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Experiences of consortia for scaling up nearly zero-energy renovations of single-family homes

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Keywords

innovation, renovation, collaboration, overcoming barriers, low-energy buildings, housing refurbishment, business models, one-stop-shop

Abstract

On average 64 % of the dwellings in Europe are owner-occupied. Although there is an enormous potential to reduce their energy use and hence CO₂ emissions, the current average renovation rate is just around 1,2 %. The development of one-stop-shops is expected to increase the market uptake of home renovation. Developing emerging frontrunner consortia of SMEs, this research looks into opportunities and barriers for stimulating business development to develop the supply of integrated nearly zero-energy building (nZEB) renovations of single-family homes.

Experiences were collected from frontrunner consortia that want to offer nZEB renovations to owners of single-family homes. Using a business model canvas approach, the main barriers and opportunities were compiled from business development meetings with 24 consortia from five countries. Furthermore, a year after finalizing this exercise, the researchers evaluated the outcomes of the business development.

Based on the findings from the emerging consortia, the research identified key issues that are important for business model development. For reaching early adoption of nZEB single-family home renovation, effort is still needed for developing collaboration of SMEs, for improving customer interfaces and for dealing with barriers that emerge after business model development. Consortia are advised to pay specific attention to the use of the business model canvas for structuring their ideas, to discuss the opportunities to jointly develop one-stop-

shops, and to seek collaboration with “independent” actors to reach out to larger groups of homeowners. Policy could support emerging consortia as the chances for successful market introduction are high.

Introduction

THE URGENCY OF NEARLY ZERO-ENERGY RENOVATIONS OF SINGLE-FAMILY HOMES

64.3 % of the dwellings in the EU – excluding Croatia and Finland – are owner-occupied (Eurostat, 2011). The European Union identified the need of reducing carbon emissions in residential sectors by 88–91 % in 2050 compared to 1990 levels, to transform the current economy into a competitive low carbon one (EU, 2011). Europe’s new buildings and major renovations will be required to reach the level of “nearly zero-energy” (EPBD, 2010). Also, the Energy Performance of Buildings Directive will be revised to require Member States to establish long-term national renovation strategies with clear milestones for 2030, previously under the Energy Efficiency Directive (EED, 2012).

European buildings account for approximately 40 % of energy use. Buildings have an estimated potential to reduce global greenhouse gas emissions by around 20–30 % (1,000–1,100 MtCO₂eq/yr) in the year 2020 (Pachauri and Reisinger, 2007). There is significant potential for cost-effective energy savings and CO₂-emission reductions in both new and existing buildings (McKinsey & Company, 2013).

The existing housing stock in Europe is predominantly of poor energy performance and consequently in need of renova-

tion work. In many of the EU Member States, about 45–60 % of the total number of dwellings was built during the post-war period without energy efficiency requirements for buildings, between 1946 and 1980 (Eurostat, 2011). Some countries like for example Belgium have an even older building stock with a large share of pre-war buildings (Hilderson et al., 2010). However, depending on the EU Member State, only 0.4–1.2 % of the stock is renovated each year (EC, 2016). It is unlikely that this 1.2 % is renovated to the highest standards of energy efficiency (BPIE, 2011; Tofield and Ingham, 2012).

Although more and more households implement single energy-saving measures and renewable energy systems, to remain competitive with future new-build houses, house renovations need to go beyond implementing single energy saving measures and integrate major renovations or deep retrofits (Haavik, Mlecnik and Rødsjø., 2012). There is currently a strategic market niche for renovating single-family homes towards ‘nearly zero-energy buildings’ (“nZEB”), with a large economic potential for frontrunners to gain a market share.

THE POTENTIAL OF COLLABORATION

The delivery of nZEB renovations of single-family homes is constrained by various market barriers (One Stop Shop, 2012; SuccessFamilies, 2012, COHERENO, 2015). Amongst these, the supply side for nZEB renovation of owner-occupied single-family houses in Europe is too fragmented, leaving the owner of a single-family home with a lot of burden to manage different actors for a renovation. Also, a lot of homeowners do not opt for nZEB renovations because of the long renovation period while they possibly have to live in their home. There is also a lack of knowledge of contractors to provide more efficient construction processes, quality assurance and better communication with home-owners. For example a study of what Norwegian house owners think about energy renovation (Risholt and Berker, 2013) showed that lack of knowledge of contractors is a barrier to reducing energy consumption. A survey among homeowners conducted as part of the COHERENO project (2015) showed that customer trust is a major issue for choosing the right supplier.

One way of significantly reducing these obstacles and encouraging renovation of the building stock would be to support the house owners in the decision-making process by making this process more structured and holistic (Galiotto et al. 2016). The idea behind a one-stop-shop service is to focus on assisting the house owner in the process by looking at many different aspects of renovation, not only energy, so as to encourage the house owner to choose the optimal renovation for the particular house (Grøn Børneboe, et al., 2017). Vanhoutteghem et al. (2011) describe such a full-service renovation concept that includes all aspects of the renovation process: initial evaluation, thorough analysis, proposal of package solutions, execution coordinated by a dedicated project manager, and also focusing on quality assurance and continued commissioning of the house.

On the other hand, Risholt and Berker (2013) discussed the importance of craftsmen for realising good project management. Collaboration is key for SMEs sharing knowledge and resources for achieving highly energy-efficient renovations (Mlecnik, 2013). Better collaboration of service providers and contractors therefore sounds like a promising way forward to encourage renovation of dwellings. But the highly fragmented

markets, the cumbersome organizational models adopted by big enterprises on the one hand and the lack of knowledge and skills of Small and Medium Enterprises (SMEs), the perpetual variability of supporting schemes, and the plethora of regulatory frameworks represent huge barriers in leveraging new ways to collaborate (Disconzi and Lorenzoni, 2017).

Particularly the renovation market of single-family homes is dominated by craftsmen that usually offer single renovation measures. This usually has the consequence that the homeowner takes up the role of a project manager while often having only limited energy and project management competencies and knowledge. Various researchers (Haavik et al., 2012; Mlecnik et al., 2012) suggested that supply side activation should aim for streamlined project management where responsibilities of actors are clearly defined, and actors collaborate to reduce fragmentation and to offer one single contact point for the homeowner. Implementing one-stop-shop business models for energy renovation of single-family houses, where a single actor can offer full-service packages including consulting, independent energy audit, renovation, follow-up independent quality control and commissioning, and financing, may help overcome some of the hindrances (Mahapatra et al., 2013). Key customer values in such business models are for example the lower burden for the client and the possible offer of quality assurance or energy performance agreements (One Stop Shop, 2012; SuccessFamilies, 2012, Mlecnik et al., 2013, Mahapatra et al., 2013, van Holm et al., 2016). However, the involvement of one single contact person does not always work out as planned (Grøn Børneboe et al, 2017). This suggests that there is a need to advance the ideas about possible business models for one-stop-shop renovations.

RESEARCH ISSUE

Research into sustainability of buildings should be underpinned by innovation in business models (Aho, 2013). However, business model research in the building and construction disciplines is still in its embryonic stage (Abuzeinab and Arif, 2014). Business models can serve as pivotal catalysts for the diffusion of innovations by overcoming both internal and external barriers (Boons and Lüdeke-Freund, 2013). Networks of collaborating actors are known to be an important factor in the introduction and diffusion of new technological solutions (Porter, 1998). Benefits generated by collaborative networks (CNs) impact the entire lifetime of an enterprise and empirical studies have confirmed that collaborating firms are more innovative than non-collaborating ones (OECD, 2001). Using the results of the COHERENO (2016) project, this paper tries to better understand the (need for) various possible business models for collaborating firms – further called “consortia” – for realising nZEB renovations of single-family homes. The COHERENO (2016) project triggered various consortia of SMEs in Austria, Belgium, Germany, the Netherlands and Norway offering solutions towards integrated nZEB home renovations of single-family homes. The overall objective of the COHERENO project is to strengthen collaboration of enterprises in innovative business schemes for realizing nZEB renovations. In order to support this, project partners in the participating countries have assisted local groups of complementary companies, e.g. architectural offices, energy consultants, contractors, tradesmen and hardware stores, in initiating and developing

innovative business schemes towards viable business plans ready for implementation. The project specifically looked into the challenges and opportunities for collaboration and business development of SMEs that want to offer integrated nZEB renovations to individual households.

RESEARCH METHODOLOGY

Previous research has explored the concept of the business model as a framework for analysing and operationalising sustainable innovations in general (Boons and Lüdeke-Freund, 2013). Only a few researchers adopted this approach for analysing energy renovations of single-family homes, such as Haavik et al. (2012), Mahapatra et al. (2013), Mlecnik and Straub (2014) and Grøn Bjørneboe et al. (2017). Regarding the challenges of convincing homeowners to adopt more than single renovation measures, a business model perspective can give new insights on how businesses position their customer value proposition. The business model concept is a suitable tool to examine the logic behind economic value creation and guides construction companies to become sustainable and more competitive (Osterwalder, 2004; Teece, 2010). The various business models that were explored in the COHERENO project are therefore analysed using the business management tool (business model canvas) developed by Osterwalder & Pigneur (2010).

The COHERENO partners investigated and guided 4 to 5 consortia per partner country. Those consortia aimed to target the relatively unexplored market of integrated nZEB home renovation and can therefore be considered as frontrunners in their countries. The aim of this paper is to learn from their experiences as innovators, without going into deep analysis of the construction sector in each country or the (legal or competitive) position of innovators and networks. The work does not aim to compare with traditional working methods, but to give a better understanding of new possible ways of collaboration to reach out to the nZEB renovation market for single-family homes. By exploring the experiences of frontrunners using the business model approach, the paper merely aims to bring insights regarding the possible variety of market approaches, and about the barriers frontrunner consortia encounter.

The experiences of 24 active consortia in Austria (5), Belgium (5), Netherlands (5), Norway (5) and Germany (4) are explored, using input from partners in these countries (Austria: ÖGUT; Belgium: PHP/ VITO; Netherlands: TU Delft; Norway: SINTEF/Segel; Germany: dena) that guided the consortia for their business development from initial idea to action plan. The paper analyses the developed business models of the 24 consortia from the COHERENO project using the approach described by Haavik et al. (2010) in the “Guidelines How to develop a business model for One Stop Shop house renovations”. To map important issues which indirectly influence the business models the consortia used the PEST analysis (Political, Economic, Social and Technological factors). To identify important factors directly influencing the competitive arena, the 6-Forces model was used, which addresses issues related to suppliers, competitors, potential competitors, substitutes, complementary businesses and the customers. Results from these analyses for the individual consortia were brought together and categorised into an overall SWOT-analysis which shows the identified Strengths,

Weaknesses, Opportunities and Threats. The so developed status analysis maps the barriers the consortia faced, addressing various information sources and views of collaborating actors on the market prospects and contexts. The Osterwalder and Pigneur “business model canvas” was then outlined for each consortium, to understand how a full-service or one-stop-shop concept for energy-efficient renovation can be reached. Based on this information each consortium would draw up a specific action plan, which defined a time planning, responsibilities and the necessary financial and human resources.

The individual business models are property of the consortia and will not be discussed in detail in this paper. This paper compiles the results of the 24 business consortia, particularly to understand how they worked with the “business model canvas”, this means identifying barriers and opportunities that they did or did not deal with during business model development. Furthermore, a year after finalizing this exercise, the researchers interviewed the main business model owners to learn from the outcomes of the business development.

Research results: challenges and opportunities for collaboration

COMPOSITION OF CONSORTIA THAT WANT TO OFFER NZEB SINGLE-FAMILY HOME RENOVATIONS

The composition of the 24 consortia is illustrated in Figure 1. Figure 1 shows that a variety of actors in the fields of informing, consulting, contracting, executing and quality assuring want to – and can – work together to develop a business model for nZEB single-family home renovation.

STRENGTHS, WEAKNESSES, OPPORTUNITIES AND THREATS OF CONSORTIA THAT WANT TO OFFER NZEB SINGLE-FAMILY HOME RENOVATIONS

For each of the consortia the main conclusions of the status analysis were gathered in a summarized SWOT-analysis (Strengths, Weaknesses, Opportunities and Threats). Tables 1 and 2 present the identified SWOT factors that were present in more than half of the consortia.

CHALLENGES AND OPPORTUNITIES EXPERIENCED DURING BUSINESS MODEL DEVELOPMENT

The business models are discussed following the business model building blocks developed by Osterwalder et al. (2005). The consortia discussed and concluded on questions asked for each of the nine ‘building blocks’ of the canvas with particular focus on how to reach out to customers with good value propositions. Figure 2 illustrates the nine building blocks of the business model canvas. We will further discuss the meaning and the compiled input from the consortia for each building block.

Customer segments

The ‘customer segments’ building block describes the segment of customers the consortium wants to offer value to. Almost all consortia defined the customer segment as homeowners with an above average income. This is based on their market understanding that a nZEB renovation requires a high upfront investment, which lower-income groups often cannot reach

Country	Consortia	Group Type	Expertise																							
			Architect	Building Planner/consultant	Garden designer	Energy Advisor	Engineer	Project coordinator	Safety coordinator	General contractor	Construction company	Insulation company	Technical contractor	Electrician	Plumber	Ventilation company	Installer	Heating company	Painter	Utility company	Bank	Supplier	Non-profit organization	Neighbourhood Residents' Initiative	Government	Municipality
Norway	Group 1, Lofoten	C								X																
	Group 2, Trondheim	C	X							X						X	X	X								
	Group 3, Trondheim	C		X						X										X						
	Group 4, Drammen	E		X		X				X		X				X	X									
	Group 5, Hønefoss	E				X				X						X	X									
Belgium	Group 1, Mechelen	A	X							X	X		X				X									
	Group 2, Kortrijk	L	X			X						X					X								X	
	Group 3, Houthalen	L																				X				
	Group 4, Puurs	E	X		X	X		X	X																	
	Group 5, Hamont	C								X	X															
Austria	Group 1, Upper Austria and Tyrol	A+	X	X		X																				
	Group 2, Lower Austria and Burgenland	E				X				X	X	X				X					X					
	Group 3, Baden, Vienna, Burgenland	E	X			X															X					
	Group 4, Vienna and Lower Austria	A	X																							
	Group 5, Styria	C		X						X																
The Netherlands	Group 1, Take Five	E				X							X				X	X								
	Group 2, Haarlem	A+	X	X		X	X	X		X	X	X	X	X	X	X	X	X	X					X		
	Group 3, Alliantie+	A	X	X						X											X					
	Group 4, ACE	E		X		X						X								X						
	Group 5, National Platform	L	X	X															X					X	X	
Germany	Group 1, Hamburg	A+	X	X	X	X				X	X			X	X		X		X							
	Group 2, Kassel	L	X	X		X	X	X																	X	
	Group 3, Kassel	C					X			X	X			X	X				X							
	Group 4, Ingolstadt	E	X	X	X	X						X								X						

Group type	Lead actor of the consortium	Number of consortia of this type
A	Architect	3
A+	Architect and energy advisor	3
C	Craftsmen /contractors	6
E	Energy advisor	8
L	(Local) authority and/or non profit organisation	4

Figure 1. Composition of consortia that want to offer nZEB single-family home renovations, sources from the COHERENO project.

Table 1. Strengths and weaknesses perceived by consortia that want to offer nZEB single-family home renovations.

Strengths	Weaknesses
<ol style="list-style-type: none"> Strong commitment <ul style="list-style-type: none"> – good teams with motivated employees Professional reliable expertise <ul style="list-style-type: none"> – good reputation – experience in sales and aftersales – good knowledge about local market – good knowledge about purchase decisions and renovation process – react quickly to customer request, flexible – good routines for internal training Quality <ul style="list-style-type: none"> – flexible, technological solutions – architectural design as added value – updated solutions – complementary services with excellent quality Authenticity <ul style="list-style-type: none"> – historic & sustainable values taken into account Companies involved are frontrunners and more open to change One stop shop with one main contact 	<ol style="list-style-type: none"> New in the market <ul style="list-style-type: none"> – lack of experience in managing a consortium – no defined strategy – not all necessary partners are involved yet – no clear reputation yet – lack of experience in marketing a new concept and managing the sales and aftersales – need of routines for training this concept – no exclusivity for consortium – limited competence on upgrading Unclear definition of the product/service Too expensive <ul style="list-style-type: none"> – cost and availability of materials – time consuming/labour intensive – customers unwilling to pay much for advice Lack of guarantee on energy performance Limited financial strength to invest in start-up Danger of overselling, i.e. clients perceive as they are advised to invest more than necessary. Lack of visibility to potential customers <ul style="list-style-type: none"> – no shop/front office

and which the consortium cannot facilitate easily. A majority of the consortia classified their most promising customer segments as young families moving to a larger home. Only a few consortia specifically wanted to target older homeowners, for example “empty-nesters”. About half of the consortia looked at types of houses according to age. Clearly the energy efficiency measures, the insulation performance and available HVAC-systems of dwelling strongly relates to the individual building’s

construction year. This typically led to pointing out the houses constructed before 1980, but with some country differences as the age of the local building stock varies. Consortia that had studied statistics over the local building stock, selected a certain period, as for example 1960–1980’s, in order to specialize and develop solutions for specific building typologies, to aim at mass production. Most consortia defined a geographical limitation of their market; typically a radius of 50 km.

Table 2. Opportunities and threats perceived by consortia aiming to offer nZEB single-family home renovations.

Opportunities	Threats
<ol style="list-style-type: none"> 1. Increased focus on the environment <ul style="list-style-type: none"> – increased knowledge – higher legal requirements 2. Possible energy savings 3. Technological development and the price development of technology 4. Increased value of homes after upgrading <ul style="list-style-type: none"> – lower insurance fee on upgraded homes 5. Market segments with potential <ul style="list-style-type: none"> – younger generations taking over older homes, particularly houses built between 1960–1985 – high income level amongst owners – many ageing houses in need of upgrading – local upgrading programs – public grants 6. Increased demand for high efficient houses 7. Strong focus on upgrading and good design 8. Limited fossil fuels resources and increasing prices 	<ol style="list-style-type: none"> 1. Little knowledge about passive houses and nZEB renovations in the business and amongst owners. 2. Competition <ul style="list-style-type: none"> – eastern European companies offering simple and cheap solutions by unregistered invoicing – DIY-trend, homeowners find quick fixes online – market is awaiting, more competition to come – new building concepts – new construction or demolishing 3. Strong focus on interior (what is visible) <ul style="list-style-type: none"> – architects lack interest in energy upgrading 4. Too much documenting for achieving public grants 5. Low energy prices <ul style="list-style-type: none"> – currently same price for self-generated and delivered energy (the Netherlands) 6. On average small budgets for renovation <ul style="list-style-type: none"> – rising house prices leave less funds for upgrading 7. Lack of specialisation with contractors

Value propositions

The ‘value propositions’ building block gives an overall view of the consortium’s bundle of products and services. All consortia acknowledged that there has to be a specific reason for initiating the idea of an nZEB renovation, next to individual energy measures, such as the house needing a facelift, or a change in life situation with e.g. a need for more space or better accessibility.

All consortia defined good project management, preferably with one main contact point (one-stop-shop approach), as a key value proposition to address the homeowner, as well as a good quality end result. All consortia also emphasized the need for delivering an initial analysis or energy audit to secure a good foundation for the decision-making process. Some consortia included (assistance in) financing the renovation, typically focusing on unburdening the homeowner for applying for grants and subsidies. All consortia included responses to the “soft needs” of renovation, such as: providing better indoor comfort and a contribution to climate change mitigation, and a better home security. Some consortia used reference customers to confirm credibility for new ones.

Other value propositions listed by the consortia are: improved aesthetics and functions; increased value of the house; tidy construction site; a maintenance-free home for many years; lower operating costs and documentation of the upgrading.

One of the most crucial discussion points in all consortia was how to include “independent advice” into the value proposition. Most consortia identified the need for “independent” advice towards the homeowner.

Customer channels

The ‘customer channels’ building block describes the various means of the consortium to get in touch with the selected customer segments to bring them the offered customer values. The channels to reach the customers were quite similar for all consortia, including: social media, press coverage, the use of demo projects and customer as ambassadors for renovations, advertising and information folders, and collaborating with specific networks.

Some consortia used particular channels related to the activities of members in the consortium, for example information events and participation in exhibitions at fairs or in a local hardware store.

Customer relationships

‘Customer relationships’ explains the kind of links the consortium establishes between itself and the different customer segments. All consortia aimed to deliver (at least) what the customer expects from them, and a fluent process, by providing good communication and personal follow up by one single contact person easy to reach.

Most consortia use known brands and references for generating customer confidence. Some consortia additionally offered after sales guarantees, service and control. Some consortia expected to generate customer confidence by making the homeowner so proud that they would act as an ambassador, by providing open book calculations and transparent continuous communication with the homeowner.

Revenue streams

‘Revenue streams’ describes the way a consortium makes money through a variety of revenue flows. Most consortia had difficulties for defining the revenue streams of the consortium and its members. This also indicates a limitation of the use of the business model canvas as an explorative tool for business model development for consortia.

Particularly it was difficult to achieve agreements between informing/consulting actors and the constructing/installing actors on how to distribute revenue streams. Consortia differed slightly in defining their pricing schemes, for example offering a fixed or conditional price or a “menu” price list, sometimes combined with a possibility to divide the financing into a breakdown in more than one year, thus leading to an offer of a phased renovation process. In this way, the renovation can be adapted to the financial situation of the owner. Some consortia defined provisions from the participating contractors for (partially) financing the one-stop-shop service or project management.

Key resources

‘Key resources’ outlines the core competencies necessary to implement the consortium’s business model. The obvious key resources are the energy advisor/architect, the project manager (either the architect or typically the main contractor), motivated and skilled craftsmen, materials, tools and equipment. However, Figure 1 also shows other possible key partners. In addition, most consortia point to the importance of good agreements and understanding, particularly a good contract between the partners, the need for a quality system and an internal communication platform for managing overall quality, and the need for tools that calculate and visualize what the customer gets.

Some of the consortia added a physical shop or contact point or a logistics system as resource, or specific actors such a sales manager or supplier. One-stop-shop collaborations have put a strong emphasis on transparency, for example open book calculation.

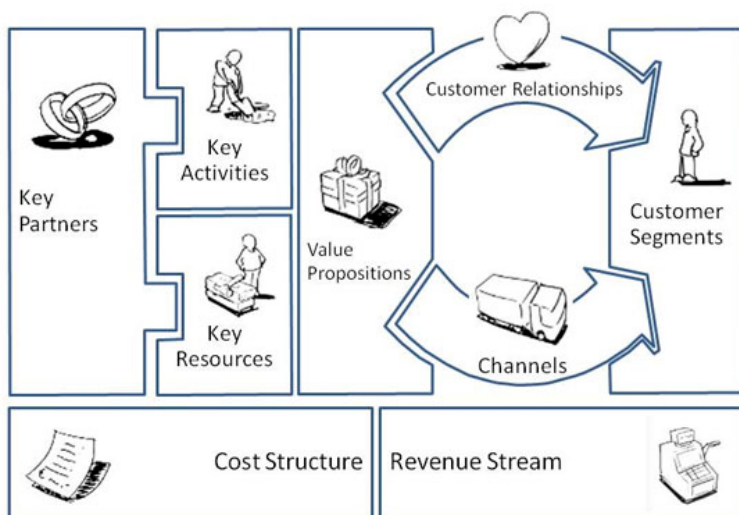
A majority of the consortia had some difficulties to understand the impact of independent advice on their needed key

resources and competencies. A few consortia therefore finally abandoned the idea of an integrated one stop shop, splitting their consortium into an informing/consulting group and a contracting/installing group that closely works together.

Key activities

‘Key activities’ describes the arrangement of activities and resources to manage the consortium’s business model. Related to the defined customer value “independent advice”, a majority of the consortia saw the need for energy audits and advice, design and planning of solutions as a key service. Consortia in countries where public bodies offer grants to homeowners for buying an energy audit were easily convinced to implement this service in their business model. For the implementation phase most consortia aimed to offer a total package and to sign one contract with the homeowner.

The key activities of consortia can differ according to who is leading the business model. For business models where contractors or architects are in the lead, this is illustrated for two business models in Table 3.



Source: <http://www.businessmodelgeneration.com/>

Figure 2. Business model canvas developed by Osterwalder & Pigneur (2010). Source: <http://www.businessmodelgeneration.com>.

Table 3. Differences in key activities for two explored consortia where a contractor or an architect are in the lead.

Example of lead actor of a consortium	Key activities for this consortium
Contractor	<ul style="list-style-type: none"> • Marketing/finding customers • Identifying the needs (energy audit) and advising on measures • Detailed planning and calculation (visualize values for the home owner) • Signing of contract • Construction/implementation, including project management and coordination • Quality assurance • Hand over • Invoicing and follow up, including one year service or service contract
Architect	<ul style="list-style-type: none"> • Use of consulting catalogue/ matrix • Identifying needs and design according to an integrated solution • Promptly calculating project costs • Individual composition of team for each project • Organise all collaborators in order to increase common understanding and motivation • Quality assurance during the process and follow up

Key partners

'Key partners' form cooperative agreements with the consortium. The consortia defined key partners, not presented in the consortium structure, based on what expertise was missing in their offer or what activities could be complimentary. Four categories of key partners were defined by a majority of the consortia: (1) Partners that provide renovation services (product and material suppliers, subcontractors for missing disciplines); (2) Partners that can effectively reach possible clients (networks, local non-profit organisations aimed at sustainability, home-owner associations, hardware stores); (3) Local/regional/national governments for implementing legislations as well as providing subsidies (municipalities or provinces, energy agencies/organisations offering subsidies); and (4) Financial support (banks and public authorities offering specific loans for energy efficiency measures).

Cost structures

Finally, the 'Cost structures' building block sums up the monetary consequences of the means employed by the consortium. Consortia dominated by contractors have defined mainly the same key elements of their cost structure: salaries for key persons and craftsmen, tools/equipment and material costs. Some consortia also included marketing and exhibition costs; a web site; costs for the development of the concept; rents, financing and insurance costs; or costs related to warranties and claims. Some consortia foresee as a cost an award fee for the advisor who brought in the customer.

LESSONS FROM THE BUSINESS MODEL DEVELOPMENT EXPERIENCES

Country differences

There are many similarities between the various developed business model canvases. Some of the observed country differences are described here. For example, in Belgium the involvement of an architect is always needed because of the protected position of the architect: every major renovation has to be filed by an architect. In contrast, Norwegian architects do not play such a strong role in retrofitting projects, which explains why all Norwegian consortium models are dominated by contractors, while in the other studied countries a more mixed picture is seen. In Germany an example of how public actors take initiative to form regional models for promoting more nZEB renovations was observed. Other differences in business model canvases may be due to the respective networks of the collaborating actors. Generally, larger consortia had more difficulties to develop a joint business model. Smaller consortia, as well as actors that already knew each other, came to a common understanding more easily.

Focus on nZEB renovation approach is achievable

A common strength for all of the studied consortia is that there is a strong focus on offering an integrated approach with one main contact point. Many of the consortia also have a clear understanding of which customer segments to target. Most consortia lack some competencies/activities, but in order to be able to offer a complete package to the customer this was solved by introducing other collaborators or key partners. However, the results also show that overall only a few consortia implemented the full one-stop-shop business model for energy renovation of single-family houses, where a single actor can offer full-service packages including consulting, in-

dependent energy audit, renovation, follow-up independent quality control and commissioning, and financing – either with or without branding it as a one-stop-shop. Most consortia consider independent advice as important, but this may conflict with the business idea to be a complete one-stop-shop including consultancy.

Enterprises are still searching the right customer interface

The results also show that most companies did not actively reflect on their customer interface before the exercise of building a joint business model. Some consortia had difficulties for defining a targeted approach to achieve good customer relationships. For example, the idea of providing quality assurance to homeowners was new to many enterprises. Many enterprises already struggled to attract customers with their usual channels or defined a long list of channels without insights about the effectiveness of these channels.

The business model canvas is mainly useful to explore the customer interface

Methodologically, this research also gave some insights regarding the usefulness of the business model canvas for market development with collaborating actors. As the business model canvas was developed for individual businesses, its use for exploring the business model of consortia was found to be experimental and mainly useful to define the customer interface. The processes showed that some of the studied consortia struggled with using this tool for consortium formation purposes. A conflict arises as the canvas can also be regarded from the perspective of the consortium serving other companies as clients, or as a model for the individual businesses serving home-owners. The important methodological issue to clarify is to decide who will be the owner of the business model. If the group agrees that one of the companies should be the single contact point to invoice the client, the business model development should be made from this perspective. In the cases where this is not obvious, the perspective would be to develop a consortium (as for a corporate business). Particularly the definition of an action plan required gathering more information on possible revenues and costs and on legal consequences when collaborating formally or informally.

Perceived barriers and opportunities after developing a business model

After developing their joint business model, many of the consortia still experienced difficulties to sell their offer to the homeowners, but this also pushed them to take additional actions. In Table 4 an overview is provided on how the consortia perceived and solved additional barriers.

There is a tension between being given an independent energy advice and paying for it. COHERENO consortia offer no clear guidance for this, but usually a first piece of advice is for free and paid for by the projects obtained or by the collaborating actors. Also, the coordinator needs to be paid for and homeowners find it difficult to perceive the added value of project management and quality assurance.

Consortia see benefits working together with unusual suspects as key partners

Some consortia actively searched for partnering with local communities, municipalities, regional energy agencies or scientific actors particularly for organizing information events,

Table 4. Barriers and possible solutions perceived by consortia who already developed a business model for providing nZEB renovations of single-family homes (as experienced by 24 COHERENO consortia).

Perceived barriers	Possible solutions
Reaching out to larger groups of homeowners	Information events in local communities and municipalities
Creating market momentum	Establish local networks/ introduce grants
Need for special solutions to convince homeowners	Advanced renovation potential analysis
Insufficient budget to complete the business model	Innovation funding
Lack of time to develop consortium	Hire new employees (innovation funding)
Conflicting interests of collaborators	Form new consortium structure
Focus remains on single measures	Collaborate with external actors offering integrated solutions
Lack of information about homeowners needs	Poll homeowners in target districts
Lack of regional embedding of the offer	Collaborate with energy agencies and municipalities
Lack of technical proof of concept	Develop demonstration and testing
Lack of interest from policy makers	Start networks based on policy plans

door-to-door approaches for finding customers or for establishing regional networks. Some consortia also actively worked together with utility companies (for reaching out to homeowners), banks (of offering financing) or hardware stores (for attracting customers via a shop-in-shop concept).

Guiding consortia with business model development leads to market uptake

Almost all of the studied consortia had internal follow up meetings and developed their business model further introducing first showcases and follow-up renovation projects. Some companies had difficulties to set up joint projects or experienced insufficient merging of interests to continue consortium formation. In these cases, the companies would still continue developing their idea individually.

Key issues for further market development

Most of the studied consortia confirmed that the guidance provided by the COHERENO project led to business development, but this guidance is now no longer provided. Based on the experiences from the COHERENO consortia, and their interactions with stakeholder groups, various key issues can be identified for further development, such as alliance formation of homeowners, introducing quality assurance related to energy performance (including certified energy audits, and for example energy-saving monitoring and performance guarantees), developing the customer journey based on client wishes, and collaborating with municipalities for alliance formation. All of the studied consortia confirmed the need for a real demonstration project to start their marketing. The collaborating actors are aware that a successful example requires priority for scheduling their activities. The test case allows defining if the needs and values of the customer segment are well addressed.

Conclusions

Despite the urgency of the matter, the market of nZEB renovations of single-family homes is still emerging. One possible way forward is to stimulate innovative market actors to work together to offer integrated renovation solutions. However,

these actors might have difficulties to understand each other's perspective and to translate their ideas into a common strategy. A business model translates a strategy into a logical framework for value creation (Osterwalder, 2004), and can therefore be used to guide emerging consortia in their business model development.

The paper demonstrates that a variety of consortia can be stimulated for the market development of nZEB renovation of single-family homes when offering guidance for business model development. In such consortia also actors such as financial agents, hardware stores, municipalities, and so on, can play a role. The nZEB goal can be achieved either in one shot or in a step-by-step manner, which can lead to different business models. Many of the collaborating networks can be considered frontrunners, particularly when they embrace the novel one-stop-shop idea in their business model. Through development of business models using the business model canvas service providers can define incentives for long-term integrated services, enable and empower the collaborating actors to achieve a long-term goal, and initiate views on how to achieve short-term returns and solve remaining barriers.

In the COHERENO project the business model canvas of Osterwalder & Pigneur (2010) was introduced as a method to stimulate the development of consortia, involving existing businesses, especially SMEs, that aim to collaborate to offer integrated renovation services to individual households. This introduction was successful and led to business development by 24 consortia, and their experiences are now used to help other consortia with their start-up. There is a strong variety of how business models can be constituted in terms of participating actors. Some are dominated by contractors, others by consulting actors, for example architects, and even some by initiatives from local and regional authorities.

Based on the learnings from the emerging consortia, the following issues important for business model development can be identified. It is key to have a clear idea of the target group and to provide one contact point and sender of invoices. An integrated perspective has to be embedded, checking ideas from the market perspective, developing procedures to gain customer confidence, and making use of the own reputation,

networks and customer channels. Ideally the business model development process results in a strong joint commitment or involvement of other necessary key partners (to be able to reach a larger group of homeowners). It remains a challenge to determine a fair risk distribution between partners and to integrate independent advice in one-stop-shops. Companies that intend to forma consortium have to keep in mind that it takes time to build trust between partners and to find the right cost structure and that additional barriers may come forward after business model development. After the business model development, it is crucial to start as soon as possible with a first demonstration project for the consortium.

The market for nZEB renovation of single-family homes is still largely dominated by SME's with limited competencies and resources for networking and collaborative business development. The research presented here also shows that these enterprises often also lack knowledge of basic ideas of business models, particularly when it comes to defining the customer interface. The COHERENO project has now ended, and it can be recommended to continue the support of similar business model development initiatives. A recommendation is to research if such support can be implemented in national, regional or local energy or innovation policy as current policy initiatives are limited.

The carried-out research did not look into the development of consortia outside the scope of the involved countries. Also, the one-stop-shop development was carried out as a starting point for business development in this research. Conclusions may be different if other business objectives are targeted.

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