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Opportunities and Barriers related to Supply Chain Collaboration for Delivering Integrated Single-Family Home Renovations

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Abstract

Single-family home renovations often show deficiencies in project management. There might be a market addressing house owners who would prefer integrated renovation services and clear responsibilities. Companies that would respond to these client's needs would have a clear market potential, particularly for ambitious energy-efficient home renovations. Such enterprises could result from collaboration between different enterprises.

This paper first examined the business activity and supply chain collaboration of different actors offering smart and speedy single-family home renovations. Furthermore, new supply chain collaboration opportunities were studied using an innovative networking method that was developed in the framework of the ERANET-Eracobuild project "One Stop Shop – From demonstration projects towards volume market: Innovations for sustainable renovation". Based on the results of these studies we defined key elements for business model generation for ambitious integrated energy renovation of owner-occupied single-family houses.

The study detected novel opportunities for supply chain collaboration for delivering integrated single-family home renovations. The results showed that many examples of innovative business models can be found, but also that detected opportunities and barriers for supply chain collaboration need further business model and market infrastructure development. A handbook for such business model development was published and is now used to stimulate business deployment in various European countries. Further European research will now be carried out in the framework of an Intelligent Energy Europe project.

Keywords: business models, supply chain collaboration, renovation, single-family homes, marketing

1. Introduction

When planning a home renovation project somebody will need to manage the project. Homeowners often engage a designer or a contractor, but these actors are not always contracted as responsible actors for the whole project management. Many house owners decide to take on the project management role themselves - even if they don't have sufficient knowledge or competence. Amongst other, poor project management may result in insufficient planning, poor supply on-site, communication deficiencies, cost increase and limited obtained quality. Responsibilities and collaboration issues should be clearly defined.

Compared to the whole renovation market, few companies and formal collaborations of enterprises provide an integrated offer for project management of single-family home renovations. Particularly for ambitious energy-efficient home renovations, this market potential is still largely untapped. In theory, there is huge potential for reducing the energy consumed by existing single-family houses by thoroughly renovating them. For the successful market development of highly energy-efficient integrated renovations, supply chain collaboration is very important, while at the same time customer demand for integrated renovations has to be stimulated. Novel supply chain collaboration solutions may be found for single-family housing renovation projects. The solution to the lack of business concepts for renovation services for single-family houses is first of all that renovation service packages should be developed to include standard technical solutions for energy efficiency improvements regarding different building systems and ages (SuccessFamilies, 2012).

This business potential for single-family house renovations was explored in an international research project - the ERANET-Eracobuild project "One Stop Shop - From demonstration projects towards volume market: Innovations for sustainable renovation" (One Stop Shop, 2012) - that involved researchers from Belgium, Denmark, Finland and Norway. It examined the opportunities and barriers to establish a "One Stop Shop" for sustainable major renovations of single-family houses. The overall aim of the "One Stop Shop" project was to facilitate market uptake of whole house renovations for single-family houses to very high energy standard while providing superior comfort and sustainability to occupants. On the one hand, an integrated supply side was aimed for, to counteract the fragmented offer in sustainable retrofit of single-family houses and to increase the level of knowledge, skills and innovations of market players and owner-occupants. On the other hand, aspects of providing reliable information and guidance for house-owners were also included.

Central to the development of project management services for integrated home renovations are the questions how to deal with energy performance criteria and cost setting, customer's planning and design wishes, commissioning and quality assurance. These questions were explored by examining the market activity of different actors that may offer smart and speedy single-family home renovations (see section 2). After developing an actor categorisation in each partner country, a networking event produced additional research results to defining new business opportunities related to collaboration between various actors, to unburden the homeowner and to achieve less fragmented renovation processes (see section 3). Ideas and methods were detected for stimulating collaboration and business model generation between different players on the renovation market. Furthermore, a handbook for business

model generation for ambitious integrated energy renovation of owner-occupied single-family houses was developed to eliminate some of the perceived barriers (see section 4).

The researchers first defined various actor categories for advanced housing renovation in Belgium, Denmark, Finland and Norway.

2. Actor categories in various countries

The first step in determining which supply-side actors need to collaborate is to define existing actor categories. We identified important actors regarding supply chain collaboration in four different countries (Belgium, Denmark, Finland and Norway). As such we aimed to learn which actors need to cooperate and who plays what role in a customer's adoption process. Throughout the different studies within this research project, the adoption process of the homeowner was defined in different steps: Information > Persuasion > Decision > Implementation > Confirmation. These are five steps in innovation adoption decision processes, as defined by innovation researchers such as E.M. Rogers (2003). We continued the logic of the five steps in the innovation adoption process when categorising actors and defined actors for each country in actor categories as: informing, convincing, deciding, implementing, and/or confirming. We proposed that actors involved in an integrated communication channel – like a One Stop Shop - need to guide the homeowner through each step with information specific for that decision phase.

- Informing actors (information).

A very large group of possible actors in each country can be found with an informing role. This role can be fulfilled by federations, policy supporting actors, non-profit organisations, research organisations, energy distribution net managers, manufacturers of products, and so on.

- Convincing actors (persuasion).

In all country reports, persuasion was related to financial support, since this encourages homeowners to choose thorough renovation. Persuading actors are therefore mostly those actors that provide financial support, such as governments, banks or energy distribution companies. A number of different actors were identified who provide guidance on the subject of renovation. In the case of minor renovation work, the homeowner will rarely hire a consultant. In case of thorough renovation work, we found that the homeowner may hire an energy consultant, architect or interior designer to help guide the process and make the right decisions. Energy consultants and energy-conscious architects often illustrate increased relative advantage of high energy efficiency, and clarify complex relations between different measures in integrated renovations. Energy performance certificate advisors do not often act as actors persuading the client to implement measures, although they list these measures in energy performance certificates.

- Responsible actors (decision-makers).

Practically, integrated renovation needs strong coordination and well-informed decision-making. We found that in the partner countries for the market of owner-occupied single-family houses, owner-occupiers are still often responsible for their choices despite having very limited knowledge of the technical issues involved in innovations. The decisions made by the homeowners depend heavily on the advisor they choose. Occasionally, an advisor such as an architect takes over (part of) the decision process. In the case of minor renovation work, the homeowner will often make a decision based on the advice of the contractors or craftsmen hired to carry out the renovation. In case of thorough renovation work, we found that the homeowner may hire a turnkey supplier or general building contractor to help make the right decisions. In Norway, emerging opportunities were detected for project managers as they were working directly for homeowners. One action to support the supply side would be to install a course on the specific topic of the project management of integrated renovations.

- Implementing actors (implementation).

In order to make an energy renovation effective, it is important that solutions are implemented appropriately. Although many enterprises claim to have some experience with deep or integrated renovation, a survey carried out in the framework of this project showed that a large majority of individual craftsmen still need to be educated on the specifics of deep renovation. There is shortage of training courses on this subject. However, all the countries studied have course material available that can be developed further in order to obtain more expertise in this field.

- Quality-assurance actors (confirmation).

The limited knowledge of implementing actors and the issue of consumer trust led to the concern that thorough renovations were perceived to need some form of quality assurance. Energy performance guarantees, avoiding thermal bridges and achieving high airtightness are particularly important. In the partner countries, there is currently no general use of a specific quality assurance mechanism for integrated energy renovations. All countries rely on the applicable legal warranty period. To some extent, voluntary labels are available in various countries. For example, the Belgian Passive House Platform offers a passive house certificate for renovated housing.

3. Networking events define opportunities and barriers

Further research focused on exploring opportunities for collaboration between actors from different categories as explained above. A research strategy was developed for detecting supply chain collaboration opportunities for advanced housing renovation, while at the same time reflecting on how to build up customer relationships to increase demand of energy renovations. The goal was to detect business opportunities and barriers from collaboration exercises between different supply side actor categories, and potential clients. As part of the One Stop Shop project, a specific networking methodology was developed which involved clustering innovative players to detect novel business models and reduce the fragmentation of the renovation process for single-family houses. Two networking events were organized.

The first one, entitled "Business Zoo", was held in Antwerp, Belgium on 18 April 2012. The event was attended by 88 professional participants from various countries, involving actors from the whole construction chain as well as potential customers. Inspired by the Business Zoo event in Antwerp in April, the Norwegian researchers designed and tested a four and half hour event on 19th of June in Nordfjordeid, located in Western Norway. This networking event relied more heavily on the regional situation, on energy audits already executed for home renovations and on the experiences of one Norwegian 'One Stop Shop' company which offers energy audits, project management of renovation of single family houses and training programs for energy efficient renovation. We note that related to these experiences, various (adapted) regional events in Europe will be held in 2013-2015 in the framework of a follow-up project.

The Business Zoo event aimed to inspire actors regarding novel forms of collaboration in the renovation chain in order to realise integrated sustainable housing renovation, using elevator pitches and problem discussions in small groups, as well as actor collaboration sessions and business model generation exercises. The questions addressed during the problem discussions included various important issues such as how to make the cost of renovation fully transparent, how to speed up the renovation of large stocks of post-war housing with faster construction methods, how to adapt energy performance certificates – and redefine the role of energy performance advisors – for integrated renovations, and so on. In further collaborative and highly coordinated knowledge pooling sessions, the participants were grouped into the actor categories mentioned above, and were asked to find a solution on renovating a particular house. In this exercise, the homeowner was given a central role in enforcing strict and ambitious demands, so that the supply side actors were forced to think from the client's perspective. We used a predefined 'animal gathering' canvas to facilitate this process and animal pictograms – such as geese, crows, horses, tigers, beavers, hawk and gulls - to represent the characteristic feature of each category – respectively the client and informing, persuading, responsible, implementing, controlling and moderating actors. After one-to-one communication of the client with each actor category, the supplying actors were urged to take up the challenge of presenting a collaborative approach to convince the client. After this exercise, the previous case development was expanded to the volume market by developing new business models. Different groups developed specific integrated business models for deep and sustainable renovation, using a business model generation canvas (Osterwalder and Pigneur, 2010).

This "Business Zoo" methodology allowed various market players to identify collaboration opportunities and challenges with partners in their group. Furthermore, supply chain collaboration opportunities were explored between various renovation market players, such as architects, contractors, project managers, suppliers, do-it-yourself stores, owners, financiers, non-profit organisations, city councils and communities. During the event, we detected that substantial innovation is still needed on the supply side, especially regarding collaboration between different craftsmen and experts. Suppliers such as contractors currently rarely offer integrated and/or sustainable renovation as a service or product. For realizing integrated renovation, usually collaboration was found with an actor who had previously shown experience in reference projects.

An important identified challenge was to unburden the client. In the growing market for deep renovation, homeowners can no longer be expected to coordinate the whole renovation process; to find all the information concerning deep renovation solutions and examples; to contact, contract and coordinate a range of individual craftsmen; to ensure quality while keeping costs and energy performance under control; and all the while managing the administrative burden and the uncertainty over financing the whole project. In order to prepare for a growing market, companies must be aware that the homeowners expect one single point of contact to take responsibility, act as project manager, and ensure quality and efficient, rapid execution.

The second event in Norway identified further opportunities and barriers when involving homeowners. Without the knowledge generated by a project management service company during a home-visit, the homeowner will probably not be able to discuss different solutions and describe his/her needs. Homeowners appeared to become more interested to increase their budgets as they learned more about specific issues such as energy performance and ventilation issues. In this event, one of the two homeowners was from the beginning interested in having a single contact point for managing the project, while the other meant initially that he could do the project management by himself. But as he realized the complexity he became more interested in hiring project management services. As local actors were hesitating to take on the whole responsibility, the One Stop Shop company was the most important actor in this process, since this enterprise could identify appropriate services and exchange experiences for optimal collaboration.

4. Guidelines for developing One Stop Shop business models

Next to these exercises in networking events, we established cooperation with pilot companies developing different types of business models. These models involve stakeholders from various levels in the value chain. The established supply chain collaboration mirrors the companies involved as well as the company in charge of the business. As such, different kinds of approaches to the One Stop Shop idea were documented in various countries: a “project management service” approach (Norway), a “consultant” approach (Belgium), an “energy service” approach (Denmark) and a “retail” approach (Finland). These cases were used to reflect and compose more general guidelines for developing One Stop Shop business models. These guidelines are now available (see: One Stop Shop, 2012). The guidelines define three consecutive steps to develop One Stop Shop pilot models.

4.1 First step – preparation for collaboration

First, a broad understanding of the competition arena in which the business model is to operate is needed. A combination of a PEST analysis and the Six Forces Model was found to be a good start. The PEST analysis is a tool for defining the most important Political, Economic, Social and Technological issues which influence the environment and framework for the business. The Six Forces Model is a market opportunities and threats analysis model, as an extension to Porter’s five forces model (Porter, 1980). Using game theory, Brandenburger and Nalebuff (1996) added the concept of complementors (also called “the

sixth force"), helping to explain the reasoning behind strategic alliances. The Six Forces model thus describes the actors playing in the competitive arena; customers, suppliers, competitors, potential new competitors, substitutes and complementary businesses. Complementary companies often turns out to be important collaboration partners or actors which somehow influence the market, e.g. banks giving lower mortgage interest to energy efficient renovation or enterprise networks dedicated to promoting highly energy-efficient housing. The PEST model and the Six Forces model then form the information basis for the SWOT analysis. The SWOT analysis describes a summary of the future business model's internal Strengths, Weaknesses, and external Opportunities and Threats, and forms the information foundation from which the business model is developing.

4.2 Second step – business canvas model

Based on this analysis, the company in charge of the future business collaboration is recommended to draw up a business model for the activity using A. Osterwalder & Y. Pigneur's (2010) "Business Model Canvas", consisting of nine analysis blocks which are defined in the following order: customer segment, value proposition, channels (communication, distribution and sales), customer relationship, revenue stream, key activities, key resources, key partners, and cost structure. These nine perspectives are used to discuss a full service or One Stop Shop concept for energy-efficient single-family home renovation.

4.3 Third step – strategic focus and implementation

In the final part of the guidelines special attention is given to clarifying important issues related to implementation of a One Stop Shop business model for the renovation of single-family homes.

Making strategic choices also includes being clear on what you are not going to do. A detected pitfall for companies is that they can make too many compromises in order to keep up good relations with various types of customers and supply chain collaboration partners. In order to implement the developed strategies a specific action plan is needed which defines progress planning, responsibilities of partners and needed resources (financial and human), as well as market segments.

It is very important that the various planners, project managers and craftsmen involved are updated on the subject of energy-efficient renovations and specifically on technical and collaboration issues crossing different skills. Therefore a plan for how to secure that the right competence is at right place and time must be defined. This includes also scheduling a training program for actors who need it.

We have experienced that there are some potential legal pitfalls when several actors are involved in renovating a private home. After buying a product or service, the consumer may return to the seller with complaints and claim replacement, repair or compensation. If a One Stop Shop responsible invoices the complete package it is this legal entity which also take on all responsibilities for all construction work and installations executed in the house. An

issue to be resolved beforehand is how to distribute the responsibilities among the involved actors. For example, the business model resulting from the second step in the guidelines for the company Bolig Enøk AS in Norway is illustrated in Table 1.

Table 1: Example of a business model development (Norway, Bolig Enøk AS)

Key partners	Key activities	Value proposition	Customer relationship	Customer segments
<ol style="list-style-type: none"> 1. Building product supplier (service provider) 2. Contractors 3. Local retail stores 4. Various partners with expertise in building physics and energy and heating. 	<ol style="list-style-type: none"> 1. Marketing 2. Building inspection and energy audit 3. Present report with recommendations and energy certificate 4. Project management <ol style="list-style-type: none"> 4.1 Help obtain approvals from local authorities 4.2 Tendering process 4.3 Regular contact with suppliers and homeowner 4.4 Quality assurance; both price levels and product/competence/service by sub suppliers 4.5 Assist in filing of applications for subventions 4.6 Inspection when renovation is completed 5. Execution of renovation (by hired contractors) 6. Service/after sales 	<ol style="list-style-type: none"> 1. Provide knowledge of holistic renovation including potential extension of the house. 2. Personal visits to the homeowner 3. On site analysis 4. Technical analysis with recommendations 5. Energy certificate 6. Project management 7. Offer holistic renovation service 	<ol style="list-style-type: none"> 1. Dedicated personal assistance. The Project Manager is the main (only) contact to the customer 	<ol style="list-style-type: none"> 1. Owners of single family houses from 60-80ies in selected areas. 2. Homeowners who have capacity to increase their mortgage loan
	Key resources <ol style="list-style-type: none"> 1. Two Project Managers 2. Administration and marketing personnel in the company 		Channels <ol style="list-style-type: none"> 1. Information in local newspaper 2. Information in House owner Associations magazine 3. Local community environment plans 4. Direct mail 5. Invitation to local information evenings 6. On site visit to the homeowner (ii-v) 7. Telephone (v) 	
Cost structure <ol style="list-style-type: none"> 1. Salaries to Project Managers counts for majority of the costs. Therefore effective use of their hours is the most critical factor for profitability. 2. Travel costs 3. Marketing costs 4. Administration and support costs 		Revenue stream <ol style="list-style-type: none"> 1. Analysis and Energy Certificate: NOK 6.900 incl. VAT 2. Renovation: NOK 100.000-3.000.000 NOK incl. VAT 		

Bolig Enøk discovered that the liability towards a consumer lasts longer to a private consumer than between companies. As a consequence they realised that they would be held responsible for defects for a longer time than the sub suppliers' responsibilities towards Bolig Enøk. As legislations differ from country to country, each business model has to check out the realities in such cases and make agreements with the involved actors how such issues should be dealt with.

The One Stop Shop should clarify beforehand how each of the involved partners will assure quality of their work during the process, and how quality is assured when connected partners interact. A system and functions for construction and installation quality assurance during and after completion of the renovation must be a part of the One Stop Shop. The guidelines address important questions dealing with the quality assurance.

Pleased customers can be a major source of recommendation towards other potential clients. Business developers should think about how to use such experiences and peer-to-peer communication for market development. The guidelines recommend to evaluate and guarantee customer satisfaction and positive client communication. Evaluations of all projects will give important input to improvements of the service and how to promote it. The aggregated knowledge will also result in changing for instance marketing strategies as the market develops. Also "after-services" should be offered to maintain contact with customers. These may be periodical supervision of installations and maintenance which also means potential additional sales for the One Stop Shop company.

By following the three parts from the guidelines (One Stop Shop, 2012), enterprises in any country should be able to develop a One Stop Shop in an efficient way.

5. Conclusion

According to our findings, companies engaging in single-family home renovation are challenged to find supply chain collaboration, to collect the right information and to reorganize the supply chain to propose integrated project management services. Clients are becoming more demanding nowadays and they need to be informed properly and be convinced to engage in integrated renovation. Companies should identify and use customer values and choose for the best solution in the specific market segment of single-family home renovation. In the single-family housing renovation market, it appears that market-proof solutions are needed when it comes to alleviating project management. Enterprises should be aware of the high importance of unburdening the homeowner, avoiding physical obstruction, offering quality assurance, and helping in obtaining energy-related information, energy labels and financing. The current fragmentation – separate enterprises each doing a fraction of a supposedly integrated renovation - is perceived as an important barrier to the advanced energy renovation of single-family housing. Our research has found that renovation processes need to be reformulated and better collaboration structures need to be developed to unburden the client.

Collaboration by different actor categories would support the market development that is needed. The five steps in innovation-decision processes (information, persuasion, decision,

implementation, confirmation) provided an interesting basis for exploring supply chain collaboration opportunities. We related different actor categories to the homeowners' innovation-decision phase in the partner countries (Belgium, Norway, Denmark, Finland) and identified a need to develop supply chain collaboration between these actors. A particular challenge is to develop project management services, and to identify strong responsible actors who can inform, coordinate and control many less integrated actors. Education of implementing actors plays an important role in this framework. Ideally, innovators would jump into this gap in the market and set themselves up as project coordinators who can support the homeowner throughout the decision-making process.

To fully exploit supply chain collaboration opportunities, the innovator activities should serve as input for a strategic reflection. A direct opportunity to make innovator activities visible was found in the development of networking events and business models. Events that help the customer in identifying their real needs can eliminate the barrier of the difficulty for the homeowner to find appropriate actors. They can also serve as step towards increasing demand for integrated services by homeowners to which the companies should answer with integrated solutions, amongst which the One Stop Shop approach is one of the possibilities.

The One Stop Shop project resulted amongst other in an important reference book that can help companies to tap the important business potential of highly energy-efficient home renovation. The guidelines show how companies can change their business towards a systemic offer of highly energy-efficient home renovation, hereby specifically reaching single-family home-owners. The guidelines are based on experiences from different pilots and different sections have been systematically ordered and deployed according to modern theory of business development.

6. Outlook

As a follow-up of the ERANET-Eracobuild project, a new project, entitled 'Cohereno' will start in May 2013. This project will be funded in the framework of the programme Intelligent Energy Europe and involves partners from various European countries (Austria, Belgium, Germany, the Netherlands, Norway). The objective of the Cohereno project is to strengthen collaboration of enterprises in innovative business schemes for realizing nearly zero-energy building (nZEB) renovations in single-family owner-occupied houses. The project focuses on eliminating barriers for collaboration, providing enterprises guidance on how to collaborate and how to develop services for the different market segments. In this way single experiences of demonstration projects will be transformed to series of renovations in a volume market.

Examples of single-family house renovations in five partner countries are used to identify experienced actors. Their role within the renovation chain is mapped in a comprehensive publicly available list. Successful collaboration structures in the partner countries are identified. These are further explored in relation to the use for various market segments. Success factors and recommendations to eliminate barriers are highlighted and a presentation template for collaboration models is developed. The project will also show how

quality assurance mechanisms can cost-effectively be integrated in the business models to improve customer confidence.

In order to counter the fragmentation of market players on the supply side and to encourage collaboration along the supply-chain in all the partner countries further Business Collaboration Events will be organized in various European countries, inspired by the One Stop Shop networking events. The events will pave the way for the concrete uptake of new business models and furthermore they will be a starting point for a long term nZEB renovation network beyond the Cohereno project. This network will be dedicated to the widespread offer of integrated, collaborative services for nZEB housing renovation across Europe, increasing both quantity and quality of single family housing renovations.

The major outputs of the project will be:

- A presentation in a comprehensive recognized publicly available list of nZEB single-family house renovations in Austria, Belgium, Germany, the Netherlands and Norway with an identification of experienced actors and a mapping of their role within the renovation value chain
- An overview of structures for successful collaboration between contractors and other actors that are involved in delivering nZEB single-family housing renovation in the partner countries which will include customer segments related to the business models, success factors and key barriers and solutions for business collaboration and an executive summary with success factors and key barriers and solutions for European Contractor Federations
- Detailed recommendations on how to implement quality assurance in the various business models, specifically aimed at increasing consumer confidence
- The organisation, promotion, implementation and documentation of the two national Business Collaboration Events in two different regions in Austria, Belgium, Germany, the Netherlands and Norway, and the compilation of high potential models for collaborative nZEB renovations of owner-occupied single-family houses in these countries.
- The enabling of motivated supply actors to launch holistic services of nZEB renovation of single family houses and the establishing of about 20-25 new business collaborative models. A report on business models as examples of deep energy retrofitting for single family houses.

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