



Original research article

Understanding energy efficiency in Swedish residential building renovation: A practice theory approach



Jenny Palm*, Katharina Reindl

Linköping University, Department of Thematic Studies—Technology and Social Change, 581 83 Linköping, Sweden

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ABSTRACT

Examining renovation processes having reduced energy consumption as an explicit goal, this article considers how energy efficiency is made part of renovation processes, focusing on the planning and design phase. Interviews and participant observations of meetings have been conducted. Applying a framework developed in practice theory, we demonstrate the importance of understanding routines, technology, meanings, and knowledge in order to understand why renovation processes repeat themselves and why a renovation practice are hard to change.

The analysis shows that the professionals were only engaged in decisions in relation to their own specialized areas, which benefited established solutions. The existing technical infrastructure, such as the HVAC shafts and the district heating system, largely determined what issues were up for discussion. It was clear that practical know-how were valued much higher than theoretical knowledge. The meaning of an energy efficient renovations for the professionals was to reduce the energy consumed as much as possible in every renovated building. With this in mind, we were surprised by how little energy efficiency was on the agenda. We can conclude that there was nothing in the studied processes that could trigger changes and dislodge the inertia of the practice.

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1. Introduction

Energy efficiency is a central political objective of the EU and its Member States. EU Member States have agreed to reduce their primary energy consumption by 20% by 2020 relative to 1990 levels. Sweden also has the objective of reducing its total energy consumption per heated area in homes and other premises by 20% by 2020 and by 50% by 2050 relative to 1995 levels [1]. In Sweden, the domestic and service sectors account for approximately 40% of total energy use [2]. According to the Swedish Energy Efficiency Committee, much remains to be done to address energy use and there is substantial potential for energy savings, particularly in the housing sector [1].

When considering energy efficiency in the housing sector, it is useful to examine existing buildings as they will continue to represent most of the housing stock in coming decades in most western countries [3]. Achieving already-set goals calls for action addressing the existing housing stock that leads to reduced energy consumption [4]. Sweden has 2.5 million apartments in multi-unit dwellings

and 2 million single-family homes. In 2011, 6085 new apartments were completed and ready to be occupied [5]. The small number of new-built apartment buildings in Sweden makes it necessary to address energy efficiency when renovating the existing stock. Sweden's national strategy for energy-efficient building renovation, which is a response to the EU's Energy Efficiency Directive, states that 75% of existing buildings will need comprehensive renovation by 2050, i.e. 1,875,000 apartments will need to be renovated, according to the Swedish National Board of Housing, Building and Planning (Boverket) and the Swedish Energy Agency (SEA) [6]. This means that 52,000 apartments will have to be renovated in Sweden every year. It is difficult to find statistics concerning the energy-efficiency measures implemented in the existing building stock. However, when it comes to multi-unit dwellings, 44% have implemented some such measures [6]. Adjusting and optimizing control systems and improving electrical efficiency have so far been the dominant measures. The increasing need for mass renovation of these buildings creates an exceptional window of opportunity to improve energy efficiency, address national energy and climate goals, and create and sustain modern, comfortable accommodations. Following Meijer et al. [3], the term renovation is here used to cover retrofitting, restoration, rehabilitation, and renovation and is used to indicate actions that go beyond maintenance.

* Corresponding author. Fax: +46 13 284461.

E-mail addresses: jenny.palm@liu.se (J. Palm), katharina.reindl@liu.se (K. Reindl).

The renovation process of one housing company in a medium-sized municipality in Sweden is analysed here. The housing company has decided to reduce energy consumption in its entire housing stock, the goal being to reduce the amount of purchased energy by 25% by 2025 (relative to 2011 levels). The housing company is a public housing company owned by the municipality; it has a dominant market position in rental apartments, controlling about 60% of the local market for apartments. Sweden has a large share of publicly built and managed housing. Public housing companies are mainly owned by local municipalities or public utilities, and one in five people rent units of such housing [5]. Public housing is intended to provide non-profit housing access for everyone, and there is no upper income limit for those who rent such accommodations.

This article examines renovation processes having improved energy efficiency as an explicit goal. We analyse how energy efficiency is made part of the planning and design phase of the renovation process, applying a framework developed in practice theory that focuses on routines, technology, meanings, and knowledge [7–9]. The practice theory framework contributes to explain why some energy-efficiency measures are, or are not, brought into the planning and design phase in renovation processes for multi-unit dwellings.

The focus of this article is on the renovation planning and design phase, which starts with an investigation and ends with a tender document. The procurement follows EU regulations and the calls for bidders were published on the Opic website (www.opic.com).

We closely followed three renovation processes from initiation until completion. This paper concentrates on the planning and design phase, as it is in this phase that the measures to be implemented in these renovations were determined. The contracting form in these projects was design-bid-build, which is the most common way of procuring infrastructure in Sweden [10]. In this contracting form the client, here the housing company, delivers the design for the project and the contractors offer bids to build, the lowest bidder usually winning the contract. The housing company is responsible for documentation and the contractor only builds according to the design [10].

The planning and design phase is implemented by the property developer, in this case the housing company, together with its consultants. The consultants hired in this phase are chosen from a list of consultants that have been contracted through public procurement for three years. Every three years, a new procurement is conducted. According to law, at least 50% of the tenants need to consent to any actions that raise apartment standards and lead to increased rent [11]. The housing company collects written consent from the tenants during the planning and design phase. See Fig. 1 for an overview of the renovation process.

The planning and design phase of renovation projects in multi-unit dwellings has been paid little attention in earlier studies, even though the decisions made early in this phase determine the final results [12]. In the planning and design phase, the energy-efficiency measures to include in the procurement document and the materials to use are determined. The negotiation of these matters, however, is often “black boxed”. How professionals reason about energy efficiency and how routines, technology, meanings, and knowledge influence the measures that “survive” and find their way into the procurement document ought to be of general interest, so the present analytical framework contributes to a general understanding applicable beyond the Swedish case. The research also helps improve our understanding of professional cultures concerning energy efficiency and of “best” engineering practices [13].

2. Practice theory and energy-efficiency renovations as practice

Energy-efficiency policies have been criticized for being simplistically based on a belief in rational actors choosing the best available technology. For example, Moezzi and Janda [14] claim that social potential is as important as technical potential in an energy-efficiency decision situation. Economic factors are of course important when analysing energy efficiency and the choice of measures during a renovation process. However, it is important not to overemphasize the economic incentives or to neglect other important factors, such as cultures, knowledge and routines, that are

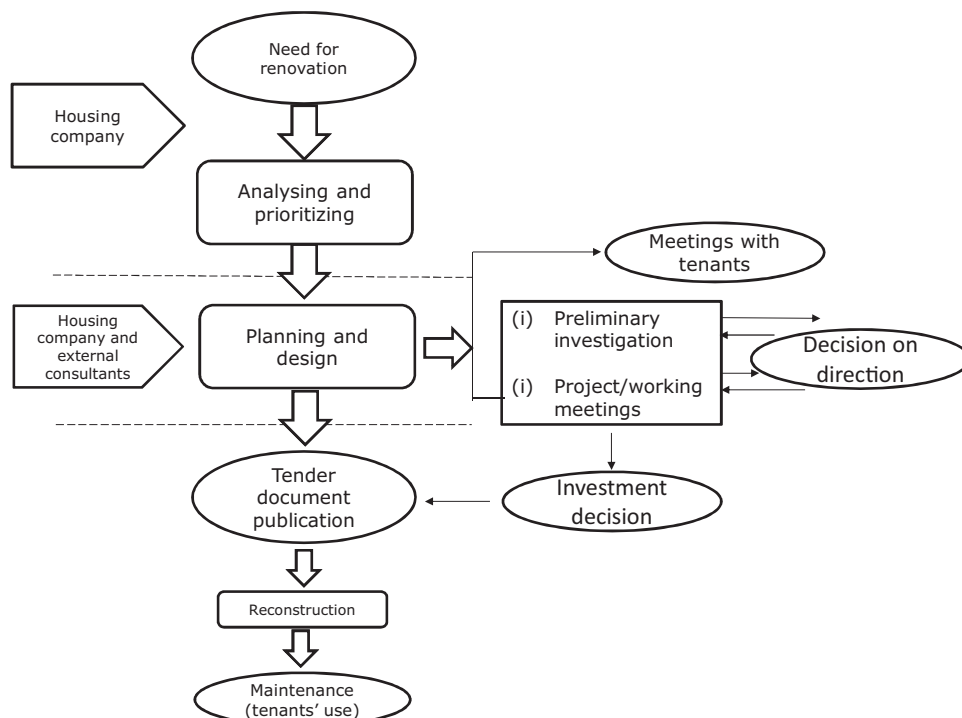


Fig. 1. Overview of the renovation process.

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