Agency and capacity in the planning and design phase of building renovations

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Abstract The building sector is a large energy consumer and is responsible for high CO₂ emissions; hence, improving the energy performance of buildings is vital. Building renovations open opportunities to improve their energy performance.

Building professionals and other actors in the early phase of renovations decide what energy efficiency and saving measures will be implemented. Their role is studied here from a middle-out perspective (MOP), investigating the different actors' agency and capacity. Agency refers here to an interest in and a willingness to implement energy efficiency and saving measures, and capacity refers to the ability to implement such measures. Higher agency and capacity are said to increase the realisation of the planned energy efficiency and saving measures.

The data was gathered during three planning and design phases of renovation projects of a municipal housing company in a middle-sized Swedish town. A case study was conducted which is based on semi-structured interviews with actors from the planning and design phase of the renovations, as well as participant observations and a document analysis.

The levels of agency and capacity of professionals in the middle of a project's planning and design phase are investigated thoroughly, but the here defined top and bottom levels are also in focus. The analysis shows that

a mismatch in agency and capacity on the different levels hindered the uptake of energy efficiency and saving measures in the planning and design of the renovation projects.

Keywords Building renovation · Energy efficiency · Energy use reduction · Planning and design phase · Middle-out perspective · Agency · Capacity

Introduction

Improving the energy performance of buildings is broadly acknowledged as an important task (Gram-Hanssen and Georg 2018). The building sector is a major energy consumer, accounting for almost 40% of energy use and about 30% of the CO₂ emissions in the EU as well as in Sweden. Thus, actions to reduce energy use and CO₂ emissions are needed as a climate change mitigation strategy (e.g. Janda et al. 2014; Gram-Hanssen and Georg 2018; Thuvander et al. 2012). Renovations of residential buildings provide opportunities not only to create updated and more comfortable accommodations but also to implement energy efficiency or saving measures (for simplicity referred to here as energy measures) and to achieve a more sustainable built environment (Mangold et al. 2016; Meijer et al. 2009; Palm and Reindl 2018).

Many international and national agreements as well as targets exist for energy efficiency and reduction in order to mitigate climate change (Jonsson et al. 2011; Mangold et al. 2016). In Sweden, the objective is to

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reduce the total energy consumption per heated square metre in homes and other premises by 20% by 2020 and by 50% by 2050 relative to 1995 levels (SOU 2008). The current trend shows that Sweden will not be able to meet the 2020 energy efficiency target (Xylia 2016), and, consequently, in order to reach the 2050 targets, extensive energy renovations are needed (e.g. Mangold et al. 2016; Meijer et al. 2009; Thuvander et al. 2012).

The existing building stock in Europe is large and the new construction rate is rather low, with about 0.5 to 2% growth of the housing stock per year (Meijer et al. 2009). Thus, the major potential for reducing energy demand lies in upgrading the existing building stock (e.g. Lindkvist et al. 2014; Thuvander et al. 2012; Olsson et al. 2015). Regarding energy efficiency renovation, Sweden has a national strategy (in response to the EU's Energy Efficiency Directive), which says that 75% of the existing buildings will need to undergo wide-ranging renovations before 2050 (Swedish National Board of Housing Building and Planning and Swedish Energy Agency 2013).

Available relevant technical means for energy efficiency or reduction are insufficiently used in renovations, however, even if they are economically feasible (e.g. Gram-Hanssen 2014; Broin et al. 2015; Sorrell 2004). This raises the question of why it is difficult to enable energy measures in renovations. Various studies argue for the importance of studying the early phases of renovation projects, such as the planning and design phase (e.g. Nielsen et al. 2016; Thuvander et al. 2012; Olsson et al. 2015; Boudeau 2013; Konstantinou and Kaack 2011). It is in these early stages when implementation decisions are taken (e.g. Lovins 1992; Palm and Reindl 2016; Reindl 2017).

Regarding energy and the residential sector, studies are more likely to focus on occupants' behaviour, and the roles of building practitioners and professionals are under-investigated (Schweber and Leiringer 2012; Janda and Killip 2013). Building professionals and practitioners do not produce or consume energy as such, but their work shapes and alters how energy is used (Janda and Parag 2013, p. 42), and it is the building professionals who decide in the planning and design phase what energy measures will be implemented according to the here studied housing company.

Janda and Parag (2011, 2013) and Parag and Janda (2010, 2014) have developed the middle-out perspective (MOP), drawing attention to the fact that change opportunities are actively driven (or impeded) by middle

actors, who are often overlooked in energy transitions and are often simply seen as rule followers or fillers (Janda and Parag 2013). Middle actors include building professionals or practitioners such as architects, HVAC or electricity consultants. They operate in a system where change is commonly seen as flowing from the top down (e.g. government policy, energy utilities) or from the bottom up (e.g. from consumer demand, end-users). The middle actors can promote and influence change upwards (to the top), downwards (to the bottom) and sideways to groups working in the same area (Janda and Parag 2013; Parag and Janda 2014). In the MOP, different actors have different levels of agency and capacity. Agency means the ability and willingness to make own free choices, and capacity means the ability to act according to these choices and perform them. Parag et al. (2017) postulate that change is more likely to take place if both the actors' agency and capacity are high. If they are either low or uncertain, then change is less likely to occur.

The aim of the study is to investigate the implementation decisions on energy measures in the planning and design phase of renovation projects using the MOP for the analysis. The question is how the MOP can be used to study the role of (building) professionals in the middle, and also to study the other actors at the top and bottom who are involved in the planning and design phase. Furthermore, the levels of agency and capacity are investigated for not only the middle actors but also those at the top and bottom. The study thereby investigates how actors at all three levels affect implementation decisions on energy measures.

Three renovation projects of a municipal housing company in a medium-sized Swedish town are studied in a case study. The studied housing company is 100% owned by the municipality, which represents the biggest landlord in the town. The company has formulated an energy goal to reduce the amount of purchased energy by 25% by 2025 (compared with that of 2011), the so-called 25–25 energy goal. Before the research project, the municipal housing company emphasised that energy questions were part of their work, and the investigated renovations would have a special focus on energy efficiency and reduction. Three renovation projects were followed. The studied buildings were rental apartments in multi-family dwellings built between 1941 and the beginning of the 1960s.

This research contributes to the development of the MOP, applying it in a novel way, to the planning and

design phase of a renovation project. Furthermore, it contributes to an understanding of why it is difficult to implement energy measures in renovation projects, looking at the agency and capacity of different actors involved in the planning and design phase. Even though the research is situated in a medium-sized Swedish town, the chosen conceptual approach is applicable beyond the Swedish case.

The article is structured in the following way: The next section sets out the conceptual approach and describes how the MOP is specifically used for this case study. Following that is an explanation of the research methodology and then the presentation of the findings and analysis for the implementation of energy measures. Finally, the findings are discussed, and concluding remarks are made regarding levels of agency and capacity and implications for the use of the MOP.

Conceptual approach and theoretical considerations

There is a growing literature on middle actors, for example, an application of the MOP for providers of housing refurbishment (Janda et al. 2014), heating engineers (Wade et al. 2016) and facility managers (Goulden and Spence 2015) (see overview in Janda et al. 2019). However, as yet there is no clear definition on what or who the middle is, exactly, the term is still rather vague, and the categorisation of who is involved in the middle, top and bottom differs from case to case. In other words, in the MOP framework, the middle, top and bottom are dynamic concepts dependent on the research context. This argumentation is exemplified graphically in Fig. 1 in relation to the case studied here.

Thus, when middle actors are studied, it is important to describe the system and system boundaries and define who the top, middle and bottom are. Also, the right middle actors in relation to the top and bottom need to be selected. Furthermore, the middle is a relational phenomenon, and when focusing on a planning and design phase of a housing company, it is possible to look at the influence on all three levels and investigate the role of the middle in relation to the top and the bottom. This is possible since the investigated system is clear and manageable. Thus, decisions taken by the middle are of interest, but so are the interactions between the middle and both the top and bottom.

In this study, the focus is on one phase in renovation projects, the planning and design phase. The project

group doing the planning and design of the building to be renovated is defined as the middle. The structure of the planning and design phase typically includes six meetings where employees of the municipal housing company (internal employees) and external consultants, who are contracted for the planning and design phase, meet as a project group. The internal employees here included a project leader, an HVAC and electricity expert, a renovation coordinator, a rent negotiator, an energy manager, an area manager, and possibly also a trainee or a real estate development manager. The external consultants consist of architect(s), an electricity consultant, a fire security consultant and an HVAC consultant. Additional external consultants (e.g. construction consultant, building engineer, sound consultant, energy consultant) may be brought in on an as-needed basis. For the three followed renovation projects, there were some overlaps of the actors. Figure 2 shows in which projects the different internal employees and external consultants participated.

The tenants along with the Swedish Union of Tenants represent the bottom. Those on the bottom can participate in two tenant meetings that take place during the planning and design phase. The Swedish Union of Tenants acts as a collective tenant during the planning and design phase, representing the tenants and negotiating new rents.

The investment group of the housing company are defined here as the top. They are crucial for the planning and design phase of the renovation projects as they have the final decision power. The investment group comprises the CEO, a business area manager, an economist, an administrative manager and a tenant manager. Additionally, the real estate development manager has an advisory role. At the beginning of the planning and design phase, based on a first draft of ideas created by the project group, the investment group takes an orientation decision, and if it is approved, the project group continues with its work. At the end of the planning and design phase the investment group takes a final investment decision.

Even though a municipal housing company initiated the renovation project, it is important to highlight that this is not a company or an organisational analysis. Rather, it is an analysis of a project phase, involving actors outside the housing company as well, including the tenants, the Swedish Union of Tenants and the external consultants contracted for the planning and design phase. The internal employees and the

Fig. 1 Examples of different definition of middles, tops and bottoms in relation to the case study

investment group are insiders in the housing company, while the external consultants, the tenants and the

Swedish Union of Tenants come from the ‘outside-in’. The top, middle and bottom actors are shown in Fig. 3.

Fig. 2 Overview of the involved internal employees and external consultants in the three different renovation projects (RP) (based on Reindl 2017)

The agency and capacity of the actors on the different levels, the top, middle and bottom of a planning and design phase, are analysed with regard to their influence on the implementation decision on energy measures. Janda and Parag (2013) and Parag and Janda et al. (2014) conceptualise the terms agency and capacity based on the sociological concepts of agency and structure as well as research on behaviour in academic literature (psychology, e.g. internal and external motivations; organisation studies, e.g. organisational ‘concern’, ‘condition’ and ‘capacity’) (Parag et al. 2017, p. 599). What is defined as agency here is an ability and a willingness to make own free choices, and capacity is defined as the ability or capability to act upon those choices and perform them. Agency and capacity are both influenced by structural elements of different physical and social constraints, for instance, infrastructure, laws, institutional arrangements, norms or culture and others (Parag and Janda 2014, p.104; Parag et al. 2017, p.599). In relation to Janda and Parag (2013) and Parag and Janda et al. (2014), agency refers here to an interest in and a willingness to implement energy efficiency and saving measures, and capacity refers to the ability to implement such measures. What agency and capacity mean for this analysis in more detail is defined in Table 1.

Method and material

In this case study, three planning and design phases of different renovation projects initiated by the municipal housing company were followed. The study examines how and why energy measures are promoted or rejected in the planning and design phase in renovation projects, and how and why implementation decisions are made (Yin 2009). This case was selected because the renovations were supposed to have an explicit focus on improved energy efficiency and reduced energy consumption. The renovation projects followed were the first ones the housing company undertook with this goal in mind. The three renovation projects took place within one housing company. Thus, this research is defined as one case with three different examples, all initiated by one housing company. An alternative would have been to see the three renovation projects as different cases under the umbrella of one housing company. However, it was decided to regard the company as one case, with three different examples, as this allows to easier discuss

the role of the company and its goals and strategies in relation to energy issues in their renovation projects. In order to reduce bias, different data sources were combined in the case study, namely, participant observations, semi-structured interviews and document analysis (Yin 2009). In addition, the validity of the study is supported by long-term involvement in the process (Maxwell 2005). The fieldwork period took place from December 2012 to October 2014.

As Flyvbjerg (2001) says, certain analytical generalisations can be generated from case studies, especially presenting a relevant phenomenon that might be useful for similar contexts and actors. Thus, the findings of this study can be useful for other researchers as well as for other housing companies and their renovation projects starting to include energy questions more in their renovation projects.

The researcher observed the planning and design phase and tenant meetings and made several site visits to the buildings that were to be renovated. In total, 18 planning and design phase meetings for the three renovation projects took place as well as six tenant meetings, two for each renovation project. Of these, 16 planning, design phase meetings, and five tenant meetings were observed, and for the remaining meetings, the protocols have been studied. The aim of the observations was to identify social interactions, actions agreed on and the processes underlying implementation decisions on energy measures, meaning how and why actions or measures were agreed on as well as the contextual factors influencing the decisions (Pettigrew 1992). The investment group meetings were not observed, however, as their importance was revealed too late in the process. Thus, interviews are the only source for analysis of the investment group meetings, which means the data has to rely on what people said rather than on direct observation. Additionally, for each building, site visits were used to better understand the building itself. The meetings and informal conversations with the building professionals were documented with case notes during the meetings, and these were written up directly afterwards.

In total, 34 semi-structured interviews were carried out with everyone involved in the planning and design phase. More specifically, 28 interviews were conducted with the project group (the project leaders and the real estate development manager were interviewed twice), five were conducted with all the investment group members and one was conducted with a representative of the Swedish Union of Tenants. An interview guide was

Fig. 3 Influence of the top, middle and bottom actors based on Janda and Parag (2013), and Parag and Janda et al. (2014)

used, which determined the overall structure of covered topics (Kvale and Brinkmann 2009). The interview guide included questions regarding the respondents' background, their role in the project, how they perceived the ongoing renovation process and progress, their perception of influences of various project actors, what role energy questions play, energy goals and measures; additional specific questions arose in each observed process which were added for each individual. All interviews were recorded, transcribed, and coded using the computer program ATLAS.ti.

In order to also include the tenants' perspective on the renovations during the planning and design phase, short semi-structured phone interviews were conducted with individuals from 39 of the apartments that were to be renovated. The three buildings to be renovated had 77 apartments altogether. The interview guide for the tenants included information such as if they lived in the buildings before and after the renovation, information they received about the upcoming renovation, if and what they would like to influence for the upcoming

renovation, their knowledge on energy measures for the upcoming renovation, their interest in energy questions, their interest to influence the uptake of energy measures, their knowledge on the housing's company energy goal or if they would consider paying more rent for the implementation of energy measures. Each of these interviews lasted around 15 min; notes were taken and then written up and summarised. The questions concerned the upcoming renovation as well as energy issues. Additionally, the gender and age of each interviewee were noted. Table 2 represents an overview of the interviews and observations.

In addition to the participant observations and interviews, a document analysis was carried out. The documents comprised descriptions, drawings and sketches, and photos of the buildings, protocols of the meetings and, after the planning and design phase was completed, also the tender documents. Furthermore, access to the documents of a planning and design phase of a renovation project from 2009 was granted. Other documents used are the municipal housing company's annual

Table 1 Overview of the different actors' agency and capacity based on Parag et al. (2017) p. 600

		Agency	
		Low	High
Capacity	High	Not interested in change, no willingness to implement energy measures but able to make decisions about implementation of measures. (<i>not interested, but would be able</i>)	Interested in change, willing to implement energy measures and able to make decisions about implementation of measures (<i>interested and able</i>)
	Low	Not interested in change, no willingness to implement energy measures and not able to make decisions about implementation of measures (<i>not interested, not able</i>)	Interested in change, willing to implement energy measures but not able to make decisions about implementation of measures (<i>interested but not able</i>)

Table 2 Overview of the interviews and observations

	Planning and design phase meetings, middle actors	Investment group	Tenants/Swedish Union of Tenants
Interviews	Semi-structured interviews (28)	Semi-structured interviews (5)	Semi-structured interview (Swedish Union of Tenants) (1) Phone interviews (39)
Observations	Observations of planning and design phase meetings (16 out of 18), 2 building site visits		Observation of tenant meetings (5 out of 6)

reports, a process document produced by the municipal housing company setting out how a renovation should be conducted (step-by-step guide) and PowerPoint presentations. The documents were not analysed in-depth, but they helped to provide a better understanding of the meetings and content of the interviews. The protocols were studied in more detail (including the 2009 renovation), as was the process document for renovation projects and the tender documents.

Analysis and results

This section begins by describing the planning and design phase and the renovation objects and then presents an analysis of the middle actors in the planning and design phase. Thereafter comes an analysis on the

influence of the top and the bottom on the middle in the planning and design phase.

The planning and design phase and the renovation objects

The studied buildings were rental apartments in multi-family dwellings built between 1941 and the beginning of the 1960s. The following three renovation projects are presented in Table 3; the table describes the characteristics of the buildings before the renovation as well as the problems each building had.

The meetings in the planning and design phase are organised in a similar way. The project leader chairs the meetings and follows more or less the same agenda. The work in this phase is done by the project group and entails the creation of an action plan where goals are

Table 3 Renovation objects: overview of three buildings to be renovated

	Renovation project 1	Renovation project 2	Renovation project 3 (two buildings)
Building built in	1961	Early 1950s	1961 (partly renovated 1985)
Number of apartments	12	33	32, 4
Floors of the building	4	3	4, 2
Building construction	Concrete frame	Lightweight concrete construction	Lightweight concrete construction
Windows	3-pane windows	2-pane windows	3-pane windows
Type of ventilation	Exhaust air with inlets under the windows by the radiators	Natural ventilation	Supply and exhaust ventilation with heat exchanger
Energy consumption (heat and water)	153 kWh m ⁻² y ⁻¹	141 kWh m ⁻² y ⁻¹	154 kWh m ⁻² y ⁻¹ (not known to me from the second building)
Problems in the building	Poor external façade, poor roof construction, old and draughty windows, several cases of water damage in bathrooms and problems with balconies	Poor plumbing, inadequate ventilation, outdated wiring, inadequate fire insulation and limited accessibility	Indoor environmental problems, low and varying indoor temperature, stuffy air and odours

broken down into sub-goals, and details of what to do in the upcoming renovation are decided upon and written down in the tender document. The housing company defined six possible energy measures in their annual report (2014, 2015), which they consider for building renovations. These six possible energy measures are (1) installation of HRV ventilation, (2) supplementary insulation, walls; (3) supplementary insulation, loft; (4) new windows (upgrade to 3-pane windows); (5) supplementary sealed glazing unit, internal and complete replacement of bathroom windows; and finally (6) exhaust air heat pump. Table 4 gives an overview of which energy measures were installed for each building. It is possible to see in the table that not all possible measures, defined by the housing company, were chosen for the different renovation projects.

The planning and design phase includes meetings and decisions that need to be made before finalising the tender document. The planning and design phase meetings take place approximately twice a month. Usually there are six planning and design phase meetings per building. After a first draft of measures is developed by the project group, the investment group takes an orientation decision, which means that it is decided whether the suggested measures are also reasonable from a financial perspective. During the planning and design phase, two meetings with tenants are arranged. The first takes place directly after the orientation decision so that the tenants get an idea of what to expect with the upcoming renovation, and they can also express their concerns and preferences. At the second tenants' meeting, a clearer renovation plan and the new rents are presented. After the final investment decision is made, the tender document is finalised, and the public procurement for the reconstruction phase can start. The whole planning and design phase is graphically presented in Fig. 4.

The middle actors' agency and capacity

The middle actors and their agency and capacity

The housing company had adopted the general 25–25 energy goal; however, no specific energy goal was set for the three followed buildings. The goal was simply to reduce the energy consumption 'as much as possible'. From the interviews, it became clear that building rules, the so-called 'BBR

demands',¹ should be followed, which appeared to be tacit knowledge held by the project group and were never articulated or discussed. During the interviews, the project group members were asked first what they thought was important to achieve with a renovation and also what the 25–25 energy goal meant for them, which refers to the agency of the middle actors in the MOP (Parag and Janda 2014; Parag et al. 2017). Secondly, they were asked if they thought that they implement more energy measures nowadays than before, which refers to the capacity of the middle.

Seven areas were thought to be important by middle actors. In decreasing order of frequency, these were (1) having a good standard for the tenants (a modern and updated apartment), (2) increased energy efficiency or reduction of energy use, (3) technical aspects and improving the technical standard of the building, (4) economic considerations, (5) a good-looking and aesthetic building, (6) following the laws and regulations and (7) getting more rent.

Energy efficiency was mentioned by 12 out of 22 middle actors as an important goal (five internal and seven external). However, they did not elaborate on what energy efficiency improvement meant. This could mean simply following the BBR demands since the buildings to be renovated did not have the best energy standards; thus, it was relatively easy to achieve some energy improvements, even with simple measures. The goal of the renovation projects was, according to the project leaders, to reduce energy use as much as possible with the BBR demands in mind. No clear energy goal for each building was set, and the 25–25 energy goal was barely mentioned during the meetings. In the interviews, the members of the project group were also asked if they knew the 25–25 energy goal and what it meant for them and their work. It turned out that only two of the external consults knew of the goal. The others claimed they had never heard of it. For some of the middle actors, there was an interest in and willingness to work with energy questions; however, for others, there was none at all. Overall, this reveals that not all the middle actors had the same agency, or interest in and willingness to implement energy measures.

The other question was whether the consultants thought that energy measures were implemented more now than in previous projects, which refers to the capacity or the actual implementation of different energy

¹ Boverkets byggregler, BBR. English: The National Board of Housing, Building and Planning's Building Rules, BBR

Table 4 Renovation objects and their implemented energy measures

	Renovation project 1	Renovation project 2	Renovation project 3 (two buildings)
Implemented energy measures	1. HRV ventilation 2. Supplementary insulation, walls 3. Supplementary insulation, loft 4. New windows	1. HRV ventilation 2. Supplementary insulation, walls 3. Supplementary insulation, loft 4. New windows	Building 1: 2. Supplementary insulation, walls 4. New windows In total, two out of six measures. Building 2: 1. HRV ventilation 4. New windows

measures. The answers to that question were also quite diverse. Some said there is a strong focus on energy now and that energy measures are implemented more than before, some said it was still the same as usual, and some said they did not know. There is not a clear picture of whether or not energy measures are implemented more often nowadays.

Upward influence by the middle to the top, examples of high capacity

There were some middle actors who exerted influence upwards to the top to argue for the implementation of energy measures that were initially rejected by the top, which shows that they make use of their capacity. This is illustrated by two situations that occurred during the planning/renovation process in (1) a case of high capacity but low agency: the replacement of the heating system in one of the buildings, and in (2) the case of the only occurrence of high agency and high capacity: the installation of LED lamps in one of the buildings.

High capacity but low agency: the replacement of the heating system It was decided by the middle actors that the heating system needed to be replaced as it was already over 50 years old and, according to them, the life span is approximately 30 years. When such a big renovation is being done anyway, they argued, one should also replace the heating system, especially since it was regarded as a ticking time bomb expected to break down in a few years.

One member of the investment group said that a heating system lasts at least 100 years, that neither a private house owner nor a private landlord would replace it, and that the argument of ‘we are doing a renovation anyway’ was wrong. According to him, it would be better to replace it later, if and when it breaks down.

The middle actors did not agree, however, especially the external HVAC consultant and the project leader, who put pressure on the investment group with phone calls and discussions. For the HVAC consultant, this was even a question of honour and reputation, as it is a small town with a small construction industry where

Fig. 4 The planning and design phase, including all steps and tasks

everyone knows each other. In the end, the middle managed to convince the top, and the heating system was replaced.

However, energy savings were only a side effect in this case; the agency was neither a consequence of interest in increased energy measures nor a willingness to work with energy questions; instead, the actual considerations were based on technical and economic arguments.

The only example of high agency and high capacity: the installation of LED lamps The second example concerns the installation of LED lamps. The installation of LED lamps was initially a discussion among middle actors, where not all shared the same opinion. The external electricity consultant did not believe in the technology and its energy-saving potential. On the other hand, the area manager pushed for it as he believed in the technology and knew that the tenants wanted it. This is also an example where the middle gets agency by using knowledge from the bottom. The project leader was unsure, but her first reaction was not to use LED lamps.

The area manager did not give up, however, and even went to members of the investment group to make his case, and he managed to convince the investment group and got their support.

This example shows two things. First, the middle gets agency using the knowledge from the bottom in the case of the area manager knowing the tenants' wishes. Second, this shows a high degree of agency, an interest in energy measures and high capacity, where the area manager in the middle managed to convince the top.

The middle's capacity to influence the bottom

The middle actors' decisions about the buildings to be renovated affect the tenants' lives and living situation in different ways.

About half of the tenants usually move out when a renovation takes place because the rent gets too expensive or because it is too much work for them to move away during the renovation and then move back when it is completed. This could also be seen as a top-down influence, as it is usually the top who decides that a renovation will take place; however, the middle actors, the internal employees, are also involved in that decision.

The middle actors further decide on the different measures to be implemented for the renovation. This not only influences the tenants' living situation but also their new rent after the renovation. The middle does not produce or consume energy as such, but their work shapes and alters how energy is used (Janda and Parag 2013, p. 42). A renovation has an impact on the indoor climate and quality of the apartments. Furthermore, the tenants' electricity consumption and the energy bills they pay are influenced by, for instance, the installation of more or less energy-efficient appliances.

This shows a high capacity of the middle to influence the bottom. If their agency was higher, possibly more energy measures would be implemented.

The middle's agency and capacity spreading sideways?

The external consultants are contracted by different companies, where they participate in different building projects. Ideas can be spread sideways between different companies and different projects; also, the stronger focus on energy (measures, goals, focus) could theoretically 'move' sideways—the agency as well as capacity. In view of this, it is possible that including energy questions could become self-evident over time and that consultants would repeatedly choose energy measures and implement them for other projects if they see that they work.

Related to this, one of the consultants told the story of an area in town where passive houses were constructed. All the professionals involved in the construction (planners and builders) had to take a course on how to build passive houses. Later, conventional houses were built in the neighbouring street by some of the same professionals. Interestingly, the conventional houses had similar standards as the passive houses, with very low energy consumption, as the building professionals brought the knowledge they gained from building the passive houses to the construction of conventional houses.

The observations of the project meetings showed also that the middle actors often referred to other (similar) projects from the past, using them as a reference point. The current projects can thus be referenced again in future projects. Thus, the middle actors perpetuate momentum and path dependency since another project is added to their experience base and their aggregated know-how on renovation projects. Usually, the measures that the middle actors know from before are

preferred and used again, coming from their aggregated knowledge base. These measures are chosen partly due to time pressure and partly because they are familiar and known to work. New solutions are usually not selected and the general opinion in the interviews was ‘to let the others make the mistakes of using new solutions.’

Where there is a middle, there is a top and a bottom: the top and bottom actors’ agency and capacity

The question is how the middle, top and bottom relate to and influence each other regarding the implementation of energy measures. This study investigated what influence there is from the top down to the middle, and from the bottom up to the middle in the planning and design phase. This was done to capture the entirety of the planning and design phase and its complex vertical and horizontal contexts.

The top and their influence on the middle

The task of the investment group, representing the top, is to take financial decisions, specifically, the orientation decision at the beginning of the planning and design phase and the final ‘investment decision’ at the end of that phase. With these decisions, they have a lot of capacity to influence the implementation of energy measures. However, there was little agency in the sense of having an interest in and a willingness to adopt energy measures. Rather, their agency was concerned with economic and financial sustainability, which often actually disables energy measures. Here, two ways in which the investment group disabled energy measures are identified:

1. Their investment decision is restricted by long-term investment decisions and the fact that many renovations will have to be conducted in the future.

It’s one of those overall tasks. For me it is very important to ensure that those projects we do are somehow long-term financially sustainable. [...] I have the final responsibility towards the board of directors to ensure that the projects will also be financially responsible, that we do not ruin the economy. And there we must have a holistic approach to the projects. You cannot just take out a single issue.

(Investment group, 3)

Any measures that have a pay-off time of less than 6 years can be suggested by the middle actors without an extra financial decision. The way the investment group regards pay-off time is a mere construct and is seen by themselves as rather pessimistic. They say that they are less inclined to enable energy measures than other housing companies in Sweden. This results in energy measures being easily disabled. However, the investment group said that including more energy measures in their renovation projects is new for them and that a balanced formula to calculate pay-off time needs to be established in the future. This will depend on whether or not the municipal housing company wants energy to play a bigger role in the future and whether they want to change their agency towards an increased interest in and willingness to implement (more) energy measures.

2. The investment group sometimes questions suggestions made by the middle actors. The project leader presents a first draft of the renovation plan for the orientation decision to the investment group. Nevertheless, it was argued by several middle actors that the investment group, in its decision-making, lacks the detailed discussions from the meetings and that, consequently, the reasons behind certain suggested (energy) measures might be missing. Additionally, the top and middle actors discuss the projects from a different premise and with a different background, the top wanting to prioritise economic considerations and the middle wanting to keep and create a functioning building.

Those of us in the investment group, we are not technicians, [...] primarily, we are supposed to count the money and see that it harmonises with the technical solution and the money we spend.
(Investment group, 1)

The bottom and their influence on the middle from below

The Swedish Union of Tenants represents the tenants’ general interests. It is a communication channel for the tenants and acts as a collective tenant. During the planning and design phase, it also negotiates the rent for the tenants, which can have an impact on the implementation of energy measures. The rent negotiations take place before the investment decision is made. The Swedish Union of Tenants can stop energy measures if

it believes their implementation would affect the rents too much. As it is now, energy measures alone are not seen as sufficiently valuable or justifiable as to increase rents, so they have to offer positive ‘side-effects’. For instance, a new window could eliminate draughts or improve soundproofing, or a new ventilation system could give the apartment better air quality. However, it is not yet clear how to deal with the implementation of energy measures and their effect on rent levels according to both the Swedish Union of Tenants and the housing company. With that, the Swedish Union of Tenants has a lot of capacity to affect the implementation of energy measures. However, its agency regarding its interest in and willingness to implement energy measures was in general low as it might affect the rents negatively, meaning the rent might get too high.

The tenants are invited to participate in two information meetings where they can give feedback on the condition of the buildings and express their wishes regarding the renovation in a survey. This survey is later discussed at the planning and design phase meetings. With this survey, some capacity is given to the tenants as they can express their wishes and can theoretically ask for energy measures. Additionally, the tenants always have the opportunity to talk to their area manager.

The tenant meetings observed in this study were organised more as information meetings, however, and few tenants participated. The interviews with the middle actors also showed that it is assumed that the tenants are only interested in cosmetic improvements and not in more technical building-related issues or energy measures. The tenants could have been involved more, which would have given them more capacity and opportunity to influence the process. Their knowledge and experience could be used more and serve as a source for collecting a problem inventory; as residents in the buildings, they have a lot of detailed knowledge about them.

The interviewees from the project and investment group stated that the tenants are not interested in energy measures and questions. That tenants lack agency regarding energy measures and questions is not so clear from the phone interviews, however. There were tenants who were very interested in energy questions and measures and thought it was important that energy measures be installed. One tenant even said that he suggested different energy measures, but they did not get implemented and he felt ignored about that. In general, the tenants had a positive attitude towards the

implementation of energy measures; some were even prepared to pay more rent.

Most of the tenants were not aware of the 25–25 energy goal and thus were not engaged with it. Overall, there was little bottom-up influence from the tenants. However, the bottom was not activated as much as they could have been with more extensive tenant engagement at meetings; also, informing the tenants about the 25–25 goal and its importance may have increased the tenants’ agency.

Discussion and conclusions

In this research, the MOP was used to understand the actors’ agency and capacity (as defined by Parag and Janda et al. (2014)) regarding the implementation of energy measures during the planning and design process of building renovations. When analysing a planning and design phase of a renovation project using the MOP, it is possible to not only investigate the middle but also consider the top and bottom in relation to the middle since it is a small, defined and manageable system. This provides a thorough understanding of the outcomes of a renovation project.

A case study approach was chosen for the investigation. Case studies are commonly criticised to not be generalisable. However, especially Flyvbjerg (2001, 2006) argue for the generalisability of case studies. For instance, common patterns and similarities between objects in the case studies can be observed. Additionally, theory can be used to validate or describe a case study, as in this case the MOP was used; and comparisons or generalisations can be made based on this theory.

There is as yet no clear definition of what, who and where the middle is. Different authors have studied different middles (Janda et al. 2019). The top, middle and bottom are dynamic concepts and are dependent on the research questions and context. What is important is also that the right middle actors are found in relation to the top and bottom. Furthermore, the system in which the top, middle and bottom operate needs to be described for an increased understanding.

The analysis presented in this paper focused on the agency and capacity regarding the implementation of energy measures, the interest in and willingness to implement energy measures as well as the ability to actually implement the energy measures. The agency and

capacity for the top, middle and bottom is summarised in Table 5.

In this case study, for the different actors, energy efficiency or saving issues did not play as a major role as expected. As seen in Table 5, this can be explained by a mismatch in agency and capacity on all levels, the top, middle and bottom. Agency and capacity regarding the implementation of energy measures would need to align

more in order to have a renovation project that focuses more on the implementation of energy measures.

Energy questions seem to be on the agenda, but it is not everyone's agency, having an interest in and willingness to work with energy questions. Technical and economic considerations are the main agency for the renovation of the middle. Most common was a low agency but high capacity to actually create change.

Table 5 Agency and capacity on the implementation of energy measures of the top, middle and bottom

			Agency	
			Low	High
The top	Capacity	High	Their high capacity lies in the orientation decision and final investment decision. They have a low agency regarding energy measures. There is the company's 25-25 energy goal, but it is viewed on a general company level and not in relation to specific renovation projects. The investment group considered financial sustainability before implementing energy measures. With their low agency, energy measures are disabled.	
		Low		
The middle			Agency	
			Low	High
	Capacity	High	Many examples show that the middle has a lot of capacity (e.g. heating system exchange). Their interest in and willingness to implement energy measures, however, are generally rather low. Additionally, not all external consultants even knew about the 25-25 energy goal.	A single example of high agency and capacity could be identified, which is the area manager pushing for LED lamps.
The bottom			Agency	
			Low	High
	Capacity	High	The Swedish Union of Tenants did not focus on energy measures as those would often lead to a rent increase. With the rent negotiations taking place during the planning and design phase, they have high capacity and mainly disable energy measures.	
			Low	High
			Some of the tenants did not think about energy measures. There was no agency or capacity there. [EXPLAIN MORE]	Some of the tenants cared about energy measures, but the tenants' capacity was rather low. They could only affect the cosmetic aspects of a building.

There was one example of high agency and capacity overlap, initiated by a middle actor, where the result was the installation of LED lamps.

The top has the financial power, and they currently tend to disable energy measures. They had a lot of capacity in that they had the final decision power regarding any work done during the renovation. But their agency was that of financial sustainability. If they want to focus on energy and work with the energy goal for their renovation projects, their agency would also need to change.

The tenants, the bottom, did not have much influence; they had a low capacity but mixed agency. However, they could be engaged more to increase their capacity, for instance, through their participation in the tenant meetings. Furthermore, the housing company could also communicate their 25–25 energy goal to the tenants and try to increase their agency. The Swedish Union of Tenants, however, acting as a collective tenant, had high capacity but low agency. With the rent negotiations and the insecurities that energy measures pose concerning rent negotiations, they mainly disabled energy measures.

The internal employees, a part of the middle actors, have worked with the energy goal for a while, initiating, developing and taking the decision to actually implement it. The energy goal might have become self-evident for the internal employees during the process of implementing the 25–25 energy goal. This means internal employees, unlike external employees, have had time to work with the energy goal. Thus, the external employees need a clear introduction to the goal. The employees of the housing company assumed that the external consultants all knew about the energy goal and

they work towards achieving it. In fact, there was a knowledge gap between the two groups. This knowledge gap is graphically shown in Fig. 5.

As it is now, it remains unclear what goals exist. It was in fact mainly the middle actors who enabled energy-saving measures. In theory, they are in a good position of agency and capacity overlap where it would be possible for them to act as change agents; they have the capacity to push for more energy measures, but here, the case study has shown that they did not have a shared and high enough agency.

Olsson et al. (2015) also suggested that a way to better integrate energy into renovation processes is to disseminate more information about energy to the involved people (here on the top, middle and bottom). The question of energy has become more important in recent years, but the renovation processes studied here remained more or less as business as usual. The 25–25 energy goal was not clearly communicated outwards, neither to the external consultants nor to the tenants and the Swedish Union of Tenants.

However, despite all housing company's efforts, enabling energy measures is not (yet) something that is clearly done by the middle professionals (or the top and bottom). More is needed besides simply introducing a new general energy goal, establishing an energy group or adding energy as a bullet point on the agenda. Part of the problem is also that there are no clearly defined goals for the specific buildings, which would lead to everyone having a shared agency, an interest in energy measures and a willingness to increase their implementation for each renovation project. Everyone will go into a project with different understandings of the aim of the renovation and will try to fulfil their tasks based on routines and aggregated knowledge. Therefore, there is a need to

Fig. 5 Knowledge gap of the 25–25 energy goal of the external consultants

create a similar understanding on the purpose of the renovation project in relation to energy. The 25–25 energy goal was more a rhetorical tool, and there was a lack of concrete goals in terms of how much the energy use should be reduced for each building. This might pull the planning and design in different directions instead of everyone going in the same direction towards increased energy efficiency. Additionally, if the housing company and the investment group decide that energy is as important as they claim, then putting more effort on education could be a good way to increase the understanding regarding the importance of increased energy efficiency and energy reduction. An example is that the potential increase in rent reduces the collective tenant organisation's agency for energy measures, as they fear a rent increase for the tenants. However, more energy-efficient buildings tend to result in lower energy cost, i.e. bills for the tenants. Thus, putting education on the agenda would be a good solution for the housing company to work with the tenants and the Swedish Union of Tenants. For example, tenants may show more agency if they are aware of potential energy bill reduction. And the Swedish Union of tenants may offset the concerns of rent increases understanding better the advantages of increased energy efficiency and energy reduction.

Implementing energy measures in renovation processes, hence, includes many actors with non-synchronised knowledge, agency and capacity. This is a reminder for those who want to speed up the pace in renovations that include energy efficiency and saving measures.

The main key lessons from this study on a general level are the following:

- A clear vision/goal is needed. In the case there was a plurality of different goals instead: There was the more rhetoric 25–25 energy goal, there were financial goals and restrictions to keep the price low, there were no specific numeric goals regarding how much an individual building's energy use should be reduced. All these goals or absence of goals were partly contradictory and sometimes worked rather against each other. These did not allow a clear focus on energy.
- Define goals clearly and communicate them to all participants in the renovation projects, including the

external consultants, tenants and the Swedish Union of tenants (or similar organisations).

- Communicate the internal defined goals clearly and repeatedly to counteract a knowledge gap between internal employees and external consultants as well as tenants or the Swedish Union of tenants (or similar organisations).
 - The middle, the project group, is not a unified group with the same interest and knowledge; thus, the communication of goals and visions is crucial to bring everyone on the same page
- Do not underestimate the influence the Swedish Union of Tenants (or similar organisations) has and include them in the process.
 - Use the tenants more as a source of knowledge about the buildings.
 - Educate the tenants and Swedish Union of Tenants (or similar organisations), what benefits there are by including energy measures in a renovation for the tenants and their energy bill.

Define goals for an individual renovation project, do measurements on the buildings current energy consumption and do calculations on what effect different measures have and follow-up during and after the renovation.

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