

IDENTIFICATION AND VALIDATION OF NEW BUSINESS MODELS FOR DSO BUSINESS ENVIRONMENT USING BUSINESS MODEL CANVAS AND STAKEHOLDER GROUPS

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ABSTRACT

Different technologies aiming to digitize the distribution grid are being developed within research and innovation (R&I) projects. To unlock the true potential of the digital technologies in the distribution grid, novel solutions must be coupled with new business models. However, creating and validating new business models in the early phase of the innovation process and during the relatively short period of R&I projects is a challenge. This paper presents a methodology to create and validate new business models using business model canvas (BMC) and a stakeholder innovation group (SIG). The methodology is currently being tested in the RESOLVD project funded by European Union under the H2020 scheme.

INTRODUCTION

The RESOLVD (Renewable penetration levered by Efficient Low Voltage Distribution grids) project aims to improve the efficiency and the hosting capacity of low-voltage distribution networks in a context of highly distributed renewable generation by introducing energy flexibility and control. The project plans to do so by acting on the grid through innovative advanced power electronics devices, with certain storage management capabilities. These devices will provide both switching and energy balancing capacities to optimally operate the grid. Moreover, RESOLVD investigates innovative business models considering energy storage and flexibility, regulatory and policy issues. These models are needed to make sure the developed technologies can be brought to the market. Integration of all the developed technologies will lever a new concept of LV smart grids with flexibility management capabilities at the grid level, and with higher efficiency and resilience in presence of distributed variable generation. Detailed description of the project and its recent achievements is presented in parallel in [1].

The outlined description of the RESOLVD project illustrates that its outcome expectations are driven by a technical/engineering perspective. The core aim is to tackle the challenge of improving physical grid efficiency as well as the hosting capacity of low-voltage distribution

networks in areas of highly distributed renewable generation. Furthermore, the variety of technologies being developed in RESOLVD create an additional challenge. The technologies might have a highly socio-economic relevance, forcing the project responsible parties to think outside their dominant industry logic. The traditional perspective on the domain of the distribution grid management must be widened to find the right business model for all the technologies being developed.

For this purpose, a five-step method is proposed to develop business models for RESOLVD technologies. The uniqueness of the method is in involving stakeholders in a co-creative way to design and validate new business models. The aim of this paper is to present this method with emphasis on two steps of creating master business model canvas (BMC) and adaptation of business model canvas using stakeholders.

METHOD

Figure 1 shows the method followed in the RESOLVD project to develop novel business models for variety of relevant stakeholders. First, a stakeholder analysis is performed to identify the relevant stakeholders and the value arising for them from the RESOLVD technologies. In the second step, the stakeholder innovation group (SIG) is formed based upon the stakeholders' characteristics. The third step is to create the master BMC comprising of all the values identified in the stakeholder analysis. This helps in identifying the whole value chain to create, deliver and capture the value of the innovations. In the fourth step, the new business models are created by modifying the building blocks from the master BMC. For developing new business models, the SIG members and the RESOLVD partners are engaged in a co-creation workshops. The fifth step involves the validation of the business models using the stakeholders and the project pilot. Validation is done by getting feedback from the SIG and the RESOLVD partners through the business development workshops.

Creating new business models and getting feedback from the stakeholders is an iterative process as shown in Figure 1. The number of iterations is subject to resources

available in the project for engaging the SIG and to the project's timeframe. Iterated mature business models will be tested in real life using the project's pilot. This provides the final validation to the developed new business models.

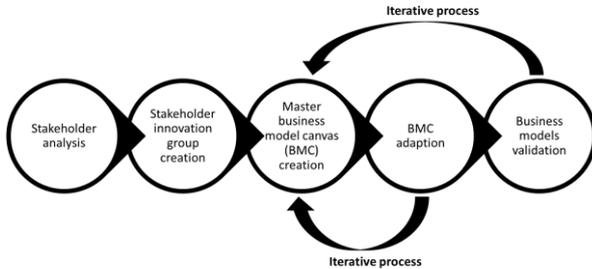


Figure 1: Methodology followed to develop business models in the RESOLVD project.

Step 1 (Stakeholder analysis) and step 2 (SIG creation) are covered extensively in [2], [3] and [4]. Thus, the next two sections in this paper will focus only on steps 3, 4 and 5 of the method (BMC creation, adaptation and validation).

MASTER BUSINESS MODEL CANVAS CREATION

During the stakeholder analysis process and the stakeholder innovation group creation it became obvious, that the stakeholder structure is highly diversified. This leads to the provision of heterogeneous input in terms of the required priorities of the innovation design. To maintain a multi-dimensional perspective regarding the creation of RESOLVD-based business models it is proposed to initially create a master business model canvas (BMC). In addition to forming a complete solution, RESOLVD innovations can be clubbed together in different packages to provide values to different customers and stakeholders, thereby showing and maintaining the modularity of the concept for the creation of different business models.

The core innovations of the RESOLVD project are focused on the creation of grid flexibility and stability. They can serve four basic purposes (see Figure 2).

Innovations can on the one hand be utilized by prosumers that own a flexible asset and thus exercise their prosumer assistive purpose. Furthermore, the innovations can be grid-assistive, allowing, e.g., a bottleneck management in the grid. The market-assistive utilization of innovations serves, e.g., to optimize the electricity consumption and procurement structure of stakeholders. In addition, it might help aggregators to capitalize on the flexibility potential according to market prices. Finally, system-assistive innovations serve to optimize the supply or demand of balancing and regulating power [5].

The overview of potential utilization and business-creating areas of the innovations clearly outlines that there might

be a significant value creation beyond the traditional domain of the distribution grid. Following this determination of general focus areas for the innovation process, the Osterwalder method [6] for the creation of a Master Business Model Canvas (MBMC) is used. The generation of a MBMC isn't a generic method of the business model process generation proposed by Osterwalder. However, it is helpful to create a very wide-ranging master canvas that illustrates the complexity of the RESOLVD innovations.

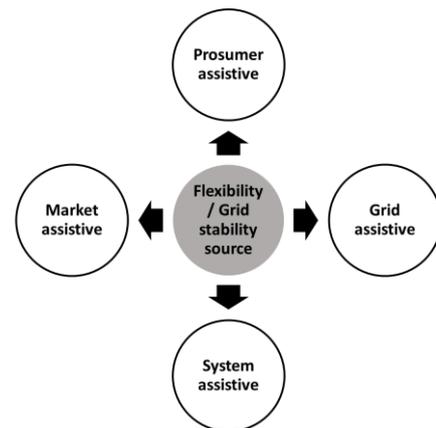


Figure 2: Four basic purposes served by the RESOLVD technologies.

The envisioned sections of the master BMC and their potential content are presented below.

Customer segments

- Prosumer-assistive:* commercial buildings, small industry consumers and prosumers; community energy managers (e.g., "Sonnen")
- Grid-assistive:* DSOs, microgrid operators, E-Mobility operators
- Market-assistive:* large industry consumers, aggregators, retailers, demand side management companies, energy exchanges
- System-assistive:* TSOs, DSOs, aggregators, demand-side management companies.

Value propositions

- Prosumer-assistive:* Support of a set-up that allows everyone to increase self-consumption and to aid the community by sharing/optimizing storage solutions; Interaction with other RESOLVD innovation technology users to share energy where and when it is needed; Reduction of overall energy cost; Become member of a sustainability movement.
- Grid-assistive:* Build more stability and crisis awareness/preparedness into the supply portfolio; reduce infrastructure investment by optimal utilization of existing assets; utilize mobile storage in a more efficient way.
- Market-assistive:* Commercialize on flexibility potential by various measures (support of demand-side management, buy low/sell high based on storage steering;

support of the set-up of local market places by advanced energy management systems; offering of new products/tariffs by retail companies.

d) *System-assistive*: Support of local and regional system stability; participation in TSO tenders for balancing and regulating power; easier bundling/aggregation of aggregator and demand-side management resources to optimize the commercial value).

Channels

Website, social networks, newsletters, project events, trade fare presence, presentations at conferences, scientific publications, RESOLVD app.

Customer Relationships

Collaborative, partly open-source material, co-creation of solutions with stakeholders, "Made in Europe" quality.

Revenue Streams

Direct sales, software-as-a-service subscription, licensing, public funding from govt. bodies.

Key Activities

Engineering, manufacturing, pilot-testing, test evaluation, marketing (e.g., publications in various journals, conferences and magazines), scientific community networking, ensuring security and privacy of data, infrastructure development.

Key Resources

Digital technology from R&I partners of the RESOLVD consortium (intelligent storage management system, intelligent energy management system, forecast technologies), sales force, intellectual property, technology experts.

Key Partners

Stakeholders (including pilot site owners/operators), industry advisors, hardware and software suppliers, EU H2020-related institutions, multipliers (media, trade fair organizers), trade & industry associations.

Cost Structures

R&I marketing & sales, fabric, offices, machinery, service employees of the value chain, raw materials, components, logistics, infrastructure and pilot sites.

CO-CREATION METHODS FOR MODIFYING THE BMC MAPPINGS

In the following section, the procedure of utilizing co-creation methods in further processing the BMC mappings towards the new business models is explained. Multiple interactions are needed to harvest the necessary input to the BMC mappings. Usually a combination of online and face-to-face activities reach the best outcomes with efficient use of available resources.

Planning of the co-creative session

At first, a detailed analysis of the current state of the development process as well as of the expectations related to the joint activity with stakeholders should be made. Starting with the five-stage Design Thinking model proposed by the Hasso-Plattner Institute of Design at Stanford [7], an extended and restructured version for better describing the different states of an iterative research and innovation project has been developed:

- *Empathy & Define*: There is a general idea or problem and an ambition to understand and get insights into a need or a situation before continuing. With regards to BMC mappings, this phase involves understanding the technology and business potential and analyzing the initial needs of different actors.

- *Ideate & Prototype*: The required insights are known, and the need/problem/situation understood, so the goal is to identify ideas and possible solutions. With regards to BMC mappings, this phase involves harvesting input to the different sections of the master BMC.

- *Test & Implement*: The need/problem/situation is understood, and some ideas have already been developed, so now the ambition is to test the ideas/prototypes to improve them further or to implement. This part is connected to harvesting feedback from both pilot sites and SIG. With this input the BMC mappings are refined.

- *Evaluate & Improve*: The target of project work has been understood, developed and implemented. Now there is a necessity to reflect on own work; what could have been done differently and how can the work process be improved for next processes.

Based on the understanding on current position in the work process, 1 to 3 aspects which should be the goal of the co-creative session can be easily identified. Within the BMC mappings, one session could focus on elaborating around new services or stakeholders, or one could decide to analyze and improve the whole BMC.

At this point, the status of RESOLVD work and the objectives of the associated co-creation setting are known so the identification of desired stakeholders from RESOLVD's SIG to attend the session can start. This phase also provides feedback to the initial selection of SIG members and is a good point for extending the group if necessary. It is important to consider the different stakeholder groups and their input to the objectives, whether they should be mixed or addressed separately, what is their motivation to participate and what is their level of understanding with regards to selected language, terminology etc.

Currently, the business model-related work is at a point for selecting the right location for the co-creative session. In general, it has been seen that web-based sessions tend to succeed only with minor, easy to understand topics and

rarely as a first co-creative event. Regarding face-to-face sessions, depending on where in the process the work is and what the purpose of the meeting is, the organizer should choose a location which supports the goal. From a more practical point of view, it is always preferable to choose a location, to which the organizer believes desired stakeholders will easily and willingly travel, as co-creative session without the co-creators will always fail. After this, it is important to consider the actual meeting venue in detail. If the ambition is to comfort people to be creative and ideate then a meeting room or auditorium might be too formal. If the goal is to test something and get usable feedback, an organizer should make sure that the surroundings and the context are realistic for the users and inspire activity.

Executing the co-creative session

When facilitating an innovation process through a co-creative workshop, there are four different aspects of the innovation workshop process and four roles for the facilitator to consider [8]:

1. Relations (Role: Gardener)
2. Knowledge (Role: Knowledge detective)
3. Ignorance (Role: Clown/Jester)
4. Concepts (Role: Concept manager)

To achieve best outcomes from the workshop, each aspect should be treated carefully, and each role should exist. However, one person can carry multiple roles, if they fit into their personality and expertise level.

Managing relations among workshop participants is crucial for achieving an environment which is fruitful for innovation to sprout. Special focus should be given to creating a trusted environment. In the case of the RESOLVD project many of the stakeholders are working in the same business and might feel sharing their insights with potential competitors risky.

Within the aspect of knowledge, especially challenging is the knowledge the individual has developed herself, through experience, reflection and practice. In the case of RESOLVD, introducing novel business actors and novel services has been identified as difficult, as people already have their established views on who is involved in the electricity distribution business and which services exist.

Ignorance is related to things for which understanding, and awareness are limited. This is the place, where radical innovation arises from. To ignite activity within this aspect, “out of the box” and somewhat “crazy” questions might be needed. In RESOLVD, like in any project within the field of digitalization of an existing industry, the future is unknown, thus the workshop should have a concise approach within this aspect.

Describing concepts is in the presented context of the RESOLVD project case related to describing the business

models. Multiple methods and parallel approaches should be used to ensure the business models are sketched properly and with the needed level of detail.

BUSINESS MODEL VALIDATION

The BMC effectively describes a business model and once business models are created the next step is to validate them and reduce uncertainties. Validation of business models involves iterative process of interacting with potential customers and stakeholders to test assumptions critical to the success of the proposed business models. Customer value proposition is central to any business model and the co-creative process of developing BMC ensures that customers’ needs are considered.

However, customers might communicate one thing (e.g., desire or feedback) and then act differently. Thus, customers’ preferences need to be tested multiple times to reveal the customers’ real behavior. Additionally, assumptions regarding other components of the BMC and stakeholders are important and need testing. All the assumptions will be sorted in order of high to low risk and will be tested in the same order. To validate business model the RESOLVD solution will be demonstrated (at a pilot site) and explained to all the relevant stakeholders. Piloting phase will provide insights to how a DSO (being a prime customer) is using the project innovations. Thus, the DSO’s preference to value proposition will be revealed. The pilot-based validation will also serve as a testing ground to investigate how project partners are cooperating in creating, delivering and capturing the value associated with RESOLVD innovations. To explain how RESOLVD solutions work workshops will be organized and feedback will be received using face-to-face interviews and surveys. Outputs from pilot, workshops, interviews, demonstrations and surveys will serve as an empirical evidence to validate hypothesis associated with business models.

DISCUSSION AND WAY FORWARD

The method proposed in this paper can be associated with the following benefits: high practicality of the approach, allowance for empirical analysis, intensive inclusion of stakeholders in the business model development process. Considering the last, possible customers are approached from the beginning to support the development of credible business models. Involving stakeholders early in the process is regarded highly efficient as it requires lesser iterations and has high impact on the successful market penetration of the technological solutions.

Yet, some limitations of the implementation are present, particularly related to time and resource. Thus, not all assumptions can be tested. Not all value propositions for all possible customer can be tested either. The negative impact of limitations can be somewhat mitigated with

efficient planning of stakeholder feedback inquiries and optimizing the time to focus on the most important and crucial for the technologies' market penetration business modeling aspects.

Importantly, the proposed work towards business modeling has its prime beneficiaries in the face of project partners. Thus, the main focus will be on developing business models associated with the project partners' role in the energy market. Only selected business models will be developed for a wider spectrum of key stakeholders, as described in [1].

The way forward for the reflected approach to business modeling can be associated with the organization of a co-creation workshop. This will help derive specific business models that are well suited the market environment. Further, the validation of created business models will take place by means of the project pilot and hopefully at the premises of other interested stakeholders, seen as potential customers of the solution.

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