who designed their new home). This allowed people to have a relatively fresh memory of their expectations and experiences about comfort in dwellings. The second criterion was that this home search had happened in Wellington, New Zealand or in Santiago, Chile. These locations were chosen because they are significantly different from each other. Wellington and Santiago differ in population, density, per capita income, climate, culture, guaranteeing that the results are not constrained to a single country or culture.

The data was gathered in two stages, both of which involved informal personal interviews that, together, covered the four main elements of Indoor Environmental Quality; namely, Thermal, Visual and Acoustic comfort, and Air Quality (Andargie, Touchie and O'Brien, 2019). Inspired on by the Meaning Structure method (Coolen, 2012), mind-maps representing people's responses were constructed during the interviews. Respondents were welcome to participate in constructing these structures when interviewed in person (some of them were interviewed remotely). This means that respondents became a second analyst, triangulating the data obtained (Patton, 1999). Also, the validity of the information was constantly contrasted with building science theory, thus performing an additional theoretical triangulation (Patton, 1999). Finally, all respondents—regardless of whether they were interviewed in person or remotely—were sent the structure as to ensure that it represented what they meant to say.

18 people were interviewed in the first stage: nine people from Wellington (New Zealand) and nine from Santiago (Chile). These respondents were asked to describe "a warm home" and "a home with good daylight". They were told that such a dwelling did not need to exist and that they should include physical elements (e.g. colour, size, location) as well as experiential elements (e.g. happiness, convenience). Stage 2 was the same as stage 1, with the following exceptions: first, because of COVID-19 restrictions, all interviews (11 from Wellington and 13 from Santiago) were performed remotely; and second, respondents were asked to describe "a home with a good acoustic performance", a "pleasantly cold home" home, and "a home with good air quality". The total number of interviews—including both stages—is 42. Theoretical saturation was reached in both stages, meaning that the data gathering stopped after reaching the point in which performing new interviews does not render new information.

All interviews were audio-recorded, and the respondents were assured that any data that could identify them would not be published. This study was approved by the Human Ethics Committee at Victoria University of Wellington.

RESULTS – WHAT IS A COMFORTABLE HOME

As explained earlier, Building Science—the discipline that studies Comfort associated with Indoor Environmental Quality—mostly expresses Comfort as the absence of physiological effort. For instance, thermal comfort is commonly reported through scales that go from "cold" to "hot" and have a single "comfortable" or "neutral" rate that represents the optimal condition (Gagge, Stolwijk and Hardy, 1967; Auliciems and Szokolay, 1997; Rohles, 2007). Similarly, visual comfort is mainly understood as the absence of uncomfortable lighting conditions (Jakubiec and Reinhart, 2012; Sawicki and Wolska, 2015; Wienold *et al.*, 2019). Thus, the *de facto* definition of comfort has mostly focused on what it *is not* comfortable, as opposed to what *is* comfortable.

While the focus on what is “not physiologically uncomfortable” can potentially make sense for offices—where the environmental conditions often prevent people from performing their duties—it does not seem to be appropriate for residential settings. On the contrary, respondents’ descriptions of comfortable homes suggested that comfort is a goal in itself and not a means for being productive.

> *“I guess it is about quality of life” ... “[I] cannot put my finger in anything different...” ... “[A cold house] is just uncomfortable”*
>
> Respondent 13 – Stage 1, New Zealand

> *“Now I have the option of hearing pleasant noises… Birds... I don’t know, now I have a garden, so I can hear the leaves. You have the option of enjoying different sounds”*
>
> Respondent 8 – Stage 2, Chile

> *"In the warm house, in winter more than in other seasons, it gives you a surplus. A wellbeing surplus that you appreciate" ... "You actually want to get [to a warm house]"*
>
> Respondent 4 – Stage 1, Chile

Respondents’ descriptions of comfortable homes also suggested that comfort and discomfort produce overwhelming automatic experiences that are not easy to explain in words. This was particularly clear when respondents described uncomfortable situations.

> *"When it is cold [at home] I cannot think... I cannot focus" ... "I am annoyed... restless"*
>
> Respondent 8 – Stage 1, Chile

> *“My parents’ house actually, talking about sound, is horrible… the noise in there is just tedious… I can’t stand it”*
>
> Respondent 15 – Stage 2, New Zealand

> *"I think [having good daylight] is not so much what you can do, it is how you feel. It is about the feeling" ... "[Because for functioning] you can always switch the lights on"*
>
> Respondent 18 – Stage 1, New Zealand

The development of comfort—at least constrained to Indoor Environmental Quality domains (i.e., thermal and acoustic comfort, and air and daylight quality)—is the result of transactions between the built environment and the individual. It is worth mentioning that the physical world includes both the quantifiable factors (which have historically been the main focus of Building Science) and also the non-quantifiable environmental cues. Examples of the former are temperature and relative humidity; examples of the latter, views outside (Beute, 2014; Turan, Reinhart and Kocher, 2020) and the appearance of the space (Rohles, 2007).

People use quantifiable physical elements of the environment (sensed through their physiological systems) as well as the non-quantifiable elements (e.g., a heater they can observe) to give meaning to the situation they are involved in. The meaning people give to situations determines how comfortable they feel. There seem to be three main judgements involved in this assessment.

The first judgement people make is based on their perceptions of the *here and now*. Strictly speaking, perceptions are people’s interpretation of Sensations; that is to say, the meaning that people give to stimuli from the environment (Coren, Ward and Enns, 2004). In the context of Comfort, Building Scientists have mostly studied perceptions that are strongly associated with the human physiological system. For instance, studies have investigated the causes and tried to predict glare (Wienold, 2009; Pierson, Wienold and Bodart, 2018; Wasilewski *et al.*, 2019), thermal sensation (ISO, 1984; ASHRAE, 2010; Enescu, 2017), loudness (Egan, 1988), among other perceptions. On top of these physiologically driven perceptions, this study identified a different kind of Perceptions, which are rooted more in cognition than in physiology. For instance, respondents expressed that their acoustic comfort depended not only on what they could hear but also on what they thought others were hearing: they want privacy and do not want to bother other people.

> *"It is, really, a nuisance to the rest. Hopefully what I do, which I enjoy doing, [does not bother the rest of the people]".*

Respondent 5 – Stage 2, Chile

> *"I am happy sometimes to hear [my neighbours]. You know, I don't need it to be deafening quiet. But I don't want to hear what they are doing and they don't want to hear what I am doing"*

Respondent 23 – Stage 2, New Zealand

The second judgement people seem to make when assessing how comfortable they feel is reflected by the fact that respondents constantly showed an awareness of the future. In other words, they judge situations not only based on the *here and now* but also on what they think will happen later. For example, it is commonly accepted that the level of personal control that people have over the physical environment affects the way they judge the situation (Veitch and Newsham, 2000; Luo *et al.*, 2014; Zhou *et al.*, 2014; Lolli, Nocente and Grynning, 2020). This could be because, when in control, people *know* they can correct future unpleasant situations. Chilean respondents, for instance, mentioned that cold was preferable to heat because dealing with the former is easier (Air Conditioning is not common in residential settings in Santiago, Chile).

> *"I prefer feeling cold [than hot]… I am not sure [why], I just suffer less. Also, you can always put some more clothes when it is cold, but you cannot take all the clothes off."*

Respondent 9 – Stage 2, Chile

The third judgement relates to the fact that people always put Comfort in the broader context of their lives. That is to say, they acknowledge that increasing their satisfaction in one aspect of their lives can deteriorate other aspects of their lives. For instance, people understand that a larger window will provide more daylight than a smaller one, which is beneficial for them. However, they are also aware that such benefit may produce overheating (due to excessive solar radiation entering the dwelling) and that it might imply cold and condensation during winter's nights (because it is the least insulated part of the facade). Even more, these trade-offs will often make people balance Indoor Environmental Quality with elements that are foreign to Building Science. For instance, on top of the extra daylight and solar radiation they allow, larger windows also imply less visual privacy and more maintenance. As suggested earlier, people tend to put Comfort in a broader context, implying that an improvement on one specific aspect will not necessarily have a positive effect on their overall comfort.

> *"[Daylight] has a positive effect on my mood" … "[But if] everybody can see inside… you cannot wake up and open the curtains"*

Respondent 12 – Stage 1, New Zealand

Taking the three judgements people make when assessing how comfortable a dwelling is, it is possible to say that people will feel comfortable when they:

- Find the *here and now* perfectly satisfying
- Do not anticipate that they will be involved in unpleasant situations in their future, and
- Had not made any significant sacrifice to get into the current pleasant situation.

While this ideal situation might be impossible to reach, it is still a useful benchmark built from what people expect of comfortable dwellings.

DISCUSSION – IMPLICATIONS OF A NEW DEFINITION OF "COMFORTABLE HOME" IN THE HOUSING SECTOR

Understanding what people *mean by* and *expect from* "comfortable homes" can potentially change how professionals design and market dwellings, and can also inform public policy design. This section will outline three implications of the definition of Comfortable Home introduced in this article in the housing sector. This is not supposed to be an exhaustive list. On the contrary, these are examples that intend to evidence that the definition of Comfortable Home introduced in this study is precise enough to be applicable in practice in the housing sector, and thus to encourage further Comfort research that combines the disciplines of Real Estate and Building Science.

The first implication relates to the fact that, at least in residential settings, comfort seems to be a goal in itself and not a means to achieving something else. Comfort is about wellbeing and quality of life. This is consistent with the literature that states that, when searching for a new home, people are looking for comfort, wellbeing and quality of life (Clark, 1993; Koklic and Vida, 2009; Dunning, 2016). On the contrary, our research suggests that people spend money and energy as a means to achieve their main goal, which is feeling Comfortable. This contradicts common current practices. For instance, some actors in the housing market have made a great effort to advertise sustainable and energy-efficient through the so-called *green labels* (e.g. Addae-Dapaah & Chieh, 2011; Bloom et al., 2011; Hyland et al., 2013; Soriano, 2008). In this context, Comfort is sometimes seen as a co-benefit of the attributes that green-labels certify (Jakob, 2006). Our research suggests that advertising or designing public policy by treating these means as ends is a misinterpretation of people's aspirations and that the focus should be on the end goal—i.e., Comfort—and treat the means—i.e., energy and money savings—as co-benefits.

The second implication relates to the fact that people tend to put Comfort in context, always being aware of what they sacrificed to achieve their current situation. This implies that every time people hear about a certain beneficial attribute of a property (e.g., "openable windows will allow ventilating and cooling down the house") they immediately think about associated drawbacks (e.g., "but if I leave my windows open bugs, thieves and noise can come in"). Thus, not addressing these concerns can undermine the positive message that the vendor was trying to communicate because, even if they are not explicitly mentioned, these trade-offs will probably still be considered by homebuyers. Vendors should try to understand and address people's concerns at the selling point.

The third implication of the definition of a "comfortable home" introduced in this paper relates to the fact that people's comfort is partly determined by what they think their future will be. This is particularly important for real estate because people's home purchase decisions are, to a great extent, driven by what they believe the dwelling can offer to them in the following years. These inferences, however, cannot be built based on perceptions of the *here and now* (because that represents a single point in time), and thus homebuyers are likely to mostly rely on non-quantifiable environmental cues. This—combined with people's scepticism towards the information they receive from real estate agents and vendors (Molina *et al.*, 2020)—suggests that Comfort cannot be communicated exclusively through scientific reports and third-party certificates, but that it must be supported by the design of the dwelling. Any mismatch between people's inferences and the information they receive is likely to make them disregard the vendor's claims. Understanding how a comfortable home *looks and feels* like—and delivering that—is crucial for successfully marketing comfortable homes.

CONCLUSION

Apart from being financial assets, dwellings have a functional connotation that mandates them to be comfortable. Nonetheless, Comfort is a subjective and elusive concept and thus utilizing it for marketing or designing dwellings is not straightforward. In an attempt to overcome these difficulties, this paper provided a definition of "Comfortable Home" and some examples of how this new definition can influence professional practice and policymaking in the housing sector. These examples will hopefully evidence that this new definition is precise enough to inform research, professional and policy-making practices, and to encourage further Comfort research in the discipline of Real Estate.

The new definition of Comfortable Home was developed from how people—with no experience in architecture, building science or real estate—described "a warm home", "a home with good daylight", "a pleasantly cold (i.e., cool) home", "a home with a good acoustic performance" and "a home with a good air quality". Respondents' descriptions of Comfortable homes suggest that Comfort is not a means to anything but a goal in itself. Likewise, their descriptions allowed identifying three main judgements people make when assessing how comfortable they feel. The first one relates to assessing whether the *here and now* is pleasant enough. The second one is about putting Comfort in the broader context of their lives; in other words, an assessment of the sacrifices they have made to achieve their current satisfaction with the *here and now.* People understand that improving one area of comfort (e.g., letting daylight in) can deteriorate others (e.g., excessive daylight can cause overheating). The third judgement people make when assessing how comfortable they feel reflects the fact that people are always aware of their future, and thus their inferences about what might happen will affect their feeling of Comfort.

This new definition of Comfortable Home can be used to inform professional practice and policy making in the housing sector. For instance, our research suggests that, contrary to Comfort—which is a goal in itself—spending energy and money is only a means to achieve and end goal. Consequently, public policy and third-party certifications should focus more on the improved Comfort of dwellings (i.e., in the main goal) and less on the energy and money savings (i.e., the means to achieve Comfort). Likewise, this new definition suggests that people always consider both the benefits and shortcomings of housing attributes (e.g., big windows increase daylight, but reduces privacy). Thus, overemphasizing the strengths of a property while trying to hide the weaknesses seems to be an ineffective practice because people will notice the drawbacks regardless of whether they were explicitly mentioned.

In summary, this paper provided a definition of "Comfortable Home", pinning down an elusive concept very often avoided by Real Estate research and practice. In fact, this definition is precise enough to inform professional practice and policy making in the housing sector. Consequently, we recommend practitioners and policymakers to pay more attention to Comfort as a relevant housing attribute. In order to successfully do this, however, we suggest further Comfort research is needed within the Real Estate discipline.

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