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BEYOND UTILITY 2.0: A SEARCH FOR RELEVANCE IN TOMORROW'S ENERGY SYSTEM

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Abstract

Questions have been raised about what role municipal energy utilities should play in the energy system of the future. Volatile energy prices have hurt profitability while technological development cause doubt about the need for local utilities, both in production and distribution. Managers are trying to meet these challenges by searching for new business models that allow for the introduction of new innovations and the creation of new customer value. This paper explores how top managers in eight Swedish municipal utilities reason about business model innovation in relation to new products and services meant for their most challenging market segment; family houses and small multi-dwelling units. The results show that the managers find the costs associated with the technology daunting and that there exists two opposing routes forward. The first route implies a 'wait and see' strategy, where managers expect technology provides to develop the technology further and in that way, allow for an implementation of the technology, sometime in the future with a minimum of changes to existing business model. The second route involves changing the business model of not only the utilities, but also that of its suppliers. This route builds on the realization that the utility does not have complete control over its value propositions and that it therefore needs to develop a capability to continuously re-negotiate not only its own business model, but also the business models of its most important key partners.

Key words: Business model innovation, municipal energy utilities.

1. Background

During the latter half of the 20th century, privatization and corporatization became dominating themes in the energy policies of many Western countries (cf. Midtun, 1997). In Sweden the wave of liberalization was more pronounced than elsewhere and took place on several different arenas at the same time, leading to an extensive corporatization of governmental activities at local, regional and national level (cf. Högselius & Kaijser, 2010). Internationally, municipal energy utilities have played an important role by providing infrastructure (Hannah, 1979) and revenues to local communities (Deno & Mehay, 1988). Since Swedish utilities had contributed to their municipalities in similar ways there was a general reluctance to privatization. When a new law on municipal activities was introduced in 1991utilities were thus often kept under municipal ownership but re-branded as firms and assigned the task of developing a corporate management style that would distance the organizations from their bureaucratic heritage (cf. Högselius & Kaijser, 2010). The subsequent deregulation of the energy markets in 1996 meant that the utilities were exposed to competition and substitutes that previously had been held at bay by legislation. Despite the increased competition, most of the utilities flourished and even expanded their market presence. This development made the years leading up to the financial crisis a profitable period for most of those municipalities that had kept ownership of their energy utilities (cf. Aronsson & Hellmer, 2009).

In Sweden the main product offered by municipal energy utilities is heat and the dominant technology used to produce and deliver heat is district heating (DH). DH allows for the utilization of production factors available in the municipality. Readily accessible local assets such as forestry bi-products or waste heat from industrial processes may be turned into profitable sources of energy. In certain cases electricity and heat can be generated at the same time with high efficiency through so called co-generation technology (Frederiksen & Werner, 2014). As a result DH production has become an important part of the portfolio of municipal energy utilities. Today, 60 per cent (60%) of the 220 firms producing DH in Sweden are wholly owned by municipalities, another 17 per cent (17%) are co-owned by municipalities and other actors while the remaining 23 per cent (23%) are owned by private, state or other interests (Aronsson & Hellmer, 2009). Having overcome the challenges posed by the market liberalization of the 1990s, Swedish municipal energy utilities now face several new threats that may put their businesses in a declining spiral (Magnusson, 2012). Low energy prices, falling demand due to increasing energy efficiency among customers, increasing maintenance costs, and increasingly competitive substitutes put pressure on managers to act (cf. Sandoff & Williamsson, 2015).

2. Problem discussion

As is frequently the case technological innovation has been touted as the solution that will enable municipal utilities to stave off financial decline. Several disruptive innovations have been conceptualized and introduced. Products such as Google's Nest or Apple's Home Kit are being based on information and communication technology (ICT) and the internet of things (IoT).These products and associated services are thought to exemplify how the "Utility 2.0" may add customer value to the heating service and raise the willingness of customers to pay a price premium. However, most consumers that use DH live in large housing complex. This means that they have no or very little influence over their heat usage and are rarely billed separately for heating. Consequently, these customers have no or little incentive to invest in innovations that will add value to their heating service. What remains is the single family houses and small multi-dwelling segment. This is a challenge to utilities since each customer within this segment consume comparatively little heat, but is resource intensive when it comes to services and customer interaction. In 2011, only nine per cent of sales volumes in Swedish DH emanate directly from this market segment (Swedish District Heating Association, 2015a). The market share within the segment was also low in comparison. In 2014 only 18 per cent of single family and small multi-dwelling units relied on DH technology for their heating needs compared with 90 per cent (90%) in multi-dwelling units and 80 per cent (80%) in business facilities (Swedish District Heating Association, 2015b). Within the segment producers of substitutes, such as heat pumps, have had time to develop attractive value propositions. Such segments have been stratified and customer oriented solutions with a high degree of individual adaptability are available at a wide price range. For DH, the technology needed to offer a similar value proposition is thought to be so costly that the price is considered to be out of reach for most consumers. Furthermore, energy utilities have a poor track records when it comes to handling this segment and since the segment has been perceived as unattractive, not much effort has been spent in developing an organization that can cater to the needs of these customers (cf. Magnusson, 2012; Sandoff & Williamsson, 2015). However, the low market share means that there is potential for growth. Finding ways to create customer value while generating enough revenue to produce profit is in business research commonly conceptualized as the creation and implementation of business models (cf. Magretta, 2002; Teece, 2010). The need to find new and innovative business models is a challenge that the Swedish utilities share with utilities elsewhere. The previously profitable business models of German utilities have been under threat from the spread of distributed solar photovoltaic (PV) (Richter, 2013) and in the UK the weak business models of municipal

energy utilities mean that they require expanded policy support in order to fully contribute to a sustainable urban energy system (Hawkey et al., 2013). The question of how municipal utilities should deal with business model innovation is thus one that is being asked in many capitalist countries.

The core challenge that managers face in the municipal utility sector is to find a business model that makes it possible for their firms to utilize new technology in their value creation processes. Research indicates that managers generally should be reluctant when it comes to introducing innovations that do not fit well with existing business models (cf. Chesbrough & Rosenbloom, 2002). There is also pressure to develop existing business model because it is the business model that allows the firm to benefit from modern technology, exploit changes in customer demand(cf. Johnson et al., 2008) and to create and develop markets through so called market driving (Schindehutte et al., 2008).As a result, managers face a dilemma where they on the one hand need to be cautious with change and on the other hand face pressure to adapt or develop business models that not only allows for the generation of value from new technology but also fosters the creation of markets.What factors that are thought to influence the managerial ability to make the right choice depends on one's perspective on the nature of managerial cognition. Chesbrough (2010) shows that research is largely separated into two fields that postulate obstruction and confusion, respectively as main barriers to innovation. Chesbrough (2010) further argues that managers rarely have a clear image of what business model should be pursued in a given situation and aligns him with the second perspective. Research on managerial work (e.g. Hummel, 1991) and decision making in relation to business models (e.g. Tikkanen et al., 2005) support his view. Furthermore, as managerial action in relation to business model innovation is both market driven and market driving, (cf. Teece, 2010) it is not only managerial views on how the world is, but also on how it should be that shapes business decisions. Consequently, the infusion of meaning, i.e. so called sense-making (Weick, 1995), into events, actors and artefacts is the process of interest when exploring why managers decide to take their firm in a particular direction. The purpose of this study is therefore to explore how managers reason about business model innovation that allows for the introduction of disruptive innovations. Through the fulfilment of the purpose the study will identify contextual factors that influence business model innovation conducted in municipal energy utilities.

3. Theoretical framework

Business model innovation has become central to the commercialization processes of technology and services (Chesbrough, 2010). Despite this development, a comprehensive review of academic work on the concept by Zott et al. (2011) shows that there has yet to emerge a commonly accepted definition of the business model. Despite this lack of a common definition, Baden-Fuller and Morgan (2010) show how the business model concept is used in professional and academic circles in mainly three different ways: (1) as a basis for descriptions of kinds within a taxonomy, (2) as something akin to models found in the natural sciences or mathematics and,(3) as something similar to recipes. Since this paper examines managers' reasoning about how the business model of their firms should look it relies on the third type of research and the study is thus akin to a case study of the process of formulating and following a recipe. Business models are often operationalized (e.g. Osterwalder & Pigneur, 2011) and studied (e.g. Demil & Lecocq, 2010) through the use of sub-constructs which are organized in frameworks. For this paper, the author relied on the popular framework provided by Osterwalder and Pigneur (2011). It builds on nine building blocks i.e. sub-constructs which in themselves form extensive academic fields. The building blocks are the following (Osterwalder & Pigneur, 2011): Customer segments, value propositions, channels, customer relationships, revenue streams, key resources, key activities, key partnerships and cost structure.

4. Method

This paper is based on case studies (Yin, 2003) of eight municipal energy utilities that were conducted during the spring of 2015. The selected firms had in 2014 an annual turnover that ranged from SEK 500 million to several billion and employed between 100 and 800 employees each. As a result, the selected group of utilities incorporates mid to large sized firms. In total, the firms represented 16 % of all district heating sale in 2012. Yin (2003) argues that the aim of case studies is to improve our knowledge of the complex processes that underlie a phenomenon and that it should be done by exploring the components which it is constituted by. Authors such as Chesbrough (2010) and Tikkanen et al. (2005) describe how the process of business model innovation is dependent on managerial sense-making (cf. Weick, 1995) about key strategic and business related concepts such as customer value, production and stakeholder relations. It is thus the sense-making about business model related concepts that is of interest. The process of sense-making is a cognitive process which is chiefly studied through interviews (Weick, 1995). Consequently, data was gathered through interviews with top managers such as CEOs, or business area managers, that were directly involved in the process of business model innovation. Interviews also enable managers to influence the stance of the researcher and thus opens up for a more equal footing between the research and individuals being studied (cf. Czarniawska, 1997; 2012). In total 11 top managers were interviewed and each interview lasted between 60 and 120 minutes. Each interview was recorded and transcribed by the author. In addition to the interviews with the managers a contextual understanding of the industry and each individual firm was built through the analysis of annual reports, marketing material–such as home pages and leaflets– and several meetings with consultants that worked with the development and implementation of the technology for the firms. All quotes were translated ad verbatim from the transcribed interviews.

5. Characteristics of District Heating and the Need for Innovation

District heating is a complex and expensive infrastructure product with long investment horizons and strong ties to the local setting. Scale and profitability are dependent on the successful planning and execution of an often vast socio-technical system that is fixed to the local geography (Summerton, 1992). This sets DH apart from most other forms of heating technology which works on a smaller scale, such as separate buildings, apartments, rooms or even individuals (Baldvinsson & Nakata, 2014). The large scale and long investment horizons of DH means that business arrangements to a large part consist of the management of long-term relationships with stakeholders such as suppliers and customers.In Sweden the heating market consists of four segments (Swedish District Heating Association, 2015a): large housing complexes (50 %), commercial buildings (28 %), industries (10 %) and single family and small multi-dwelling units (9 %). In the first three market segments the municipal dominance is strong with close to 90 % market share (Aronsson & Hellmer, 2009). This dominance arises from several factors among which the most important once are given here. First of all, if it is possible to connect to an existing local DH network substitutes, such as borehole heat exchangers, are generally financially unattractive since they require considerable investments and run on electricity. In Sweden the price of electricity is decided on a spot market which means that it might fluctuate greatly and especially so during the coldest winter months when heat is needed the most. Heat exchangers are also often unable to provide enough energy to warm buildings to a satisfactory level when temperatures go far below freezing which means that there is a need for top-up systems such as boilers or district heating. Another contributing factor to the dominance of municipal utilities is a tradition

among municipalities to own large housing complex, meaning that large customers simply would not switch heating solution due to having a common owner.

The existence of contextual and cultural factors that influence the shaping of DH-systems and for that sake other energy systems implies that the choice of technology for production and delivery is not based on a neutral cost and benefit calculation. Instead the choice is based on subjective assumptions that arise from the social, cultural, financial and political factors active at the local level. It is thus far from obvious what combination of technological solutions, building features and preferences for indoor temperature that will shape market demand. Innovations based on ICT not only offer the ability to remotely and in real-time check and control indoor climate but also present managers with the opportunity to renegotiate boundaries with the stakeholder that constitute the DH system. In addition such technology introduces the possibility to influence and shape what expectations that a customer should have when they choose DH. As hinted earlier, DH is associated with a high degree of complexity both when it comes to production and delivery. This is something customers, probably due to the low rate of breakdowns and high degree of quality, rarely are aware of (Rydén et al., 2013).

The development of ICT and IoT based innovations opens up for the possibility to visualize the complexity of DH to customers in previously unimaginable ways. It is thus, not only the facilities of the customer that may be manipulated to improve the economy and environmental profile of the DH collective but also the individual customer's attitudes and behavior. Based on these possibilities the ambition in the industry has been to present the utility as a possible hub for a range of resource and information flows that are considered as essential to the local society. The Utility 2.0 would then become a portal figure for a range of services needed in the integrated society of tomorrow. The development described in the background makes it apparent that this vision of the future role of the municipal utility needs to be revised. Several actors present an alternative vision of a future energy system with insular and detached self-sufficient actors in thickly insulated buildings utilizing different types of distributed generation and storage of energy. The idea of an integrated energy system that is balanced with respect to efficiency and utility by a central actor is challenged by a new ideal of self-sufficiency and independence. The vision of the Utility 2.0 is thus threatened by the possibility for other actors to readily enter and exit the role of energy producer. Analysing the history of DH and its main substitutes it is possible to argue that the development can be summed up in Figure 1.

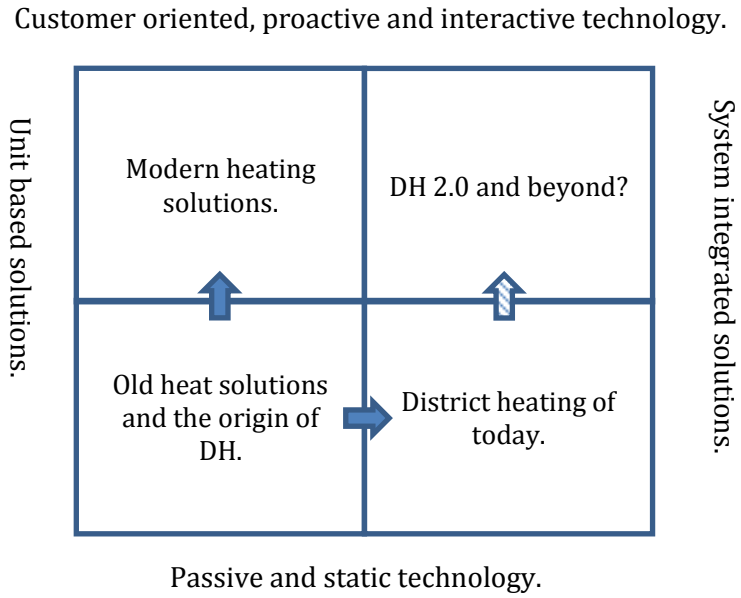

Figure 1. The development of DH and its substitutes.

Conceptually heating solutions such as heat pumps and DH share a common heritage. The initial concern was to heat, in the case of DH with a distant energy source, a single property or a unit, such as a room, within a property. It was a mini-system that was to be heated without the need to balance the energy flows of a larger collective such as the local municipality (Collins, 1976; Gallo, 2003). By focusing on solving issues related to the expansion of delivery networks and the use of multiple fuels of lesser quality DH technology came to embody the ability of large engineering projects to generate competitiveness through economies of scale and scope. In some markets, DH thus came to be an integrated, large scale socio-technical system that works in the background of society by generating and converting energy (Frederiksen & Werner, 2013). At the same time the core of the value production for heat pumps was fixed, that is to say that the main purpose has remained to be the heating of a limited space by converting a limited number of energy types. While the scale and the energy sources utilized in products such as heat pumps changed little over time competition meant that producers developed the value proposition not only by gradually increasing the efficiency of the product, as was also the case with DH, but also by including new customer oriented and individually adaptable features. This led to the creation of consumer oriented smart technology able to be not only interactive but also proactive in its delivery of customer value. Analyzing this historical development we see that the vision of the Utility 2.0 takes its starting point in the systemic view and that customer value is a bi-product of the production system rather than the core reason for the system's existence. However, as indicated in the problem discussion, it is unclear how managers reason about the future of DH.

6. Results

The managers that were interviewed had a view of DH that closely mirrors Figure 1 in that they saw DH as a product with features that made it unique in comparison with substitutes. They were also convinced that their product and services had superior quality and was the alternative that had the least environmental impact among currently available technology. The managers were perplexed about how they should convey this to the customers and especially to customers with little or no technological understanding. The belief was that the

new technology should be a cornerstone in the new value proposition. A quote from one of the CEOs portraits this belief:

> "*You have to create an attractive profile for your product and we view this technology as a good way to do that. It enables you to, among other things, control your environmental impact, even if it is not by a considerable amount. However, it is enough to make the customer feel that it is participating and that the product is up to modern standards. That is the main problem for district heating. It is considered to be a technology of yesterday.* "

Managers were unable to directly pin-point how the new value proposition should look but they described it as a system integrated climate solution that enables the following: (1) the differentiation of customer value, (2) the ability of customers to make additional choices and purchases or easily change arrangements, (3) transparency in all steps that make up the value chain for each customer, (4) services that increase the energy efficiency of the customer and finally,(5) a platform that is open for the establishment of relations between third party actors and the customer.

To keep the product unique to DH the new value proposition would need to be built on the established system of key resources, such as boilers and pipelines while opening up for the addition of a new key resources, activities and partnerships. In essence, the managers thought that the new value proposition would require three things. First, a new computerized substation that was imagined as a unit that is separate from but able to communicate with existing machinery. Second, the enabling of a multi-actor based control of the substation, meaning that the activities of coordinating and prioritizing between different actors needs become a top priority. Third, the establishing of a platform for partnerships with producers of services that may be delivered through the substation and for this, managers mainly believed that there would be a need for direct partnerships with software developers and firms providing different types of internet based services. The financial side of the new business model was difficult to assess and none of the managers had done more than fairly rudimentary estimates on revenues, costs and potential effects on other activities. The factors that the managers considered as important cost and revenue drivers are listed in Table 1.

Table 1. Revenues and costs associated with the new technology

Potential sources of revenue and savings	**Direct and indirect costs**
The sale, lease etc. of the sub-station and potential hardware add-ons. Service contracts. Detailed segmentation of the market. The sale of services such as: - Energy efficiency solutions. - Customer based comfort agreements. - Access to customers for third party actors. - Platform services for other actors than customers. Effects on production and administration: - Improved control and management of peak loads.	Purchasing, managing and maintaining sub-stations and related infrastructure. An added need for R&D. An added need for marketing skills. Education of personnel. Updating standard contracts. Updating existing production and delivery control system. Updating existing IT- and management systems. Updating existing price models.

- Remote checking on error messages. - Customer based administration.	

Even though the managers had a fairly congruent image of the foundations of a future business model and the technology that it would help to introduce, there were distinctly different views on how the firms should be able to get both business models and technology in place. It turned out that there were two groups that had entirely different thoughts on how to proceed. The first group was populated by managers from smaller firms with little experience of the particular technology. These managers described the product as stand-alone and also made calculations on associated costs and benefits in that manner. Those calculations showed that the introduction to a desirable amount of customers would pose an unbearable financial burden for the firm or raise the price of DH to levels which would make it less attractive to customers. Their assessment was that they would be unwilling to make changes to their existing business model in order to accommodate the technology. Instead the managers expected that if the technology had any potential other actors would develop it further, allowing the utilities to pick up the products later at a lower cost and with a more well-defined value proposition. This "wait and see" strategy meant that managers expected third party actors to develop the technology in ways that enabled the firm to implement it with a minimum of change to existing business models. Furthermore, the changes that they saw as possible were linked to the development of new relationships, e.g. new customers and suppliers. Disturbing existing relationships or changing existing resources was seen as too risky. When asked about the main reasons behind why these managers saw the product as an isolate and shunned linking it to a wider portfolio of opportunities, they described how they had no mandate from their owners to take a wider and more innovative approach to the challenges that the managers perceived. Instead, focus was on delivering a yearly result and not taking on more risk than absolutely necessary. A CEO for a mid-sized but highly profitable firm presented his view in the following way:

> *"The market might be ready but in order to launch there is a need for a massive marketing effort and that will cost much more than what we will be able the make from it. I do not see any business case for this product beyond building customer goodwill."*

The second group contained managers working in mid-sized and large firms with an explicit directive from their owners to be innovative. These managers saw the potential of developing customer and owner value, i.e. dividends, from the product as being intimately linked to the development of the firm's business model. They also described how such development required a risk tolerance among the owners. The municipality had to accept that the managers would make mistakes and that the utility could lose, and lose big, on some of its projects. If that was not the case, the managers thought that they would not be able to assure that the firm would deliver profits in the long run. This was a conclusion that the managers were actively conveying in their interaction with the owners. These managers basically saw the value that the product would generate as a motive for business model innovation and were convinced that the factors presented in Table 1 would in the long run generate considerable positive cash flows for their firms. They were, however, uncertain about how to motivate the complex changes that they saw as necessary since they had little experience both with the technology and with business model innovation at the scale that they saw necessary. Furthermore, they believed that the technology would mean that the utility would lose control over parts of the value propositions to other actors such as suppliers or other firms utilizing the technology as a platform. A managed and gradual loss of control was seen as inevitable if the DH technology was to be able to increase the content of its value proposition within the current investment cycle (i.e. within a timeframe of 20-30 years). As the task appeared overwhelming the managers recognized that there was a need to learn as they

proceeded. There was also a realization that the utility would need allies, not only within the municipality but also elsewhere, in order to succeed with the changes that the managers expected to be necessary. In order to proceed, they therefore were working on several arenas at the same time. Their firms were investing in human resources and technological development at the same time as the managers used their political capital, through industry trade groups and lobbying, to push for industry wide technological standards and the creation of a public majority that favored the same "municipal utility of the future" as the managers themselves envisioned. A major problem for these managers was that the existing key resources and key partners resisted change both actively and passively. The active resistance was linked to internal factors such as corporate culture but also external factors such as key suppliers who saw that their existing relationship with the DH firm was under threat. Passive resistance was described as the lack of "initiative and drive" both among employees and stakeholders. The managers saw that there was a need for a more convincing narrative about what the managers were aiming for, i.e. a new positive image of the future of the firm and its stakeholder. A senior manager responsible for market development at a larger firm expressed his concern over this problem in the following way:

> *"I am working in a municipal utility that needs help pulling this heavy load. However, we are not getting that help. That is a problem for us today. Traditional suppliers have a very low capacity to innovate and bring forth ideas. We lack people with smart ideas or the people that we interact with have not bothered to try to understand how we actually function today. […] A good supplier pushes his customer forward. That is the least it should do, but it is not working like that today. It is very worrying."*

A key conclusion that these progressive managers presented was that the municipal utility has to reconfigure not only its own role but also most of its existing relationships with its stakeholder and the relationships between stakeholders in order to fully take advantage of the potential of new technological innovations that come out of ICT and IoT. Moreover, the reconfiguration was thought of as being a process in which not only the link between the firm and its stakeholders changed but also as a process in which the roles of those stakeholders changed. Consequently, managers expected that the business models of their existing suppliers would change and that new suppliers with radically different business models might appear. The inspiration for such visions was gathered from the automobile and banking industries.

7. Discussion & Conclusion

It appears as the dilemma of business model innovation in relation to the introduction of radical new technology is being associated with visions of the activity level of the individual firm that spans over a spectrum that goes from no or little internal change to a complete overhaul of not only the firm's own business model but also the models of the firm's key partners. In the first case, managers viewed the product as an isolate and expected that external parties will take on development of technology and business models and thus enabling the utility to wait for the appropriate opportunity to step in and invest. This perspective seems a bit naive when compared with the expectations expressed by the managers believing in the second scenario. They instead were convinced that business model innovation was inevitable and that it should be pursued in several arenas at the same time while pushing other actors to innovate independently. The position held by these managers indicates that they are aware of a connection between business model innovation and strategy that the first group of managers appears to have missed. Within business model literature the connection between business model innovation and strategy is considered as crucial to the long term success of firms (e.g. Casadesus-Masanell & Ricart, 2010; Teece, 2010).

The managers that saw the product and its associated business model characteristics as an isolate would leave the future of Utility 2.0 in the hands of other parties while the managers in the second group appear to move beyond Utility 2.0 to something even more integrated and open to stakeholder influence. Their willingness to release control over the value offering implies a view of a future municipal energy utility as something that resembles a local brokerage firm – dealing with flows of energy and information. However, instead of controlling and centralizing all flows, as in the case of Utility 2.0, the brokerage also facilitates the independent arrangement of meetings between stakeholders such as customer and suppliers in order to satisfy their needs.

Analyzing the two different perspectives it would be tempting to draw the conclusion that firm size and thus, the availability of resources is a major factor behind the differences in attitude. However, the importance put on the owners' perspective on risk taking means that it is likely that the size of the firmis of less importance compared to the strategic progressiveness of the owners. The difference between the groups, thus, emanates from what type of narrative that is used to shape and make sense of the purpose behind the firm. Finally, the results show that if top managers want to go ahead with business model innovation they not only need to express the logic about how the firm should produce and capture value in a way that convinces their stakeholders, but also need to actively engage with those stakeholders when shaping said logic.

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