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Towards housing sustainability: a framework for the decision-making process of tenants

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Abstract. The mismatch between the supply and demand of rental apartments in Switzerland represents an obstacle to the transition towards a more sustainable society. The difficulty for the housing providers to accommodate the fast societal change of the demand brings about an increase in vacancies and, to minimize investment risks, a resistance to innovation in the building sector. In this context, understanding the determinants of tenants' residential mobility and location choice becomes key to designing and promoting sustainable housing. In this paper we present a new interdisciplinary framework for the decision-making process of tenants. To do so, we elucidate the main parameters of the decisions to move and where to move, based on literature review and a group discussion in the Swiss canton of Vaud with the tenants of the two housing providers SCHL and Swiss Mobiliar. We find that the desired housing *function* determines the tenants' housing selection. We observe that this desired function changes according to the type of trigger that pushes tenants to move. Additionally, we elicit the potential sustainability implications of the housing functions in the Swiss context. We conclude that the framework can serve as a starting point for rethinking sustainable interventions in the housing sector.

1. Introduction

Considering that nearly a third of the global final energy use and CO₂ emissions comes from buildings, and that 75% of these are residential [1], the transition towards sustainable housing is crucial. The ways to implement this transition are, however, still unclear. In fact, housing is a central and interconnected part of an urban system, whose complexity makes both the system understanding and its sustainability assessment a difficult endeavor [2]. As a consequence, and despite the many attempts to conceptualize it, housing 'sustainability' remains an ambiguous notion that is rarely regarded – as proposed by the 2015 UN Geneva Charter on Sustainable Housing [3] – in its environmental, economic, social and cultural components. Furthermore, each of these components is often weighted very differently [4] by each of the actors in the housing value chain, whose requirements and expectations do not always coincide [5]. This mismatch manifests itself in the rental housing market, where discrepancies occur between the needs and strategies of the housing providers (e.g., apartments layout, location, features) and the ones of the increasingly fast changing demand (e.g., ageing population, high divorce rate, trend towards single living).

Currently, in Switzerland, the mismatch between the residential preferences of the tenants and the offer of the housing providers is resulting in increasing vacancies [6], which often involve new constructions: in June 2017, 1 in 6 vacant apartments (ownership and rent) was newly-built [6,7].



Therefore, an increase in the number of new low-carbon and zero-energy housing solutions cannot support alone the transition towards sustainability: for these solutions to be effective, dwellings need to be rented. However, this is not possible if buildings and related measures negatively impact users' quality of life e.g., by layout restrictions, occupancy rules, or the need to move to a different home if their circumstances change [8]. In fact, when the buildings cannot accommodate users' needs, these move to adjust their housing disequilibrium [9]. On these premises it becomes clear that ensuring *acceptability* and *acceptance* of housing sustainable solutions is crucial for determining their success, and overcoming the 'innovation resistance' of the building sector.

To understand the factors governing the success of sustainable housing solutions, the identification of the driving factors determining people's decisions has been proven to be key [10]. In the context of residential mobility and location choices, these factors have been studied by a multitude of disciplines [9,11,12]. They can be grouped into the two following categories:

- *The triggers: the determinants of the decision to move.* Triggers are situational or 'push' factors [11] – such as opportunities (e.g., new job), problems (e.g., noise), changes in family structure – that affect the stress threshold of the household. When this threshold is overcome, the household moves to adjust its housing disequilibrium [9].
- *The determinants for the selection of a new dwelling.* The household perceives its housing environment in terms of characteristics [9], defining both the dwelling (balcony, view, materials) and its context (the location and neighborhood). The characteristics that play a role in the selection of a new dwelling are divided in 'non-substitutable' (must be there) and 'substitutable' (interchangeable) [11].

Concerning the triggers, previous research shows (1) that the determinants of the decision to move are not equally influential and effective in exceeding the household's stress threshold and (2) that these determinants have unequal correlations with the level of satisfaction of the household [9]. Therefore, greater study of the interrelationships between the triggers, the level of satisfaction of households with their dwelling, and the final decision to move is needed. With regard to the determinants for the selection of a new dwelling, studies have prioritized the role played in the decision by the characteristics of dwelling, location and neighborhood, which, grouped in categories, have long defined the building *typologies* used by practitioners (e.g., 'Multi-family residential'), or researchers (e.g. for the sustainability assessment in the construction sector [13]). However, households may not necessarily group the characteristics into categories as theorized by economic publications [9].

Therefore, it becomes clear that, in the context of rental housing, the study of the decision-making process of tenants needs a systemic understanding. To acquire system knowledge and explore the interrelationships between the decision components, we address the following research questions (RQ):

- **RQ1:** Which determinants prevail in the decision for the selection of a new dwelling?
- **RQ2:** How do the triggers influence the decision to move?
- **RQ3:** Is there a relationship between the triggers and the determinants for the selection of a new dwelling?

In this paper we propose an interdisciplinary framework, which links the elements playing a role in the decision-making process of tenants. The framework displays the interaction between supply and demand, advancing the hypothesis that, being the determinant of the system's dynamics, the *function* of housing plays a central role in the housing decisions of tenants. Furthermore, investigating how this desired housing functions can hinder sustainable housing strategies allows us to question how sustainable interventions are currently designed or promoted.

We structure the paper as follows. First, we introduce the methods for identifying the determinants of the decisions to move and to choose a new dwelling. Subsequently, we display the framework obtained, the functions and their validation, and explore the determinants of the decision to move based on the analysis of the qualitative group discussion in the Swiss canton of Vaud. Lastly, we critically review the methods adopted, the results, and our contribution to the practice, and conclude with an overview of the next steps of the research.

2. Methods

2.1. Project Partners

This research was carried out in collaboration with two of the largest housing cooperatives in Switzerland, ABZ and SCHL, and a large insurance company and institutional property owner, Swiss Mobiliar. SCHL (Société Coopérative d'Habitation Lausanne) owns over 2'100 dwellings in and near Lausanne and ABZ (Allgemeine Baugenossenschaft Zürich) about 5'000 in or near Zurich. Swiss Mobiliar, an institutional property owner, owns 3'500 dwellings located all around Switzerland.

2.2. Framework Development

To acquire system knowledge, we first developed a systematic conceptual framework by conducting interdisciplinary literature review. Theoretical frameworks are fundamental in interdisciplinary contexts, where their use allows for the integration of disciplines [14]. To develop the framework, we scanned literature by discipline and subject and defined the boundaries of the system studied. Following this step, theories were identified and combined in a first conceptual representation displaying the relationship between variables. Furthermore, literature review supported the identification of the different functions fulfilled by housing, which were then represented in a table structured in line with the system elements (Table 1).

2.3. Qualitative Group Discussion

To assess whether the theories and assumptions of the framework were *credible* (or to ensure the *internal validity*) [15], we organized a group discussion. The group discussion allowed us to validate the functions, and to further explore their relationship with the trigger. The structure of the group discussion was based on the *Pilot Study* proposed by Ajzen [16], where behavioral outcomes, normative referents and control factors are elicited from a small sample of individuals.

2.3.1. Sampling. The group discussion took place in November 2018 in the École Polytechnique Fédérale de Lausanne, Switzerland. The location made it possible to gather the tenants of two project partners, SCHL and Mobiliar. After defining the sample universe, we adopted two different sampling strategies: the purposeful sampling first, followed by convenience sampling [17]. We then sourced the samples accordingly [18]. To contact the tenants, agreement on the data to collect was established with our partners, their technical administrations, and the Human Research Ethics Committee of EPFL (HREC). The final sampling resembled the original structure of the stratified purposeful sampling, involving 10 participants: 5 tenants of the SCHL and 5 of Swiss Mobiliar, among which 5 women and 5 men, 4 living alone and 6 in larger households. The total duration of the group discussion was about 2h, and the language used in the session was French.

2.3.2. Analysis. The group discussion was organized in 5 different phases. It investigated the tenants' reasons for moving as presented in the framework (*Phase 1*), the relevance of each housing function in the decision process (*Phase 2*), the 'non-substitutable' characteristics of their former and present dwelling (*Phase 3*), the determinants for the selection of a new apartment (*Phase 4*), and the lessons learnt during the discussion (*Phase 5*).

The material collected at the end of the group discussion was in form of drawings, post-its, questionnaires, and recordings. Data were then extracted, condensed and summarized. Code construction was followed by the design of qualitative tables for the analysis. The systematic presentation of information in the data displays allowed for comparisons and pattern recognition, and was used to draw descriptive conclusions [19]. Two matrices were found to be useful for data display: the checklist matrix and the thematic conceptual matrix. The first was used to display the diversity of determinants of the decisions to move and to choose a new dwelling; the second (Table 2) resulted from blending inferences drawn from the first and was used to analyze and display the relationship between the determinants of the decisions (to move, to select), the housing function and the level of satisfaction.

Furthermore, to validate the functions proposed, word counting was performed. Finally, from the data display, a summary set of analytic comments was laid down.

3. Results

3.1. The framework

Nested in the system of interactions between the social structure, with its rules and resources, and the natural and technical environment, the housing system is defined by supply and demand constraints [9]. The supply is the dwelling itself, with its characteristics (design, location, neighborhood) and the values, standards, regulations shaping it, while the demand is the result of the tenants' decisions. In order to investigate these interrelationships, we propose a conceptual framework for tenants' residential choices (Figure 1). The framework combines Binder's work [20], which is based on the Structuration Theory of Giddens [21], and the Theory of Planned Behavior [22].

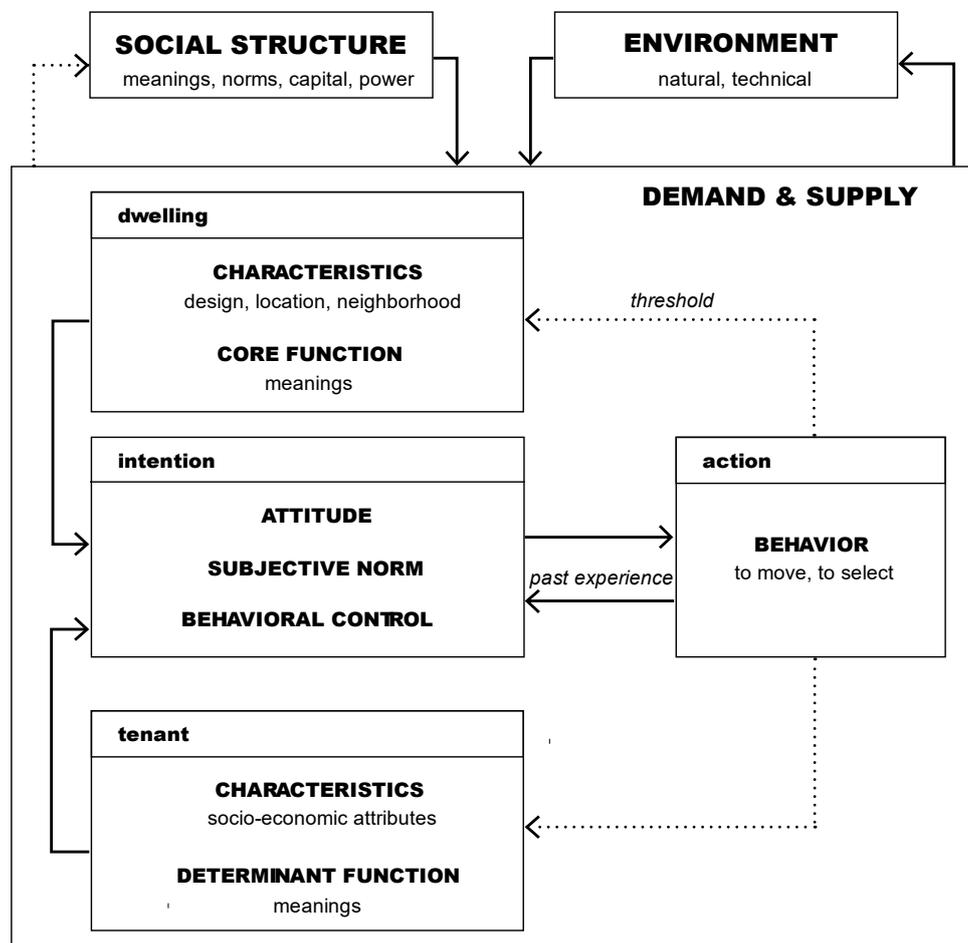


Figure 1. A new framework for tenants' residential mobility and location choice. The interaction between environment, social structure, and action is from Binder [20]; the intention and related factors are from Ajzen [22].

Binder's framework displays the interaction and feedback between social structure (e.g., legislation, culture, and economic system), human action (agent) and the environment [20]. More specifically, it displays that, when making decisions, agents consider external factors (i.e. the existing social structure conditions) as well as internal factors (i.e. their personal motivations and individual environmental awareness). At the scale of the agents, the work of Ajzen [22] provides insights for predicting and understanding tenants' decisions, determined jointly by the *perceived behavioral control* (or the ease or

difficulty of performing the behavior of interest), the *attitude towards the behavior* (the favorable or unfavorable evaluation or appraisal of the behavior in question) and the *subjective norms* (the perceived social pressure to perform or not to perform the behavior). The framework considers the housing *function* as the determinant of the residential mobility and location choice of tenants. According to Meadows [23], the *function* of a system is the most crucial determinant of the system's behavior. Applied to the housing system, the housing function can be considered as determining the system's dynamics. Therefore, being nested in the larger housing system, the decision-making process of tenants is also affected by the housing function, which determines tenants' intention and final behavior. More precisely, this function originates in the social structure, which manifests itself through the sociocultural values [24] and collective meanings, later translated into material forms. The core function of the dwelling has to match the function that the tenant desires the dwelling to have, in line with the individual meaning it attributes to housing. This hypothesis makes it possible to overcome the heterogeneity and incompatibility of the research outcomes that have focused on housing characteristics as determinants of the household's decisions. Additionally, in the framework it can be seen how actions (to select a dwelling) provide diachronic (dotted lines) and synchronic (full lines) feedbacks to tenants, dwellings, the environment and the social structure (e.g., if a dwelling is often vacant, after a certain time threshold and according to the owners' strategies, its rent can decrease, or it can be demolished).

The *credibility* (i.e., internal *validity*) of the framework was assessed positively by the tenants during the group discussion. Firstly, preliminary results confirmed the applicability of the Theory of Planned Behavior to the housing case: the tenants considered the questions asked during the group discussion as pertinent, and were able to describe each intention component (e.g., *subjective norm*) that had played a role in their decision to move and select their current dwelling. Secondly, concerning the role played by the social structure in the decision, we recorded differences in the intention components between e.g., the tenants from the housing cooperative SCHL and the private investor Swiss Mobiliar, and tenants moving from foreign countries (undergoing a political transition e.g., Brexit). Lastly, we also proved the environment to play a role in the decision, in terms of awareness of the *natural* and *technical* possibilities in Switzerland (e.g., importance of view, green spaces, housing quality).

3.2. The role of the function

Dwellings are not only physical structures, but also social ones. The functions that these structures have to fulfill range from the basic provision of shelter and protection [25], to ensuring domestic activities [26], permanence, security, control, status, sense of belonging [27]. These functions vary among social groups and across history [28].

Table 1. Extract of the functions ranked by the tenants among the three most and three least important in the group discussion.

STRUCTURE	PURPOSE	BEHAVIOR	BEHAVIOR	BEHAVIOR	SOURCE
Changing factors	Functions	Physical implications	Social implications	Potential implications (CH)	
Location S-E status	SHELTER <i>refuge, protection</i>	-Basic house providing shelter	-Dream of the suburban house	-Obstacle to shared living	[25–27]
Location S-E status	SECURITY <i>for family and very restricted friends</i>	-Undifferentiated homes -Specific room function	-Desire for privacy -Recreation outside of the house	-Obstacle to flexibility and adaptability	[5,25,27–29]
Place of the individual in the culture	IMPERMANENCE <i>liberation from tradition and history</i>	-Comfort as negotiable social construct	-Different ideal solutions for household groups	-Increase in housing mobility and redistribution	[11,26,27,30]
Place of the individual in the culture	PERMANENCE <i>continuity, belongingness</i>	-Universal archetype of house -Long-lasting structures	-Rigid customs, codes and regulations -Attachment, identity	-Unsophisticated building technologies -Resistance to innovation	[5,11,24,27,30]

Table 1 displays an extract of the 9 functions derived from literature, organized according to the components of a system such as the structure, purpose and behavior. Each of the 9 functions proposed was ranked by the tenants at least once among the three most important functions of their dwellings. The function *Shelter*, followed by *Security*, occupied in the largest amount of cases the first, second and third ranking. The function ranked the most often among the least important, instead, was housing as a ‘permanent’ place. This can be explained by the fact that participants were tenants (and renting is not a long term investment). It must also be taken into account that international work migrants represent 1 in 3 persons in employment working in Switzerland [31] and frequently do not plan to stay permanently [32]. *Impermanence* was also a function often ranked amongst the least important. In fact, *Permanence* and *Impermanence* are not mutually exclusive: an impermanent dwelling might reflect the tenant’s life-stage, needs and desires regardless of the future ones, while encompassing a desire for permanence, and an attachment to tradition.

Lastly, in the table, we introduce the ‘potential implications’ of each function specific to the Swiss context (CH), as discerned by the authors. Together with the physical and social implications, potential implications are relevant when considering the role played by each function in determining the behavior of the larger housing system. For example, the function *Shelter* can represent an obstacle to the use of shared spaces, and therefore hinder, in a sustainability setting, the goal of reducing the floor area per person.

3.3. The trigger

From the literature, we know that some triggers (1) are more effective than others, and (2) have unequal correlations with the level of satisfaction of the household with their dwelling [9]. Furthermore, triggers are difficult to represent in the framework, since they can influence all its components, and originate in each of them (e.g., a new child changes the household’s characteristics and can result in the search for a new dwelling function and characteristics: larger, closer to school).

Table 2 displays the relationship between the levels of satisfaction, the situational factors (triggers), and the determinants for the selection of a new dwelling (functions, characteristics), resulting from the qualitative analysis of the group discussion. It is important to underline that this analysis does not lead to the design of a bidirectional link: the matrix displays only the trigger *needed* for tenants to move as observed in the data, or the link leading from the satisfaction to the trigger and function, and not the opposite (e.g., if the people with high satisfaction need an imposed trigger to move, it does not mean that all the people moving because of an imposed trigger have a high level of satisfaction).

Table 2. Thematic Conceptual Matrix: Relationship between levels of satisfaction and the mobility and location choices of tenants.

Satisfaction	Low	Medium	High	High
Trigger type	<u>Trigger needed:</u> <u>Any trigger (AT)</u>	<u>Trigger needed:</u> <u>Opportunity (OP)</u>	<u>Trigger imposed 1:</u> <u>Radical Change (RC)</u>	<u>Trigger imposed 2:</u> <u>Problem solving (PS)</u>
Trigger	Work opportunity	Opening of a bar, construction of a new building	Household formation (divorce, new family), retirement	End of contract, new job location
Characteristics	Correspond to what was missing	Some same others improved	New	Same plus problem solving
Function change	No change	No change	Change	No change
Function	Shelter	Asset; Impermanence	Production / Consumption; Property; Self-representation	Shelter

Four main observations can be made. Firstly, there is a relationship between the level of satisfaction of tenants with their dwelling *prior to the trigger* and the type of trigger pushing them to move. Secondly, the level of satisfaction determines the function and characteristics needed in the new dwelling. Thirdly, according to the different triggers, the function of housing is more, or less, prone to change; conversely, the function of housing suggests whether the tenants will be more keen to move or not. Lastly, there is a relationship between the change in function and the change in characteristics.

In fact, data show that when the level of satisfaction is low any trigger (AT) can push the tenants to move. In this case, the desired characteristics for the new dwelling correspond to the ones missing in the former location, and the desired function, which was not fulfilled, doesn't change. When the level of satisfaction is 'medium', instead, specific triggers are needed for people to move: opportunities (OP) (e.g., the opening of a bar, the construction of a new building in front of the current one) easily become triggers, presenting themselves to the tenants as favorable circumstances to improve some of the housing characteristics, and get closer to the desired housing function. Tenants belonging to this group display desired functions such as '*Asset*' and '*Impermanence*', which suggest a greater propensity to move. When the level of satisfaction is high, an imposed trigger is the only push factor that can lead to the move. A radical change (RC) in the current life cycle stage (e.g., household formation, retirement) results in a change of the desired function: e.g., when retiring, the dwelling is not used for activities in after-work hours anymore, but rather for inviting friends and spending the day. The functions the most common in this category are the '*Property*' and the '*Selfrepresentation*'. Furthermore, tenants with high satisfaction are often forced to move because of another type of imposed trigger: problem-solving (PS). Examples of problem-solving are the end of the contract, or a change in job. In this case, tenants look for a dwelling with the same characteristics, of which one necessarily has to change to solve the problem. However, we must take into account that housing choices are often compromises between the desires of each household component. Therefore, despite having high levels of satisfaction, small improvements in the characteristics can be recorded. This category of movers has been found to be related to the function '*Shelter*', whose inhabitants tend to move only when conditions are not met (low satisfaction), or when triggers are imposed.

4. Discussion

The goal of this paper was to provide a systemic understanding to the study of tenants' decision-making process, in order to inform the actors in the housing value chain about housing dynamics and eventually mitigate the current discrepancies in the Swiss rental housing market, which prevent the promotion of innovative and acceptable housing solutions. We therefore answered the questions concerning the determinants for the selection of a new dwelling (RQ1), the role played by the trigger in influencing the move (RQ2), and the interrelationship between the determinants of the decisions to move and to choose (RQ3). We found that the housing *function* is the key determinant of the decisions to move and select the new dwelling: on the one hand it influences the level of satisfaction with the current dwelling (function is or is not fulfilled), on the other hand it changes – together with the dwelling characteristics – according to the type of trigger leading to the move and the level of satisfaction prior to the move. Other studies have previously explored the type of trigger, level of satisfaction and housing characteristics [9,11,12]. We go beyond these studies by integrating each of these components in the housing system, by means of an interdisciplinary approach.

It is also relevant to state the limits of this study. We acknowledge that, in the process of validation, the risk of *accumulating positive cases*, or gaining further evidence for the pre-defined hypotheses [33] can occur. Furthermore, *illustrative display formats* can lead to 'superficially comparable' but 'intrinsically different' data [19].

This research also provides relevant contributions to the practice. Practitioners can benefit from the housing functions as *reading keys* or *design tools*. More specifically, to ensure the success of the project in the long term, dwellings should be designed in such a way that they integrate more than one function, and therefore accommodate the new needs deriving from different types of triggers (e.g., change in family size). Furthermore, the implications of each function (Table 1) would also need to be (i)

acknowledged (for a better understanding of a project's failure), (ii) overcome (as the starting point for a design e.g., *shelter*, but *permeable*; *permanent*, but *innovative*), and (iii) adapted to specific locations (e.g., Switzerland).

Based on these considerations, this paper was a first step towards a greater knowledge on the strategies for housing sustainability transition. Additional research in this direction should firstly assess the degree of dependence to the context of the results obtained, which can be done by implementing a second group discussion with the tenants of ABZ and Swiss Mobiliar in the canton of Zurich. Secondly, it should explore the correlations between the type (and not only change in) housing characteristics and the function. Thirdly, it should quantify the relationship between trigger, satisfaction and function. Thereby we consider that a survey, conducted with 10'000 dwellings from our partners, will allow for the methodological triangulation and quantification of the conceptual elements and links of the framework.

5. Conclusion

In this paper we proposed an interdisciplinary framework representing the elements playing a role in the decision-making process of tenants, with the goal to increase the knowledge on the housing system and support the transition towards housing sustainability. More specifically, we focused on the housing function as the determinant of the system's behavior. By combining the theories of Giddens [21] and Ajzen [22], we identified the determinants prevailing in the decisions to move and select a new dwelling as subordinated to the intention, and influenced by the social structure and the environment. In a group discussion with the tenants of our project partners, we further explored these components and their links, and validated the housing functions proposed. We found that the trigger influences the choice of moving according to its type (e.g., radical change) and the level of satisfaction prior to it. Additionally, we found that the determinants for the selection of a new dwelling (the function, and the dwelling characteristics) depend on the type of trigger leading to the move.

The housing functions are a new design challenge. We recommend practitioners from the housing sector, such as architects, urban planners and housing providers, to use them as a starting point to design or promote sustainable housing strategies that meet the needs of the tenants in the long term.

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