



## Path creation for sustainable consumption: promoting alternative heating systems in Finland

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### ABSTRACT

There are many cost-effective technologies to reduce resource use and carbon dioxide emissions in space heating, yet they are adopted very slowly, and inefficient heating systems persist. In this article, we examine path dependence and path creation in home heating systems. Path dependence refers to the self-sustaining characteristics of existing systems such as the dominant energy system. Path creation is a related concept that highlights entrepreneurship in ‘mindfully deviating’ from existing paths and creating new ones by engaging various stakeholders and generating momentum. Research on path creation in energy systems has focused on energy production systems, whereas end-use technologies have gained less attention. We explore the role of path creation in end-use technologies through four attempts to change heating systems for detached houses in Finland via the promotion of heat pump technologies. Within the path creation process, we focus on how the initiators of new paths try to counter the forces maintaining the dominant system. In particular, we pay attention to how small organizations make use of co-operation to challenge the existing path. The aim is to identify the conditions for successful path creation by entrepreneurs and energy end-users under adverse conditions.

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### 1. Introduction

Energy use for space heating is one of the most resource-intensive consumption items for consumers in cold climates. In Finland, energy used at home amounts to about 15% of the total environmental load from consumption, and it is second only to food as a contributor to various environmental problems (Nissinen et al., 2007). Space heating for residential, commercial and public buildings accounts for about 21% of Finland’s total energy consumption (Statistics Finland, 2009a). More importantly, however, it involves a significant cost-effective potential for reducing CO<sub>2</sub> emissions (Heljo and Laine, 2005; Rinne, 2009).

There are many cost-effective technological solutions that can cut down the environmental load of space heating. However, because turnover in the housing stock is slow, it takes a long time for these better solutions to diffuse. Moreover, the fact that there are many competing solutions makes the situation confusing for consumers. Owners of existing detached houses are particularly challenged: there is little unbiased professional advice available, major investments are costly, and every major renovation involves many uncertainties and risks.

In this article, we examine home heating systems in detached houses as path dependent systems and parts of the energy system, which in itself is highly path dependent. This is because of the large fixed costs of today’s large-scale energy systems, learning effects (lower costs for mature technologies) and coordination and network effects (Unruh, 2000). The stability of the existing system is maintained by industry and inter-industry forces of coordination such as standards, finance mechanisms and networks based on education, institutions and associations (Wüstenhagen and Teppo, 2006). Existing energy producers have vested interests in the current system and are likely to resist attempts to change. The forces that create path dependence, however, can also be actively shaped to create new paths. Path creation (Garud and Karnøe, 2001) is a concept that highlights the entrepreneur’s active role in ‘mindfully deviating’ from existing paths by creating new networks and generating momentum for a new path.

In this article, we examine four attempts to change heating systems for detached houses in Finland by small players promoting energy efficient alternatives, in particular, heat pumps. According to optimistic estimations, heat pumps could cut global CO<sub>2</sub> emissions by up to 8% (IEA Heat Pump Programme, 2009). In per capita terms, Finland is one of the leaders in applying heat pump technologies (Forsén, 2009), yet it lags significantly behind neighboring

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Sweden, which is the world leader (Lind, 2009). The operating environment in Finland is not particularly amenable for energy saving in detached houses; nonetheless, small players have made progress through inventive moves. The aim of this analysis is to identify the conditions for successful path creation by entrepreneurs and to explore the nature of path creation in end-use efficiency technologies.

This article is structured as follows. First, we examine the role of small players in energy systems and their potential for path creation. We then turn to four cases of entrepreneurial action to change space heating systems in existing detached houses in Finland. On the basis of these cases, we analyse successful and unsuccessful efforts to create new paths, and especially the role of various stakeholders and co-operation among them. Our conclusions suggest some implications for both entrepreneurs and policy makers.

## 2. Path creation in energy systems – can small players change large technological systems?

### 2.1. Path creation and related concepts

Path dependence is a powerful force in energy systems, but many authors have explored the role of human agency in the creation of path dependent systems. Path creation refers to the active role of entrepreneurs in shaping technological paths by setting in motion processes that shape emerging social practices and technologies (Garud and Karnøe, 2001). The notion suggests a reflexive role for entrepreneurs (Sydow et al., 2005; Strobel and Duschek, 2007): entrepreneurs can recognize the factors creating dependency on the currently dominant path, and take action to “mindfully deviate” from existing structures. This means that entrepreneurs understand that their technologies are socially and historically embedded (Garud et al., 2009).

Path creation stresses the role of collective action. Garud and Karnøe (2001, p. 14) acknowledge that “most deviations are met with apathy at best and resistance at worst”. They stress the need for innovatively combining existing and new competencies and recruiting supporters for the new product. Path creation also involves translating the emerging innovation in a way that makes sense to and captures the interests of outsiders and the testing of the innovation with critical feedback from outsiders (Garud and Karnøe, 2001).

When analysing path creation, it is indeed important to recognise that new paths emerge in parallel to the destabilisation of the old path (Anderson and Tushman, 1991; Meyer and Schubert, 2007). This aspect is stressed in the literature on *strategic niche management* (e.g., Elzen et al., 2004; Schot and Geels, 2008), which emphasizes the importance of making use of ‘windows of opportunity’ afforded by crises in the dominant system. Strobel and Duschek (2007) prefer to speak of *path management*, which includes three types of mindful actions: *path creation*, *path extension* and *path deviation*. Here, path creation can involve, e.g., the winning of first adopters by offering them substantial benefits, political action such as lobbying, and the building of consortia to spread set up costs and risks and to promote compatible technologies. Path extension can entail, e.g., moves to keep out other technologies and to secure new markets. Path deviation includes moves to destabilize the existing path by discrediting previous experience and received truths.

The literature on path creation thus suggests a number of particular moves that energy entrepreneurs can use to shape the future in their favour. These include the destabilisation of the existing path, the reinforcement of the new path and the active use of networks to span boundaries and generate momentum.

### 2.2. Destabilisation of the existing path

One of the manifestations of path dependence in energy systems is the high ‘implicit discount rate’ that end-users exhibit when evaluating energy efficiency investments (Geller and Attali, 2005). For example, users often expect payback periods of 5 years or less from energy efficiency investments. Thus, investments in energy efficiency are evaluated on more stringent criteria than investments in energy production. Reasons for this include the high information search costs, perceived risks and uncertainties of new technologies and the low liquidity of energy efficiency investments (Golove and Eto, 1996). Energy efficiency potentials are dispersed throughout society in many small units and the cost of capital for small energy end-users is often much higher than for energy producers. For example, an investment in heat pump technology in an old detached house may cost up to EUR 20,000 and payback period may be as much as 10 years. In energy production such a sum of money and time may not be problem, but for a family this sum of money and time period may exceed its financial resources or time horizon.

These observations point to path dependencies of the existing system that need to be destabilised by entrepreneurs promoting alternative systems (Strobel and Duschek, 2007; Heiskanen et al., 2009):

- Entrants need to surmount the coordination effects enjoyed by incumbent companies, such as the wealth of existing research, development and exemplars existing in the market (reducing perceived risks by customers). *Awareness raising and advocacy* are ways to question to existing path. *Lobbying* for policies to counter the existing path could be a more forceful weapon.
- New entrants cannot easily compete in production or service delivery efficiency with incumbents, as they are at the start of the learning curve. In this context, Lampel (2001) stresses the need to *change the evaluation criteria used by customers*. The logic within the dominant path is termed one of ‘critical evaluation’ – the focus is on costs, problems and limitations. Representatives of the emerging path can try to evoke other evaluation criteria, such as enthusiasm about new technologies, environmental considerations, or convincing visions of the future leading to shorter ‘mental’ payback periods. Coalitions with local communities or environmental movements may support such efforts (Seyfang and Smith 2007; Seyfang 2010).
- Customer experience in quality, performance and price stability bias the market toward incumbents. New entrants can try to destabilize this situation through *arguments highlighting changes in the operating environment* (e.g., oil price peaks) that call into question the dominant system. Public bodies can be important allies in arguing for the need for change.
- New entrants need to surmount barriers to entry, such as the existing customer contacts of incumbent energy companies. New entrepreneurs have to find *alternative ways of contacting customers*, as they do not have an existing customer base.

Efforts to destabilize the existing path are fraught with risk and require resources. Lack of financial and political power can easily dampen the enthusiasm of the entrants to confront the incumbents head-on (see Hockerts and Wüstenhagen, 2009). Examples of successful efforts (Bergek et al., 2008) usually involve large coalitions of players.

### 2.3. Reinforcement of the new path

Reinforcement of the existing path requires the active management of increasing returns (Arthur, 1996; Sydow et al.,

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