
FIGHTING THE (RIGHT) WINDMILLS:
An extended view on business model innovation impediments for the energy transition

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Abstract:

The energy industry is facing technological, societal and regulatory pressures. Business Model Innovation (BMI) is regarded as a means to withstand the challenges of the changing industry by leveraging competitive advantages stemming from novel, innovative Business Models (BM). However, BMI theory has largely been developed based on empirical data from the e-commerce and internet industries. Thus, the question arises whether BMI can reach its envisioned potential in a regulated industry such as the energy industry. By addressing the question of *how* BMI functions in the energy industry in light of its regulatory impediments, we uncover that BMI is hampered by different industry- and firm-level factors. Based on these results, we suggest that BMI theory should be adapted to better account for boundary conditions such as regulation and the type of the firm (incumbent vs. start-up). We contribute to practice by revealing different kinds of impediments to BMI and we contribute to BMI theory by suggesting a research agenda.

Introduction

Disruptive technological, societal, and political changes force energy companies to engage in business model innovation (BMI) (Richter, 2013a) to maintain their competitive edge (Teece, 2010). However, extant BMI literature mostly focuses on agile service companies that share little with the heavily regulated and path-dependent energy industry, calling for research.

We follow Massa et al. (2017) in their conceptualization of business models (BM) as an attribute of the firm. Here, a BM consists of the firm's activities and their outcomes. BMI refers to reconfigurations of these activities to create and capture value for the firm's stakeholders (Casadesus-Masanell & Zhu, 2013).

In the energy industry, recent research has shown that the creation of value through BMI is especially challenging, as utility companies fail to commercialize new technologies (Richter, 2013a) and find themselves restricted by external boundaries in the form of policy frameworks (Burger & Luke, 2017). These policy frameworks are often much more rigid than those in the industries that utility companies take as inspiration for their BMI logic (Helms, 2016), resulting in a potential mismatch between the own setting and desired solution. This mismatch between BMI logics from service industries and the particular context of the energy sector create a need for additional research. To address this issue, we ask:

1. How does Business Model innovation function in the energy industry in light of its regulatory impediments?
2. How can BMI theory be adapted to accommodate areas of study with unique restrictions?

We conduct an exploratory, qualitative survey of the Swiss energy industry, which results in 16 semi-structured interviews with high-level representatives of incumbents, start-ups and new entrants to the energy industry from other industries.

Our results create much-needed innovation insights for utility companies and furthers BMI literature with a case of BMI mechanisms under uniquely restricted boundary conditions (Wirtz et al., 2016). We identify regulation as well as firm type (incumbents and start-up) as boundary conditions to the general BMI theory. From a practical perspective, we highlight the interplay of external restrictions and their effect on firm-level innovation. Unlike existing studies that investigate innovation in deregulated energy sectors (e.g. Hall & Roelich, 2016), we present a specific case in which interdependence of regulated and deregulated parts of the energy sector prevent radical innovation on the firm level. Overcoming these may depend on new institutional arrangements as partly deregulated energy markets do not seem to yield the envisioned level of BMI.

Theoretical Background

Business Model and Business Model Innovation

The research field of BMI has gained increasing popularity among practitioners as well as scholars, as it is widely accepted as an instrument enabling firms to adapt in various aspects to their changing environment (Chesbrough, 2010). Since BMI is an extension of BM literature (Foss & Saebi, 2016) firstly, we outline the applied framework of BM for this paper. Due to the fact, that the term BM has been used in different theories and contexts (George & Bock, 2011), we follow the critical assessment of BM research by Massa et al. (2017), concluding their extensive review with three interpretations of the role and function of BMs. The present study interprets BM as an attribute of real firms, because it has a direct real impact on business operations (Massa et al., 2017). In this context, each BM is classified by two major parts: the set of activities that the firm performs and the outcomes of performing these activities (Casadesus-Masanell & Ricart, 2010; Casadesus-Masanell & Zhu, 2013). In line with Chesbrough & Rosenbloom (2002), the BM is understood as a structural template that describes the firm's organisational and financial architecture encompassing the following components: value proposition, value creation and value capture (Chesbrough, 2010; Zott, Amit, & Massa, 2011).

BMI as a research topic emerged the first time around the year of 2000, from the BM literature (Foss & Saebi, 2016), where several researchers identified BM as a potential unit of innovation (Zott et al., 2011) and discussed in particular the idea that managers can purposefully innovate their BM (Mitchell & Coles, 2003). Since then, an increasing number of research papers have aimed attention on the innovation dimensions of BMs and explored BMI from various angles (Foss & Saebi, 2016). For the purpose of this study, and as a logical deduction of how we interpret a BM, we agree with (Casadesus-Masanell & Zhu, 2013) defining BMI as follows: “At root, business model innovation refers to the search for new logics of the firm and new ways to create and capture value for its stakeholders; it focuses primarily on finding new ways to generate revenues and define value propositions for customers, suppliers, and partners.”

BMI in context of the energy transition

BMI as a potential framework to overcome the challenges posed by the energy transition has gained growing attention by scholars. As new laws demand the integration of renewable energy sources, which is likely to shift energy generation from central to decentral, incumbent utilities with traditional BMs face a severe challenge (Richter, 2013a). Therefore, one major stream of BMI literature in the energy sector focuses on how utilities can adapt their current BMs with respect to the integration of renewable energies to maintain their role in a changing industry. For example, Richter (2013c, 2013b) examines two potential paths for BMI - integration of distributed PV sources and investment in offshore wind energy from the perspective of German utilities. Secondly, the increasing deployment and relevance of Information and Communication Technologies (ICT) in the energy industry, results in BMI opportunities primarily focusing on servitization. While some of these empirical studies concentrate in particular on capital-intensive commodity providers being challenged by the asset transformation (Helms, 2016), others are investigating the opportunities towards a service-oriented electricity systems from the perspective of entrepreneurial ventures and new actors (Hannon & Bolton, 2015a). Thirdly, Shomali & Pinkse (2016) explore in the context of a partially liberalised Swiss energy market, whether the participation of ICT firms and the deployment of smart grids has enabling or rather contradicting effects on electricity firms' engagement in BMI. Finally, regulatory measures will constantly force energy utilities to innovate their BM to ensure certain thresholds are met. For example,

new services related to energy efficiency have been investigated by various scholars (Apajalahti, Lovio, & Heiskanen, 2015; Hannon & Bolton, 2015b) as well as BM uncertainties resulting from carbon dioxide capture and sequestration endeavours (McGrail et al., 2012).

Limiting and promoting factors of BMI

While scholars regard BMI as a means for companies to adapt to changing external and internal conditions (Foss & Saebi, 2016), there is also wide-spread agreement that some organizations might be better equipped for BMI than others. The focus of existing literature on determining limiting factors especially regarding BMI implementation and internal capabilities to implement new BMI sheds light on two streams: (1) *Cognitive and organizational factors regardless of a specific BMI and*, (2) *factors related to a specific new business model*. An example for the first stream is Chesbrough (2010) who explores conflicts with existing assets and BMs, as well as the processes of experimentation and effectuation, and organizational change to overcome these barriers. Along similar lines, Achtenhagen, Melin, & Naldi (2013) highlighted critical capabilities such as experimenting with business opportunities, using resources in a balanced way and achieving coherence between active leadership, culture and employee commitment as crucial factors to implement value creation of BMI successfully. Further, distinct facilitating and hindering aspects arise for entrepreneurial firms vs. incumbents (Bohnsack, Pinkse, & Kolk, 2014). Regarding the second stream that observes BMI in a particular context, Richter (2013c) for instance points out that the challenges of utilities to access the distributed PV market are related to lack of products, services, demand, competencies and profitability. Others examine the transformation towards a service provider when assets play a major role in the current business model (Helms, 2016).

Regulation in the Swiss energy industry

According to the understanding of (Foss & Saebi, 2016), who highlight various boundary conditions of BMI, we interpret regulatory impediments as such for the energy sector.

The Swiss energy industry is still largely organized in a monopoly that is governed by regulation, locking customers into the offerings of their local utilities. However, since 2009 the electricity market has seen a first wave of deregulation with large industrial consumers now being allowed to switch suppliers. The Swiss government is currently planning to revisit the issue and to come up with new laws that ultimately lead to a complete opening of the electricity market.

Despite the monopolistic market, the competitive landscape of the Swiss energy sector is undergoing fundamental changes because of the newly adopted Energy Strategy 2050. The Energy Strategy 2050 is a set of different measures and laws that shape the future of the Swiss energy industry (Nabe, Trinkner, & Bons, 2015). The three main pillars of the strategy include: (1) phase-out of nuclear, (2) reduction of CO₂ emissions, and (3) increased energy efficiency (PwC, 2017). These goals entail erecting new infrastructure and leveraging the advantages of digital technologies. Further, government subsidies are distributed to increase the share of renewable energy sources in the energy mix.

Bridging the gap between this industry specific boundary conditions and the BMI theory, only a small and recent subset of BM studies have analysed external barriers and explicitly the role of regulatory

risk on BMI. Leisen, Steffen, & Weber (2019) explore the effect of regulatory changes for the case of Germany focusing primarily on the value capture part of BMI. They find that many BMs are service-oriented and as such asset light. Furthermore, Burger & Luke (2017) identify a set of BM archetypes from the electricity sector and highlight on the one hand, that such are profoundly embedded in countless political and regulatory frameworks and pointing out that distributed energy resources BMs in particular are driven more by regulatory and policy factors than by technological factors.

However, as research in the BMI field has emerged from the observation of the e-commerce industry, some findings regarding industry- and firm-level capabilities cannot be adopted as a blueprint for other contexts. Therefore, additional research is needed to advance the understanding of boundary conditions that apply. One further major boundary condition, which has been partly taken into account is the type of firm, i.e. entrepreneurial vs. incumbent firms. Despite the need to advance the understanding of BMI theory, it is of practical urgency to sharpen the industry- and actor-specific limitations and challenges of BMI in the energy sector due to the large-scale impact of this particular industry on society. It is consequently worth investigating not only the opportunities arising from new regulation as done by e.g. Richter (2013a), but to critically assess the interplay between regulation and BMI.

Methodology

Given the explorative nature of the research question, we chose a qualitative approach and conducted an exploratory qualitative survey of the Swiss energy industry. A qualitative survey captures diversity in a population (Jansen, 2010), which we found most suitable to account for as many manifestations of the phenomenon under investigation as possible. The Swiss energy industry has been chosen because regulation is more rigid compared to other European markets. Hence, it can be assumed that the transfer of BMI logic from other industries and sectors faces higher impediments than in other countries.

Our data collection encompassed in-depth semi-structured interviews with executives of 14 companies from Switzerland and one company from Germany. In total, 16 interviews were conducted, resulting in 106-pages of primary data. The interviews were held via telephone and all participants were asked the same open questions.

To include a variety of different companies in the sample that are all active in the energy industry, we spoke to incumbents, start-ups and new entrants to the energy industry from other industries. The incumbents range from a multinational utility to a small regional utility with no more than 40 employees. The start-ups are active in different parts of the energy value chain, with most of them focusing on decentral energy generation or novel technologies to manage decentral energy generation. The new entrants to the industry represent actors that have their main business operations outside the energy industry but choose to invest in the energy industry. An overview can be derived from Table 1.

The semi-structured interview questionnaire was based on desk research and informal conversations with actors and stakeholders in the energy industry. It comprised three main sections: (1) presumed development of renewable energy sources, (2) regulation and sources of uncertainty, (3) processes / means for developing new business models.

The interviews were transcribed and coded by independent researchers to ensure inter-coder validity. Results were triangulated with existing literature and complemented with follow-up interviews to clarify open questions.

Table 1: List of interviewed companies

Company name	Company type	Focus	Interviewee position	Interview duration
Large regional energy provider	Incumbent	Energy supply and distribution	Representative of the media department	36 min
Regional energy provider	Incumbent	Energy supply and distribution	Head of Energy Management	16 min
Municipal utility	Incumbent	Energy distribution	Head of Energy Sales	27 min
Large international utility	Incumbent	Energy production, supply and distribution	CEO and Head of Marketing	34 min
Municipal utility	Incumbent	Energy supply and distribution	Project Manager Innovation	45 min
Regional utility	Incumbent	Energy production, supply and distribution	Director	20 min
Regional utility	Incumbent	Energy supply and distribution	Head of Sales and Energy Management	40 min
Innovation Department of large multinational utility company	Incumbent / Start-up	Smart energy solutions / Renewable energies / Business transformation	Managing Director & CFO, COO, Senior Vice President, Chief People Officer	36 min
Virtual power plants	Incumbent / Start-up	Virtual power plants	Co-Founder and Managing Director	25 min
Wind energy start-up	Start-up	Small-scale, decentralized wind power	CEO	39 min
Software start-up	Start-up	Exchange and trading platform for Smart Home and Smart Grid solutions	Founder	39 min
Decentralized power control and storage	Start-up	Smart solutions for off-grid power production and storage	CTO and Co-Founder	40 min
Solar energy start-up	Start-up	Crowdfunding solutions for solar power	President and Founder	26 min

Furniture wholesale	New to the industry	E-Mobility infrastructure	PR Manager	47 min
Supermarket	New to the industry	E-Mobility infrastructure	Business Development Manager	41 min
Innovation culture consultancy	New to the industry	Change Management	Founder	21 min
				532 min = 8.867 h

Source: Own illustration.

Results

Our data analysis indicates that different constraints to BMI occur on the industry- and the firm-level. Industry-level constraints are caused by regulation and the dependence on the physical infrastructure, i.e. the grid. Firm-level impediments differ depending on the type of firm. Incumbents struggle with path-dependencies that hamper future decision-making, while entrepreneurial firms face resource constraints that are aggravated by limited options for scaling. Further, both types of firms seem to struggle with the process of BMI as especially incumbents revealed that they do not know *how* to proactively innovate their existing proven BMs.

Industry-level impediments to BMI

Our data suggests that the intertwined nature of the Swiss energy industry poses a major challenge to BMI especially in the parts of the industry where deregulation has not yet occurred. However, the partly deregulated/partly regulated state of the industry does not result in the aspired innovativeness of the whole industry to advance the energy transition. Overall, our findings can be summarized into four key statements.

1. Dependence on the shared and centrally managed physical infrastructure of the energy sector (the grid) prevents major BMI in the form of service-oriented and asset-light models.

Despite the rising importance of digital technologies and their potential for developing new business models, our data indicate that the dependency on the physical infrastructure is higher compared to other industries. Therefore, all BMI centered around data generated by smart meters or coordinating decentral energy production via smart algorithms is hampered by the necessity to establish an interface between the digital and the physical world. The ambiguity caused by incomplete regulation regarding the control of this interface adds to this problem. This issue has been acknowledged by the many different actors from inside and outside the energy industry that have started to create platforms to enable various kinds of transactions and services ranging from smart billing to analyzing customer data for marketing. While such platforms have been able to leverage data for competitive advantages in other industries, the energy industry is obligated to ensure supply and grid stability which limits the transformational impact of such data-driven BMI on the energy industry.

2. Rather than limiting innovation in a universal manner across the entire sector, regulations stifle BMI in only some areas while leaving others free to innovate and try out new approaches.

The future goal of decentral renewable energy supply has opened the energy industry to a new rage of actors. With the increasing number of private households producing and supplying energy to the grid,

a main task for the future energy industry is to coordinate all these different actors. As the new Swiss energy laws now allow for neighboring private households to produce, trade and feed excess energy into the grid, new BMs have emerged for managing these communities. While the management of the grid is still regulated and in the hands of a few entities, the billing, trading and maintaining of these small prosumer communities allows for different companies to compete in a free market with their innovative solutions. The shift to decentral renewable production has also enabled technological innovations for small-scale energy production. In a central energy world, small power plants were not economically viable. However, with the goal to include renewables in the supply mix, formally non-viable solutions now become very attractive to consumers allowing firms to enter the industry that fundamentally challenge the idea of *how* energy is produced.

3. The deregulation of some areas of the energy market has not resulted in major BMI, as the intertwined nature of the different parts of the sector create a state of dependency between agents in the deregulated parts and dominant players in the larger industry.

While BMI is not completely absent from the energy industry, it has not yet led to the anticipated large-scale transformation of the industry that many scholars regard as a key driver for the energy transition. Based on our data it seems that the power remaining in the hands of some few actors in the energy industry, cannot be overcome by BMI. These actors are transmission and distribution companies that control the grid and the accessibility of the grid. Further, large utility companies that cover the entire value chain in the energy production from generation to transmission and ultimately distribution, seem to be looking for options to extend their current BMs by adding services rather than fundamentally innovating their BMs. As these companies own and operate large parts of the existing physical infrastructure, large-scale BMI is unlikely to emerge without cooperating or partnering with these actors. Understanding these intertwined mechanisms, incumbents and start-ups are often teaming up in an effort to leverage each other's capabilities to jointly create new value propositions.

4. Despite their greater operational freedom, newly deregulated parts of the energy sector also feature relatively little BMI as they tend to be the less profitable parts of the sector and attract fewer investments from both incumbents and new entrants.

Another issue that has been repeatedly emphasized by our interview partners is the pricing scheme in the Swiss energy industry. While some subsidies are paid to private households to ensure the integration of renewable energy sources, the pricing mechanism of the quantities of electricity sold is still controlled and regulated by the government. The margins found in deregulated parts of the industry are only partly attractive for new entrants as they are not able to cross-finance small margins with other more profitable business activities. Large incumbent utilities have a competitive advantage here because they are able to use their profits from regulated and protected parts of their business activities to continue operations in a less attractive environment. This pricing mechanism has driven out some start-ups that could not cover their costs and thus, has strengthened the position of incumbents. It has, however, also stifled BMI as the environment does not attract enough investment.

Firm-level impediments to BMI

On the firm-level, our data revealed three main reasons why the potential of BMI cannot easily be deployed. The main reason is the missing understanding of incumbents and start-ups how to adapt or innovate their BMs. However, incumbents seem to be struggling more with this task than start-ups. Second, incumbents' decision-making is constrained by path-dependencies, while start-ups can experiment more freely. Third, start-ups do not have enough resources at their disposal that enable experimentation and perseverance in an industry that changes rather slowly.

1. Incumbents and start-ups struggle to identify processes and strategies for BMI with incumbents being even more hampered by the simultaneous operation of their current BM and the search for new BMs.

Regarding firm-level processes for BMI all our respondents indicated that they do not have a clearly defined approach implemented in their organizations. Instead, BMI seems to emerge from a rather fuzzy and simultaneous set of different actions that include: desk research on market trends and competition, understanding of macro trends and their implications for the business, and conversations with research institutions, experts and other actors in the industry. Further, technology scouting and technology management are significant parts that are considered for BMI. However, these aspects can all be summarized as a preamble for the actual undertaking of BMI that is necessary to evaluate whether the current BM is able to secure long-term competitive advantages. In our sample, all actors agreed that BMI is indispensable, but most respondents were not able to describe *how* they aim to realize BMI. Most of our interviewees answered that they aim to experiment on new BMs by entering partnerships or collaborative activities. Start-ups seemed to be more willing to join forces with incumbents while incumbents view start-ups as threats to their current BMs. Thus, incumbents are less willing to enter close relationships with other companies but are open for some loose collaborations. In addition to collaboration as an enabler for BMI, experimentation and rapid prototyping were mentioned to quickly test and rule out new ideas. Further, it was emphasized by our interview partners, that the development of new products and services is centered around understanding emerging customer needs. In this case, incumbents are better positioned as they often have long-term relationships with their customers.

Based on our data, however, incumbents seem to be facing a higher level of complexity when innovating their BMs. This is due to the simultaneous operation of their current BMs, which might require different resources and capabilities compared to exploring new options. This so-called *ambidexterity* (Andriopoulos & Lewis, 2009) entails multi-level challenges for incumbents ranging from organizational design to leadership and management. Start-ups and new entrants from other industries are less hampered as they can focus their attention on bringing innovative BM to the energy industry.

2. Incumbents are dependent on their past decisions and are thus constrained in their BMI by path dependencies.

Path dependence means that prior choices limit the decisions that can be made today (North, 1990). While regulation has not changed over the past and has ensured profitable operations for most incumbents, the new partly deregulated market now leads to incumbents perceiving regulation as the highest risk and uncertainty in the industry. Hence, future decision-making is constrained by incumbents' willingness to embrace risk and uncertainty, as they did not have to deal with these issues in the past. This is implied by their attitude towards changes, which are seen more as a threat as the change in regulation and new technologies endangers the old BM and long-term revenue streams. It becomes even more apparent in multiple statements that put the challenge of BMI into the hands of the younger generation as they are regarded as a source for new ideas and more creativity. More senior employees in the company do not feel responsible for innovation activities but rather think of themselves as the guardians of the old proven cash cow BMs.

Furthermore, most incumbents possess substantial physical assets such as the grid, power plants and other, which they need to maintain and operate. These costs limit the amount that incumbents can invest in exploration activities for BMI. Further, BMI in the energy sector is centered around the idea

of a decentralized grid, which contradicts the current arrangement of the existing infrastructure. It is thus not in the economic interest of incumbents to foster BMI that would ultimately cannibalize parts of their existing infrastructure.

3. The slow pace of the energy transition might lead to a race between resources rather than innovative ideas.

While nearly all incumbents from our sample view deregulation as a threat and do not seem in favor of a further opening of the market, all start-ups are calling for more deregulation. Two start-ups even emphasize that their BMs are profitable in other more liberalized markets for example in Germany or outside of Europe, but that the Swiss energy market offers slim margins, which do not allow for enough revenues to cover all costs. The situation is further aggravated by the strong lobbying of incumbents to maintain the status-quo. Some of our respondents further emphasized that some of their more innovative BMs are designed by betting on the full opening of the electricity market. This leads to the question whether start-ups and new entrants from other industries have overestimated the potential of the energy industry and have chosen to enter the market too early. However, while market entry decisions are always accompanied by some risk, the special case of the energy industry entails opposed effects on incumbents and start-ups / new entrants. The longer the status-quo is kept, the longer the current BMs of incumbents stay protected and the perceived threat from new entrants decreases. On the other hand, the longer the status-quo is kept, the more difficult it is for start-ups and new entrants to stay in the market.

Implications

From our results we can derive implications for practitioners and for the research agenda of BMI theory.

All interview respondents have highlighted regulation as a source of uncertainty. Therefore, innovative BMs should be established in a manner that they can deal with an uncertain external environment. This is in particular a challenge for incumbents as they are used to a relatively stable environment from the past. Incumbents should thus leverage their current protected positions in the market to actively shape the future of the energy market. Due to the unequal power distributions in the energy industry caused by regulation, incumbents might have the upper hand in determining and building the future BMs for the energy industry. However, this requires incumbents to become more ambidextrous to continue operating their current BMs while at the same time coming up with radical innovations that might include the replacement of current operations at one point. This includes new organizational structures, new leadership styles and cultural changes.

Our empirical assessment of the applicability of BMI to the context of the energy industry uncovers further that BMI theory could profit from a better understanding of the effects of boundary conditions. The underlying notion of BMI being a major competitive advantage seems to be limited in context where competition is regulated. Our findings suggest, that BMI cannot overcome monopolies or competitive advantages created through regulation. Thus, it can be derived that BMI theory might only be applicable in certain contexts. Additionally, we have uncovered differences between incumbents and entrepreneurial firms with regards to BMI. In our sample, we find that path dependencies are a boundary condition that has stronger negative effects on incumbents than on start-ups. In line with Foss & Saebi (2016) we therefore suggest, that future research in the field of BMI should focus on the differences between firm types and more clearly delineate whether BMI is a fruitful approach to secure competitive advantages in regulated industries.

Conclusion

Through an exploratory qualitative survey, we have studied the limiting factors of BMI in the energy industry. A deeper understanding of these factors is crucial as the energy industry has come under unprecedented pressure stemming from society, technological innovations and the global phenomenon of climate change. Our results have indicated that a partly regulated energy industry as is the case in Switzerland does not seem to provide the optimal incentives for the actors in the industry to engage in BMI. Further, we have found that industry- and firm-level impediments to BMI evolve around regulation and firm-type dependent issues. We contribute to the current discussion on BMI in the energy industry by pointing out the intertwined nature between the regulated and the deregulated parts of the energy industry and derive some key recommendations. In addition, we contribute to BMI theory by studying BMI in a special context and by investigating differences between incumbents and start-ups. From this we conclude that BMI theory needs to be adapted to incorporate boundary conditions such as regulation and different firm types.

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