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From the pilot project to the mainstream practice - Learning explored in planning and design of a low-energy quarter

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Abstract

Pilot projects are common platforms for developing/testing construction methods or solutions for e.g. low-energy house-building. Whereas studies report on their technical/engineering outcomes, little is known from a learning perspective. In our study of pilot-project learning, the planning for and assessment of learning from a "low-energy quarter" pilot was explored. In step one, the initiators and the local authority participants were addressed. The findings of the interviews indicated the changed understandings during the pilot of e.g. the planning and design criteria for sustainable building. Although stressed at the pilot outset, it seems that the learning among the stakeholders was not so well documented or systematically evaluated and shared so that the mainstream practice could have been informed or changed.

1. Introduction

Governmental initiatives in Sweden with the long-term objective to support the transformation towards a more energy efficient and sustainable built environment have frequently been organised as pilot projects. The Swedish Energy Agency coordinates energy-related building research in Sweden including programmes, such as LÅGAN which provides financial support for pilot projects in building for very low energy use. The Delegation of Sustainable Cities has also awarded financial support for nearly a hundred pilot projects relating to sustainable urban development. Pilots like these have been researched and reported upon in studies addressing e.g. the implications of low-energy buildings in terms of costs (Janson, 2010; Filipsson et al., 2013), how the measured energy performance

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compare to the designed energy performance (Boström et al., 2003; Janson, 2010; Filipsson et al., 2013) and the user perception of indoor environment (Boström et al., 2003; Janson, 2010).

Pilot projects are common means by which innovations (e.g. new construction methods or solutions) are applied and adapted to real-world situations and have been suggested to provide platforms for learning, where for example communication can be enhanced across actors and domains and changes in perceptions and practices can be supported (c.f. Vreugdenhil et al., 2012). Still, the actual impact of pilot projects from a change perspective (i.e. diffusion of project outcome) has rarely been studied in-depth. In Sweden, energy and building research has mainly been focused on physical measurements and evaluations of the building envelope, to some extent on the building process, and to an even lesser extent on building occupants (c.f. discussion by Karresand, 2010). That is, similar to energy and building research in general (c.f. Schweber & Leiringer, 2012) much focus has been on technical solutions and innovation outcomes. However, main barriers for a shift towards sustainable building have been recognized to relate to social aspects rather than to technology (c.f. Gluch et al., 2014 and referred work by Häkkinen & Belloni, 2011; Oreszczyn & Lowe, 2010). Thus, how pilot projects in general actually perform as platforms for learning has not attracted much research attention and, regardless of the overall "learning for the future"-objective of governmental initiatives, little is known about aspects relating to the learning process preceding pilot outcomes and resulting understandings of participants regarding energy-efficient and sustainable building.

In the on-going study, acknowledging learning being at the core of any change or development and an antecedent to sector renewal, process change and innovation leverage, the potential transition from a "low-energy quarter" pilot to a sustainable mainstream business and practice is examined. The overall purpose of the study is to better understand pilot projects as learning platforms and their impacts on mainstream practices. Adhering to calls by e.g. Schweber and Leiringer (2012), the study takes an interpretivist approach to energy and building research as it focusses on learning among stakeholders (e.g. urban planners, contractors i.e. house-building companies, architectural and engineering consultants) for the planning and design of a quarter dedicated for low-energy houses in a sub-arctic environment, where previously few systematic attempts of this sort have been made.

The aim of the first step of the study is to explore (a) for what different purposes and in what ways (i.e. activities) learning from the studied low-energy quarter pilot was planned for and (b) how learning activities and outcomes are described and evaluated by the initiators and participants from the local authority (LA). The results are addressed from the perspective of pilot-project learning at odds with the current mainstream practice and the supporting (or not) of a transition towards a new mainstream practice of planning and design of low-energy housing and sustainable building in the LA. In the subsequent steps, the perspectives and learning of additional pilot-project participants will be included in the study to further explore the pilot project as a learning platform and the potential impacts on mainstream practices from a multi-stakeholder perspective.

2. Learning at odds with current practice to set a new

Inherent in the concept of learning is an integrative approach since learning brings together various levels of analysis i.e. individual, group, organization, and inter-organization (e.g. Dodgson, 1993; Jones, 2007), where groups and organizations learn through individuals internal or external to the group or organization. For a pilot project to serve as a learning platform, the opportunities for enhanced communications across actors and domains were put forth by Vreugdenhil et al. (2012). This implies that the constitution of pilot-project participants needs to be carefully considered, e.g. by acknowledging in what ways different domains are represented. Vreugdenhil et al. (2012) also suggested that pilot projects can support changes in perceptions as well as in practices. However, as suggested by Dodgson (1993) learning is conflictual, conservative and may be motivated by attempts to improve an organization's efficiency or productivity as well as by attempts to improve its innovativeness or adaptability. In organization theory, this is often discussed as a conflict between exploitation and exploration where the concepts are defined by March (1991) as learning oriented towards "refinement of an existing technology" (i.e. exploitation) and learning oriented towards "invention of a new one" (i.e. exploration).

In a similar vein, Argyris, and Argyris and Schön (see e.g. Argyris & Schön, 1978; Argyris, 1983) made a conceptual distinction between single-loop and double-loop learning. The distinction made (c.f. Argyris, 1983;

Huber, 1991) is between learning within a frame of reference, related to changes in e.g. methods where the underlying values and policies remains the same throughout the change (i.e. single-loop learning) and learning a new frame of references, related to the non-routing, long-term outcome where underlying values and policies are re-examined and changed (i.e. double-loop learning). Exploitation and single-loop learning is important to continuously improve current practice and short-term efficiency, exploration and double-loop learning is important for long-term innovation and new knowledge to emerge, potentially challenging current practice and presenting opportunities for new practice to be established. Subsequently, outcomes of both strategies are necessary at the organization level and constitute the prerequisites for continuous renewal at the sector level, but are suggested to be supported by generically different learning processes. Bessant (2005) for example concludes that whereas learning to support steady-state innovation is about transferring experienced-based or well-proven lessons in an adaptive way, learning to support innovation beyond the steady-state is about building on "shared experimentation and comparison of experience" in a generative way. For pilot projects intended to be a mean by which innovations are applied and adapted to a real-world situation, not only at the one unique occasion of the pilot project but to potentially suggest a change of mainstream practice, it is argued that the pilot project subsequently need to acknowledge the conflict between exploitation and exploration, and serve as a platform for learning where double-loop as well as single-loop learning is acknowledged.

The argument for the different learning processes called for can be further elaborated on and supported by research on decision making and organizational information processing, highlighting also what barriers to overcoming inertia a pilot project might face. From previous learning and experience humans tend to develop simplifying strategies and cognitive rules-of-thumb to simplify information processing and to fill in gaps of information (March, 1994). Tversky and Kahneman (1974) suggested that the more information that the decision maker lack the more likely he or she is to rely on these rules-of-thumb. When applied to situations or problems where previous learning and experience, and subsequent rules-of-thumb, do apply this is found to be a generally helpful strategy (as discussed by e.g. Engström & Hedgren, 2012). However, in situations where a break with current knowledge and practice is implied, not only are information scarce regarding "the new" but the cognitive rules-of-thumb can also be misleading and subsequently need to be challenged.

Building on research taking an interpretive approach to decision making and organizational information processing (e.g. Neill & Rose, 2007; Dinur, 2011; Levander et al., 2011), and for the purpose of releasing the organization from reinforcing the status quo, Engström and Hedgren (2012) promoted an approach for innovation beyond current frames of reference that takes into account the subjective, professional judgments made by decision makers as well as the dynamics of change and how rules-of-thumb are formed, employed, assessed and revised continuously over time. More specifically, when new opportunities and alternative ways of building significantly differs from common practice Engström and Hedgren (2012) inferred (similar to conclusions by Neill & Rose, 2007) that a multiplicity of meanings may need to be managed in ways so that different and even conflicting meanings of stakeholders can "surface, interact and potentially suggest that different conclusions, at odds with stakeholders' established beliefs, can be drawn". Moreover, elaborating on the concept of sense making, Weick (2001) stated that frameworks are affected by meanings, but also that meanings are affected by frameworks. That is, rules, roles, and procedures are all reflecting as well as facilitating meanings, and by shared interpretive schemes, interaction patterns stabilize meaning.

More recently, on studying decision making about adoption of innovative energy-efficient designs and technologies in commercial real estate in the USA, Beamish and Biggart (2012) found shared rules-of-thumb for making critical decisions to play a central role and to provide input to the answer as to why the industry had been so slow to adopt the innovations. Just as individually held ones, the rules-of-thumbs shared among many people can be misleading, serve as change barriers and be even more difficult to challenge and eventually change. In line with suggestions by Weick (2001), they are typically formalized in organizational practices and, as highlighted by Brooks (2009), fundamental organizing principles such as e.g. rules, procedures and regulations do often obstruct the learning of new and different ways of working, organizing and managing, and thus, that organizations risk getting locked into single-loop learning, keeping on course and doing the same over and over again.

3. Method

The pilot project (henceforth referred to as the Pilot) addressed is the planning and design of a low-energy quarter in a municipality with about 40 000 inhabitants in a sparsely populated region of northern Sweden. It was initiated in 2009 by the LA, as a showcase for (initially) the planning and development low-energy housing (including single-family houses and multi-dwellings) and (later on) sustainable building. The Pilot was co-financed with demonstration project grants and was given a high priority by the local government and LA officials. From January 2010 (the start of the development of the detailed development plan) until the last official meeting (a sales meeting) in January 2014, one of the researchers was invited to follow and actively participate in the Pilot. The Pilot was led by a steering committee (SC), members of which also were engaged in different task forces during the Pilot. The SC consisted of five officials representing different areas of responsibilities within the LA and a representative of a local industrial development centre (see Table 1), as well as the invited researcher. Connected to the SC was also the leading politician of the Local Environment and Building Committee. Background material for the interview study reported in this paper consists of the researcher's notes from formal Pilot meetings and workshops, by official minutes as well as by the researcher's notes from informal talks with Pilot participants, and working documents and e-mail correspondence between Pilot participants. Based on a general overview and compilation of the background material six semi-structured, retrospective interviews were held with members of the SC.

Table 1. Interviewees (i.e. Pilot initiators and key participants from the LA).

Interviewee	Role/title during the pilot	Role/title at the time of the interview (if changed)
A	Head of Department (HOD) Environment & Building, (until Jul, 2013)	HOD Planning & Building in the LA of another municipality in Norrbotten County
B	Head of Land & Forest Office, Dep. of Property Management & Service (until Dec, 2013)	HOD Spatial planning (including the former Deps. of Property Management & Service, and Environment & Building)
C	Planning architect, Dep. for Environment & Building	
D	Manager Social Development and coordinator for the project Sustainable Municipality in the LA, Dep. of the Executive Committee (until Dec, 2013)	HOD Business & Society (including the former Dep. of Business & Industry)
E	Manager Business Development, Dep. of Business & Industry	
F	Proj. leader Industrial Development Centre in Norrbotten County	

Each interview (lasting about 1h30min) started with an open talk where the interviewee was asked to generally describe the Pilot and the work within the municipality towards the municipality vision of "a sustainable and attractive living". The second part of each interview included questions concerning the why (purpose of the Pilot), the what (explicit/implicit and emerging goals of the Pilot), the how (key aspects of the process and how the work was carried out) and the outcome (perceived achievements and goal fulfilments). During the final part of the interview the interviewee was presented with an overview of the Pilot activities as identified by the researcher having followed the Pilot. Activities, participants, available documentations and the interviewee's retrospective reflections regarding the process were discussed in an open conversation. During the interviews, both researchers were taking notes. All interviews were also recorded. In a first round of analysis the researchers independently tagged their separate notes to identify to what extent and in relation to what (activities, purposes and outcomes) "learning" was described and evaluated by the interviewees. In a subsequent step, the separate analyses were compared and discussed (reassessing notes and consulting interview recordings in the case of different interpretations). Finally, the learning supporting a transition towards a new mainstream practice was assessed.

4. Results and analysis

In the following chapter, references to interviewees are indicated by letters A-F (see Table 1).

4.1. Learning purposes and ways in which learning was planned for

The initial intention of the LA i.e. to present a showcase for the planning and development of low-energy house-building shifted during the early planning of the Pilot toward a broader sustainability perspective with focus on the quarter (rather than on individual buildings). The perceived overall aims of the Pilot, or learning purposes, are subsequently described in retrospect by the interviewees as: to develop a collective understanding of the concept of sustainable building from an ecological, social and economic perspective (B, C, D, E); to provide a practical interpretation of this understanding manifested in a quality programme for the Pilot (A, B, D); and to generate a physical representation of the concept in terms of a pilot/test quarter (D, F) or showcase quarter (A, B, C, E). The aims of the Pilot are further described by the interviewees in terms of intended outcomes such as e.g. "a new way of thinking" and the development and adoption of a subsequently new approach to the planning process (B), a (new) interactive and boundary-spanning planning process with a closer cooperation across functional departments within the LA (A), and a shared understanding within the LA of goals relating to sustainability (D) setting the future standards for new-build in the municipality (C). Elaborating on Pilot aims, interviewees stressed the importance of Pilot-process aspects relating to different stakeholders such as e.g. providing learning and business-development opportunities during the Pilot for the local contractors to support and enable for them to respond to expected future demands relating to low-energy and sustainable building (A, C, D, E, F), as well as the importance of providing the means and opportunities for stakeholders (including local contractors and consultants as well as LA officials belonging to different functional departments) to better understand each other's competences and subsequently enable for these to be acknowledged in the future (A, C, D, E, F).

Learning activities during the Pilot planning and design process described by interviewees as planned for and important to the participants' knowledge building (B, C, D, E) and sharing (A, B, C, D, E) include expert-led workshops on sustainability, study trips to housing projects for low-energy and sustainable building, and expert inputs and dialogues relating to the process of developing sustainability criteria for the Pilot. As described by several interviewees, the intention of the LA was that a broad constellation of actors and stakeholders would participate actively in Pilot activities. Public invitations to information seminars about climate and energy-efficient building and to workshops to discuss the vision and goals for the planned low-energy quarter were first sent out broadly. As described by one of the interviewees (D) a core was crystalized from the broader constellation which came to consist of an actively engaged and personally interested group of participants from different functional departments of the LA as well as the trade and industry. Thus, the following detailed planning and design stages, with more operative task-meetings, came to engage (in addition to SC members) representatives from local contractors, architectural and engineering consultants, the local energy company and the LA (participating in specific meetings). The dedication and motivation of these participants, together with their professional-network accesses, was by another interviewee (A) described as what basically shaped the Pilot learning process. To drive and manage a process as long as this one the importance of a close relationship between the SC members as well as a sound political support of the Pilot purpose was also specifically highlighted by one interviewee (D). The constellation of representatives from different areas of experience and spheres of authority was stressed as key by one of the interviewees (A) to enable boundary-spanning discussions addressing the ecological-economic-social interfaces of sustainability.

4.2. Evaluated descriptions of learning activities and outcomes

The interviewees from the LA considered the expert-led workshops important for the development of a collective understanding of the concept of sustainable building. The workshops contained lectures provided by an architect and certified passive house designer. One interviewee (C) highlighted the importance of these lectures for providing generic understanding of the sustainability concept and, subsequently, an increased awareness of the wide-ranging

meaning and significance of sustainable building in relation to low-energy building. Interviewees generally also put forth the study trips to housing projects for low-energy and sustainable building in Sweden, Germany and Austria as important learning activities during the Pilot. They described the study trips as important for providing inspiration (D) regarding how social and ecological aspects can be integrated in urban planning and design (A). Furthermore, the study trips were considered to serve as a mean for establishing interaction between trade and industry representatives and LA officials (E) as well as for gaining a common experience among local contractors of technical solutions for passive house building (F) and associated production methods (A). The study trips were regarded important for getting Pilot participants to work in a joint direction (E), to provide the common grounds to support discussions spanning different areas of experience and spheres of authority (F), and to establish experience exchange among participating, and normally competing, contractors (F). The regular SC meetings were also put forth by one interviewee (E) as important to obtain and maintain a collective engagement towards goals set for the Pilot. In addition, the development of the quality programme was described by all interviewees as an essential part of the Pilot process where sustainability criteria for the Pilot were set by engaged experts based on the previous workshop discussions and in dialogue with the SC.

When describing actual outcomes of activities during the Pilot, interviewees highlighted an increased knowledge of how the sustainability concept can be interpreted in planning and design (C, D, E), especially with regards to the social aspects (B) and to the multiplicity of considerations incorporated in sustainable building (e.g. choice of building materials, efficient space use, provision of meeting places, planning for mixed housing) in contrast to a one-dimensional "kilowatt hours per square meter"-focus on energy, as expressed by one interviewee (E). Interviewees (C, E) also stated that at the outset of the Pilot the LA was hesitant to whether it would be possible to achieve low-energy houses in a subarctic environment and, if so, if local contractors had the capabilities necessary to comply. According to interviewees the expert-led workshop dialogues and study trips built confidence regarding the possibility of setting challenging demands for the Pilot.

Yet, the main aspect regarding Pilot outcome emphasized by all interviewees was that no buildings had to date been built which, in turn, was attributed to important considerations being overlooked. According to interviewees, estate agents, property-owners and developers were sparsely represented, or not represented at all in the Pilot process. Subsequently, interviewees concluded that economic sustainability in terms of e.g. investment and housing costs for future residents was overlooked (D) and the market response to the high ecological standards of the quality programme was misjudged by the LA (A). To better include the market perspective, interviewees suggested that the public property-owner should have participated in the planning and design process of the Pilot (E), that they should have been represented in the Pilot SC (D), that the LA should have included property owners and estate agents even in the initial phase of the Pilot when the location of the quarter was selected (C), and that an external market consultant should have been engaged to counterbalance the social and ecological perspective of engaged experts in the workshops on sustainability (B). Moreover, even though local contractors did participate in the Pilot and according to one interviewee (E) did raise concerns regarding sales and market attractiveness these concerns were not considered in the process of setting sustainability criteria in the quality programme.

Interviewees (C, E) also suggested that during the design process one aspect of sustainability in particular i.e. energy performance of buildings came to have precedence over other aspects. As explained by one interviewee (E), the use of location, placement and orientation of buildings was based on energy optimization criteria rather than market attractiveness such as optimizing use of views in window placements. The design of buildings was also according to another interviewee (F) based on energy optimization over flexibility and adaptability to buyer preferences. A related remark made by yet two other interviewees (A, C) concerned the importance of minding all three aspects of sustainability (i.e. ecological, social and economic) and striving towards determining a suitable balance between the different and potentially conflicting demands originating from each of these perspectives.

Whereas the quality programme was highlighted as an outcome of the Pilot by all interviewees none of the interviewees could present explicit examples of documentations of learning experiences relating to the processes of developing and effectuating it (such as the ones described above) or examples of the diffusion of learning experiences to the mainstream organization and practice. Even though interviewees from the LA expressed a will to change the way the planning process is currently managed based on Pilot experiences (and in line with the aims of

shared understanding and a new frame of reference) they found planning practice remaining mainly the same, and potential changes to not be explicitly related to experiences from the Pilot. Although interviewees (A, B, D) described how they perceived that the Pilot had provoked thoughts about the potential to plan and design in dialogue with companies the preconditions of the Pilot enabling new ways of doing things had so far proved difficult to replicate in mainstream practice. The latter is explicitly highlighted in two interviews where interviewees (E, B) remarked that the learning activities of the Pilot are not feasible in all projects due to time and cost restrictions.

4.3. Learning in the pilot - sustaining inertia or supporting a transition towards a new mainstream practice

The interviewees' descriptions of Pilot aims, learning purposes and ways in which learning was planned for indicate that there was the intention from the outset to develop a shared understanding and a new frame of reference for planning and design to support sustainable building in the Pilot and, by learning from the Pilot, to also support sustainable building in the municipality and in the Norrbotten County for the long term. The intention from a learning perspective subsequently seems to have been on achieving double-loop learning, rather than on learning about sustainable building to simply inform current practice (i.e. single-loop learning).

The ways in which learning was planned for seem to have included possibilities for established believes, rules-of-thumb and current frames of references to be challenged. By including a broad constellation of actors and stakeholders and by organising platforms for their meeting and interaction there were the potential in the Pilot for a multiplicity of meanings to surface and interact. However, the conservatism of learning appears not to have been easily overcome in the Pilot. Although the intention was to develop a new and integrated understanding of sustainability the focus on social and ecological sustainability (with emphasis on low-energy) seems to have remained the centre of attention and significantly affected the manifested interpretation and meaning of "Sustainable building" developed in the Pilot. Whereas expertise in social and ecological sustainability had large impact on the criteria set in the quality programme, market aspects seem to have been mainly ignored in the process of developing the quality programme. As implied by interviewees' own reflections, representatives that potentially could have been challenging the social and ecological sustainability perspective by meanings and interpretations on sustainability from a market/economic perspective were not participating in the Pilot process in ways and at times so that their meanings could properly interact with meanings relating to social and ecological perspectives, and thus, potentially suggest different conclusions to be drawn concerning e.g. sustainability criteria.

One way of understanding the interviewees' descriptions of learning activities is that expert-led workshops and study trips were mainly focused on transferring learning of experienced-based or well-proven lessons from experts (understood by the SC at the Pilot outset as suitable knowledge providers to support the adoption of "a new way of thinking") and from other low-energy and sustainable building Pilots (understood as "good examples") in an adaptive way. This learning was considered important by interviewees for the progress of the Pilot, but seems to have had limited, or unclear, impact on mainstream practice. As suggested by Bessant (2005) learning to support innovation beyond the steady-state (in this case e.g. a new approach to planning and design in the municipality) is about building on shared and compared experimentation and experience in a generative way. It is indicated though, from interviewees' descriptions and the background material, that little attention has been paid to how such learning could have been (or in fact was) supported in the Pilot.

Yet, the learning outcomes extending beyond the single Pilot can be found from the interviews, particularly when comparing conclusions drawn by different interviewees belonging to different functional departments of the LA. Interviewees described a change of understanding during the pilot of e.g. planning and design criteria (e.g. conflicts between different sustainability perspectives) and how the planning and design process could be managed differently (e.g. in dialogue with companies). Still, even if new ways were tried in the Pilot (at odds with current organizational practices and organizing principles) no indications from interviews or background material are on these learning outcomes (including e.g. critiques regarding the lack of a market perspective) being shared among other members of the LA and systematically implemented into the mainstream practice (or used to change it).

5. Conclusion

Findings indicate that although being stressed as key at the outset of the Pilot learning among stakeholders is not well documented or even evaluated as Pilot objectives and outcomes by the interviewees. Similar to building and energy research in general, little attention seems to have been paid to the learning process and to individual and collective understandings developed during the Pilot that can have affected Pilot outcomes, i.e. what is, or will be the observable showcase, including the quality programme and how it is interpreted in terms of technical solutions, specific building designs and the design of the Pilot quarter as a whole. The same seems to be the case with potentially different and conflicting understandings of Pilot outcomes, including e.g. how outcomes are interpreted and evaluated from a sustainable building perspective by other Pilot participants, by professionals belonging to the different organizations associated with the Pilot, and by those potentially looking to the Pilot to learn from it. Additionally, preconditions for and resources allocated to the Pilot that enabled a different way of working within the Pilot do not reflect mainstream practice in the LA and are according to interviewees difficult to replicate in subsequent projects. This raises the important question of whether the realization of a mainstream practice of low-energy housing and sustainable building do require a change of the current LA practice (as implied by interviewees' Pilot experiences) and, if so, how to manage such a change to support a new, sustainable practice.

Hitherto, Pilot initiators and participants from the LA have been addressed. However, to describe and assess the Pilot as a platform for learning and potential impacts of the Pilot on mainstream practices the various and potentially conflicting perspectives and learning of different Pilot participants need to be acknowledged. In the next step of the study the focus will be on the local contractors addressing e.g. their assessment of Pilot learning activities, Pilot outcomes such as a new understanding and/or an improved ability among contractors relating to future demands on sustainable building, and the potential impacts on contractors' mainstream businesses and practices.

Acknowledgements

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