
Exploring challenges in data-driven business model innovation from Austrian enterprises

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Abstract: The increasing amount of generated data and advances in technology and data analytics are enablers and drivers for new business models with data as a key resource. Currently established organisations struggle with identifying the value and benefits of data and have a lack of know-how, how to develop new products and services based on data. There is very little research that is narrowly focused on data-driven business model innovation in established organisations. The aim of this research is to investigate existing activities within Austrian enterprises with regard to exploring data-driven business models and challenges encountered in this endeavour. The outcome of the research in progress paper are categories of challenges related to organisation, business and technology, established organisations in Austria face during data-driven business model innovation.

Keywords: Austria; big data; business model; business model innovation; challenges; data-driven business model; data-driven service.

1 Introduction

There is a common understanding in literature, that the growing amount of available data and the technological developments in (big) data analytics are a major driver for entirely new business models (Hartmann et al. 2016; Günther et al. 2017). Hence, it is not sufficient for established enterprises to focus on product, service and process innovation, it is necessary to rethink business models towards data-driven business models (DDBM), business models “*relying on data as a key resource*” (Hartmann et al. 2016). Currently established organisations struggle with identifying the value and benefits of data.

Furthermore, it seems to be challenging for established organisations to develop and integrate new business models into existing business. There is a shortage of knowledge on how data-driven business models can be generated and implemented in organisations.

2 Related work

Current DDBM research focuses mainly on frameworks and patterns (Hartmann et al. 2016; Engelbrecht et al. 2016; Schmidt et al. 2018), how data-driven innovations have changed existing business models (Schüritz, Satzger 2016; Zolnowski et al. 2016) or on occurring challenges and barriers (Brownlow et al. 2015; Schroeder 2016). Up to date research results are often focused on start-ups (Engelbrecht et al. 2016; Hartmann et al. 2016; Schüritz et al. 2017b; Schmidt et al. 2018).

Out of manifold options for data-driven business model innovations (Schüritz, Satzger 2016), three main directions arise: (1) use data for internal optimization; (2) enrich existing core products or services with data; and (3) provide new stand-alone data-driven services (Schüritz et al. 2017c; Wixom, Ross 2017). Recent studies on data-infused business model innovation from Germany (Schüritz, Satzger 2016) and digital business model innovation from Austria (Breitfuss et al. 2017) revealed, that most organisations are leveraging data mainly for internal optimization. The focus of this research are corporations which are developing a new or enhanced value proposition based on data, thus leaving out internal optimization projects based on (big) data.

Little research exists so far focusing on data-driven business model innovation in established enterprises. There are hardly any specific tools, methods and processes available tailored for established enterprises to systematically develop DDBMs. Hunke et al. (2017) for instance proposed requirements and a process model prototype with six phases (mobilization, initiation, ideation, implementation, integration and administration) and three process content layers (data, organisation and ecosystem) for data-driven business model innovation. Schüritz et al. (2017) investigated 10 servitization barriers and datatization sub-categories in pioneering enterprises, that transformed to a data-driven business (strategy, organisational structure, processes, skills and capabilities, design of offering, design of revenue model, market, culture, co-creation and transformation).

3 Research question

The overall research goal is to identify: (1) current understanding of data-driven business models in Austrian companies; (2) existing activities within Austrians enterprises with regard to exploring DDBM; and (3) challenges encountered in this endeavour / barriers towards starting such activities.

4 Methodology

To answer those research question, a qualitative research approach was chosen, which is suitable, when “how” and “why” questions are formulated (Yin 2009). It is also appropriate to understand the “*process by which events and actions take place*” (Maxwell 2013) and to improve existing practices (Maxwell 2013).

In order to identify the challenges and needs, 20 semi-structured expert interviews with practitioners, who are deeply involved in data-driven business model innovation, like product, service or innovation managers, are conducted, following the methodology of Meuser and Nagel (2009). Data collection through interviews is a common approach in qualitative research (Ritchie et al. 2013). Interviews are suitable to “*explore topics and explain other findings*” (Saunders et al. 2009).

Data collection

The interviewees are selected from (1) established Austrian enterprises, who are currently developing a data-driven business or service and (2) consulting, to bring in an external perspective from consultants, who assist organisations in (data-driven) business model innovation. This research-in-progress is limited to a first sample of 10 interviews.

The cases are selected using a combination of theoretical sampling, convenience sampling and purposeful sampling (Ritchie et al. 2013). Research in grounded theory often starts with an initial convenience sampling “*to get into the field and in touch with the first cases and insights*”, as this research in progress did, before continuing with more purposeful sampling strategies (Flick 2009), like theoretical sampling.

The interview guideline is divided into six parts: in the beginning, the topic, goals and the interviewee and his organisation are introduced, followed by questions to the understanding of DDBM, the organisations approach and procedure in DDBM innovation, the applied tools and methods, occurred challenges and barriers and at last an outlook to the future.

Currently, data collection is in progress. Table 1 shows the structure of already conducted interviews. The interviews were carried out either on the organisations site or via telephone between January and March 2018, recorded if permission was granted, transcribed and lasted between 50 and 75 minutes.

Data analysis

To derive barriers, challenges and needs from the interview data, the qualitative content analysis approach suggested by Mayring (2015) is applied. First main categories are defined, based on the process model from Hunke et al. (2017), then coding rules defined and anchor rules phrased. Afterwards challenges are screened and assigned to categories. During analysis, the category system and definitions are refined iteratively if necessary. This procedure identifies challenges during data-driven business model innovation. Furthermore, a category system to structure those challenges according to their origin is derived.

Table 1: Description of conducted interviews

<i>Interview</i>	<i>Industry</i>	<i>Employees</i>
1	Telecommunication	> 10.000
2	Engineering	5.000 – 10.000
3	Manufacturing	5.000 – 10.000
4	Manufacturing	2.500 – 5.000
5	Technology Provider	10 – 25

6	Information Technology	10 – 25
7	Information Technology	10 – 25
8	Consultant	> 10.000
9	Consultant	10 – 25
10	Consultant	10 – 25

Source: Own representation.

5 Results

Table 2 shows identified challenges in data-driven business model innovation from analysis of first data and serves as a structure for further interview results. The challenges and barriers were clustered into organisational, business related and technological challenges as well as internal and external perspectives following a bottom-up approach.

Table 2: Challenges in data-driven business model innovation

	<i>Internal perspective</i>	<i>External perspective</i>
<i>Organisation related challenges</i>	Corporate culture ^C	
	Data inventory ^C	
	Internal communication and stakeholder management ^C	Collaboration with external partners ^C
	Organisational structure ^C	Shortage of skilled people
	Self-cannibalism of existing business ^C	
	Commitment of management ^C	
<i>Business related challenges</i>	Idea generation	
	Finding the right value proposition	Finding the right key partners
	Investigate value of data and related price	Selling a data-driven service (sales)
	Communication of benefit and value of data	Dependence on external data
	Time-to-market ^C	Legal challenges
<i>Technical challenges</i>	Development of (machine learning) algorithms	Decisions on technology and standards
	Transition of the system into live operation	

Source: Own representation. (C ... corporate specific challenges)

Organisation related challenges

Corporate Culture: An appropriate corporate culture, also called “data-driven culture” is one essential prerequisite for a successful data-driven business model innovation

(Brownlow et al. 2015; Schüritz et al. 2017c), as a data-driven innovation requires the development of new competencies, open mindsets and cross department collaboration as well as collaboration with external partners.

Internal communication and stakeholder management: Business model innovation involves or at least affects several divisions across an organisation. Many departments and stakeholders need to be part of a data-driven innovation project or run activities and projects in parallel. Hence it is challenging to bring together ideas and projects, to inform and not to overlook someone. Especially in implementation and integration phases, additional departments, like sales or legal department play an essential role and therefore have to be involved early enough.

Organisational structure: How to integrate a data-driven business and/or big data capabilities, e.g. as an analytics competence centre (Schüritz et al. 2017a), into the existing organisational structure is seen as one major challenge the literature (Günther et al. 2017, p. 197). For instance, in case 1 analytics activities are performed by the corporate start-up, whereas case 2 established an analytics team in the engineering business unit.

Self-cannibalism of existing business: New data-driven services have the potential to cannibalise existing business, thus affected departments have to evolve and change. For instance, a data-driven predictive maintenance service may cannibalise the existing profitable service business of a machinery engineering company, as downtime of facilities are reduced.

Collaboration with external partners: Organisations increase collaboration with partners in data-driven business models (Schüritz et al. 2017c), for instance with data providers, technology or research partners. Organisations realize that they now have to collaborate with partners, which was not anchored in the corporate culture before.

Commitment of management: The commitment of top management was perceived as a crucial prerequisite and challenging for data-driven business model innovation. Adopting a data-driven “*approach requires management commitment*” (Wixom, Ross 2017).

Shortage of skilled people: The implementation and integration of data-driven business models requires manpower in the field of software development, data science and machine learning. As many organisations are seeking for such talents, there is a shortage of skilled people.

Data inventory: Especially in large organisations it is challenging to get an overview of existing internal data sources across departments, especially to concentrate the data or at least the know-how on the data at a single position (Mathis, Köbler 2016), thus it is an important activity in a DDBM innovation process (Hunke et al. 2017).

Business related challenges

Idea generation: Established organisations with less background in data science and business modelling struggle in finding ideas for DDBMs that go beyond obvious patterns as predictive maintenance. There is a need for best practice examples and tools, especially to generate ideas or see the potential for combining existing data with new and/or external data sources.

Finding the right value proposition: Finding the right value proposition is also challenging in many data-driven business models, as there are many interesting insights in the data, but potential customers are only willing to pay for some of them.

Investigate value of data and related price: Defining the value and finding the right pricing for a data-driven service is challenging and much harder compared to a physical product or an hour-based (engineering) service.

Communication of benefit and value of data: The interviewed experts see a challenge in communicating the benefit or value of the new data-driven product or service to other stakeholders. On an internal perspective, the added value and economic potential of the data-driven business model has to be communicated to the management and owners due to decision making. On an external perspective, it is challenging to communicate the value to existing customers and potential new customers and/or the distribution partners in sales activities.

Selling a data-driven service (sales): Existing sales team and structure often does not fit to new requirements of DDBMs and may be overchallenged. Particular challenges are: (1) finding the right customer segment; (2) change in the sales model from a single asset/licence sale to a periodic revenue stream, due to different sales incentives; and (3) technical competencies and willingness to learn of the sales staff.

Time-to-market: Time for implementation is even more critical and shorter compared to classical product development processes, as a minimum viable product or service has to be tested with customers and competitors will adopt fast.

Finding the right key partners: As mentioned in organisation related challenges, organisations have to increase collaboration with partners in data-driven business models. There are often few possible partners for specific tasks, like prototyping, and available partner may have ancillary covenants as they deeply collaborate with competitors.

Legal challenges: Organisations face uncertainties in their data-driven business model due to ambiguous and new legal requirements, regarding to the GDPR (general data protection regulatory) and data ownership, especially in the context of customer's machine generated data.

Dependence on external data: External data may be one key resource in a data-driven business model (Hartmann et al. 2016). The availability of, or the change in, external data is critical, if the business model relies on external data as a key resource. This has a special impact to the revenue model (Mathis, Köbler 2016), thus the type of contracts.

Technological challenges

Development of algorithms: Data analytics is one key activity in a data-driven business (Hartmann et al. 2016). It may be challenging for non IT companies to apply statistical methods to their datasets and to develop machine learning algorithms that go beyond standard methods. In several cases, such algorithms were developed with external research partners in funded research projects.

Transition of the system into live operation: The underlying technical system architecture of a data-driven business has to be suitable for an increasing data volume in the transition from a prototype to a scaling up live operation. The challenge during scaling up is, if the system is still working and can reach the required performance.

Decisions on technology and standards: Especially in data-enhanced products business models (Wixom, Ross 2017), decisions on technologies, standards and protocols, e.g. for additional sensors, have to be made. This can be challenging, as on one hand sensors have a lifetime of 15-30 years inside a product and standards are developing and changing continuously on the other hand.

6 Discussion and conclusion

The present paper has shown insights from first data analysis for research question 3 (challenges and barriers). The bottom up clustering of challenges shows the heterogeneity and interdisciplinary of DDBM innovation, which involves organisational transformation, new technological know-how and new business and legal related challenges.

First analysis results shows, that organisation related challenges are specific for established large enterprises (interviews 1-4) in contrast to small and medium enterprises (interviews 5-7). One approach to face those organisational challenges would be a spin-off or corporate start-up for the new business model, as organisations from interview 1, 6 and 7 did. For instance, in case 1 the corporate is responsible for data generation, infrastructure and sales and the start-up is developing algorithms and services. Both organisations are closely cooperating through a shared revenue model and data supply contract.

The process model and process layer framework from Hunke et al. (2017) was not convenient for category development in data analysis based on current data, as many identified challenges may occur in several phases, like organisational structure, corporate culture or collaboration. Furthermore, the three process content layers did not cover non-data technological challenge. Hence a bottom up inductive category development approach was followed in qualitative content analysis. For future data analysis, this bottom up approach will be continued and categories and challenges refined as additional data is available.

The categories of challenges of this research in progress will be extended, refined and theoretical generalization with existing literature, as additional empirical data is available. 10 additional interviews with organisations and consultants from various industries (energy, mobility, manufacturing, engineering) will be conducted in near future.

7 Area for feedback and development

Although we performed a literature review as rigorous as possible, we are thankful for any recommendations of recent findings filling our theoretical basis, as this is a topical research field.

Furthermore, we are looking for appropriate categorization schemes for challenges and barriers in data-driven business model innovation. Particularly we are interested, what are data-driven specific challenges in business model innovation, how to identify and differentiate them from common business model innovation challenges and barriers.

Moreover, we welcome feedback from innovations practitioners' experience, may be corresponding or opposing to our findings.

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9 References and Notes

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