

HOW TO SHAPE DIGITALIZATION IN THE ENERGY SECTOR – A NEW APPROACH FOR SYSTEMATIC BUSINESS INNOVATION

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ABSTRACT

Two of the strongest drivers for the ongoing energy transition are renewable energies and digital technologies. As an implication of current transformations new business models appear, while conventional ones vanish. This threatens incumbents, but provides manifold opportunities at the same time. The current transition leads to falling barriers, changing roles and markets, and the appearance of new players – a rapidly changing environment that allows agile companies to obtain new fields of business. The challenge is to shape new business models, which will successfully transform or extend current businesses. Therefore, we developed a novel approach to hands-on tackle this challenge in five phases: understand the environment, ideate new value propositions, cluster and select promising value proposition bundles, design business models around them, and evaluate their viability. This approach guides companies from endless possibilities to concrete options that can be chosen or rejected based on quantitative assessment – dissolving paralysis and enabling action. We successfully applied the approach to utilities in Germany, India and Italy. In this paper, we present our systematic business innovation approach by explaining the general process, a sample application with Enel Global Infrastructure & Networks and give our 10 key recommendations for successful business innovation projects tackling the digital transformation challenge in the energy sector.

INTRODUCTION

Today's business environment of the energy sector is changing tremendously with various developments going on simultaneously: The massive growth of renewable energies and decentralized generation, in consequence a paradigm shift from demand-oriented generation to generation-oriented demand, as well as trends towards the convergence of different systems (e.g., gas, electricity, heat, mobility) leading to hybrid networks, and the increasing amount and importance of data within the supply system.

The whole system becomes increasingly interconnected, via digital technologies and cooperative business models,

which facilitates and accelerates the energy transition [1]. Digitalization is changing today's societies, economies and enterprises not only in the energy sector – in other sectors the digital transformation has already further evolved (e.g., think of the music, hotel, or taxi industries). Many companies change their processes, become more efficient and continuously improve in numerous small steps – few transform fundamental parts of their business. Some companies move slowly and loose market share, some even get replaced, destroyed by the power of creative destruction in the circle of economic life [2]. Digital technologies have proven to be the basis of countless impressive innovations, changing not only the way companies run their business, but customers' behavior too. However, they lead to the biggest disruptive impact, when they are not only applied in existing business models, but harnessed to implement new business models (e.g., think of Spotify, AirBnB, or Uber in the above mentioned industries) [3].

The ongoing energy transition leads to falling barriers, changing roles and markets, and the appearance of new players (e.g., think of google's investments in renewable energies and home automation, or numerous startups in the energy sector). Existing companies have to apply digital technologies to continuously improve their traditional products and services, but that is not enough. Besides product and process innovations, they also need business model innovations to transform themselves instead of waiting for others to disrupt their markets. Even if a company's traditional business model continues to work in the changing environment, that company should explore the promising chances to offer additional value-added services. Incumbents can build upon not only their specific knowledge advantage, but also on their existing large customer base and strong relationships. The tremendous ongoing changes, complexity and endless possibilities can be perceived as intimidating, cause individuals to get stuck in rigid thought patterns and paralyze companies, when action should be taken [4].

We developed an approach to hands-on tackle this challenge and bring companies from endless possibilities to concrete options, which can be chosen or rejected based on a quantitative, flexible and transparent assessment – dissolving paralysis and enabling action.

In the following, we present this approach, describe one

sample application in Italy, and highlight our 10 key recommendations for successful guided business ideation and modeling projects.

APPROACH FOR GUIDED BUSINESS IDEATION AND MODELING – THE PROCESS

The presented approach for guided business ideation and modeling combines selected existing and well-proven methods into a comprehensive process. Core of the process is a 2-4 day workshop embedded in solid preparation and evaluation phase. The approach can be split into 5 steps: (1) understand the environment including its key roles, (2) ideate new value propositions, (3) combine and select promising ones, (4) design business models around the selected value propositions and (5) evaluate their viability (see Figure 1 for an overview).

Step 1: Understand the changing environment and roles: Dare a peek into the Futures

Before starting a guided business ideation and modeling project first, the project team has to be built: It includes representatives of the company’s management to highlight the strategic importance, experts from all relevant departments and method coaches, who manage the guided business ideation and modeling process. The preparation includes an analysis of the business itself and of its environment considering not only technological, but also business, legal, political, social and environmental aspects. In the first part of the workshop, gained insights about the changing environment and market roles, especially regarding digitalization are shared with the group and discussed. It is important to create a common understanding of the challenges of different actors and to break up existing thought patterns such as current assumptions, proven business logic and well-known limitations of today’s business model.

Step 2: Ideate new Value Propositions

The ideation of the new value propositions is the creativity core of the approach. It builds on the solid understanding of the business environment and ecosystem that was developed in Step 1. Besides other methods the ideation of new value proposition builds upon Osterwalder’s value proposition designer and relies on additional creativity impulses and a systematic structure and engaging moderation [5]. The selected well-proven methods and systematic structure efficiently release the large creative potential of the group as everyone actively works simultaneously and each participant has the option to bring in new initial ideas and to refine ideas of others. To come up with initial ideas for new value propositions, ‘gain creators’ can address different actors’ interests and needs, ‘pain relievers’ would address actors’ challenges and pain points, and new services or products could directly improve the actors’ activities and processes [5]. Step 2 leads to a large number of diverse value propositions.

Step 3: Combine and Select Promising Value Propositions

In the next step, the method coaches need to analyze the developed value propositions for categorization and high-level assessment to combine value propositions to bundles towards more sophisticated product and service ideas. This first-level selection should result in 10-20 remaining value proposition bundles. These have to be further prepared for the following speed-dating session. The speed-dating is a compressed session in which the first-level selection is presented to the entire workshop group, which then votes for the most promising bundles that should be further developed into business models. It is important to choose the right number of value proposition bundles to continue the workshop to ensure the adequate level of detail of the business model development.

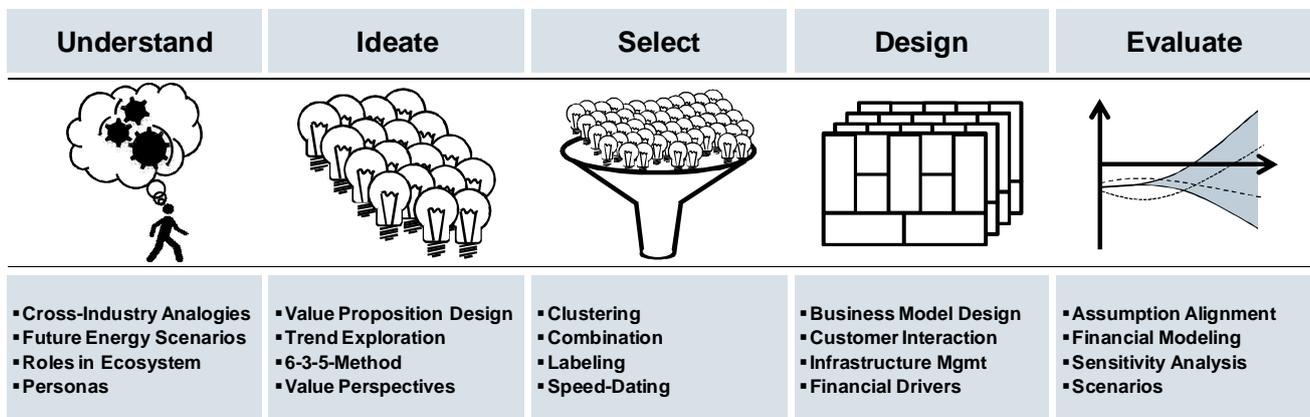


Figure 1: 5-Step Approach for guided business ideation and modeling

Step 4: Design Business Models to Create and Capture New Value

The selected value proposition bundles are the seed from which a full qualitative business model grows within the course of the workshop. The entire group of participants gets divided into small teams. Each team is responsible for the development of a business model. Based on the value proposition, a business model additionally describes how the value is created, delivered and which part of the additional value is captured by the organization that offers the value. First, each team qualitatively designs the customer interaction and the infrastructure management using the building blocks of the well-known business model methodology of Osterwalder and Pigneur [6]. Second, the product- or service idea itself has to be elaborated and clearly presented in a brief and to the point description. Third, the business model description is complemented through identifying the main cost and revenue streams and proposing key drivers of the streams. The finalized qualitative business model design will be the starting point for the quantitative assessment in the next step.

Step 5: Evaluate Business Models

For the business model evaluation, we quantitatively model the identified cost and revenue streams for every designed business model. This modeling exercise requires to think through the logic of the designed business models in-depth. The identified key drivers of the financial streams are starting points for defining the variables of the model, which are to be complemented during the modeling process. Next step is to find values for all input variables through research, our domain know-how or making assumptions that should be aligned with the respective team for each business model. Once the logic of the financial streams is defined, we combine the streams in a comprehensive financial analysis. The quantitative analysis allows to identify most important financial streams and to determine the key drivers and assumptions through sensitivity analyses. For the final evaluation of the designed business model a scenario analysis provides the basis for a risk assessment and enables a sound decision whether to further develop a given business model on a solid base.

APPROACH FOR BUSINESS IDEATION AND MODELING - EXPERIENCES

We have applied our approach for business ideation and modeling to utilities in Germany, India and Italy, where it proved to be practical, lean, fast and effective. In this section, we first describe an innovation case study conducted with ENEL Infrastructure & Networks in Italy (in the remainder of this text: ENEL) and second give key recommendations for successful new business innovation projects.

Example: Business innovation with ENEL

Together with ENEL, a distribution system operator in Italy, Spain, Romania & Latin America, we went through the whole business ideation and modeling

process and focused on the area of low voltage networks.

Based on a solid preparation, we conducted a workshop with 2 moderators plus a team of 16 participants (14 of ENEL and 2 of Siemens). Within the first day, we visited the business ecosystem in different scenarios and analyzed 4 actors in the low voltage network using the persona-method. Building upon this common understanding of important roles with their interests and needs, we went through 3 ideation rounds using the brain-writing-method, which resulted in a total of 83 documented value propositions.

After the first day, we combined and clustered these value propositions into 12 value proposition bundles, which can each serve as a nucleus to build a whole business model around. The speed-dating on the beginning of the second day provided us 4 preferred bundles as the most promising or relevant ones. These have been developed into holistic business models including qualitative descriptions and a collection of important drivers for cost and revenue streams.

Following the workshop, the business models were further refined and aligned with the respective responsible team coordinators and quantitatively modeled. As one example we present a summary of the developed idea "Social Surplus Program".

The Social Surplus Program (SSP) is a social business idea with the objective to create value for the society: The SSP creates value for the deserving poor, the municipality, the distribution system operator and distributed generation operators (DGOs) by offering a platform to donate surplus energy in times when not needed by the electricity-generating entity. DGOs - businesses and households - can participate in the SSP by registering using the platform and connecting their smart metering devices respectively. In situations, when they generate more electricity through their photovoltaic plants than they consume (and their storage system - if existing - is fully charged), they can decide to donate a certain share of the surplus energy instead of selling it. Depending on the regulation selling might not be an option. Participants of the SSP are primarily doing good, which might lead to an improved reputation. However, the DGOs can as an additional benefit also participate in joint maintenance programs, which help to drive down their costs. The donated energy will be distributed to registered deserving poor households, for whom energy bills are a large share of their expenses. Additionally available surplus energy can also be used to power services of the local municipality, such as street lighting or pumps of public park fountains. Deserving poor can register to the program at partner-non-governmental-organizations (NGOs) such as the red cross. The partner-NGOs evaluate their poverty as an input for determining the order of receiving social tariffs. Social tariffs can then be booked at partner energy vendors. The start-up costs could be funded by sponsors or via governmental support, whereas the long-term operational costs can be covered by selling a certain share of the donated energy (see figure 2). Key to the success is a high level of transparency. Thus, all donors receive bi-annual reports providing insights on what was achieved through their support.

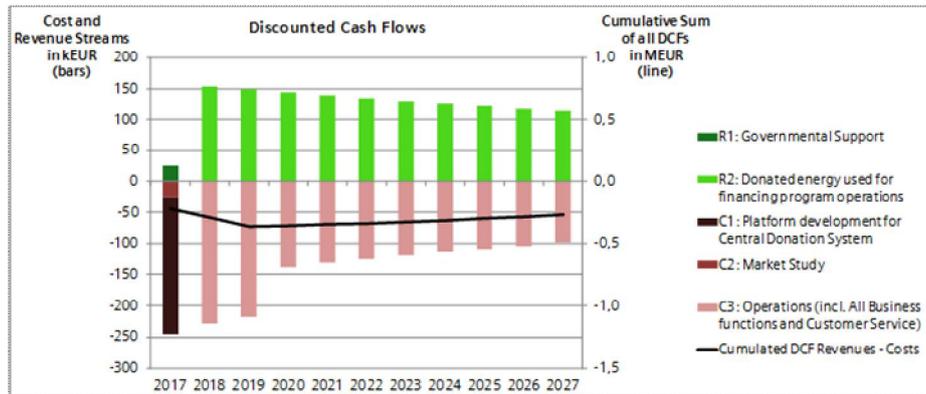


Figure 2: Quantitative evaluation of the base case scenario for the Social Surplus Program business idea

In our quantitative assessment, we estimated cost streams based on ENEL and Siemens experiences regarding personnel and hardware/software requirements. The revenue stream from donated energy is based on the following assumptions: electricity price of 0.2 €/kWh, eligible PV production of 4 TWh with 0.15 percent annual growth, fixed percentage of 0.1 percent of the PV generated electricity is donated, and a maximum share of the donated energy used for financing program operations is 20 percent. This interesting social business model does not result in a positive net present value (NPV) in the base case scenario with initially aligned assumptions. However, it could provide more than 1600 poor family household with free electricity, which could also be distributed wider by offering only partially supported social tariffs to let more households benefit from the program. Figure

2 provides a graphical overview of the discounted cash flows of aggregated revenue streams (R1, R2) and cost streams (C1, C2, C3) and the black line showing the cumulated discounted cash flows resulting in a negative NPV of ca. 250.000 € considering a period of 10 years. However, the business model could be turned into a viable social business with small adaptations, which we investigated (see discounted cash flows of scenarios in Figure 3). The evaluation facilitates making a solid decision whether to further pursue one of the four developed business models. The quantitative model proves to be a powerful tool for assessing diverse future developments and business model adaptations quickly and flexibly and can be of further use in the detailed development process for business models that are chosen for implementation.

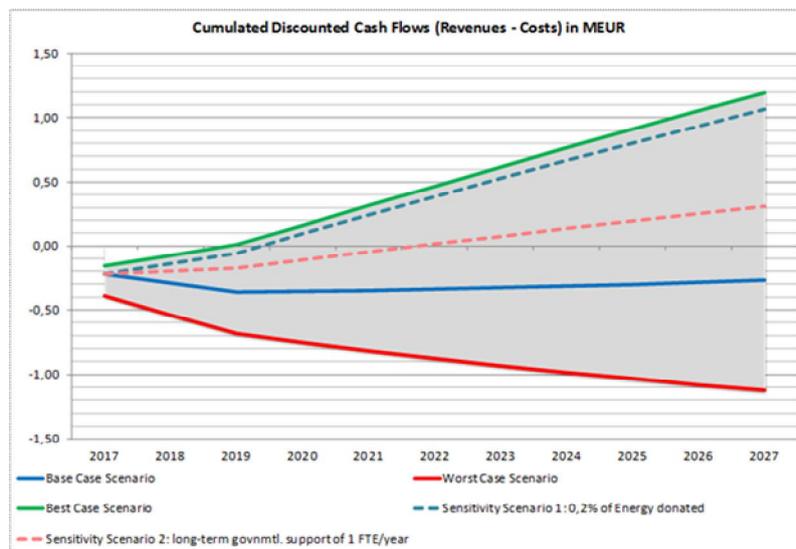


Figure 3: Scenario analysis for the Social Surplus Program business idea

10 key recommendations for business innovation:

Based on our project experiences, these 10 key points should be considered for successfully conducting business innovation projects in the energy sector:

1) Bring substantial energy domain knowledge

The workshop participants are experts in each of their

fields (e.g., asset management, network operation, maintenance, marketing or pricing) and it is the goal to leverage the combination of the gathered expertise. To do that, workshop moderators should bring substantial knowledge about the diverse perspectives on the energy domain to challenge participants and actively drive discussions. This includes not only technology and

business aspects, but also views on society, environmental policies and the regulatory framework.

2) Look out for diversity

The innovation project group should be composed of participants with diverse backgrounds, not only in the sense of professional functions within the utility, but also in terms of additional aspects, such as gender, professional background, culture, or hierarchical level.

3) Divide and shuffle

The entire group should be divided into small effective teams for interactive sessions. The best team size for an intense creative collaboration during the workshop is between 3 and 5. If a team is too small, it can get stuck in existing thoughts and ideas – if it is too big, time consuming discussions and restraint participation of more introverted participants lead to suboptimal results. To achieve the highest motivation, the team composition process should consider the participants' preferences.

4) Create the right atmosphere

It is essential to create an open atmosphere of relaxed and positive excitement. To support the creative process, participants should not feel stressed from pressing deadlines, but be excited about the tremendous possibilities to shape the future. Encourage participants to come up with “futuristic, unrealistic or stupid” ideas, as they can be the basis for the next great concept.

5) Create the “right box”

Help the teams to think outside every-day boxes, but within well-chosen boxes of possible futures and customer needs. Sometimes complete freedom, thus thinking outside every box, paralyzes creativity and does not lead to concrete new ideas. By providing different perspectives and possible addressees of value and the fitting level of abstraction the “right box” can be created, in which participants create new ideas on the basis of their personal expertise.

6) Provide strong guidance and moderation

Free the participants' minds to release their creative potential. Clearly define restricted time slots and confidently provide strong method guidance to avoid participants' distraction caused by organizational questions and doubts, but support them in their intense concentration on each creativity exercise.

7) Provide tasty food for thought

Prepare versatile foods for thought before the workshop and let it serve as multiple unexpected thought-provoking impulses in the right moments of the workshop.

8) Fuel the imagination

Make use of vivid pictures and videos – wherever possible.

9) Rely on self-selection

Self-selection leads to highly motivated participants. If conducted successfully, participants come up with a tremendous number of ideas and possible value propositions. The ideas for further evaluation should be selected with equal rights by the workshop's participants to ensure highest motivation and involvement within the business model design process. It also ensures that

interests and strengths of the group are considered.

10) Tell the story before thoroughly calculating the potential

Creativity sparks more easily without the complexity of concrete numbers. However, once the qualitative story of an idea is told and cast into a business model, it is necessary to quantify the economic potential. Calculate financial streams transparently building on aligned assumptions that are based on research or experience to create credibility. Use the quantitative modeling phase to iteratively improve the business model.

CONCLUSION

Digitalization transforms the business environment and the energy sector at an increasing pace and provides numerous new business opportunities. To successfully harness these vast business opportunities, stakeholders in the energy sector should work on business innovation in a systematic, structured and transparent way. To fuel the creative process of business ideation and modeling, we designed a novel approach by combining well-proven methods for each of the five steps: understand – ideate – select – design – evaluate. Even though business models can be quantitatively assessed once they are designed, a huge creative effort is necessary to develop promising new business models. This is the art of business model design. In this paper, we describe our approach for business ideation and modeling that combines the qualitative art of business model design with their quantitative evaluation. Furthermore, we present a sample application of the approach and give our key recommendations that we base on our experience from a series of successful innovation projects.

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