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From innovation to commercial market – understanding technological innovation systems

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Thematic track: Innovation

Introduction

Innovation is the process of developing a new idea and translating it into a product, service or process that creates value for businesses, consumers and society. To better understand the development and diffusion of innovations, it is important to understand the environment wherein innovation occurs. By identifying the strengths and weaknesses of the innovation system, measures can be taken to counteract potential barriers or to reinforce mechanisms conducive for the development of the innovation system.

This study presents an analytical scheme used as a tool to analyse the dynamics of a technological innovation system, but also to identify structures and processes that may either support or impede the innovative development. The presentation is accompanied by an example that analyses the technological innovation system of vertical, closed-loop ground source heat pump (GSHP) systems.

Vertical, closed-loop GSHP systems utilise the ground as a heat source in order to provide residential buildings with space heating and domestic hot water. This type of GSHP system consists of a heat pump and one or two borehole heat exchangers (BHE). The BHE are boreholes, often 50-150 m deep, wherein pipes are inserted. The pipes are connected to the heat pump, so it constitutes a closed circuit. A heat carrier fluid is circulated through the pipes installed in the boreholes, during which the fluid extracts heat from the ground and transports it to the heat pump. The heat pump transfers the heat to the house, during which the low-temperature heat is elevated to high-temperature heat with the help of electricity. The technology is fairly new to the Danish energy market, and currently the market size is very small. The analytical framework was, therefore, used to analyse the current advancement of the innovation system and to identify the components which have the strongest influence on the advancement.

Material and Methods

The analytical framework, presented in this study, was proposed by Bergek *et al.* (2008). The first step in the scheme is to analyse the structure of the innovation system by describing the structural components (*e.g.* actors, networks and institutions) and their interactions. This is

followed by a description of the activities within the innovation system, which are defined by seven key processes: *knowledge development*; *resource mobilisation*; *market formation*; *influence on the direction of search*; *legitimation*; *entrepreneurial experimentation*; and *development of external economics*. With an overview of how the innovation system functions, the next step is to assess the performance of the innovation system and identify the components which have the strongest influence on the system's performance. This includes the identification of inducement and blocking mechanisms for the advancement of the technology. Lastly, the analysis is concluded by the specification of potential initiatives that may encourage inducement mechanisms or counteract blocking mechanisms, so as to facilitate the transition from innovation to commercial market.

Results and Conclusions (What did you learn from the project, what was the outcome?)

The analysis of the technological innovation system of the vertical, closed-loop GSHP system resulted in the identification of the inducement and blocking mechanisms shown in Figure 1. In order to remove some of the blocking mechanisms, three research initiatives were proposed (see Figure 1). If these initiatives are implemented, it may facilitate the advancement of the technology on the Danish Energy market.

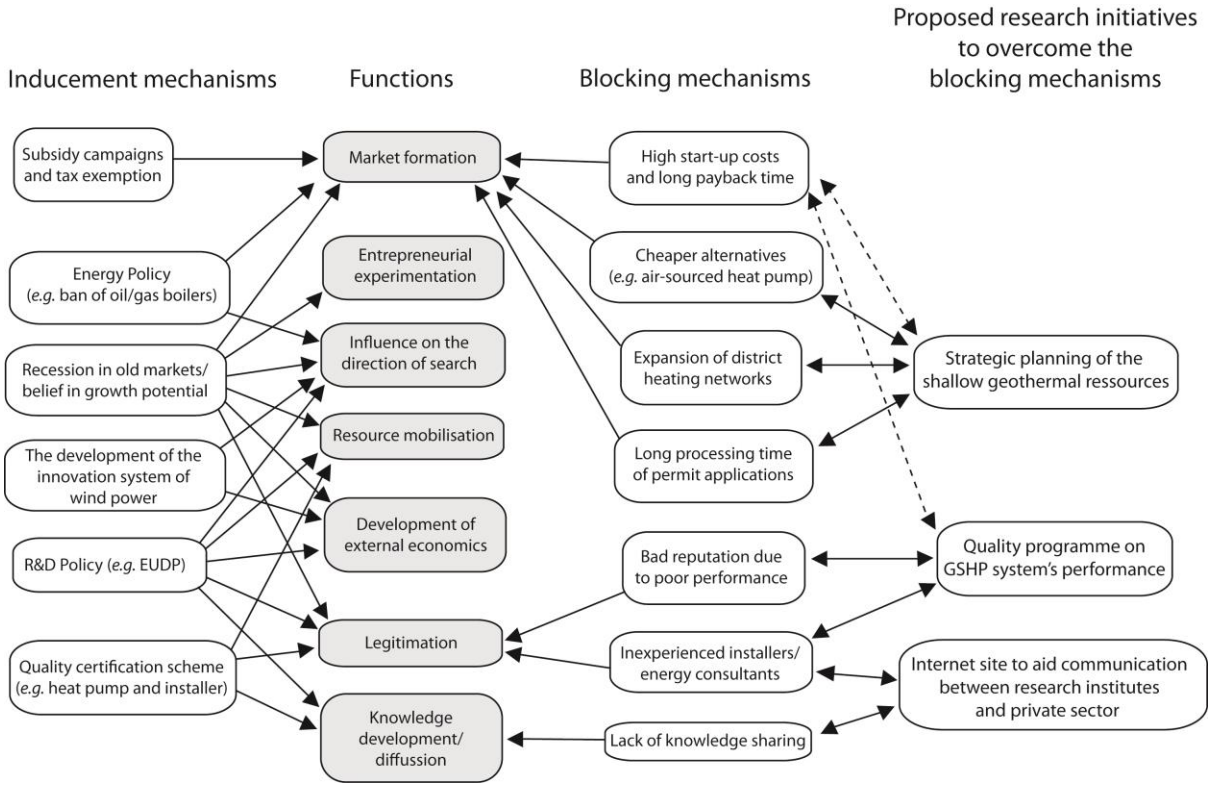

Figure 1 – An overview of the inducement and blocking mechanisms that affect the development of the technological innovation system of vertical, closed-loop GSHP systems. Research initiatives are proposed to overcome some of the blocking mechanisms.

References

Bergek, A., Jacobsson, S., Carlsson, B., Lindmark, S.& Rickne, A. (2008). Analyzing the functional dynamics of technological innovation systems: A scheme of analysis. Research Policy, 37, 407-429.