Consumer-Based Ranking for Strategic Selection of IoT Business Models

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Short Paper

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Abstract

The digitization of business environments requires companies to be more consumer-centric than before. In the course of these adjustments, managers operate in the area of conflict between value creation for the firm, consumers' limited willingness to pay for products and services, and the need to gain and maintain consumers' trust. To support managers in the challenge to redefine their business models to fit the new digitized business environment, we suggest that managers should incorporate consumer's attitudes towards Internet of Things (IoT) business models in their strategic business model choice. Based on a choice experiment with 301 individuals, we identified a set of business models ranked according to the probability that users are most likely to agree with, and thus accept. The results of the study provide direct indications about which IoT business models are from a consumer perspective desirable and which not so that managers can directly implement these insights in practice.

Keywords: IoT, business models, consumer preferences

Introduction

Due to the undisputed importance of business models for a firm's long-term success, the topic garnered much attention in various disciplines. In general, business models are "industry and context-dependent" (Leminen et al., 2012), so that research on this topic has developed largely in silos. Nevertheless, the existing literature presents an increasingly consistent understanding of the purpose and role of business models within an organization. Scholars agree that in essence, business models articulate how businesses create and deliver consumer value, and make profits (e.g., Currie 2004; Mahadevan 2000; Rajala et al. 2003; Teece 2018). However, Teece (2018) extends this perspective and postulates that a business model also "reflects managements' hypothesis about what consumers want, how they want it, and how the enterprise can organize to best meet those needs" (Teece 2018, p. 172). Following this extension, and the consumer-centricity paradigm, which postulates that firms should focus on fulfilling consumer needs rather than just selling products (Shah et al. 2006), it becomes evident that incorporating consumers' preferences in all business decisions is critical for sustainable success (Sheth et al. 2011).

Although scholars have been emphasizing the importance of consumer-centricity for more than 50 years (Shah et al. 2006), the significance of this paradigm grew manifold in the advent of Information Technologies (IT) (Teece 2018), the Internet of Things (IoT) and the digitization of businesses (Veit et al. 2014). While the adoption of IT and digitization progressed, trade became global and competition among companies intensified. Since consumers enjoy more transparency on the supply side, and thus can better compare and scrutinize the products and services of different providers, companies which want to be successful need to be more "consumer-centric" (Teece 2010) than ever before. As a result, companies face the challenge of revising and changing their product-oriented business focus, organizational structure, selling approach and business models (Shah et al. 2006) towards more consumer-focused ones.

Simply put, consumer-centricity requires companies to concentrate on bringing value to consumers (Kohli et al. 2019, p. 14). Accordingly, embracing a more consumer-centric strategy mandates companies to first explore and then consider consumers' needs and preferences in the design of their products, services, selling approaches, and ultimately their strategic decisions, such as the choice of business models.

The focus of this study is to support managers to redefine their business models in order to fit the new digitized business environment and simultaneously comply with the goal of more consumer-centricity. To support practitioners in this endeavor, we propose a new, consumer-centric perspective on the strategic selection of business models.

By employing a structured methodology that combines and translates insights from related academic work on business models to our research setting – i.e., IoT products and services – this study presents a concrete ranking reflecting consumers' acceptance of various business models. Although the business model ranking presented will be primarily of practical importance, this study also extends the literature on business models by introducing our new perspective on the topic.

This paper is organized as follows: we first present a brief overview of our research setting as well as the theoretical background this study builds on. After this description of our study methodology, we discuss the pre-selection of business models and the results of our choice experiment resulting in a ranking of business models in accordance to consumers' preferences. We conclude with a discussion of the research approach and contribution.

Research setting and theoretical background

As ever more devices are equipped with sensors and computational capabilities, which enable them to collect and exchange all types of data, companies use these data increasingly as a source for value creation. Particularly in the context of digital goods, companies view consumers' data more and more as an asset (Spiekermann et al. 2015). Accordingly, companies use consumers' data to reduce search costs and improve the distribution of their products and to develop as well as launch more individualized products and more innovative services, which allow them to charge a price premium. Moreover, companies use consumers' data to lower transaction costs and pursue price discrimination strategies (Spiekermann et al. 2015).

IoT business models are characterized by an integration of consumers, service orientation and analytics (Fleisch et al. 2014). Therefore, the IoT products and services setting is particularly suitable to illustrate the increasing conflict between companies' effort to extract value from consumers' data, and consumers' wish for transparency, data ownership and empowerment. Ultimately, managers of IoT-related businesses are caught in the area of conflict between three goals: (1) value and profit creation for the firm, (2) consumers' insufficient willingness to pay for products and services, and (3) the need to gain and maintain consumers' trust. As managers need to create revenue streams in spite of consumers' very low or even nonexistent willingness to pay for products and services (Shah et al. 2006; Teece 2010), monetizing or creating value from consumers' data seems a reasonable strategy at first. However, against the background of consumers' becoming increasingly sensitive and concerned about the use and misuse of their data, managers are better advised to identify business models, which consumers agree with. This rationale is based on the insight that users' dispositional factors are measurable constructs (Malhotra et al. 2004) that are fully mediated by the context of their privacy decisions (Kehr et al. 2015). In fact, as Samat and Acquisti (2017) show, the presentation of a privacy decision is more relevant to the outcome than the actual risk involved. Put differently, as prior literature on consumer preferences for assistance services reveals, consumers are strongly opposed to monetization of their personal information, even if they would benefit from it. Particularly in the context of personal intelligent assistance, consumers would much rather accept

personalized advertisements based on their personal data (without explicit consent for data processing), than directly consent to the processing of the same (e.g., Mihale-Wilson et al. 2019; Zibuschka et al. 2019).

Notably, the literature on business models presents various taxonomies for business models. Timmers (1998), for instance, proposed a classification for business models within the context of electronic markets. It distinguishes between ten generic e-business models: e-shop; e-procurement; e-auction; e-mail; third-party marketplace; virtual communities; value chain service provider; collaboration platform; and information brokerage. Another scholar, Applegate (1999), presented a typology of six business model groups applicable to all types of businesses (Hedman and Kalling 2003). According to Applegate's taxonomy, business models can be organized around distributors, producers, infrastructure distributors, infrastructure portals, and infrastructure producers. Furthermore, another noteworthy taxonomy for business models is presented by Gassmann and his team from the University of St. Gallen (2013). Their taxonomy was developed on the basis of a comprehensive analysis of initially 250 business models that have been implemented during the past 25 years, across various industries and business contexts. According to the findings presented by Gassmann and colleagues (2013), 90 percent of the 250 business models were combinations of 55 core business models. Consequently, the list of business models compiled by Gassmann and his team is not only the latest effort to classify and identify patterns of successful business models in digital business, but also to date, the most complete one.

To conclude, we note that decision makers require concrete means and strategies to master the strategic challenges posed by digitization. Based on the rationale that companies wishing to be more consumer-centric and successful should strategically opt for business models that consumers agree with, we present a consumer-based ranking of IoT business models. With this, we aim to support practitioners in their endeavor.

Methodology

The goal of this study is to elicit consumers' preferences for various IoT business models. To this end, we conduct a study based on a two-step approach: Firstly, based on the pool of core business models presented by Gassmann et al. (2013), we pre-select the business models relevant to this study. Then, in a second step, we scrutinize consumers' preferences for these business models via a Best-Worst Choice Experiment with 301 individuals. The following two sections of the paper describe the mentioned research steps in greater detail.

Pre-selecting relevant business models

Our analysis builds on the work of Gassmann et al. (2013) as an initial pool of business models. This follows our literature review that revealed the comprehensiveness of this taxonomy, as well as the fact that those 55 business models exhibit a high potential to be adapted and enhanced for other business contexts (Gassmann et al., 2013). Further, our analysis builds on Spiekermann et al. (2015)'s study that postulated use of consumer's data as an asset. According to Spiekermann et al. (2015), companies use consumers' data to improve the distribution of products; reduce search costs; lower transaction costs; pursue price discrimination; individualize products; and create super products for which the company can charge a price premium.

Due to limited time and resources, we could not include all 55 business models of the initial business model pool in our experiment. Besides, from a consumer perspective, not all 55 business models are relevant to our study. To make sure our study incorporates only, but all relevant business models from consumers' point of view, we turn to the expert judgment methodology. It relies on the estimates of people considered experts in the area of interest (Li and Smidts 2003).

To pre-select the most pertinent business models for this study, we summoned five experts with different experience backgrounds (i.e. academia, practice) appertaining to different industries (e.g. automotive, consulting, research hub). This was done to avoid dependency issues arising when experts have similar backgrounds, training, or experience. Hence, the experts were selected based on their knowledge in the area of IoT, business models, knowledge of electronic markets, and knowledge on consumer preferences in general. Furthermore, we made sure to select experts with different experience backgrounds (i.e., academia,

practice) and various industries (e.g., automotive, consulting, research hub). Table 1 provides an overview of the experts who took part in this study:

Table 1. Overview of the Experts Panel		
Expert	Occupation	Sector/Research area
#1	Industry	Automotive, Telecommunication
#2	Industry	Management Consulting
#3	Academia	Electronic Markets
#4	Academia	Business Management
#5	Industry / Academia	Research & Development of new Products, electronic markets

Table 1. Overview of the Experts Panel

After organizing the expert panel, the panel participants were briefed, to make sure they understand the context and goals of the survey. Further, they were asked to opinion independently which of the areas of use for personal data postulated by Spiekermann et al. (2015) are the most important and evident for consumers. After receiving the opinion of all five experts we noted the discrepancies and conducted a clarification workshop. Within this workshop, the experts agreed that from consumers' point of view the distribution of products, the individualization of products, the pricing scheme, and the existence of price premiums are the strategic decisions most evident and important for the majority of consumers. Then, based on the panels' agreement on the mentioned four focal strategic decisions, the experts were asked to indicate which of the 55 business models identified by Gassmann et al. (2013) can be assigned to the four strategic decision group. The panel experts were already acquainted with the 55 business models, as they all served on another panel for another study, which also used the same business models taxonomy. Accordingly, the panel was able to identify and allocate the business models to one of the four strategic decisions: distribution of products, individualization, pricing and price premium.

Table 2 presents the business models clusters that emerged as the final results of the panel.

Table 2. Overview of Relevant Business Models		
Cluster	Business model	Description (see also Gassmann et al. 2003)
Distribution	Direct selling	Product distribution directly to the consumer (e.g., download on the company's homepage).
	Supermarket	The company distributes apps and services via an app store, along with a variety of products from other companies.
	Full-service provider	The company distributes a total coverage of apps and services, consolidated in one company owned app store.
Individualization	Ultimate luxury	Apps and services have very high-quality standards or offer exclusive privileges and target the luxury segment. Prices are correspondingly high.
	Mass customization	Although produced within mass production environments, apps and services can meet consumers' individual needs, for instance through modularization.
	No frills	Apps and services are kept as simple as possible and focus on delivering one main value proposition.

Pricing	Freemium	Basic versions of apps and services are given away for free while an extended premium version of the product can be purchased for a certain price.
	Add-on	Basic versions of apps and services are priced competitively. Additional functionalities can be bought on top. These purchases drive the end price of the product up.
	Cross-selling	Additional revenue is generated by providing additional products and services, which are not necessarily related to the main product.
	Subscription	Consumer pays a regular fee (i.e., monthly).
	Flat rate	Consumer pays a single fixed fee and can use a variety of products and services for a certain amount of time.
	Pay-per-use	Consumer pays only for what she or he consumes.
	Barter	Although no actual money involved, this business model refers to an exchange. For instance, an app or service is provided to the consumer, and the consumer provides certain information in return.
	Hidden revenue	Company's main source of revenue is a third party and not the consumer.
	Self-service	Part of value creation is transferred to the consumer, in exchange for a lower price.
Price premium	Guaranteed availability	App or service is available with no downtime.
	Robin hood	The same product is sold to wealthy individuals at a much higher price than to poorer people, mainly to improve the company's image.
	Solution provider	All products come from one single company and thus interact perfectly with each other.
	Mass customization	Modularization of apps and services so that individuals can meet their needs by combining single components into one product.

Table 2. Overview of Relevant Business Models

Best-Worst Choice Experiment (Case 1)

After having identified the pool of business models that are important in the context of this study, we conducted a discrete choice experiment with 301 individuals. There, participants were asked to rate various sets of business models according to their preferences (Green et al. 2001). More specifically, we designed and conducted an experiment based on the best-worst scaling (Case 1)[1] - the methodology introduced by Flynn et al. (2007). In this methodology, participants view multiple choice sets consisting of various business models and are required to choose their most and least preferred business model of each choice set. Hereby, each business model has been transferred into a statement related to our research context (i.e., "I choose my apps and assistance services from a central marketplace" refers to the supermarket business model). This way, the participants could relate to the items they were supposed to rank, and reveal their

[1] Scholars can choose from three different types of Best-Worst scaling: Case 1 – the one we use in this study – is appropriate for studies in which researchers wish to find out the relative value / importance of attributes in comparison to each other (Flynn et al. 2007).

most and least preferred business model in the choice set (see Figure 1). The validity of the statements was tested in a small pre-test with 10 individuals which were not included in the final data set.

By employing the Best-Worst (Case 1) choice methodology, participants are forced to make trade-offs between the items – i.e., the business models stated in a choice set. Based on the participants' choices for various combinations in each choice set, the participants reveal their least and most preferred business models, and we can rank the queried business models according to their consumer acceptance perspective. The Best-Worst choice experiment was conducted in collaboration with a German market research institute which provided a sample of German participants and implemented using the Dynamic Intelligent Survey Engine (DISE) – a web-based survey engine allowing scholars to conduct technically sophisticated surveys with limited effort and time (Schlereth and Skiera 2012).

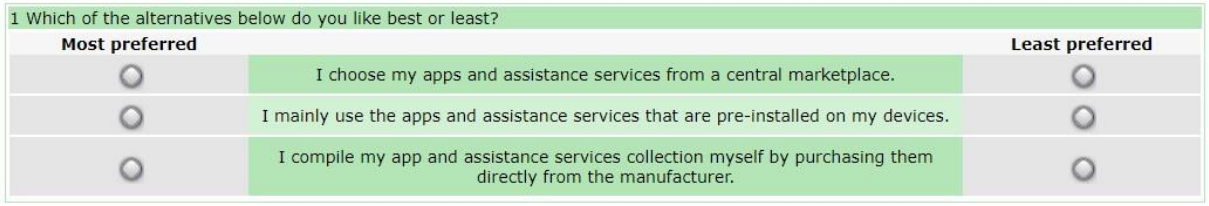

Figure 1. Example Choice Set from Study

From a total of 450 participants initially invited to take part in the study, 301 participants completed all the required parts of the study. The gender split in our data set is relatively balanced, with 51% females and 49% males, and the majority of the participants (i.e., 45%) are between 35 and 54 years old. In contrast, 29% of the participants are between 18 and 34 years old while 26% reported to be between 55 and 69 years old. Accordingly, in terms of marital status, the majority of the participants (i.e., 67%) are either in a relationship or married, while 30% indicated to be single. While 48% of the participants do now have kids, 43% have either one or two kids, and 8% have 3 or 4 kids. Finally, in terms of employment, the majority of individuals indicate to be employed full time (i.e., 49%) or part time (i.e., 17%), meanwhile the remainder of individuals are either enjoying their pension (i.e., 15%), in an apprenticeship (i.e., 6%), or otherwise.

As these descriptive statistics reveal, our participants feature different socioeconomic backgrounds and demographics, representing a wide range of potential customer segments.

Analysis Results

Table 3 provides the ranking reflecting the participants' attitude towards the queried business models. Additionally, it reports the scaled best-worst score each business model received. These scores allow us to compare the preference of each business model in relation to the others in each strategic business model cluster.

Table 3. Business Models Ranking

	Rank (#1 highest)	Business model	Scaled best-worst score
Distribution	#1	Supermarket	100
	#2	Direct selling	73
	#3	Full service provider	0
Individualization	#1	Mass customization	100
	#2	No frills	55
	#3	Ultimate luxury	0
Pricing	#1	Flat rate	100

	#2	Freemium	91
	#3	Cross-selling	90
	#4	Hidden revenue	63
	#5	Pay-per-use	51
	#6	Add-on	51
	#7	Subscription	46
	#8	Self-service	31
	#9	Barter	0
Price premium	#1	Mass customization	100
	#2	Robin hood	34
	#3	Solution provider	23
	#4	Guaranteed availability	0

Table 3. Business Models Ranking

Regarding the **distribution** of IoT products and services, the participants prefer the *supermarket* business model (score=100) over the *direct selling* business model (score=73). Notably, the participants' least preferred product distribution strategy is the *service provider* business model (score=0), where a company is the sole source of products and services. These findings indicate that consumers prefer to use IoT products and services from various firms and do not want to be bound to only one sole company. Since the score for the *supermarket* and *direct selling* business models are not too far apart, we conclude that either one of these two business models could be a strategically savvy choice. Accordingly, managers' final decision about employing either the *supermarket* or the direct *selling business* model must incorporate deliberations whether the company has the necessary resources to actually carry out/operate a *direct selling* channel.

With respect to the **individualization** of IoT products and services, the results reveal that participants were not interested in the *ultimate luxury* strategy (score=0), while the *no-frills* business model is only partly popular (score=55). The most popular individualization related business model is the *mass customization* business model (score=100). Accordingly, we conclude that consumers prefer modular built systems that allow them to choose exactly the building blocks they need at reasonable and competitive prices. Against the backdrop that *ultimate luxury* is the least favored business model, while *mass customization* the most favored, these results indicate that the participants are price sensitive. At the same time, if the price is reasonable, participants favor *customizable* products and services over the *no-frills* option, which although much cheaper than the *mass-customization* model, does not offer any individualization options at all.

In terms of **pricing**, it is noteworthy that participants favor the *flat rate* model (score=100) almost as much as the *freemium* (score=91) and *cross-selling* (score=90) business models. In fact, the *flat rate* model was in our sample the most favored business model, surpassing the popularity of the *freemium* business model. Considering that in the *flat rate* model consumers have to pay a fixed fee for a product or service, this result is surprising. Nevertheless, it is explainable when looking at the age structure of our sample. Since 70.7% of our sample participants are older than 35, it is conceivable that this group of users is, compared to younger participants, still used to paying for products and services.

Other surprising results related to the pricing business model cluster are the rankings of the *hidden revenue* (score=63), *pay-per-use* (score=51), and *barter* business models (score=0). On the one hand, participants voted that the *barter* business model is the least appealing to them, on the other hand participants agree with the *hidden revenue* business model. Recalling that: (i.) in the *barter business* model no money is exchanged but companies can give consumers products and services for free, requiring to process their data in return, while (ii.) the *hidden revenue* business model works based on the same principle (i.e., requiring consumers' data in order to show personalized advertising). This result reflects the paradoxical consumer behavior discussed by Samat and Acquisti (2017).

Another surprising result is that in our sample, the *hidden revenue* business model is rated better than the *pay-per-use* business model. Considering that in the *pay-per-use* business model consumers pay only for what they consume, this pricing model seems much fairer than other business models. Yet, consumers would prefer having their data processed in the background, or sold without their explicit consent (*hidden revenue)* instead of a relatively fair pricing model. This may provide an explanation for earlier work observing consumers preferring IoT services financed through advertising over other forms of revenue generation (Mihale-Wilson et al. 2019; Zibuschka et al. 2019).

Ultimately, from the perspective of practitioners, the results of the pricing business model cluster reveal that managers should consider using either the *flat rate*, *freemium,* or *cross-selling* business model. If neither of the three business models can be implemented, managers should consider business models such as *hidden revenue*, *pay-per-use* or *add-on*.

Finally, regarding the **price premium** business model cluster, the results reveal that users are willing to pay a price premium for modular products and services – i.e., *mass customization* (score=100), but none for *guaranteed availability* (score=0). At the same time, only a small portion of the participants would be willing to pay a price premium for the *robin-hood* (score=34) or the *solution provider* strategy (score=23). Hence, we conclude that managers should consider *mass customization* as the most suitable business model for the price premium business model cluster.

Conclusion

The digitization of business environments and technological developments such as the Internet of Things require companies to be more consumer-centric than before. In the course of these adjustments, managers operate in the area of conflict between value creation for the firm, consumers' limited willingness to pay for products and services, and the need to gain and maintain consumers' trust. To support managers' challenge to redefine their business models in order to fit the new digitized business environment and simultaneously comply with the goal of more consumer-centricity, we propose a new perspective on the strategic selection of business models. To be more specific, following the premise that in the digital economy consumers' trust is decisive for success or failure, we postulate that companies can achieve more consumer-centricity and gain consumers' trust by incorporating consumers' needs and preferences in their strategic business model choices.

Based on a two-step empirical study, with experts from the industry and academia, followed by a Best-Worst (Case 1) choice experiment with 301 individuals, we identified a set of business models ranked according to the probability that users are most likely to agree with, and thus accept. The results of the study provide direct indications on which business models are from a consumer perspective desirable and which not. Accordingly, the results of this study are first and foremost relevant to practitioners. Moreover, our study contributes to the existing literature on business models by proposing a new perspective on the strategic selection of IoT business models.

Finally, it is notable that despite all our efforts to produce generalizable results, our study represents only a current snapshot of the consumers' general opinion on business models. Over time, consumers' views on data monetization might change along with a change in pertinent social values or amendments in the data security and privacy-related laws, the ranking presented in this study might not hold anymore. In this case, it would be recommendable to create a new ranking through repeating this study at a later time and possibly with a larger sample.

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