
Collaborative business modelling for systemic and sustainability innovations

René Rohrbeck*

Aarhus University, Business and Social Sciences, Department of
Business Administration, Bartholins Allé 10, 8000 Aarhus, Denmark.

E-mail: rrohr@asb.dk

Lars Konnertz

Technische Universität Berlin, Straße des 17. Juni 135, 10623 Berlin,
Germany.

E-mail: larskonnertz@gmx.de

Sebastian Knab

Universität Hamburg, Chair of Business Ethics and Management, Von-
Melle-Park 9, 20146 Hamburg, Germany.

E-mail: sebastian.knab@wiso.uni-hamburg.de

Abstract: Sustainability innovations are characterized by a systemic nature and require that multiple organizations act in an orchestrated fashion. To jointly identify opportunities and plan sustainability innovations, new methods and approaches are needed. In this article we describe a case study where 8 firms have collaborated to envision and create new business models in the energy industry. After describing this collaborative business modelling (CBM) approach, we discuss its strengths and limitations and compare it to two alternative methods of strategy and innovation planning: scenario technique and roadmapping. We find that CBM creates a powerful platform for (1) jointly identifying economic and societal value, (2) defining value creation/value capture systems, and (3) planning of complex and uncertain future markets.

Keywords: New market creation, collaborative innovation, business model, sustainability innovations, systemic innovations, collaborative business modelling.

This paper is a revised and expanded version of a paper entitled “How Collaborative Business Modelling Can Be Used to Jointly Explore Sustainability Innovations” presented at ISPIM Annual Conference, 2011, Hamburg, Germany

Introduction

The need to move towards a more sustainable future is perceived by many as both critical and imminent (Ulhoi & Madsen, 2009; United Nations Secretary-General's high-level panel on global sustainability, 2012). Increasingly the need to become more sustainable is also entering corporate board-room agendas and an increasing number of firms are reporting that investing in sustainability measures pays off (MIT Sloan Management Review & The Boston Consulting Group, 2012). However sustainability innovations often consist of incremental enhancements within one organization, rather than more radical innovations that create new markets and solve grand societal challenges (de Boer & van Bergen, 2012).

The failure of economic agents (governments, non-governmental organizations, and firms) to produce such radical innovations has been attributed to different factors. One reason is that there is no expectation of a positive impact on their competitive advantage, and therefore firms do not respond to the increasing stakeholder pressure (Garces-Ayerbe, Rivera-Torres, & Murillo-Luna, 2012). This issue might improve over time as more and more firms report on value creation through the implementation of sustainability measures and eventually also through a change of mindset as Porter and Kramer argue in their conceptual article (Kanter, 2011; Porter & Kramer, 2011).

Another reason is the complexity and uncertainty of creating a new economic system, which is needed in many radical sustainability innovations. In that respect Johnson and Suskewicz (2009) note that:

Conventional approaches to renewable energy are falling short. The key is to shift focus from developing individual technologies to creating whole new systems.

A third reason is the lack of confidence in the individual economic agents as to their ability to get access to the specialized assets from other actors, that they need to commercialize the innovation (Pinkse & Kolk, 2010). Thus, the more prudent strategy is not to invest in the sustainable innovation opportunity.

In this article we present and discuss an approach where multiple firms have worked together to identify, describe and evaluate business models in the field of smart energy, i.e. in integrated and partly automated management of the supply side, the demand side and the transportation of energy (Knab, Strunz, & Lehmann, 2010).

The challenge to create sustainability innovations

Sustainability innovation

We define sustainability innovations as...

...inventions in technology, process or market that simultaneously create economic and societal value. Societal value can be differentiated in protecting the environment, ensuring economic growth and advancing social well-being.

The complexity of sustainability innovations might in some cases be low, when for example a new invention allows a firm to provide a child-care scheme to its employees. Here, only two economic agents would be involved: (1) the firm and (2) the part of the employees, who are parents. The innovation might raise the productivity of the parents, create economic value for the firm and enhance the education and well-being of the children, thus creating societal value. Such a service might be engineered and funded by the firm and supplied for free. In such a case, the overall uncertainty attached to the innovation is limited to the technical feasibility and thus perhaps so low that the firm can take the risk alone.

Other sustainability innovations in the past, such as the introduction of electrical lighting, have a considerably higher inherent complexity. Edison did not only need to invent the technical design of the light bulb, he also needed to (1) invent the electricity distributions system, (2) envision how to finance the installation of the infrastructure, (3) overcome regulatory obstacles and survive the opposition of the kerosene-based lighting industry (Johnson & Suskewicz, 2009).

The majority of sustainability innovations still takes the form of incremental innovation (Hellström, 2007). However major sustainability goals, such as the European Union's objective to reduce greenhouse gas emissions by 80-95% until 2050 compared to 1990 is not achievable by incremental innovation (European Commission, 2011).

Systemic Innovation

This systemic nature of sustainability innovations (Dubosson-Torbay, Osterwalder, & Pigneur, 2002; Paucar-Caceres & Espinosa, 2011) with many interdependencies between the elements and complex architecture (Johnson & Suskewicz, 2009; Ulhøi, 2008) often requires that multiple organizations work together and pool complementary assets (De Laat, 1999; Miles, Miles, & Snow, 2006). Many expect that in the future more of these networked innovation activities will take place (Berg, Pihlajamaa, Poskela, & Smedlund, 2006). To succeed, such networks need to create a shared vision with powerful expectations that will allow mobilizing sufficient resources (McDowall & Eames, 2006; Rohrbeck & Kallehave, 2012).

To envision future value chains, plan joint R&D efforts, forecast demand and willingness to pay, a common platform for discussion among the actors is needed (Probert, Farrukh, Gregory, & Robinson, 1999). Such a framework needs to be comprehensive enough to touch all major issues, but if it becomes too detailed or complex, it would prevent effective strategic discussions and consequently inhibit the development of a common understanding and joint goals (Lichtenthaler, 2005). In addition, it should also help to avoid the risk of over-emphasizing the technology perspective of the innovation (Hanninen, 2007).

Managing sustainability innovations of a systemic nature

If sustainability innovations require that multiple actors work together, they will have to adapt to some open-innovation principles to a certain extent (Chesbrough, 2003). In open-innovation collaborations, organizations pool knowledge, technologies and other assets and work together across industries and along the value chain (Chiou, 2011; Lichtenthaler, 2011). Scholars report about a growing number of firms that open up and

introduce processes and mechanisms that allow them to work together with public and private partners to create innovations jointly (Dodgson, Gann, & Salter, 2006; Rohrbeck, Hölzle, & Gemünden, 2009). It can be regarded as a promising sign that one of the requirements for creating sustainability innovations is thus being met.

Another requirement is that a suitable discussion and a framework for planning can be found. When looking into innovation management methods, we identified three candidates that can be expected to be particularly suitable to (1) deal with uncertainty, (2) provide a holistic picture of future states, (3) provide a platform for collaborative discussion and (4) serve as a framework for planning:

- The *scenario technique* is known to successfully enable strategic discussions and visioning (Chermack, van der Merwe, & Lynham, 2007; Visser & Chermack, 2009), but less suited for detailed planning (Ringland, 2010).
- *Roadmapping* has its strengths in planning (Phaal, Farrukh, & Probert, 2004c) and decision-making (Petrick & Echols, 2004) as well as identifying interrelationships between the market and the technology (Groenveld, 2007; Phaal, Farrukh, & Probert, 2004b; Thom, Rohrbeck, & Dunaj, 2010) and facilitating open innovation (Lichtenthaler, 2008b).
- *Business modelling* which allows discussions and visualizations of new value creation/value capture systems on a conceptual level (Itami & Nishino, 2010; Teece, 2010) and works particularly well in uncertain, fast-moving and unpredictable environments (McGrath, 2010).

Various authors have documented that roadmapping and the scenario technique can successfully be applied by private companies, (Rice, Leifer, & O'Connor, 2002; Ringland, 2010; Wells, Phaal, Farrukh, & Probert, 2004) in public R&D planning (Saritas & Ayles, 2008) and in public-private research projects (Phaal, Farrukh, & Probert, 2004a). It has also been noted that the scenario technique is suited to create common ground in a collaborative innovation setting (Cairns, Wright, Van der Heijden, Bradfield, & Burt, 2006). Roadmapping has its strength in the coordination of different actors either within the firm or with external partners (Phaal et al., 2004c). Used with external partners, roadmaps allow the integration of open innovation processes, particularly to support external knowledge exploitation (Lichtenthaler, 2008a).

Our proposition for the role of collaborative business modelling (CBM)

In this paper we want to report and discuss the role that collaborative business modelling may play in discussing, inventing and planning sustainability innovations. For this paper we define three key terms as follows:

- A *business model* to be the logic and architecture of economic and societal value creation and value capture system (Amit & Zott, 2012; Chesbrough & Rosenbloom, 2002; Siggelkow, 2002; Teece, 2010; Zott & Amit, 2010). It may allow a firm to attain a competitive advantage and/or to create a new market (Storbacka & Nenonen, 2011; Thompson & MacMillan, 2010; Yunus, Moingeon, & Lehmann-Ortega, 2010).
- *Business modelling* to be a creative and inventive activity that involves experimenting (Chesbrough, 2010) with content, structure and governance of

transactions that are designed to create and capture value (Sosna, Treviño-Rodríguez, & Velamuri, 2010; Timmers, 1998; Zott & Amit, 2010).

- *Collaborative business modelling* as an activity where multiple organizations that might differ in type (industry, public research and non-profit), their position in the value chain (manufacturing, service, etc.) and industry (energy, ICT, etc.) work together to create a value creation system. In some cases, they will also attempt jointly to create the value capture system.

We engaged in the study of collaborative business modelling with three expectations:

- In order to create sustainability innovations that are complex and yield sufficient value to create a new market, multiple actors need to act in an orchestrated fashion (Johnson & Suskewicz, 2009). The need for coordination is particularly high in innovation fields that cross industry boundaries and where a technological convergence is occurring (Lei, 2000).
- Developing new markets necessitates decisions and planning, while a high level of uncertainty about key variables persists (Hacklin & Wallnöfer, 2012; Ruff, 2006). In such circumstances, the ability to foresight and predict key developments with other organizations will facilitate decision-making (Doz & Kosonen, 2010; McDowall & Eames, 2006).
- The business model framework and the graphical representation of the business model canvas (Osterwalder & Pigneur, 2010) provide a particularly suitable platform to experiment with alternative configurations of a business model (Chesbrough, 2010) and has a level of detail, which is effective for facilitating strategic discussions and innovation planning.

These expectations also represent the hypotheses against which we will evaluate the methodology in general and the case project in particular.

As a frame of reference, we used Osterwalder's ontology of a business model (Osterwalder, 2004). It consists of four "main areas", which are broken down into a set of nine building blocks (see figure 1). Since its introduction, it has been further developed to a methodology designed for use in workshops or similar creative environments. It uses a visualization concept in form of a canvas, which shows all relevant aspects of the business model and facilitates joint editing and development (Osterwalder & Pigneur, 2010).

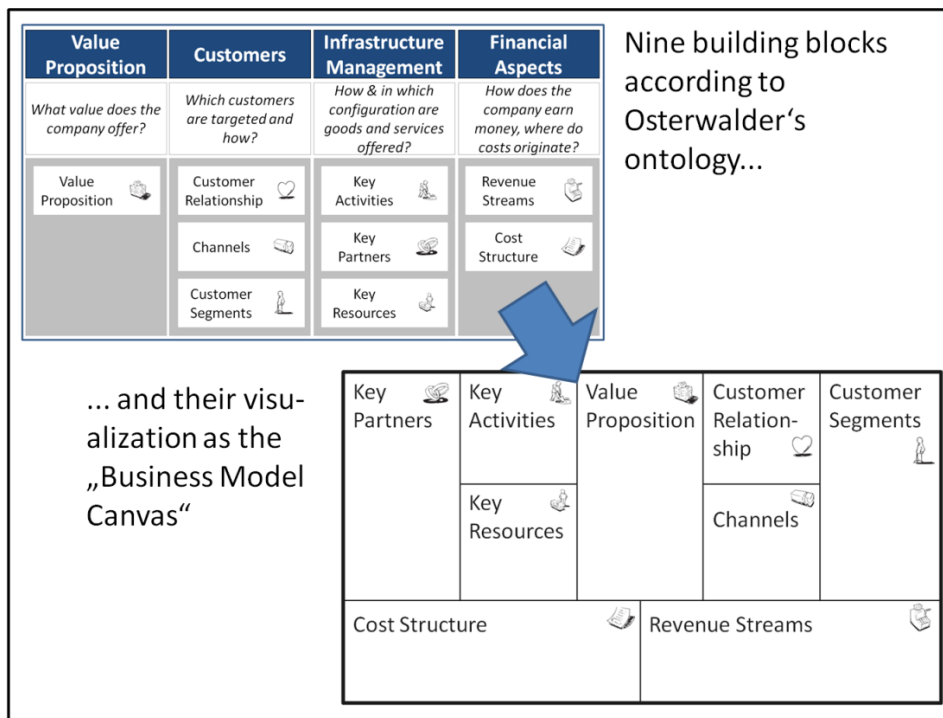


Figure 1: Building blocks of Osterwalder's business model ontology and the "Business Model Canvas".

Case study in the German smart energy market

Case setting

The German energy sector is changing due to liberalization, a pressure from the public for more sustainability, new legislation and emerging technologies (Bouffard & Kirschen, 2008). These changes will lead to a market that is more flexible, fast changing and highly dependent on the collaboration of different companies along the value chain (Knab et al., 2010). However, most energy utilities lack organizational structures and processes that allow them to respond effectively to a rapidly changing environment (van Dinther, Weidlich, & Block, 2006).

Even though smart metering and smart grid topics are currently heavily discussed in the German energy market and important benefits from smart metering and smart grids are expected, innovations are not pursued fast enough (Price Waterhouse Coopers (PWC), 2008). As discussed above the systematic nature of smart-grid innovations is also a key barrier for innovation activity. Smart metering innovations for example require the meter producers, the energy grid providers, the energy producers and the local as well as the national governments to act in an orchestrated fashion.

The setting of our case study was eight companies from both the energy and the ICT sector. The participants included six energy utilities, a telecommunications provider, and

a telecommunications research institution. The energy utilities had a diverse background in terms of size, product and service scope, and geographical reach. Some of the participating companies were competitors, while others worked at different levels of the value chain. The case study was set up as a working group with representatives of all companies. Participants had a diverse background and came from R&D and innovation management, product development and sales, network operations and smart energy pilot projects.

Application of the collaborative business modelling approach

The case study was conducted from April to October 2010 and spanned over three workshops supplemented by additional research between workshops. The participants also shared internal knowledge and research results from their respective organizations. The research conducted between workshops consisted mainly of interviews and desk research. The research was used to revise and detail the output from previous workshops and to prepare input for the upcoming workshop.

In the following, the implementation of the three steps of the CBM approach in this case study is explained. Figure 2 highlights some of the methods used within the respective step.

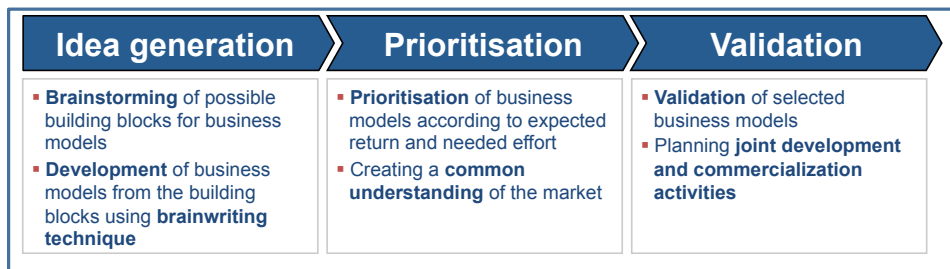


Figure 2: The Collaborative Business Modelling process

Idea generation

In the first phase, the focus of the exercise was on generating many options and building blocks for smart-grid business models. As it was the first meeting of the participants of the working group who came from very different backgrounds, it was very important to create trust within the group by getting to know each other and share expectations towards the collaboration.

Before the group started the idea generation, there was an introduction to the smart energy market and the methodological approach. Both sessions were followed by time for group discussions to start synchronizing the participants' views on the market opportunities and harmonising terminology. At the same time, these steps supported the creation of an atmosphere of openness and trust among the participants.

After formation of groups, the actual idea generation process started with the brainstorming of potential building blocks of smart-energy business models. Building blocks were developed without looking at how they fitted together or how realistic they were. The focus was on quantity, creativity and novelty.

In the next step, the brain-writing technique was used to start putting building blocks together and develop smart-energy business models. For this, the participants were

divided into groups of six. In these groups, the participants worked individually on business model canvas. After having filled in a couple of building blocks, the person gave the canvas to the next participant of the group who extended the business model. This continued until everyone had contributed to all business models of the group.

At this stage, novelty and creativity were still the focus. However, we also started to ask the participants to assess the interrelations between the business model elements. The business models were then assigned to individuals who checked them for consistency and made a first assessment concerning feasibility. All business models were then discussed in the groups and the two business models that came out as favourites were presented to the other groups.

This exercise resulted in 21 draft versions of business models. In the phase until the next workshop, the models were then described in further detail through desk research and virtual collaboration.

Prioritisation

The prioritisation workshop started with a discussion on trends and expected changes in the emerging smart-energy market to create a common outlook for the future. The trends were derived from a compilation of different trend studies. This helped to create a common understanding about the contingency factors that influence the business models and also helped to create a common view on the market.

In the voting process for the business models, two dimensions were used: 'attractiveness of' and 'effort to' develop the business model. The dimension 'attractiveness' consisted of four underlying factors:

- Potential cost savings
- Expected revenue
- Influence on the company's image
- Fit with customer needs

For the evaluation of the effort dimension, three underlying factors were used:

- Expected costs of implementation
- Technical complexity
- Organisational complexity

After introducing these criteria, all business models were visualized with their canvas and displayed (in a market-place fashion) on the walls of the meeting room. Participants had time to review and discuss the models with other participants. This ensured that participants were aware of all business models, the decision criteria and they thus already then started reviewing the models according to these criteria.

Each business model was then briefly presented. After clarifying questions regarding the comprehension of the model, there was room for discussion. The discussion was followed by a voting on the attractiveness of the business model and the needed effort for implementation using the above-mentioned underlying factors. The participants voted on a three-point scale: 'high', 'medium' or 'low'. The votes were discussed either if requested by one of the participants, or if votes diverged by more than one step (i.e. at

least one participant voted “high” and at least one voted “low”). This allowed consolidation of the expert opinions in a Delphi-analysis-like fashion, where divergent opinions are discussed. To compare the business models, the votes were plotted in a portfolio, which is shown in figure 3. Displaying the voting visually has the additional advantage that the group can validate the ranking by comparing the position of the models, which makes it very intuitive and normally triggers discussions and repositioning.

Overall, six business models were ranked as ‘very attractive’, ten were ranked as ‘interesting’, and five were ranked as ‘currently not interesting’. Further conclusions can be drawn from the results of the prioritisation process when looking at the results in a little more detail.

More than half of the business models were rated with a high effort needed for implementation and only two were rated with low effort. This shows that many business models in the smart-energy market require rather large changes in companies and high efforts in terms of investment and technology needed. On the other hand, only five business models had low expected results. Thus it can be said, that the innovation opportunities were judged on average as very attractive. But at the same time pursuing the opportunity might be discouraged by the expectation of high development effort.

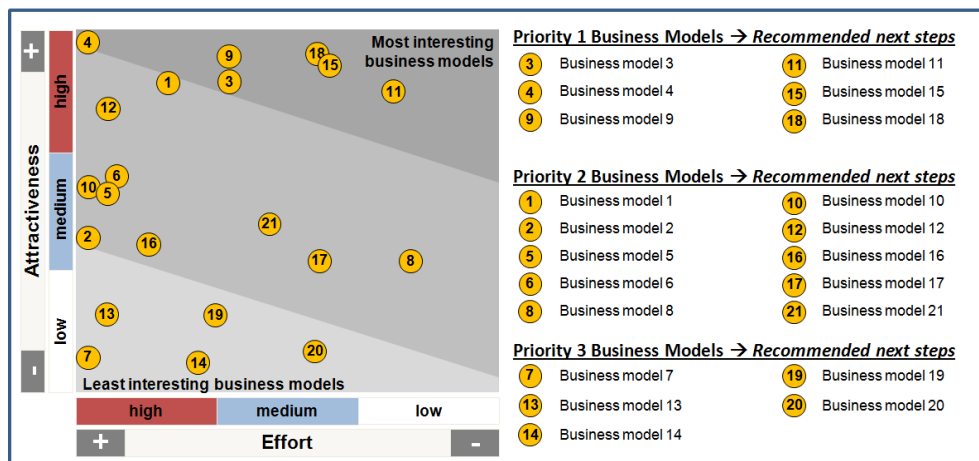


Figure 3: Forcing decisions through a prioritisation scheme.

In a collaborative business modelling (CBM) project, the questions ‘Which business models should be implemented’ and in ‘what sequence’ are not fully addressed, as this is a management decision, which needs to be taken by the individual organization. However, the participants shared one conclusion, which was that it would be advisable to develop a portfolio of high effort and low effort business models. From the high-effort business models only the ones with the highest expected results should be pursued. Additionally, low-effort and medium attractiveness business models, such as models 8 or 17 in figure 4, can be used as “quick wins”. They were expected to generate value relatively fast and with a smaller effort compared to other models. They could also be used as market entry models to gather first experiences in the new smart energy market.

Validation

The business models, which were ranked highest in the second step, were validated in the third and last step. The basis for the validation was desk research, expert feedback and discussions in the working group. Each building block of the proposed business model underwent this process and was labelled as ‘available/realistic’ (green), ‘uncertain/to be developed’ (yellow) or ‘not available/potential show-stopper’ (red). An example of the result of the validation is shown in figure 4.

If a business model contains red building blocks, it needs to be reviewed to see if the red building blocks can be substituted or if it can be expected that the red ‘show-stopper’ building block might become available in the future. In general, the dominant colour of the canvas (green or yellow) already gives a first visual indication of the feasibility of the business model and thus facilitates strategic discussions.

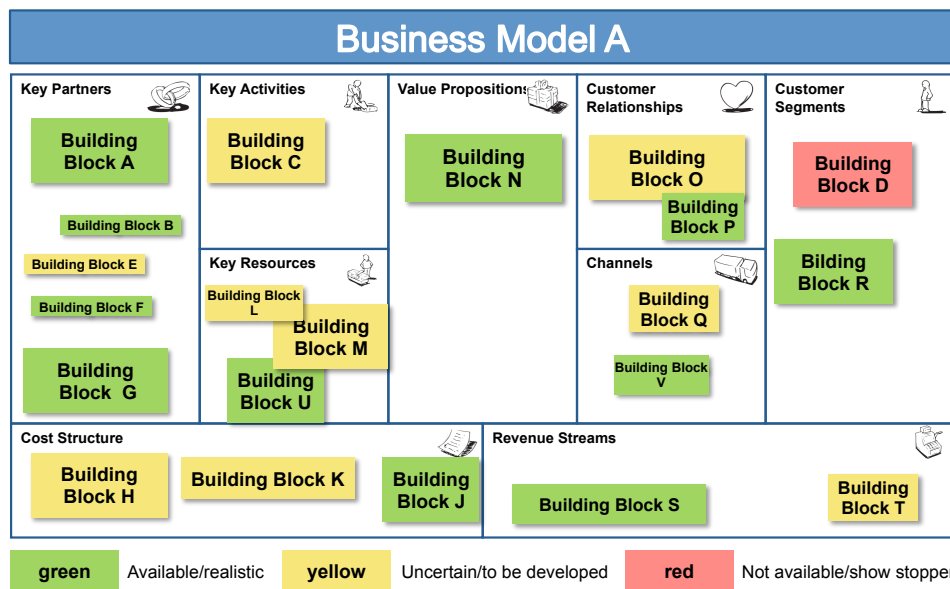


Figure 4: Validation of business models.

In the second part of the third workshop, the participants developed general recommendations and concrete action steps for each of the validated business models. The general recommendations included a list of show-stoppers and enablers that are relevant for most business models. Action steps on the business-model level were developed in small groups and then also discussed in the whole group to share ideas and capitalize on all different backgrounds of the whole working group.

After finalizing the business models, room was given to discuss next steps and how to continue the collaborative innovation process. That led to some concrete collaboration projects and a joint list of policy recommendations to overcome the regulatory and legislative barriers that prevent smart-energy business models.

Evaluation of the approach

To evaluate the approach, we built on the feedback we received and on our own reflections from comparisons with other approaches, which we have used earlier. These approaches were primarily used in market exploration projects and involved using the scenario analysis and roadmapping method (Heger & Rohrbeck, 2012).

Overcoming the general barriers to innovation

Firstly we wanted to assess if the approach helped to overcome the general barriers to innovation. These include insufficient thinking out-of-the-box due to daily routines, the lack of willingness to work with external partners, the resistance to challenge basic assumptions and the lack of persistence in driving innovation (Rohrbeck, Döhler, & Arnold, 2009). Figure 5 shows how the approach has contributed to overcome these general barriers to innovation:

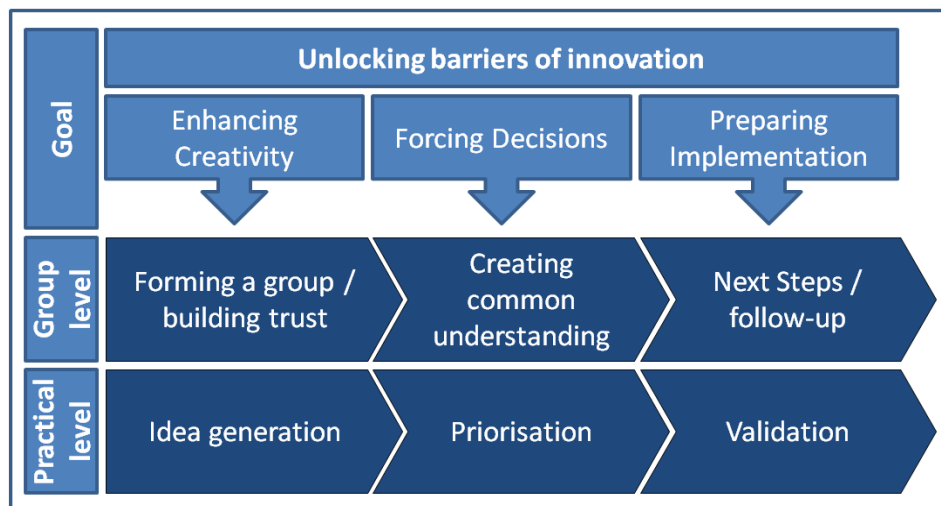


Figure 5: Three steps of the collaborative business modelling process.

1. In the first step, the approach helped to start unlocking barriers of innovation by enhancing creativity. In addition, group dynamics were triggered, including building trust among participants and preparing them to work jointly on innovative ideas. On a practical level, different creativity techniques were used to create a multitude of ideas on potential business model elements.
2. In the second step, the portfolio ranking method was used to force decisions. This was prepared on a group level by reviewing the key trends, which in turn created a common understanding and common terminology within the group. On a practical level, the following criteria-based ranking allowed the group to create a shared prioritization of the business model candidates.
3. The third step has its strength in preparing the implementation of business models. On a group level, this step allowed the identification of development activities that

need to be addressed jointly by multiple participating companies. On a practical level, the step allowed a thorough validation of the business model.

Overcoming the specific barriers of sustainability innovations

At the offset, we expected CBM to facilitate strategic conversation and innovation planning for sustainability innovations that are characterized by a high degree of uncertainty and a systemic nature. These characteristics are present in many sustainability innovations such as e-mobility, i.e. electric-propulsion vehicles, (Johnson & Suskewicz, 2009) and in our case, the smart-energy business models.

The starting point from the participants' point of view was that they all had done analyses and developed concepts on the future of the smart-grid market from the perspective of their organizations. The outcome of these analyses had mostly been (1) that they had been *overwhelmed by the complex system of the interdependencies* that resulted in (2) a *lack of willingness to approve substantial investments* by the top management, and (3) that the *uncertainty* did not allow them to create a business case that would suffice to ask for a top management decision.

These reported barriers matched with the barriers, which we discussed in our literature analysis to be particularly challenging in complex sustainability innovations. When comparing the situation of the participating firms before and after the CBM, we can identify four strengths of the approach:

- *Dealing with uncertainty*, through three mechanisms: First through a real reduction of uncertainty by sharing information across organizations. All participants came with some knowledge about factors that may influence the future development. By sharing these insights, a more holistic and reliable picture was created. Second, the participants realized that all interested parties were affected by the uncertainty and when obtaining more information through their sharing of their individual insights, they now felt to have a competitive advantage against organizations outside the group. Third, they enhanced their understanding about factors that prevent the emergence of the smart-energy market and could for example formulate policy recommendations to promote the market development without the need to predict the market development trajectory in detail.
- *Finding creative solutions*: Most participants had done extensive analyses in their organizations and overall had the feeling that they had well understood what can and cannot be done to promote the market. However, by bringing together participants with diverse backgrounds and by using creativity techniques, ideas and solutions emerged that had not been identified before. This confirms the expectation that designing winning business models is an inventive process (Sosna et al., 2010; Zott & Amit, 2010) that, if successful, creates virtuous cycles that reinforce the competitive value of the business model (Casadesus-Masanell & Ricart, 2010). The different backgrounds of the participants reduced the barrier of 'limiting the ideas by the current assets of the firm' (Chesbrough, 2010), and allowed to find creative solutions to strategic paradoxes (Smith, Binns, & Tushman, 2010) and also to break away from the organizational memory that might stand in the way of creation (Govindarajan & Trimble, 2011).

- Facilitating a *strategic discussion* about business models through which benefits are not only identified from the perspective of the focal firm, but also from a societal perspective (Doz & Kosonen, 2010; Laszlo, Laszlo, & Dunsik, 2010), including their impact on sustainability goals (Thompson & MacMillan, 2010). It has been argued before that value cannot only be created by individual firms, but also through multiple firms that engage in a collaborative entrepreneurship (Miles et al., 2006). The level of detail of the business model canvas seemed to work particularly well to discuss and create shared visions thus creating promising expectations about the emerging market (McDowall & Eames, 2006). This can be seen as a first step in unlocking the barrier of unwillingness to allocate sufficient resources to develop the market.
- The building block level also allowed *to start the innovation planning*. Participants were particularly pleased by the possibility to tie detailed feasibility analyses to the individual elements of the business models. After classifying the elements in green (available/realistic), yellow (uncertain/to be developed) and red (not available/potential show stopper), the groups identified actions that needed to be taken in order to transform red or yellow building blocks into green ones. Some of these actions were in the scope of what the participants could do themselves and others were transformed into recommendations to policymakers or joint actions.

Overall it can be said, that CBM can contribute to understanding the systemic nature of sustainable innovations. It can create a more holistic picture of how a new value creation/value capture system can emerge and allow the identification of actions designed to promote and develop a more sustainable future.

Limitations and obstacles of the CBM approach

Our project was focussed on creating visions about how the market might develop and to create value-creation architectures. In future research it would be interesting to choose a case where joint value-capture is also part of the project in order to be able to assess also the strength of CBM for the implementation of new business models. We were therefore not able to establish if CBM can support the voluntarily and emergent processes that are associated with the evolution of business models (Demil & Lecocq, 2010).

One obstacle of the approach could be the required time. Particularly the need for three full-day workshops will prevent firms to engage in such activities frequently. However, the relatively high time consumption will also work in a positive way as it will ensure the participation of only organizations that have a sufficiently high expectation about the outcome of the approach and a sufficiently positive view on the potential value from the systemic innovation. Continuous participation is also promoted by the provision of intermediate results after each workshop, which allows participants to bring valuable insights to their organizations throughout the whole process.

Comparison with alternative methods and approaches

The different frameworks for collaborative exploration of new markets have particular strengths and weaknesses. Overall, it can be said that the scenario technique is very suitable for creating an image of future developments and facilitating strategic discussions (Ringland, 2010). Roadmapping has its strengths in planning, enforcing

decisions and identifying interdependencies between market and technology (Phaal et al., 2004b; Phaal et al., 2004c; Thom et al., 2010). The CBM approach facilitates planning, implementation and decision-making when dealing with sustainability innovations and a high level of both complexity and uncertainty.

Due to the different characteristics, the optimal usage of the frameworks depends on the given task. It is important to select the most suitable framework according to the given situation and the expected results. We believe that if the whole innovation process should be covered, all three frameworks can be appropriately used at different stages of the innovation process.

In the case of sustainability innovation, the following combination of the different frameworks to a “collaborative business field exploration process” can be suggested.

- Through the *scenario technique*, different images of the future can be developed. Participants get a concrete idea of how the market might develop. It is a very broad approach and includes environmental conditions, which are not directly connected to the examined market. It creates an understanding of the future rather than being a planning tool. This broadens the horizon of the participants while making the future development more concrete. The scenario technique profits greatly from collaborative work and different backgrounds and experiences of the participants. In a first step of collaborative business field exploration, it can be used to set the frame for a brainstorming process by triggering ideas for relevant business models of the future.
- *Roadmapping* creates a more detailed frame of the future. It shows a way to one or more desired or expected future scenarios. It answers questions such as when certain technologies are expected to be available, which rules and laws apply at which point and how these milestones are based on each other. It gives an indication about needed competencies and necessary steps, but does not yet go into the details of individual products or business models. Rather it breaks down a scenario that is expected in year X to milestones along a timeline leading to this scenario. This can be useful to be aware of the development of a market and later refer back to this timeline to place business models along it.
- Using *CBM* as a third step strengthens the business perspective and facilitates the transition from planning to implementation (Richardson, 2008). Building on the expectations from scenario analysis and roadmaps, CBM is used to create and validate value creation and value capture systems. CBM therefore also answers the crucial question of how the individual organization will profit from creating the market. Through the business model, the answers can be given on a conceptual level, which will sidestep the question of the monetary benefit. But the conceptual answer might be sufficient for organizations to take substantial investment decisions.

Conclusion

We have argued that a CBM approach can be used to create sustainability innovations, especially if a new market or a value creation/value capture system needs to be created. We have concluded from the case that in a context with a high level of uncertainty, CBM carries the benefit of staying on an architectural level. In that way the compelling

business logic can be presented without the traditional business case. The approach has been described, discussed and evaluated on the basis of the participants' feedback, through comparison to alternative methods (scenario analyses and roadmapping) and through comparing expected and actual benefits from the method.

In the case study we have shown that the CBM approach can support the joint development of business models, particularly for sustainability innovations, where pooling of complementary skills, technologies and assets as well as an orchestrated implementation are needed. Results from the case study show that CBM between actors along the value chain can contribute to create a common understanding of drivers and barriers as well as creating a common view on how the market might function in the future (Baden-Fuller & Morgan, 2010). This also opens the opportunity to co-create business models and value networks (Koen, Bertels, & Elsum, 2011) that are operated jointly by industrial firms and non-governmental organizations (NGOs) operating on non-profit business logics (Dahan, Doh, Oetzel, & Yaziji, 2010). From an innovation system point of view, CBM can support an economy to adapt to sustainability objectives by facilitating the collaboration of multiple organizations (Ulhøi, 2008).

Our study revealed that by building trust and identifying mutually benefiting business models and by enabling participation of the different organizations, fertile ground for a future implementation has been created. The building of trust matters also because divergent goals and interests can be expected to hamper the willingness to develop systemic innovations and thus might prevent the successful development of sustainability innovations (Ruohomaa & Kutvonen, 2010).

The successful implementation of the CBM approach will also require that the participants commit to share valuable insights, complementary skills and assets and commit to an open-innovation paradigm. Our study could not reveal to what extent sharing of skills and assets would have occurred, but the amount of shared insights (such as internal reports, open discussions about expected future development) is particularly remarkable as some organizations are direct competitors. This might be explained because business modelling strongly facilitates strategic discussion and thus contributes to the forming of teams consisting of the participants from competing firms (Hoegl & Gemuenden, 2001). Also the usage of brain-writing, where everyone contributes in private (i.e. through writing on the canvas) might decrease the perception that corporate secrets are communicated.

In this article we have (1) given a detailed description on how to conduct CBM, (2) discussed the strengths and limitations, (3) confirmed the applicability of CBM for joint market development, and (4) framed CBM as an important innovation management tool for systemic innovations.

By discussing the case of smart energy systems, we also contribute to the discussion on how innovation management has to be enhanced to work in highly uncertain environments, in innovation fields that are characterized by a high-level of interdependencies, and to allow integrating societal value creation as a desired outcome (Seelos & Mair, 2007).

We hope that we have motivated a broader discussion on which innovation management tools are needed to identify, plan and develop sustainability innovations. We believe that governmental and industrial actors need common platforms to discuss, plan and execute joint initiatives and thus overcome the barriers that prevent the development of effective policies and sustainability innovations.

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Biographical information

René Rohrbeck is Associate Professor of Strategy at the Aarhus University. His research interests are organizational change, strategy as practice, innovation management and corporate foresight.

He has 6 years of practical experience in the ICT and automotive industry, where he worked for Deutsche Telekom and Volkswagen on strategic management, innovation management and corporate foresight. In addition he has served as consultant for various companies in the ICT, automobile, luxury goods and energy industry.

René Rohrbeck's teaches strategic management, innovation management, corporate foresight and technology management on MBA, Master and Bachelor level.

Lars Konnertz works as a logistics coordinator for Greenpeace Germany. He studied mechanical engineering and management at the TU Berlin where he specialized in renewable energy. During his studies he worked at the energy business group of the EICT where he participated in the development of the collaborative business modeling approach. Later he worked in the wind energy industry where he developed a procedure for multi-plane balancing of wind turbine drive trains.

Sebastian Knab is a research assistant at Universität Hamburg, Chair of Business Ethics and Management. His research interests include innovation management and ethics, strategic management, sustainability and energy management.

Before joining Universität Hamburg he was a project manager for innovation management at the EICT for 3 years and a research assistant at Technische Universität Berlin, Chair of Sustainable Electric Networks and Sources of Energy. At the EICT he established the energy business group where he successfully conducted consultancy and research projects on innovation planning, corporate foresight, business modeling and roadmapping mainly in the energy and telecommunications industry.