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BUSINESS MODELS IN THE DIGITAL ECONOMY: AN EMPIRICAL CLASSIFICATION OF DIGITAL MARKETPLACES

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Business Models in the Digital Economy: An Empirical Classification of Digital Marketplaces

Business Models in the Digital Economy: An Empirical Study of Digital Marketplaces

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ABSTRACT

Advances in digital technologies have led to the emergence of new business models that potentially challenge the status quo of many industries. The business models of ventures such as Airbnb or Uber have already created measurable changes for their industries. These businesses have built digital platforms that match two independent customer groups to enable commercial transactions. In the last years, hundreds of such digital marketplace business models (DMBMs) emerged. Yet, little knowledge on this type of businesses is available to date. Thus, this study aims to generate first empirical insights into DMBMs. In particular, the study examines a number of questions: How do seemingly simple business models like Airbnb create value for their users? When a lot of start-ups are claiming to build the next »eBay for X« or »Airbnb for Y«, what are the criteria to distinguish their business models? What are the key value propositions, customer segments, activities, resources, or revenue streams of DMBMs? This study constructs an empirical taxonomy to identify different types of DMBMs, building on a novel framework for the analysis of DMBMs that identifies their main attributes and specifications. The study systematically analyzes 100 DMBMs along 82 business model attributes. Using cluster analysis, we identify six different types of DMBMs. We characterize each of these types both quantitatively and through representative ventures to advance the understanding of DMBMs. The identified business model types can serve as an inspiration and blueprint for entrepreneurs as well as managers of established firms. Further, the research provides a contribution towards more rigorous approaches of business model analysis and classification.

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1
Introduction

In 2011, Marc Andreessen, co-founder of Netscape and the venture capital firm Andreessen-Horowitz, wrote a highly regarded article on »Why Software Is Eating The World« (Andreessen, 2011). Andreessen was analyzing how businesses like Google, Facebook and Twitter that had changed the daily lives of billions of people. These firms had disrupted many industries in the first decade of the twenty-first century by digitizing the way we communicate, consume media or search for information. Andreessen concluded that »[o]ver the next 10 years, I expect many more industries to be disrupted by software.«

Since the article was published, we have seen a stark rise in start-ups building software-based platforms for industries that once seemed immune to digitization. Most notably, such digital platforms go beyond the areas of communication and information by transforming industries such as transportation or hospitality. Take the example of Airbnb, a technology start-up founded in 2008. Airbnb connects travelers with people who can accommodate them. It provides value for individual hosts by enabling them to generate an additional income by renting out their property; guests receive value through the personalized experience and the relative low prices compared to staying in a hotel. Some hosts offer a room in their own home, though the majority of the properties listed on the site are self-contained, ranging from studio apartments to castles. Airbnb's business model has enabled the start-up to build up a total capacity of over a million beds. For comparison, Airbnb already provides more rooms than the largest hotel groups in the world such as Hilton or Marriott (Quartz, 2015; World Economic Forum, 2014), without owning one of these rooms themselves. The business model has enabled Airbnb to rapidly scale and grow to a global presence in 190 countries. Airbnb is now valued at over USD 25 billion (O'Brien, 2015). In addition to the strong growth potential , marketplaces become more attractive »because as they grow bigger they get stronger, with network effects that drive powerful, durable, and high-margin growth« (Hagiu and Alvarez, 2014: 9). Similar to the former generation of start-ups – Google, Facebook, or Twitter – many observers doubt the sustainability of these business models. However, »instead of constantly questioning their valuations,« concludes Andreessen, »let's seek to understand how the new generation of technology companies are doing what they do«.

Following the success of marketplaces such as Airbnb, countless start-ups have created new digital marketplaces in recent years. We define digital marketplaces as firms that provide a technological platform to match a demand and supply side and facilitate transactions between these sides. On the investor network AngelList, almost 5000 start-ups are classified as marketplaces (Angel.co). Most of these start-ups are too young to be assessed on the basis of their financial performance. However, the expectations in the success of these ventures is driven by an over-proportional set of highly valued digital marketplaces. Out of 125 firms that have received market valuations of a billion dollar or more (so-called *unicorns),* 33 (or 26%) can be categorized as digital marketplace. For Europe, eight out of 40 European unicorns are classified as marketplaces (Madhvani et al., 2015). Jörg Rheinboldt, one of Germany's most renowned start-up investors, explains that digital marketplaces are attractive to investors because a small entrepreneurial team can yield high revenues (Drotbohm, 2014). He therefore emphasizes »marketplaces are, by far, the most successful online business models«.

Why can digital marketplace business models (DMBMs) change entire industries? Marketplaces have been around for centuries to match buyers and sellers, facilitate

their transactions and provide some form of regulating environment to increase efficiency (Bakos, 1998). However, the expansion of reliable internet access has become a key driver in bringing such marketplaces from the physical into the digital space. Marketplaces in the digital space are accessible from every corner of the world and at any given time. Buyers and sellers can conduct transactions without ever being simultaneously available at the same time. A buyer on eBay can place an offer for a product several days after the seller has listed the item on the site. The seller, in turn, might only return to the marketplace some days later. In the meantime, several potential buyers have competed in an auction for the listed item. Both buyers and sellers benefit from the efficiency of the continuous availability of product information, automated payment options or the fraud protection systems provided by eBay as the marketplace provider. It is easy to see how digital marketplaces have increased the efficiency of commercial transactions in comparison to physical marketplaces. The recent technological advances in mobile GPS-based technologies and highly sophisticated search algorithms have further allowed transferring these mechanisms from the exchange of goods to time-sensitive and location-based services. These service marketplaces do not only promise high efficiency gains in comparison to prior solutions, but often sometimes entirely new value propositions.

Given their relevance to practitioners and the dearth of academic literature on the topic, this study is interested in understanding the business models of digital marketplaces. »A business model describes the logic of how a firm creates, delivers and communicates value to its customers out of a value proposition and ultimately captures value for the firm itself« (Abdelkafi et al., 2013). DMBMs differ from other business models because they can apply different revenue models for their two customer sides, namely sellers and buyers. As such, the study answers a number of seemingly relevant questions:

- What are the elements of DMBMs that create value to customers?
- What mechanisms do DMBMs apply to communicate and deliver their value to customers?
- How do DMBMs generate revenues?

Our previous research has shown the variety of different elements and options used by DMBMs in service industries (Täuscher et al., 2016). In theory, there exist thousands of possible options to combine the business model elements to develop unique DMBMs. However, this research builds on the hypothesis that digital marketplaces apply a small set of different business model types. Therefore, we aim at identifying and distinguishing the generic types of DMBMs. In this vein, business model literature recently called for empiric and more rigorous classifications of business models (Lambert 2015). Hence, we aim at developing an empirical classification system of DMBMs. To advance the understanding of the under-researched field of digital marketplaces, we primarily aim at answering the questions:

- **What are the main types of digital marketplace business models (DMBMs)?**
- **What characterizes the main types of DMBMs?**

To answer these questions, this study is organized as follows. Section two gives an overview of the current state of the art on the related research areas. The next section (3) presents the guiding framework to analyze DMBMs. The subsequent sections (4) elaborate on the applied research methodology and (5) present the empirical findings. The final sections (6) discuss the implications of the findings for entrepreneurs and managers and (7) provide an outlook on both the development of digital marketplaces as well as further research opportunities.

2
State of the Art

2.1
Business models

With the advent of the new economy, business models have become an increasingly popular unit of analysis to explain differences in firms' success (Afuah and Tucci, 2003). Business model research suggests that appropriate business models can lead to sustainable competitive advantage and superior financial performance (Amit and Zott, 2001; Zott and Amit, 2007). The business model, as a construct, is a layer located between the firm's strategic and operational layer (Osterwalder, 2004). While strategy determines the intended positioning and long-term source of a competitive advantage, the business model can be seen as the vehicle to achieve these long-term objectives (Casadesus-Masanell and Ricart, 2010). In comparison to the operational layer, it provides a less detailed and more holistic perspective on the firm. The concept specifically draws attention to the firm's core logic of creating and capturing value (Amit and Zott, 2001). Business models have been considered as a perspective or instrument to analyse firms as well as a subject that can be designed and innovated itself.

Business model literature finds its roots in many well-established research branches such as strategic management, information systems, and innovation and technology management (Zott et al., 2011). These fields look at the business model concept through different lenses. The literature has proposed different conceptualizations, reflecting an a priori disagreement of what a business model should actually represent. For instance, the primary focus of business models can be the firm's activities and transactions with stakeholders (Amit and Zott, 2012), its resources (Demil and Lecocq, 2010), or its choices and consequences (Casadesus-Masanell and Ricart, 2010). Yet, an increasing number of definitions have in common that they approach business models not only as a set of specific elements, but also incorporate how these elements are interconnected and mutually influence each other (Casadesus-Masanell and Ricart, 2010). This understanding is driven by the logic that it is the particular combination of elements that allows a firm to create and appropriate value in a unique way. The motivations for doing research in business models can be diverse. Baden-Fuller and Morgan (2010) identify three major functions of the business model construct: a perspective for the classification of existing types of businesses, a unit of analysis for academic inquiry, and a recipe for practitioners to copy and further innovate. Recent literature reviews conclude that the approaches towards business models neither converge towards a common theoretical framework (Zott et al., 2011), nor does one dominant approach emerge. Therefore, business models have been considered as »a slippery construct to study« (Casadesus-Masanell and Zhu, 2013: 480).

Several approaches have emerged to identify the generic elements of business models (Schallmo, 2013, provides an extensive overview). These elements represent the key decisions for developing and analyzing a business model. While there is a strong divergence in the number and selection of elements, business model literature converges towards the understanding that these elements can be aggregated into a small set of dimensions (Zott et al., 2011). This study is based on the Business Model Framework by Abdelkafi et al. (2013) which focuses on five value dimensions: value proposition, value delivery (customer segments and distribution channels), value creation (key partnerships, resources and processes), value communication (communication channels and story), and value capture (revenue streams and key costs). Table one summarizes the five value dimensions and serve as a guideline for

selecting and integrating the attributes of DMBMs presented in the subsequent chapter.

- *Value proposition* denotes »an overall view of a company's bundle of products and services that are of value to the customer« (Osterwalder, 2004:43). Similarly, Johnson (2010) describes value proposition as an offering that addresses the 'job-to-be-done'.
- *Value communication* ensures the delivery of value proposition as a message to the target groups, such as customers, investors, etc. Since different target groups require different information, value proposition has to be conveyed by a story which should be understandable, catchy and coherent.
- *Value creation* represents the key processes, resources and partners necessary to create the value proposition.
- *Value delivery* describes to whom the value proposition is addressed and how it is distributed. It defines the means by which enterprises establish interactions with the customer in order to provide the value proposition.
- *Value capture* describes how the value proposition is transformed into revenue stream and then captured as profit. Value capture depends on the cost structure, which includes »direct costs and overhead, taking into account economies of scale« (Johnson, 2010:36). The revenue stream is the product of the offering price and the quantity of sold goods. The difference between the revenue stream and costs represents the enterprise's profit.

Fig. 01 The selection of elements for DMBMs

Source: Abdelkafi et al. (2013)

2.2
The digitization of businesses

The increasing digitization and the development of internet-based technologies have a strong impact on all aspects of the economy. Digitization generally describes the gathering and preparation of data for processing or storage in an electronic (i.e. digital) system (BMWi, 2012). With the information and communication (ICT) industry, an entirely new industry has arisen in the process of digitalization. However, the impact of digitization reaches far beyond the ICT industry. Companies from all industries face rapidly changing opportunities and challenges due to the emergence of new internet-based technologies. Westerman et al. (2014) propose three areas in which managers can utilize new digital technologies:

- *Customer experience:* firms can apply the digitalization of information and communication to engage their customers in novel ways. For instance, they can establish digital user communities to provide additional value.
- *Operational processes:* digital technologies enable large gains in operational efficiency in processes along all steps of the value chain.
- *Business models:* digitization enables the development of entirely new forms of creating and capturing value. This includes, for example, the entire reconfiguration of a value delivery model and entirely novel value propositions.

The implications of digitization on business models are diverse. For instance, digital technologies allow shifting the boundaries of firms towards more collaborative models. Firm resources and capabilities have become more modular, connectable, and conveniently shareable (El Sawy and Pereira, 2013). Firms that primarily build their business models on digital and internet-based technologies generally differ from non-digital businesses. Figure 2 gives an overview of the characteristics of such businesses in regards to their interaction with partners and customers. The table is the result of a literature review of scholarly articles on 'digital businesses' and 'internet firms'. In general, digital business models generally lead to higher levels of connectivity between different actors. Such businesses typically compete on a larger scale then physical

businesses due to low geographic boundaries and resource requirements for reaching customers. Since costs of search and communication have decreased considerably, transaction costs are generally much lower than for physical businesses (Porter, 2001). Besides, higher transparency among offerings and prices leads to easier imitation and lower differences between competitors' products and services (Porter, 2001). Internet technologies have intensified the level of competition, reduced entry barriers, led to more substitutes, and increased the power of customers. Hence, profit opportunities have decreased in most industries (Porter, 2001). As digital businesses generate more and more information about the customer's preferences and buying behavior, they can design customized value propositions and determine individualized prices for customers (due to low menu costs). Consequently, digital businesses induce economic environments that are often characterized by a dynamic competition and high consumer surplus. The emergence of new business models is, however, not only a consequence of the new possibilities of digital technology, but also a response to the increased velocity and turbulence of the digital business environment (Gawer and Cusumano, 2008).

Fig. 02 Characteristics of digital businesses

Characteristics of digital businesses	Description	Representative studies
High levels of connectivity between actors	Digital technologies serve as mediators and connectors between different parties leading to a higher connectivity between organizations and between firms' and users. This partly dissolves traditional firm boundaries.	Afuah and Tucci, 2001; Singh and Kundu, 2002; Javalga et al., 2007;
Low geographic limitations	Digital technologies reduce the strength of physical boundaries; pure digital markets are global by design.	Porter, 2001; Slywotzky and Morrison, 2001; Afuah and Tucci, 2001; Kim et al., 2004; Grover and Ramanlal; 2005; Javalgi et al., 2007
Low switching costs	Customers can switch businesses at a relatively low cost due to low search costs through accessible and comparable information.	Porter, 2001; Kim, 2004; Grover and Ramanlal, 2005; Weill and Woerner, 2013; Lambrecht et al. 2014
Transparency of customer behavior	Businesses in the digital economy can capture a large amount of data and information about their consumers' behavior. More customer interaction, better data collection and analysis tools lead to high information about customers.	Lambrecht et al. 2014; Slywotzky and Morrison, 2001; Kim et al., 2004;
High transparency of firms	Customers and partners, in return, have more information on the focal firm since activities can be traced and retrieved more efficiently through digital channels. For instance, new	Slywotzky and Morrison, 2001; Kim et al., 2004; Yelkur & DaCosta, 2001; Porter, 2001

	customers can inform themselves more easily about the experience of other customers	
Low transaction costs	Transaction costs are lowered due to reduced coordination costs, low geographic barriers, and high information levels	Afuah and Tucci, 2001; Brousseau and Penard, 2007;
Opportunities for price discrimination	Price discrimination arises when a digital business charges different prices based on a consumer's willingness to pay. Internet enables firms to collect better information about consumer characteristics and WTP.	Smith et al., 1999; Yelkur & DaCosta, 2001; Kim et al., 2004;
Low menu costs	Menu costs incur when a price is changed. Digital media allow changing prices at almost no cost. Low menu costs make it more cost effective to dynamically change prices online.	Elberse et al. (2002)

2.3 Digital marketplaces

Marketplaces classically represent the space in which a buyer and a seller side can conduct transactions. A marketplace has three main functions: matching of buyers and sellers (by aggregating demand and supply), supporting transactions, and ensuring the institutional infrastructure (Bakos, 1998: 35). Figure 3 provides an overview of the general functions of marketplaces.

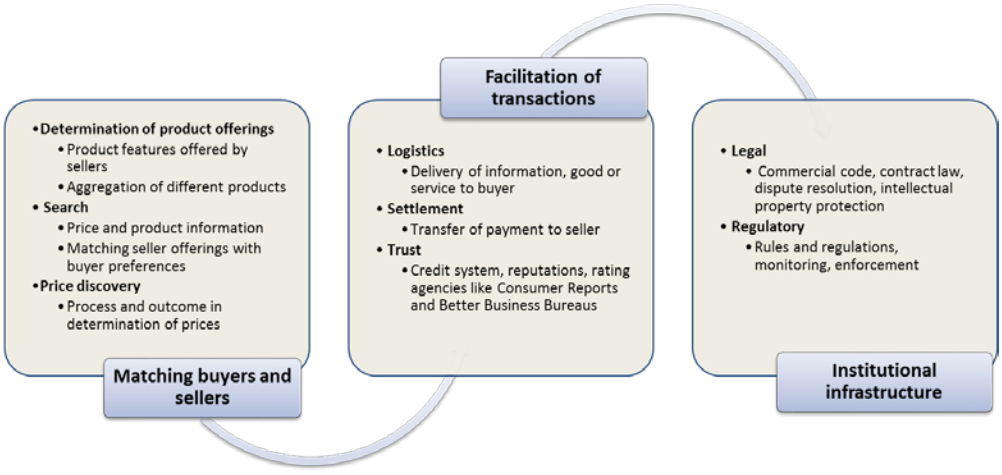


Fig. 03 Overview of functions of marketplace; Bakos, 1998

Marketplaces are a form of multi-sided platforms. Multi-sided platforms (MSPs) have garnered increasing attention with the rise of the digital economy (Parker und van Alstyne 2011). Research in strategic management has been concerned with studying the phenomenon of MSPs since the 1980s (Katz and Shapiro, 1985). Hagiu and Wright (2011: 2) define MSPs as »organization that creates value primarily by enabling direct interactions between two (or more) distinct types of affiliated customers". Related research is mainly rooted in the field of network economics (z.B. Rochet and Tirole, 2003). Network economics is concerned, among others, with the phenomenon of network effects. Network effects emerge when the value for a user of the network increases with the size of the network (Katz and Shapiro, 1985). Network effects can be direct or indirect. Direct network effects exist if users gain more value from an increase of the user segment they are part of (Parker and van Alstyne 2005). Take, for example, the telecommunication service Skype. The value for a Skype user increases with the amount of other users. Indirect network effects exist if a user's value depends on the size of another user segment (Katz and Shapiro, 1985). The credit card market is a typical example. The value to Visa card owners increases with the amount of shops that accept Visa card payments. For business owners, in turn, the value of owning a Visa card reader increases with the number of consumers that use a Visa card as their primary payment method (Sun and Tse, 2007). The existence of network effects has a strong influence on the development of business models of marketplaces.

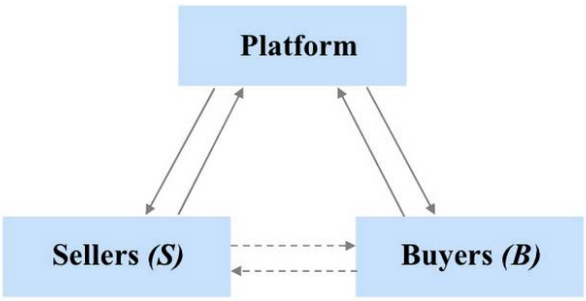


Fig. 04 Representation about three-dimensional relationship between buyers, sellers and platform

There exists a significant amount of research on electronic markets and marketplaces; this research stream, however, focuses primarily on highly automated product markets in the realm of Business-to-Business (B2B). Alt and Klein (2011) provide an extensive overview of the existing research on electronic markets. This research rather focuses on the business model of the venture that develops a digital marketplace.
While digital marketplaces are insufficiently defined yet, we can identify four defining conditions for classifying a firm as a digital marketplace. First, digital marketplaces connect independent groups of buyers and sellers via a digital platform. Second, buyers and sellers enter direct interactions with each other to initiate and realize a transaction. These interactions go beyond the highly automated processes in electronic commodity trading or stock markets. Third, the platform provides an institutional and regulatory frame for transactions. This criterion excludes internet portals that offer algorithmic aggregation of different marketplaces. Fourth, the platform does not substantially produce or trade goods or services itself. This condition excludes business models of producers or retailers that additionally allow other parties to offer goods via their digital platform. Digital marketplaces in the sense of this study therefore differ from the conceptualizations of electronic markets / marketplaces through its focus on the marketplace as a business rather than an institutional phenomenon.

3
Framework of DMBMs

3.1
Overview of attributes

To empirically assess DMBMs, we develop a systematic framework of the business model attributes and their specifications. The framework is derived from existing research on business model elements, a series of expert interviews with investors and entrepreneurs of digital marketplaces and in-depth analysis of several DMBMs. The framework is depicted in and contains in total 21 attributes.[1]

Fig. 05 Overview of business model attributes and specifications

	BUSINESS MODEL ATTRIBUTES	SPECIFICATIONS				
VALUE PROPOSITION	**Key value to buyers**	Price / Cost efficiency		Design / Usability	Platform image	Community / network
	Key value to sellers	Price / Cost efficiency		Design / Usability	Platform image	Community / network
	Transaction objects	Physical goods	Digital goods	Online service	Offline service	Other
	Industry scope	Vertical	Horizontal	-	-	-
VALUE COMM.	**Primary acquisition channel**	Online marketing	Offline marketing	Sales	-	-
	Virality mechanisms	Direct network effects	Word-of-mouth	Casual contact	Incentives	-
	Transaction incentives	Featured listings	Bundling / price promotions	Recommendation system	-	-
	Retention mechanism	Targeted marketing	Social network functions	Design of lock-in mechanisms	Changing content on platform	-
VALUE CREATION	**Key activity**	Data services	Community building	Content creation & curation	Other	-
	Price discovery mechanism	Fixed prices	Prices set by seller	Prices set by buyer	Negotiated	Auction
	Trust mechanism	One-sided user reviews	Mutual user reviews	Review by marketplace	Other	-
	Security mechanism	User verification	Security deposit	Insurance options	Other	-

[1] For further information on the methodology for developing the framework, please refer to Täuscher et al. (2016) (forthcoming).

	Key resource	Customer relationship and data	Patents	Service capacity		Other	-
	Key partners	Strategic partnerships with non-competitors	Strategic partnerships with competitors	Piggy-backing		Large customers	Other
VALUE	**User segments**	C2C	B2C	B2B		-	-
	Geographic scope	Global	Regional	Local		-	-
VALUE CAPTURE	**Key revenue stream**	Commissions	Subscriptions	Advertising		Service Sales	Retail
	Main revenue partner	Seller	Buyer	Third party		Hybrid	-
	Pricing mechanism	Fixed pricing	Market pricing	Feature-based dif.	Quantity based dif.	Customer-based dif.	Geography-based dif.
	Key costs	User acquisition & retention	Platform infrastructure & development	Service capacity		Other	-

3.2 Value proposition

Key value to buyers / sellers

The key value to buyer / sellers denominates the main value that the platform offers in comparison to existing solutions. The attribute is derived from Osterwalder and Pigneur (2010). *Price / cost efficiency* refers to the value of saving time and money compared to the usage of other solutions. The key attribute *platform image* deals with the perceived value that customers receive from the firm and participation in the marketplace. Some platforms offer value through an active c*ommunity* that fulfills social needs of users. The specification *design / usability* depends on the ease of use, intuition, and visual attractiveness of the platform. The attribute can have different specifications for the buyer and the seller side.

Transaction type

The attribute is concerned with the objects that are transacted via the platform. Based on Wirtz (2013), we can distinguish digital businesses on two dimensions: (a) whether they sell a good or offer a service and (b) whether the good or service is delivered physically or via digital channels. As a consequence, four types of transaction can be derived: Physical goods (e.g. cars), digital goods (e.g. music files), digital services (e.g. educational content), and physical services (e.g. taxi rides). While physical goods have to be delivered offline, digital goods can be sent via digital channels to the buyer. For digital services, the transaction parties do not meet in the physical world, while physical services require a physical interaction of some kind. Each marketplace serves one dominant transaction type.

Industry scope

In the electronic markets literature, marketplaces are categorized into vertical and horizontal (Dai and Kauffman, 2000; Kaplan and Sawhney, 2000). The former offer goods and services within specific industrial sectors and the latter offer goods and services across various sectors (Janita and Miranda, 2013). Vertical marketplaces (e.g. Airbnb) can therefore be considered as *industry-* or *sector-specific.* Vertical marketplaces rather optimize buyer-seller relationships while horizontal marketplaces (e.g. eBay) optimize the process of buying and selling a specific good or service (Movahedi, 2012).

3.3 Value communication

Primary acquisition channel

This attribute is concerned with the primary channel to reach potential customers and convert them into customers. We distinguish between *online marketing* (e.g. website, mobile app, banner ads, search engine optimization), *offline marketing* (e.g. television, radio, print, street ads) and *sales* (e.g. agents, salesmen, email, telephone). Both customer sides might apply slightly different channels.

Virality mechanisms

A platform has a high virality when it acquires new customers through direct, customer-to-customer transmission. Derived from Eisenmann (2012), we distinguish between four different virality mechanisms: Network effects, word-of-mouth, casual contact and incentives. Direct (same-side) network effects refer to network effects resulting from the direct interaction of users. In marketplaces, direct network effects exist mostly, when the buyer and seller side partly overlap. Word-of-Mouth refers to a spread of marketplace participation that is driven by the satisfaction and excitement of users with the service. For instance, a satisfied traveler who stayed at an apartment booked via AirBnB might recommend the 'AirBnB experience' to friends. Even without active recommendation, a platform can be viral if it allows *casual contact* of potential users with its services. Take the taxi service Uber as an example. Non-users become aware of the service whenever they charge a Uber car with a friend who's using the service. The fourth viral mechanism refers to the implementation of *incentives* for users to encourage them to recruit new users. The last mechanism is technically not a viral mechanism because it requires the venture's action; however, it generally does not involve direct marketing spending (Eisenmann 2012).

Transaction incentives

The value attribute is derived from a study by the investment firm *Insight Partners* (2015): Does the platform effectively deploy tactics to drive increased purchasing behavior? We can distinguish between three major forms of incentives: featuring *selected listings in and outside the marketplace*, providing *promotions and price bundling*, and developing an *algorithmic recommendation system* that presents desirable offers to customers based on their previous behavior.

Retention mechanism

The value attribute aims at assessing the mix of instruments that is employed by the venture to convert members into active users. We can distinguish between (a) *targeted marketing campaigns*, (b) *social network functions* to connect users and motivate them to communicate openly in the marketplace, (c) design *lock-in mechanisms* and (d) create frequently *changing website content*. Lock-in mechanisms can, for instance, take the form of a subscription model that binds users to the firm's services.

3.4 Value delivery & customer segments

User segments

User segments or customer segments have been identified as key business model element by most business model frameworks (Teece, 2010). For marketplaces, the key decision is whether the platform is directed at private individuals or businesses on the seller and the buyer side. Consequently, marketplaces can aim at three combinations: Business-to-consumer (B2C), business-to-business (B2B) and consumer-to-consumer (C2C). The third option is sometimes also referred to as peer-to-peer (P2P). It has to be mentioned that the segments cannot always be differentiated easily and some marketplaces can attract both businesses and consumers on one or both market sides.

Geographic scope

The attribute deals with the geographic regions in which the platform is available to users and is based on Schief (2013). The specification *local* refers to a single country. *Global* addresses a platform with more than 20 individual markets spread over more than two continents. Regional addresses platforms that operate in more than one but less than 20 countries or only operate on one continent.

3.5 Value creation

Key activity

The key activities of digital marketplaces can be categorized into *data services*, *community building*, and *content creation & curation*. *Data services* refers to activities that generate value to customers or increase a firm's efficiency by utilizing available data about customer behavior or transaction patterns. Airbnb, for instance, has developed a self-learning fraud detection systems to increase its security. *Community building* refers to developing a social community around the marketplace platform. Some marketplaces primarily aim to engage their users in activities other then the pure transaction of goods and services. Such platforms have to provide social network features (e.g. user profiles, user connections, messaging services, status symbols) and stimulate discussions and social interaction between users. *Content creation & curation* encompasses the activities related to providing listings on the platform. Airbnb, for instance, employs professional photographers to visit the accommodations to both verify the provided information and increase the attractiveness of the offers with professional images.

Price discovery mechanism

Price Discovery is a key function of markets because it allows sellers and buyers to determine a price at which they both would accept a transaction (Bakos, 1998). There exist several options to support the process of price discovery. A first option is that *one market side (buyers or sellers) sets the price in advance* and the other side only accepts or declines the offer or inquiry at the proposed price. Secondly, the *price can also be set by the marketplace provider*. In this case, both seller and buyer have to accept the price if they want to participate in the marketplace. A third option are *negotiations* between buyers and sellers, which are primarily relevant for goods of higher value. Finally, buyers or sellers can enter a bidding competition in an *auction format*, where the other side has to accept the final price.

Trust mechanism

A key function of marketplaces is the establishment of trust between buyers and sellers. Uncertainty in regards to the trustworthiness of a transaction partner represents an important inefficiency in market transactions. To improve the transaction efficiency, platforms have to provide buyers and sellers with information and mechanisms to enhance trust. A key element for many internet platforms is the creation of a *review system*. Buyers at eBay can get information about how many transactions a particular seller has already conducted and how prior buyers have reviewed these transactions. In the other direction, a host on AirBnB also reviews his guests and thereby establishes their level of trustworthiness to future hosts. Reviews can either be from buyers to sellers (*one-side user reviews*), between both sides (*mutual user reviews*), or directly from the marketplace provider (*review by marketplace).* In the third case, the review is mostly based on objective metrics such as the percentage of answered requests. Review systems have been identified as a major source of value for online marketplaces for creating trust and as a reason for capturing premium prices (Pavlou and Dimoka, 2005).

Security mechanisms

Besides a trust-enhancing review system, marketplaces need to provide mechanisms to protect sellers against fraud, destruction of property and/or physical danger. One mechanism is to *verify the identification* of users as a prerequisite for taking part in the platform. This may include connecting the user's social network profile to the platform, taking a copy of his identification card, confirming personal details or receiving a password that is send to the user's home address. Some marketplaces request the demand side to place a security deposit when booking to prevent no-shows or misbehavior. Similarly, marketplaces can provide *insurance* to their sellers, which covers potential costs incurred by buyer behavior (Chesky, 2011).

Key resources

Key resources are an important element of business models (e.g. Schallmo, 2013). A key resource for many companies in the digital economy is the *customer data* which are captured during the interaction of customers with the platforms . However, to create value, these data need to be utilized or commercialized in some way. In many cases, data are used to improve the matching of transaction partners. *Patents* can serve as another key resource if they allow the firm to protect its business model. For instance, Amazon holds a patent for the '1-Click' function that provides a major source of purchasing efficiency to buyers. The third generic form of key resources is

summarized as *service capacity*. It includes both the digital and non-digital resources that are built up to provide a marketplace service.

Key partners

This value attribute refers to the firm's key partners which are critical to the success of its business (Osterwalder and Pigneur 2010: 38). We distinguish between *strategic partnerships with competitors*, *alliances with non-competitors* and *piggybacking*. Partnerships with non-competitors include strategic cooperation with large customers. Piggybacking refers to a type of partnership that has been specifically discussed for marketplaces (e.g. Parker and van Alstyne 2014: 4). For instance, Airbnb launched by integrating into the horizontal platform Craigslist without securing permission to do so. Hence, Airbnb »piggybacked on existing networks without having to create new demand« (Parker and van Alstyne 2014: 4). These partnerships enable the business model to initially grow or become more scalable.

3.6 Value capture

Key revenue stream

Revenue stream refers to the generic type of revenue generation. The categories are based on Schlie, Rheinboldt and Waesche (2011). The authors argue that all internet revenue models can be assigned to one of seven categories. For digital marketplaces, five types of revenue streams seem possible. In a *commission model*, the firm receives a fee for every completed sales transaction. The *advertising* model builds on fees that are paid for an opportunity to access potential customers by firms that are not direct users of the marketplace. In a *subscription model*, the firm sells a service contract with recurring fees that is automatically continued. A service sale is a model in which the company is paid for non-standard services. In some specific cases, marketplaces might also generate a minor revenue stream with a *retail* model by buying or selling themselves in the marketplace. The two additional models, license sale and financial risk, do not occur for marketplace platforms.

Main revenue partner

This value attribute determines who primarily pays for the marketplace services. The choices are derived from Schief (2013) and extended to reflect the two-sided nature of marketplaces. *Seller* means that the actors from the supplying market side primarily pay for the solution. *Buyer* means that the demanding market side pays primarily for the solution. *Third party* refers to actors other than the product users (e.g. advertisers). Hybrid refers to a model in which several groups contribute substantially to the revenue generation.

Pricing mechanism

The value attribute is also known as pricing method (Osterwalder 2004) or pricing system (Rappa 2001) and refers to the firm's decision on how to determine the pricing for its products and services (see also Morris et al. 2005). Derived from Osterwalder (2004) we distinguish between the three specifications of *fixed pricing*, *differential pricing* and *market pricing*. Fixed pricing is based on static variables and is not

differentiated between customers or product features. The category of market pricing describes pricing methods that are based on market conditions and contain negotiation, yield management, real-time-markets, and auctions (Movahedi et al., 2012). Differential pricing can further be divided by its discriminating factor: *product feature, customer characteristic, volume,* or *geography*.

Key costs

This attribute refers to the decision on how to invest the firm's financial resources. For marketplaces, we can distinguish between four generic cost drivers. *User acquisition & retention* encompasses all expenses that relate to marketing, sales and investments directed at attracting users. *Platform infrastructure & development* refers to all costs incurred by the technological hardware and the development of technological solutions. *Service capacity* refers to the costs related to own and contracted personnel to create and deliver the goods and services. Since marketplaces mostly moderate the creation and delivery of the good/service itself, the service capacity rather refers to the support of customers, the curation and approval of listings or the execution of additional services such as insurance.

4
Methodology

The methodology of this paper follows the approach for business model classification by Lambert (2015). Lambert proposes a generic process model to develop rigorous classifications. The six steps of the process model are depicted in figure Fig. 06.

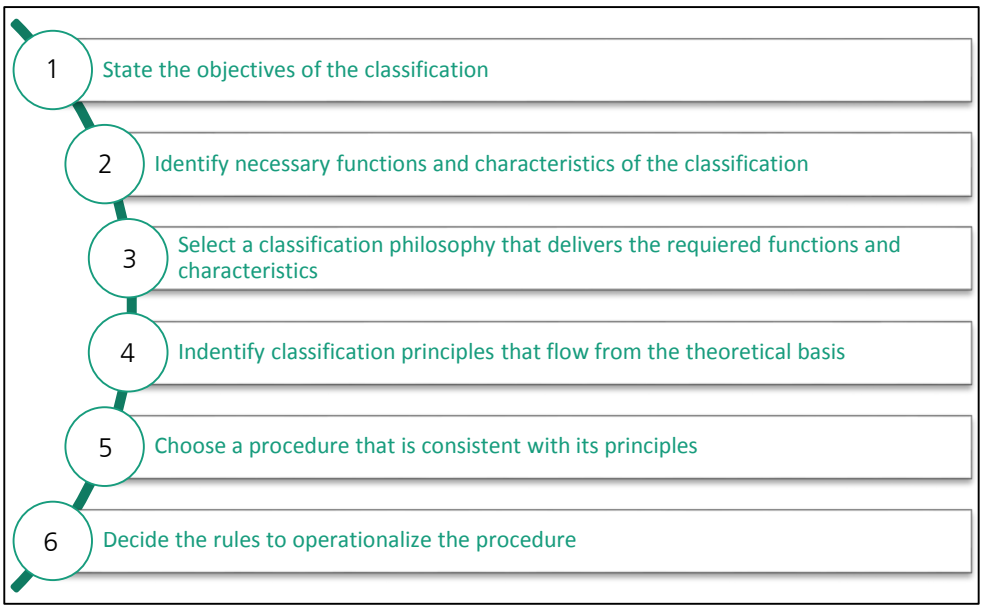


Fig. 06 Process model for developing business model classifications

Source: Lambert (2015), p. 55

The *first step* specifies the purpose of the classification. The purpose of this research is to identify types of DMBMs in order to derive generalizations and hypotheses about these types and potentially study their impact on firm performance.

The *second step* aims at specifying the necessary functions of the classification approach supporting the research purpose. The research objective calls for a classification based on quantitative analysis to provide a basis for developing new insights and hypotheses. Most importantly, we aim at empirically identifying different types of DMBMs.

The *third step* is concerned with identifying the classification philosophy that best serves the required functions. Based on the overview of functions provided by Lambert (2015: 53-54), the required functions are best provided by a numerical taxonomic approach. A taxonomy describes »an empirically derived classification of objects based on the totality of their observable characteristics« (Lambert 2015: 52). This approach follows an empiricist philosophy. Such a classification philosophy aims at forming objects that share a large number of characteristics as opposed to classification on one single characteristic (Sneath & Sokal, 1973). Hence, to identify and understand the different types of DMBMs, the classification approach should use a set of variables that is not completely selected ex ante by the researcher. This is specifically necessary when relevant literature is scarce (Hambrick, 1984).

The *fourth step* of the process defines the classification principles. In general, taxonomies numerically assess the affinity between objects to create categories based on a large number of variables (Sokal & Sneath, 1963). As such, categories are derived through observation and data are collected based on many variables to form polythetic groups (Lambert, 2015). Therefore, we choose to codify and assess all attributes from

the business model framework presented in the previous section. Figure 15 in the appendix provides an example for the process of transforming the framework into a set of binary variables. Most attributes from the framework presented in the previous section are transformed into binary variables that can be answered with »yes« (1) or »no« (0). This approach aims at reducing the rater's bias and consequently the subjectivity in the ratings. Some categories, however, require a more subjective assessment. Take, for example the attribute of key costs. Almost every firm incurs to some extent the identified types of costs. Consequently, assessing the existence of a specific cost type will not serve as a discriminating factor between different firms. Therefore, some attributes have to be assessed by selecting one of several predefined options. The options generally equal the specifications from the DMBMs framework. These variables are transformed into binary variables after the coding process. For the example of key costs, only one of four options (user acquisition & retention, platform infrastructure & development, service capacity, other) is consequently coded with a value of '1', while the remaining options are coded as '0'. The codification process aims at developing a database of standardized binary values for the observed objects.

In s*tep five* of the process model, the researcher selects and defines procedures that are consistent with the classification philosophy and principles. A first decision relates to the selection of the firm population and sampling unit. The sampling methodology of this research follows the approach by Hartmann et al. (2014). Companies are drawn from the database *AngelList* (www.angellist.com), a network which was created to simplify matchmaking between angel investors and start-ups. The database provides start-ups with the possibility to create a profile on its website to increase its visibility to investors, potential employees and other interested persons (Hartmann et al., 2014). Our sample of firms consists of those start-ups that are categorized as 'marketplaces' on the AngelList database. As of September 2015, AngelList represents 4,522 such companies. Then, we excluded those companies that had less than 100 followers at the time of investigation to exclude very young or unknown start-ups. This criterion allows including only firms with a minimum amount of publicly available data. Subsequently, we randomize the remaining list of start-ups. Random sampling reduces the researcher bias that exists when selectively choosing a sample of firms. The companies are randomized using the service random.org, which generates randomness via atmospheric noise. The first 100 companies from the randomized list are selected as the study sample. Within the process of analyzing the firms, we had to exclude a total of 69 firms which do not meet the applied definition of marketplaces (e.g. retailer) or do not provide sufficient information. For every exclusion, the subsequent firm from the randomized list is added to the sample.

The second procedure relates to the data collection. Obtaining data for start-up companies is a difficult undertaking. The developed framework and questions require some knowledge about the underlying definitions to allow for consistency within the dataset. Therefore, we choose to collect data ourselves based on secondary sources instead of conducting a survey among these companies. This approach follows prior empirical research on business models (Zott and Amit, 2008). Data are selected from the company's websites, start-up focused databases such as techcrunch.com and venturebeat.com as well as online articles of newspapers and journals. Prior research has shown that this methodology is valid for analyzing business models of start-ups (Hartmann et al., 2014). In total, 460 different documents are identified and analyzed.

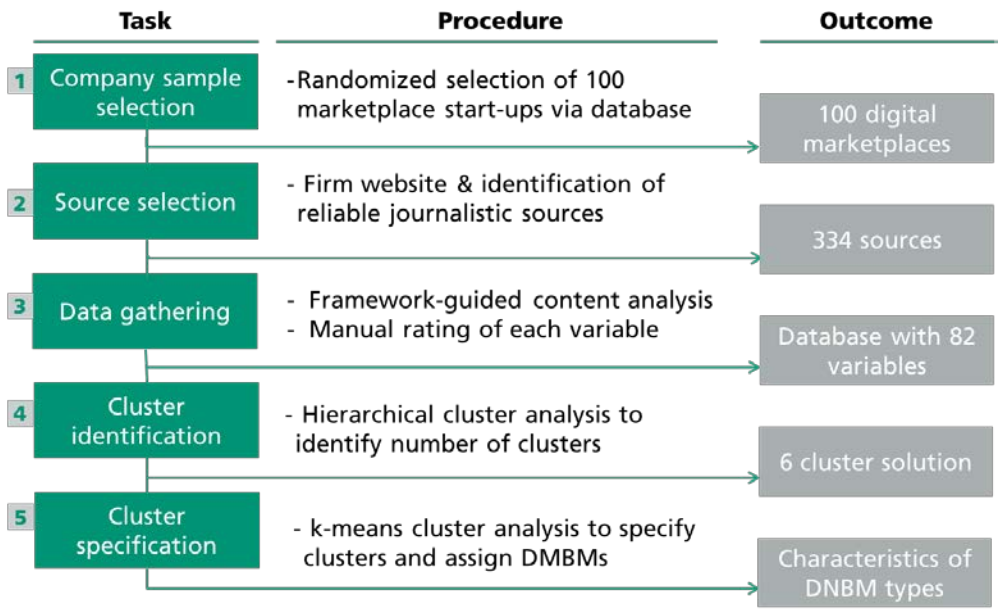


Fig. 07 Overview of chosen procedures for classification

The coding procedure requires an approach that provides high transparency and consistency. We therefore develop a standardized process based on the set of identified variables and extensive documentation. After the variable transformation, the assessment scale consists of 96 binary variables. Out of these 96 attributes, 35 variables are independent. The other variables are derived from attributes in which only one of several options can be selected (e.g. key costs). The identified documents are manually examined for statements regarding particular attributes of the framework. Every meaningful text passage is coded accordingly. We use the qualitative content analysis software MaxQDA 11 for the documentation of the coding process and the retrieval of codings afterwards. Each of the 35 independent variables is represented as a category in a category system in MaxQDA. The documents are partly coded by two independent researchers. After coders A and B perform the manual assessment process, coders meet to compare coding results and resolve disagreements; the paper's lead author acts as a judge to generate an agreement between the coders. This procedure is necessary when interpretation of textual data can cause disagreement between coders (Fastoso and Whitelock, 2010). After coding all documents about a marketplace firm, we review the information for the 35 categories. If there is no information about a category, the existing documents are specifically scanned for such information and – if necessary – additional sources are added. During the coding process, we had to remove some variables that did not allow the gathering of reliable data points. The output of the coding process is a repository of 100 DMBMs with 82 binary variables.

The next procedure relates to the task of identifying a suitable number of different DMBM types using computerized statistical software. We primarily apply cluster analysis for identifying the number and characteristics of DMBM types. Cluster analysis aims at discovering distribution patterns and identifying interesting correlations among data attributes. The methodology supports discovering ideal types of a similar group of objects (Ketchen and Shook, 1996). We follow the recommendation by Ketchen and Shook (1996) and apply hierarchical clustering methods to determine the number of clusters, but identify the clusters with a non-hierarchical method. To define the number of clusters, we conduct an agglomerative hierarchical clustering method and analyze the dendrogram. An agglomerative hierarchical clustering method groups the clusters step by step according to the similarity of individual objects in the sample until they belong to only one cluster. The agglomerative hierarchical clustering analysis includes all 82 binary variables. We choose a method that aims at maximizing the homogeneity within the clusters, applying an Euclidian scale to measure the distance. The

dendrogram is depicted in fig. 17 in the appendix. Based on visual examination, the dendrogram suggests a six-cluster solution.

To identify the six clusters, we follow the recommendation by Ketchen and Shook (1996) and apply a nonhierarchical clustering process. Nonhierarchical clustering partitions a data set into a predefined number of clusters, aiming at generating optimized solutions. Contrary to the hierarchical methods, clusters are rearranged during the process. We use the nonhierarchical method of k-means that partitions the *n* observations into *k* clusters in which each observation belongs to the cluster with the nearest mean. The center of each of the k clusters can subsequently be interpreted as an ideal type of the cluster.

To discover and select the limited set of variables for k-means clustering, we combine an analytical with an experimental approach. »Only those variables should be selected that are believed to help determine the underlying clustering in the data, as adding irrelevant variables can 'dramatically interfere with cluster recovery' (Miligan, 1996). For the given sample size, literature recommends the selection of six or seven independent variables (Hartman et al. 2014). We aim at integrating variables from different value dimensions. Figure 8 gives an overview of the selected variables.

Fig. 08 Selected variables for k means cluster analysis

Value dimension	**Value attribute**	**Binary variable (1 = yes; 0 = no)**
Value proposition	Transaction object	*Services*
		Digital
Value creation	Key Activity	Community building
Value delivery	Customer segment	B2B B2C C2C
Value capture	Revenue partner	*Revenue from buyer side*
		Revenue from seller side

The seven selected variables are derived from four different value attributes of four value dimensions. To measure value proposition, we include the attribute of transaction object. The assessment process has coded each business model according to its main transaction object as 'digital goods, 'online services', 'physical goods' or 'offline service'. We transformed the four options into two independent variables: (1) 'digital' (online) vs. 'offline' (physical) and (2) 'goods' vs. 'services'. The binary variables of 'services' and 'digital' therefore implicitly represent their opposites '*goods'* and '*offline'*. For the value creation dimension, we include only one variable from the attribute *key activity*: 'community building'. The variable contains the information whether the marketplace primarily focuses on building an active community of users (e.g., by providing social networking features). For the value delivery dimension, we select the variables regarding the 'customer segment'. For every marketplace, only one of the three options – B2B, B2C, or C2C – is selected. Consequently, these variables are dependent on each other and are treated as one variable. For the value capture dimension, we include the value attribute of 'revenue partner' as a major marketplace decision. The attribute is measured through two variables: 'revenue from buyer side' and 'revenue from seller side'. Based on the predefined number of clusters and the selected variables, we conduct a partitioning k-means cluster analysis with the statistical software SPSS.

The *last step* of the classification process focuses on defining specific rules on how to carry out the procedures. One key rule of the sampling unit refers to the decision that each start-up is treated as one single business model. While larger firms often apply several business models simultaneously, start-ups usually apply one business model. In some cases, the necessity for some of these specific rules only becomes apparent in the codification process. For instance, we had to define rules on how to treat non-marketplaces in the sample or how to deal with firms that are no longer operating. Overall, the coding and classification process yields a unique dataset of DMBMs that allows identifying and specifying clusters in a reliable and transparent approach.

5
Empirical Findings

5.1
Description of sample firms

General & value proposition

This section provides some descriptive information on the 100 DMBMs of the random sample. The firms are evenly distributed over several industries with the largest shares in hospitality (13%), delivery and professional services (12%), manufacturing goods (11%), consumer goods (10%), and education (9%). Nearly 90% of sample firms are based in the United States, with a high concentration in the state of California (58% of the total sample). Seven firms in the sample are based in Europe. The sampling methodology might introduce a slight bias towards US American firms; however, the high concentration of firms is in line with the general population of marketplaces provided by other databases (e.g. Crunchbase). Most of the firms were founded after the year 2008. Since then, there has been a stark increase in digital marketplaces. Figure 9 provides a cumulative view of the emergence of these firms. The 100 firms are separated according to their main transaction type. It becomes apparent that few firms from the sample were founded after 2013. This is not surprising since these marketplaces might not have gathered a minimum number of 'followers' on AngelList yet (which is a criterion to be included in the population). Figure 9 further shows that the sample contains an almost equal amount of marketplaces providing physical goods, online services and offline services. The number of offline services rapidly increased after the year 2010. The oldest marketplace for digital goods was founded in 2011; hence, marketplaces of digital goods seem to be the least developed so far. The *key value* of the marketplaces is relatively concentrated: 75% of the firms in the sample provide value through increased efficiency or cost savings for their users. However, nearly one third of the marketplaces also provide value through their brand image (e.g. social sharing) and/or their community feeling.

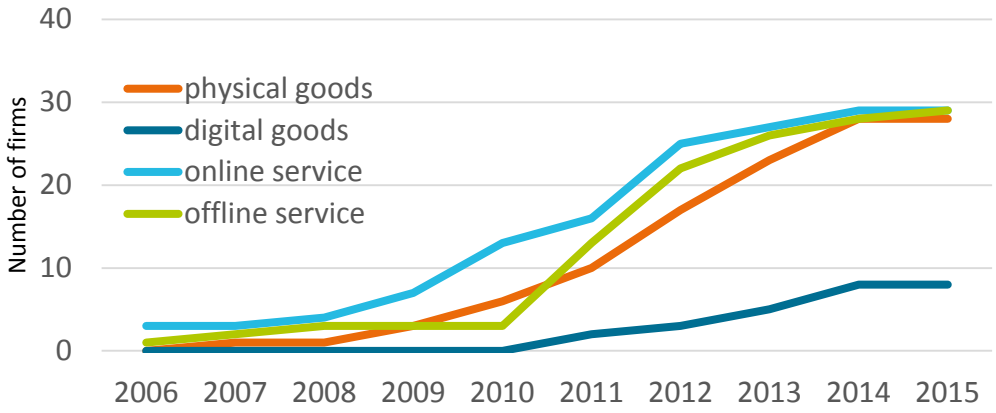


Fig. 09 Age and transaction type of sample firms

Value communication

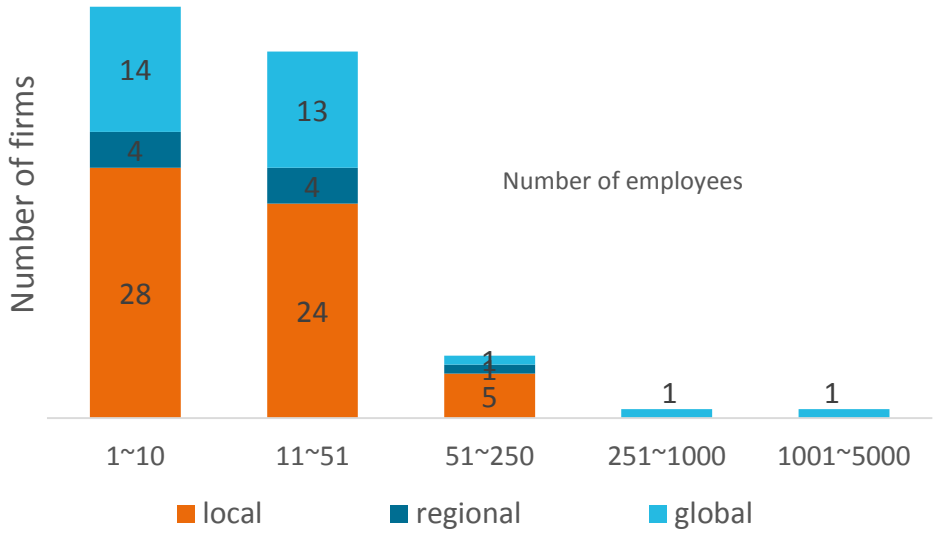
Variables from the value communication dimension proved to be the most difficult to objectively assess. Throughout the coding process, we had to dismiss most of the attributes from the value communication dimension due to low data reliability. All but

two marketplaces communicated primarily through online channels with their customers. The two remaining firms have a strong focus on providing an offline sales force. Nearly four out of ten marketplaces communicate and deliver their value via a mobile app to their users. To activate and engage customers, 12% of the firms have developed recommendation systems that suggest product/ services based on the user profile and behavior. Another 11% offer price promotions on product bundles to stimulate the simultaneous purchase of several goods. Regarding the customer retention mechanism, the sample firms concentrate on targeted marketing activities (22%), social network functions (14%) and lock-in mechanisms (13%). These data, however, highly rely on the visibility of such mechanisms to non-members and should therefore be interpreted cautiously.

Value creation

From the 100 marketplaces in the sample, 90 employ currently less than 50 employees. Half of the firms exist of less than ten employees.[1] Even in the sub-sample of marketplaces that operate globally, 71% employ less than 50 employees (see Figure 10). Regarding the mechanisms for trust and safety, we identify the review system as a common means for building trust. However, the data suggest that a review system is much more common in service marketplaces (74%) then in product marketplaces (40%). Marketplaces in the areas of education, design services and home services have the highest share of review systems. In around 80% (46/57) of the cases, the review system allows only the buyer side to assess the seller side ('one-sided review'). Quality reviews by the marketplace provider (14%) and mutual-sided review systems (5%) are the exception. Marketplaces generally create value by supporting the price selection process. In 68% of the sample firms, the seller side is responsible for price setting. In the remaining DMBMs, the marketplace itself determines the price in 15 cases, both sides enter negotiations (8), buyers compete in auctions (7), or buyers determine the price (2).

Fig. 10 Size and geographic scope of sample firms



[1] Note that these data are primarily derived from the company profiles on crunchbase.com and the information provided by the company itself. Since these data rapidly change for start-ups, the number of employees is expected to be higher on average.

Value delivery

The statistics suggest that most of the marketplace companies operate either locally (60%) or globally (31%). Regarding the customer type, only eight marketplaces match businesses with each other (B2B). This is in line with our definition of digital marketplaces that excludes highly automated and standardized commodity trading (e.g. stock markets). The majority of sample firms (60%) match individual buyers and sellers with each other (C2C). In half of these C2C marketplaces, customer segments can overlap; a customer can simultaneously act as seller and buyer. One third of marketplaces matches businesses with consumers (B2C). Additionally, some of the marketplaces attract both individuals and businesses on the supply or demand side; however, the classification considers only the primary customer segment.

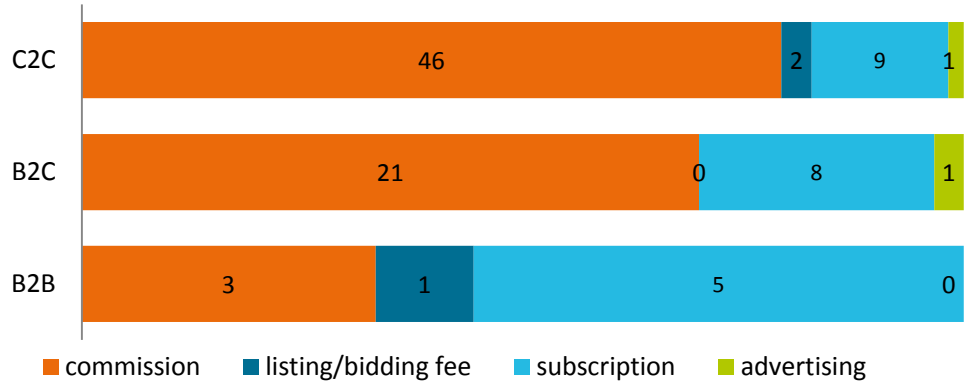


Fig. 11 Share of revenue streams for different customer segments

Value capture

The variables from the value capture dimension show that 72% of marketplaces generate revenues from commission fees. Another 22% generate subscription fees, while listing/bidding fees (3%) and advertising (2%) are the exception. Ten of the sample firms combine a commission fee with a subscription or listing/bidding fee. Yet, 9% of the analyzed firms have no visible revenue streams at this point. Breaking down the revenue stream by user segment, commissions are the primary option for C2C (79%) and B2C (70%) marketplaces (figure12). B2B marketplaces focus less on commissions (3 in 9) and focus more on subscriptions (5 of 9). While these descriptive statistics are not statistically significant, they serve as an indication for the population of DMBMs in general.

5.2
Taxonomy of marketplace business models

The clustering process resulted in six different clusters. The table lists the cluster centers for each of the clusters. All DMBMs belong to one of the clusters, with only eight of them showing a distance higher than 1.3 from the cluster center.

		Cluster Center of Final Solution					
	Cluster number	1	2	3	4	5	6
	# of firms	11	12	12	12	28	25
Value proposition: *Transaction type*	**Service**	0	0	0	**1**	**1**	**1**
	Good	**1**	**1**	**1**	0	0	0
	Digital	0	**1**	0	0	**1**	0
	Offline	**1**	0	**1**	**1**	0	**1**
Value creation: *Key activity*	**Community building**	0	**1**	**1**	0	**1**	0
Value capture: *Revenue source*	**Supplier**	**1**	0	**1**	**1**	**1**	**1**
	Buyer	0	0	0	0	0	0
Value delivery: *Customer types*	**B2B**	0	0	0	0	0	0
	B2C	0	0	**1**	**1**	0	0
	C2C	**1**	**1**	0	0	**1**	**1**

Fig. 12 Technical Cluster Center of k-means analysis with six independent variables

We can primarily characterize the clusters by analyzing their technical centers. It becomes apparent that there is an even split between product-focused and service-focused business models. Besides, two clusters focus on digital transaction objects, while four clusters contain marketplaces that provided offline goods. As a consequence, each cluster can clearly be related to one type of transaction good: 1 and 3 center on physical products, cluster 2 focuses on transactions of digital products, 4 and 6 on offline services and 5 on online services. A second variable with high discriminative power is the firm's focus on community-building activities. Contrary to the remaining four clusters, firms from 2 & 3 focus strongly on community-building activities. Surprisingly, the clustering process did not use the revenue source as a discriminator. Here, all but 2 centers around the same option: only the seller pays for the service. The last variable – customer types – has a discriminating impact; however, all clusters are either focused on B2C (3 & 4) or C2C transactions. These technical cluster centers give a good idea of the general characteristics of firms in the cluster. Nevertheless, this does not mean that all companies of the cluster fulfill the particular attribute. This refers specifically to cluster 2, which – according to the cluster center – charges neither the buyer nor seller side. In fact, only one firm in cluster 2 shows such a characteristic. The other firms in cluster 2 use some form of revenue stream. To reveal the constituting attributes of the six clusters, figure 13 represents them as a matrix with transaction type (value proposition) and customer type (value delivery). In the representation, the technical center of each cluster is represented with one color. The shadow of the same color represents the spread of different business models in that cluster. For instance, cluster five technically represents C2C online services. However, the cluster also contains firms that provide online services for B2C and B2B customers. It becomes apparent that clusters 1, 3 and 2 partly overlap regarding these two variables.

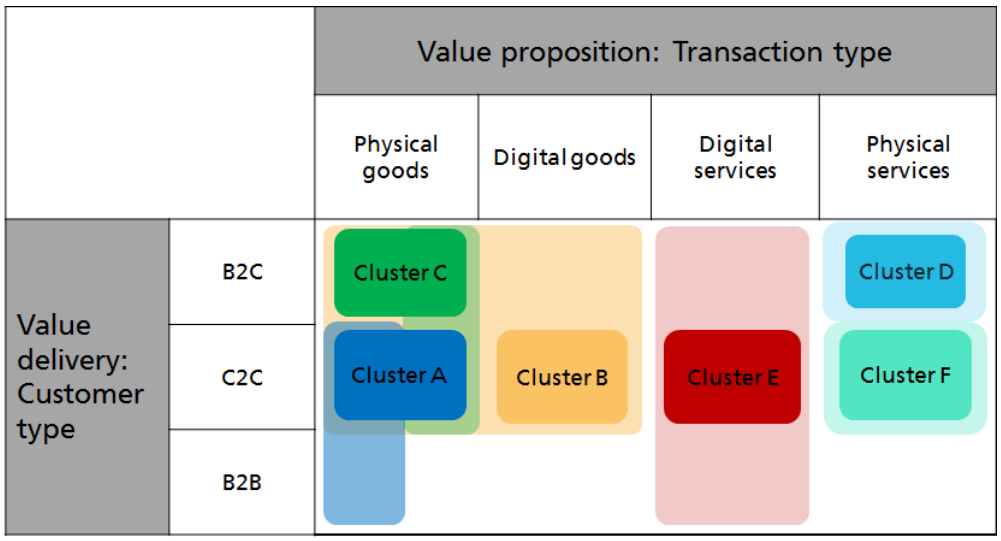


Fig. 13 Clusters plotted against two business model attributes

The focus on the six selected variables allows to identify the key discriminating attributes of the six clusters. Nevertheless, analyzing the six clusters in relation to other variables can allow important insights and provides a better understanding of their specific characteristics. Therefore, figure 14 presents descriptive statistics for the firms in each of the six clusters. The table only includes those variables that provide a certain reliability (low rating subjectivity) and discriminatory power. For instance, the variable 'viral mechanism' is not included since it requires a high level of subjective judgement by the rater. All percentage values are rounded; therefore, they do not necessarily add up to 100%. Please note that the quantitative data on the percentage distribution of the business model attributes is only indicative but not statistically significant given the relatively small sample size. Next, we will discuss these characterizing statistics for each of the clusters to provide a qualitative cluster interpretation.

5.2.1
Cluster 1: Efficient product transactions

Cluster 1 consists of marketplaces of physical products. Two thirds of the firms facilitate transactions between individuals (C2C), while one third facilitates transactions between businesses. Companies in this cluster create value for buyers by enabling them to efficiently find sellers and negotiate prices. The majority (64%) of the marketplaces in this cluster exchange manufacturing goods. Therefore, these marketplaces often aim at standardizing and commoditizing products to facilitate search and negotiation. For the individual sellers, the platform offers access to a large market of potential buyers. The statistics depict that for 91% of the sample firms in this cluster, customers use the platform primarily for superior efficiency and prices. Almost 90% of the firms charge the seller side, including 13% that charge both sellers and buyers with a fee. Two thirds of firms generate revenues from commissions; one fourth also generates revenues from subscriptions. These subscriptions are often charged to the seller side for additional services, increased visibility or access to customer data. In the cluster, half of the marketplaces charge fixed fees. The other half offers different fee options to customers. In particular, all subscription models are offered with different price options based on the included services. Regarding the review system, sellers are assessed by the buyers (45%) or the marketplace provider itself (27%). Half of the marketplace firms focus on data services to increase the matching efficiency and/ or offer additional value. To activate new users, 64% of firms primarily apply targeted marketing activities. We label the cluster 'efficient product transactions' to reflect its strong focus on creating value through transaction efficiency.

Beepi is an exemplary firm for this cluster. Founded in 2013 in Los Altos (United States), the venture has built a marketplace for used cars and aims at substituting physical car dealers operating from a car lot. On the buyer side, Beepi is targeting people in their 20s and 30s who are accustomed to conducting transactions via their mobile device. Cars are tested by inspectors at the firm's headquarter before being certified for sale and visually presented on the firm's online platform. Founder Owen Savir says that »[p]eople nowadays are used to buying things online. They are used to transacting with Amazon, they are used to transacting with others and so buying a car online is the next logical step«. Beepi enables sellers of used cars to avoid time-consuming negotiations with multiple parties as the platform alleviates the information asymmetry problem that is pervasive in the used car sales market. To match buyers and sellers, Beepi has developed a proprietary pricing algorithm that suggests a price based on data from the geographic market. Beepi facilitates the transaction by providing electronic payment systems and delivering the cars directly to their buyers. The platform receives a commission fee of three to nine percent from the seller side. Currently, Beepi serves customers in three US American states (California, Arizona and Texas). Beepi has raised over USD 300 million on a two billion dollar valuation and plans to expand beyond the United States in 2016 (LeBeau, 2015).

5.2.2
Cluster 2: Product community

The second cluster comprises marketplace start-ups that primarily build a community around products. It contains all firms that enable transactions of digital goods, which represent two thirds of the cluster's companies. The remaining third of firms focus on the exchange of physical goods. The marketplace primarily creates value to sellers and buyers by creating an active community of like-minded people (67%). Therefore, we label the cluster as 'product community'. Users of these platforms are, for instance, enthusiastic about discussing and sharing specific music. To foster the community development, firms in this cluster provide the highest share of social network functions (25%) among the clusters and focus their key activity on community building (75%). While most of the transactions are between individuals (83%), 17% of the cluster firms apply a B2C model. One third of the companies receive revenue from the seller side, 25% from the buyer side, 17% from both, 17% from a third party and 8% offer the service for free to both sides. Among revenue streams, commission fees are the dominant revenue form (69%). If fees are differentiated, differentiation is most likely based on quantity. Two thirds of the marketplaces in this cluster only focus on one industry. This cluster has the lowest share of firms that operate only in one country. This is not surprising since platforms with digital goods can expand to a global market relatively easy. Interestingly, this cluster contains the highest share of marketplaces in which buyers can set prices. Given the standardized nature of many of the products that are exchanged in this cluster, only one in three marketplaces offers a review system for their users. Overall, the cluster of 'product community' applies mechanisms and instruments that aim at increasing user engagement with the platform rather than pure transactions.

An example of a product community is the self-publishing platform *Sellfy.* Sellfy enables creators of digital content such as e-books, music, videos, or software to commercialize their content via the platform. The platform has built a community of independent authors, musicians and designers on the seller side. The platform engages buyers with community features such as the possibility to follow and interact with one's favorite creators. Besides the novelty to buyers, Sellfy aims at guaranteeing superior product quality by selectively curating products on the platform. Besides, the company activates and retains customers with special price deals and unlimited access to their purchases in an online library. Sellers are given the opportunity to reach a larger customer market, have their products actively promoted, and increase their

efficiency in the transaction process through Sellfy's hosting, payment, and delivery services. In addition, Sellfy offers its sellers a data-based analytics tools and sales dashboard to analyze customer behavior. On Sellfy, sellers set the price for their goods. Sellfy charges a 5% commission fee on every transaction from the supplier side, while buyers are currently not charged at all. The platform was founded in 2011 in Latvia, but rapidly expanded to a global presence. Currently, there are over 50,000 sellers on the platform have created nearly 200.000 listings.

5.2.3
Cluster 3: Product aficionados

This cluster consists entirely of marketplaces that facilitate the exchange of physical goods. Two thirds of the DMBMs in this cluster facilitate exchange between businesses and consumers (B2C) and one third between individuals (C2C). A large share of marketplaces in this cluster create value from the image of the platform (67%); meaning that association with these marketplaces can be considered as desirable. The community aspect of these business models is much higher than in cluster 1 – the other cluster of physical products. On the other hand, efficiency and price advantages have the lowest importance among all clusters (42%). As for cluster 2, these DMBMs strongly focus on community building as a key activity (58%). DMBMs from this cluster have the highest score for changing content on the platform to retain users and the second-highest percentage of firms offering an app. All marketplaces charge the seller side; either with a commission (77%) and/or subscription (15%). Sellers set fixed prices for the products they sell (85%), but have to accept fixed fees from the marketplace. Firms in the cluster tend to apply a vertical model to concentrate on one distinctive product category (67%). With the exception of one firm, they either operate in one individual country (42%) or are globally active (50%). While start-ups in this cluster focus the least on data-activities (17%), they are the most active cluster in creating and curating the product listings. One third of the firms offer a system for buyers to review the sellers; but in most cases, there is no review system in place. We label the cluster as 'product aficionados' since firms of this DMBM type have in common that they build a community of people with a shared passion for a certain product type. Such users are drawn to the community to discuss these products and inform themselves. Examples include aficionados of independent art products (artsy), handmade design (solidarum), educational products (educents), independent music (merchbar), or collectibles (hobbyDB). Once such a community of enthusiasts is established, it is a rather easy task to bring sellers to the platform.

A case in point is the product marketplace *Storenvy*. Founded in 2010 and located in San Francisco, the firm matches sellers and buyers of indie fashion brands. For the seller side (independent fashion brands), the marketplace offers high efficiency in creating and maintaining e-commerce activities. To do so, Storenvy provides a platform with tools for designing a digital storefront, displaying products, marketing, online checkout, inventory and order tracking, delivering deals, and tracking sales. Their value proposition claim to sellers is to open an e-commerce store in 20 minutes. Storenevy applies a hybrid model in which sellers can decide whether they use the tools to build and strengthen their own branded site (custom store) or to sell their items on Storenvy's marketplace. The marketplace model – introduced in 2012 – offers consumers to »[b]uy directly from the world's most awesome indie brands« (Storenvy website). Buyers can discover unique products ranging from handmade goods to apparel, jewelry or home decor. The marketplace classifies itself as »much more than just shopping. It's about discovering and connecting to amazing brands, people, and products« (Storenvy website). Its founder Jon Crawford specifies that Storenvy aims to »reduce the gap between consumers and merchants so that when you shop online it's like walking into a boutique and meeting the owner« (Angulo, 2014). Storeowners

therefore have brand pages for consumers get to know them. Storenvy engages and retains users with social network functions such as the 'envy' button to express one's admiration of a product or the option to 'follow' other users. Storenvy changed its revenue model: Initially, the company's main revenue source was based on subscription plans for sellers for receiving advanced e-commerce solutions. With the shift towards a marketplace, the company started charging a 10% commission fee from sellers on every marketplace transaction. The firm operates on a global scale and has built a community of 65,000 merchants to its platform.

5.2.4
Cluster 4: Offline services on-demand

Cluster 4 comprises marketplaces that match service firms with consumers. The exchanged services are delivered offline and therefore require some form of scheduling. The primary value for both the businesses selling the services and the consumers demanding them can be related to their efficiency gains (83%). For some firms, the value from brand image (33%) and platform design (17%) play an important role as well. None of the marketplaces creates significant value through the platform community. Rather, these firms focus their activities on generating data solutions (75%) to increase efficiency. Within the cluster, companies can be subdivided into two groups. A first group contains firms that act as aggregators for services that fully integrate the customer and therefore require exact time reservations. Examples include hairdressers (styleseat), car rides (technorides), or touristic activities (gidsy, headout). The second group of marketplaces serves firms with services that do not require the full integration of the customer and are therefore less time-sensitive. Often, however, they are requested within a short period of time. Examples include services for shipping (shyp), alcohol delivery (drizly) or construction work (buildzoom). In both groups, providers have limited capacity and therefore benefit from the scheduling process provided by the marketplace. DMBMs in this cluster provide the highest share of apps among all clusters (58%), which serve as a mobile scheduling device. Passive users are activated and retained through targeted marketing activities (42%). The companies in the cluster generate revenues through commissions from the sellers (73%), while buyers mostly use the marketplace for free. The marketplace fees are either fixed or differentiated between different marketplace features or segments. Most of those companies (75%) use a vertical model, which is in 67% of cases limited to one country. Prices are mostly set by sellers (67%); in some cases the marketplace itself establishes a standard price for the exchanged services. For instance, Shyp offers its delivery services at a standard price which has to be accepted by both the delivery supplier and the demand side. The cluster has the highest percentage of firms that provide ratings of sellers. Since positive ratings have a strong impact on the marketplace success of individual sellers, the rating system provides an effective mechanism to sustainably incentivize suppliers to schedule appointments via the platform. Overall, this cluster resembles the concept of on-demand services. Therefore, we label the cluster as 'offline services on-demand'.

An exemplary firm of cluster 4 is StyleSeat, a start-up founded in 2011 and based in San Francisco. StyleSeat is an on-demand online and mobile marketplace that aggregates beauty salons, stylists, colorists, manicurists, masseuses and the like with anyone who is looking for beauty services. Users are able to find stylists in over 15,000 cities across the US and schedule an appointment via the platform. The value proposition to users is to avoid the hassle of calling several beauty salons and perceive only a limited number of options. Users receive access to the profiles of service providers which are reviewed by others users of StyleSeat. From the service provider's perspective, the marketplace helps increase service orders by scheduling the vacant time slots more efficiently. The marketplace handles payments, taxes and provides CRM solutions to beauty salons. The founders claim to increase the beauty professionals'

revenues by around 70% through participation on their platform. Styleseat charges a 30% commission from the service providers and offers additional premium packages for a monthly subscription fee. The premium packages include additional tools for marketing and scheduling. StyleSeat's business model relies on mobile devices for scheduling appointments; more than 60% of the transactions occur through Styleseat's mobile app. To date, StyleSeat operates in various cities in the US, where it has aggregated more than 320,000 beauty professionals and over 2 million clients and facilitated USD 350 million in services booked on the platform.

DDBM Dimensions			Characteristics of 6 DMBM Types					
			1	2	3	4	5	6
			Efficient product transactions	Digital community	Product aficionados	Offline services on-demand	Online services	Peer-to-peer offline services
Number of companies			**11**	**12**	**12**	**12**	**28**	**25**
VALUE PRO-POSITION	Key value	Platform Image	0%	33%	67%	33%	29%	28%
		Design/ Usability	9%	0%	0%	17%	0%	8%
		Price/Cost efficiency	91%	58%	42%	83%	75%	88%
		Community/ network	9%	67%	50%	0%	57%	8%
	Transaction Type	Physical goods	100%	33%	100%	0%	0%	0%
		Digital goods	0%	67%	0%	0%	0%	0%
		Online services	0%	0%	0%	0%	97%	0%
		Offline services	0%	0%	0%	100%	3%	100%
VALUE COMM.	Retention mechanism	Changing content on platform	9%	0%	25%	0%	0%	8%
		Design of lock-in mechanisms	9%	17%	0%	0%	21%	20%
		Social network functions	9%	25%	0%	8%	7%	16%
		Targeted marketing	63%	0%	33%	42%	7%	12%
	Communication channel	App	36%	25%	50%	58%	25%	48%
VALUE CAPTURE	Key revenue stream	Commissions	64%	69%	77%	57%	55%	80%
		Listing/bidding fees	9%	8%	0%	0%	3%	0%
		Subscriptions	27%	0%	15%	36%	28%	16%
		Advertising	0%	0%	8%	0%	3%	0%
	Main revenue partner	Seller	88%	33%	100%	73%	68%	55%
		Buyer	0%	25%	0%	9%	8%	30%
		Hybrid	13%	17%	0%	9%	12%	10%
		Third party	0%	17%	0%	0%	0%	0%
		Free	0%	8%	0%	9%	12%	5%

Fig. 14 DDBM Dimensions

	Pricing Mechanism	Fixed pricing	50%	50%	89%	42%	46%	62%
		Market pricing	0%	0%	0%	0%	0%	5%
		Differentiated pricing	50%	25%	11%	50%	42%	29%
	Price discrimination for fees	Feature based	60%	0%	0%	50%	36%	33%
		Geography based	0%	0%	0%	17%	0%	0%
		Quantity based	0%	67%	0%	0%	45%	33%
		Segment based	40%	33%	0%	33%	18%	33%
VALUE DELIVERY	User segments	C2C	63%	83%	33%	0%	57%	100%
		B2C	0%	17%	67%	92%	32%	0%
		B2B	36%	0%	0%	8%	11%	0%
	Industry scope	Vertical	64%	67%	67%	75%	75%	80%
		Horizontal	36%	33%	33%	25%	25%	20%
	Geographic scope	Local	72%	33%	42%	67%	54%	80%
		(Intra) Regional	0%	25%	8%	25%	7%	0%
		Global	27%	42%	50%	8%	39%	20%
VALUE CREATION	Key activity	Data services	45%	25%	17%	75%	39%	28%
		Community building	9%	75%	58%	8%	57%	12%
		Content creation & curation	0%	17%	25%	8%	11%	4%
	Price Discovery Mechanism	Fixed by seller	50%	55%	85%	67%	64%	73%
		Fixed by buyer	0%	18%	8%	0%	4%	0%
		Fixed by platform	8%	18%	0%	17%	21%	15%
		Negotiated	17%	0%	8%	8%	7%	8%
		Auction	25%	9%	0%	8%	4%	4%
	Review System Mechanism	One-sided user review	45%	17%	33%	58%	50%	56%
		Review by platfom	27%	0%	0%	0%	11%	8%
		Mutual-side review	0%	8%	0%	0%	0%	8%
		None	27%	75%	67%	42%	39%	28%

5.2.5
Cluster 5: Online services

Companies in this cluster share the characteristic that they offer services that are delivered via the internet. This includes services that involve individuals 'sharing' their previously untapped skills. For instance, the last years have seen the emergence of educational services such as individuals tutoring languages (italki) or creating online courses (udemy, skillshare). The cluster also includes firms that aggregate professional freelancers such as divorce attorneys (wevorce, breakthrough), municipal financial investors (neighborly), designers (visually), or scientific researchers (experiment). These marketplaces provide a high efficiency to the supply side in earning an additional income or even to substitute their formal employment. Marketplace participation provides sellers with a clear advantage in reaching their target audience. In many cases, the demand-side users receive value from the community around the core service. In

75% of cluster firms, the value proposition is targeted at one single market (vertical). More than half of these marketplaces operate only in one country. Since some of the services are rather standardized, the share of marketplaces setting a fixed price is the highest among all clusters (21%). Only 25% of the marketplaces offer an app. The marketplaces of this cluster monetize by charging sellers (68%), and/or buyers (20%). The fee is mostly charged as commission (55%) or subscription (28%). Nearly half of the firms offer differentiated fees. Cluster 5 represents the largest cluster, containing 28% of firms from the entire sample.

Udemy – a marketplace »for professional educators or anyone with an expertise to join and share their knowledge« – provides a good representation for this cluster. Launched in 2010 in San Francisco, Udemy offers individuals the possibility to create, distribute, promote, and sell their educational courses on topics such as entrepreneurship, software programming, or fitness. The key value proposition to these content suppliers relates to earning an additional source of income. The buyer side is offered a selection of more than 30.000 educational courses. Udemy's CEO Dennis Yang underlines that »[b]y bringing a true marketplace model to education, we're giving people unparalleled access to their choice of sought-after skills […].With Udemy's web and mobile offerings, students access content and experts where and when they want to« (Business Wire, 2013). The uncertainty about the quality of the online courses is reduced through previous user ratings, free sample material and detailed outlines of course contents. The courses are increasingly watched via Udemy's mobile app on smartphones and tablets. The platform's revenue model is based on commissions from both students and instructors. The commission system for instructors depends on whether the instructor has acquired a learner through her own marketing activities. Instructors pay a 3% commission fee if they attract users through their coupon codes. If students are acquired via the marketing and sales activities of Udemy (e.g. promotions, featured listings, blog posts), instructors pay a commission fee of 50%. Udemy has acquired more than 8 million students and 19.000 instructors from all parts of the world.

5.2.6
Cluster 6: Peer-to-peer offline services

The sixth cluster comprises companies facilitating the exchange of offline services between individuals. Companies in this cluster can be further divided into two sub-types according to the seller side: (a) individuals sharing their physical resources (10/25) and (b) individuals providing their time and skills (12/25). Resource sharing firms include shared private accommodation (Airbnb), office space (sharedesk), or cars (getaround). Time- and skill-sharing services comprise pet sitting (spotwag), delivery services (postmates), home services (zaarly), or event organization (honeybook). For the private supply side, firms in this cluster often provide a novel source of income. These marketplaces create value to the buyer side through an increase in transaction efficiency (88%) and – less commonly – through the platform's perceived image (28%). In particular, some of these marketplaces are closely related to the positive image of the 'sharing economy'. The companies in this cluster mostly apply vertical business models (80%) and are only active in one country (80%). Prices are set mainly by the seller side (73%), while sometimes the platform determines a standard price (17%). Overall, 72% of the firms in this cluster provide a review system to generate trust between the users. Firms from this cluster over-proportionally provide lock-in mechanisms to retain customers. Half of the firms offer an app for mobile booking of the service. Revenue is generated primarily from the seller side (55%), but the share of firms charging buyers is highest among all clusters (30%). The fees are standardized in 60% of cluster firms, with the other 40% equally differentiating in regard to service features, quantity and segment characteristics. The revenue model is predominantly

based on commission fees (80%). With one fourth of firms assigned to the cluster, peer-to-peer offline services represent the second-largest DMBM type in the sample.

Airbnb exemplifies peer-to-peer offline services. Airbnb provides value to its hosts by enabling them to generate additional income from renting out their private property. The business model has enabled the activation of resources that were previously unused. Airbnb's buyer side receives value form the site's sharing image, the efficient booking process and the novel experience of sleeping in private accommodations. The firm creates value for their hosts by providing insurance for their property, automated payment systems, professional photographers and the promotion of their listings on the platform. Both buyers and sellers are actively encouraged to rate each other to increase their trustworthiness to other users. Airbnb generates revenues from commissions on bookings. Hosts pay a commission fee of 3%, while guests pay between 6% and 12%. The company is currently valued at over USD 25 billion dollars and has over 1,000,000 listings operating in 190 countries.

In summary, the six theoretical clusters can be interpreted in a plausible way. The six resulting DMBM types do not only differ in regards to the variables included in the k-means clustering, but are also distinguishable in regards to further attributes.

6
Managerial Implications

The process of analyzing and classifying the 100 DMBMs has yielded new insights into the general characteristics of digital marketplaces and their business models. The empiric taxonomy provides first insights into the underlying differences of these business models. The descriptive statistics provide some indicative benchmark values for practitioners to compare their business model with other companies. Most importantly, the awareness of the six business model types enables managers to select comparable firms from other industries as an inspiration for changing their own business model. Managers of digital marketplaces can use the successful start-ups with the same DMBM type as a blueprint to adapt their business model configurations.

The data gathering process has revealed certain strategies for dealing with the most critical challenges of developing digital marketplaces. One key challenge relates to the selection of an appropriate revenue side. The firm sample has shown different possible combinations; however, most marketplaces primarily charge the seller side for their services. This suggests that the buyer side might generate more value to the seller side (cross-side network effects) then vice versa. In addition, the data might suggest that the seller side is less price sensitive to marketplace fees. This seems plausible since the marketplaces often provide sellers with the possibility to generate new forms of income (e.g., by teaching a course online) that were not available offline. Such an additional income provides a net benefit to these sellers despite the marketplace fees. Regarding the revenue partners, managers should differentiate between marketplaces that are only more efficient than previous solutions (e.g. selling products) and marketplaces that provide novel value propositions (e.g. short-term rental of private accommodation). The analysis leads to the suggestion that the efficiency-centered marketplaces (clusters 1, 3 and 4) should strongly focus on incentivizing the buyer side to join the marketplace (by subsidizing them financially). In these cases, sellers will generally join those marketplaces that have already attracted the largest buyer side. For firms in cluster 5 and 6, incentivizing the seller side plays an equally important role. As we have seen in the data, a large share of DMBMs in clusters 5 and 6 also subsidize the seller side to attract them to the marketplace.

Subsidizing one customer side is, however, not sufficient for building a critical mass of customers. The analysis of the sample firms reveals the existence of three different strategies to acquire the critical mass of users. The first strategy relates to a strong focus on building one market side. These ventures started often as a one-sided business. Take the example of Sellfy, the digital content marketplace presented above (type 2). The venture started offering services only to the customer segment of content creators (supply side). After Sellfy had built a critical mass of content creators, they changed their business model to a marketplace model. Having already connected 50.000 content creators, Sellfy was able to successfully advertise its newly created marketplace to potential buyers. A second strategy relates to the selection of a larger network as a key partner ('piggybacking'). Airbnb, for example, initially encouraged its hosts to link their listings to the dominant marketplace *Craigslist*. Thus, the marketplace was able to benefit from the network size of craigslist as a buyer side. When Craigslist visitors clicked on an offered accommodation, they were redirected to Airbnb's platform for booking. A third strategy is derived from the findings regarding the geographic focus and the industry scope of the sample firms. Starting in a limited market (geography or industry scope) facilitates the development of a critical mass of users. Many of the product marketplaces in the sample started with a very narrow product focus. For instance, the platform *Artsy* matches sellers and buyers of art pieces. Starting from a narrow selection of paintings, the marketplace has expanded its scope

into a wide range of artefacts, after reaching a critical mass of providers for their initial art categories. Most of the providers of offline services (4 and 6), initially start their service in one city where they expect a critical mass of early . A high share of the sample firms started their offline service marketplace in San Francisco and only moved to other cities after they had activated a critical mass of users there. We suggest that each of the six DMBM types might have a preferable strategy for overcoming the challenge of acquiring a critical mass of users.

7
Conclusions and Outlook

Digital marketplaces have become highly popular business models among entrepreneurs and investors. The research has yielded new insights into the relevant but under-researched topic of digital marketplaces. The presented framework of attributes and specifications of DMBMs synthesizes knowledge from practitioners with relevant literature in a structured way. The framework allows analyzing DMBMs and can serve as a supporting tool for designing and changing such business models. Most importantly, the research provides a novel taxonomy of digital marketplace business models (DMBMs). The taxonomy advances the discussion towards a more differentiated and structured analysis of these business models. Further research can utilize the DMBM types to identify differences in performance. Moreover, the methodology of empirical classification contributes to the business models literature by adding to the small number of empirical studies and potentially advancing the field towards a better understanding of how to apply the business model concept beyond pure conceptual description. Entrepreneurs, managers and start-up investors can apply the framework and taxonomy as mental models to refine their understanding of digital marketplaces.

This research is not without limitations. First, the company population only consists of start-up firms. This might significantly influence some of the variables such as the geographic scope. However, the population of digital marketplaces that are beyond their start-up phase is rather small. Future research could, however, focus on a more mature sample of firms, including public companies like eBay. Second, the coding process builds on a certain level of subjective judgement, which potentially reduces the reliability of the quantitative results. Future research should therefore verify the clusters with a different firm sample. Third, we acknowledge a potential bias resulting from the reliance on secondary sources. To increase data reliability, we have used data from the company websites, database information and published articles from online journals. However, we notice that these articles are, on average, slightly biased towards an optimistic valuation of the venture's potential. Since we do not assess the performance of these start-ups, this potential bias should not influence the results of the study. Lastly, the sample size of 100 firms does not allow generating statistically significant findings for the individual clusters. Future research could therefore extend the sample size or focus on one individual cluster to increase the statistical significance of the findings.

Digital marketplaces only started to gain traction a few years ago. Thus, we can expect further emergence of new and innovative business models for digital marketplaces. The characteristics of digital marketplaces – as discussed in section 2 – generally lead to a winner-takes-all effect (Eisenmann, 2006). Therefore, it is likely that today's leading digital marketplaces will become more dominant and lead to the exit of the majority of competitors within their category. Such a consolidation process can potentially lead to a decline in the number of digital marketplaces. As indicated in section 1, digital marketplaces in some industries (e.g. consumer goods) are more mature then in others (e.g. education). Therefore, we expect to observe consolidation in some industries, while marketplaces in other industries continue to diverge and hundreds of new start-ups to emerge in the coming years. In addition, digital marketplaces might emerge in entirely new industries.

The study has shown that most digital marketplace start-ups can initially subsidize one customer segment, while strongly investing in user acquisition. Such rapid growth strategies generally require external founding through venture capital. The continued emergence of such business models will therefore depend on the level of venture

capital availability. The market valuations of digital marketplaces such as Airbnb and Uber can serve as an indicator of the current attractiveness of DMBMs to investors. Nevertheless, only few digital marketplaces have proven the sustainability of their business model over a longer period of time. Hence, the failure of several highly valued marketplaces could decrease the euphoria regarding these models. On the other hand, a few successful IPOs (Initial Public Offerings) could further increase the expectations in DMBMs in general. Besides, regulators can potentially become an important factor for the sustainability of these business models, particularly in marketplaces that rely on a network of freelancers. Today, individuals can earn multiple incomes by renting out their home on Airbnb, working as a driver on Uber, teaching languages on Italki, and selling courses on Udemy. These new forms of work provide novel income opportunities to individuals, but can equally increase their risks. For instance, unlike an independent Uber driver, a driver employed by a taxi company is entitled to social benefits such as payment continuation in case of sickness. In addition, several digital marketplaces have been criticized for offering professional services without being subject to taxation. Because of these ongoing debates, new regulations might emerge that potentially reduce the attractiveness of some of these business models. The banning of Uber in certain parts of the world has already shown a drastic example of how policy makers can influence the performance of these firms. Hence, developments in the financial and regulatory spheres might challenge existing DMBMs – but can simultaneously spark the development of new ones.

8
Appendix

	BUSINESS MODEL ATTRIBUTES	QUESTION FOR RATERS	VARIABLE TYPE	MINIMUM / 0	MAXIMUM / 1
VALUE CAPTURE	**Key revenue stream**	Does the platform charge commissions?	Binary	0; no	1; yes
		Does the platform charge a listings or bidding fee?	Binary	0; no	1; yes
		Does the platform provide a subscription option?	Binary	0; no	1; yes
		Does the platform generate revenues from advertising?	Binary	0; no	1; yes
		Does the platform generate revenues from selling their own products and services?	Binary	0; no	1; yes
	Main revenue partner	Does the supply side contribute more revenue than the demand side?	Binary	0; no	1; yes
		Does the demand side contribute more revenue than the supply side?	Binary	0; no	1; yes
	Pricing mechanism for demand side	Can seller use the platform for free?	Binary	0; no	1; yes
		Can buyer use the platform for free?	Binary	0; no	1; yes
		Can demand-side users decide between different pricing models?	Binary	0; no	1; yes
		Can demand-side users conduct transactions for free on the platform (Freemium)?	Binary	0; no	1; yes
	Pricing mechanism for supply side	Can supply-side users decide between different pricing models?	Binary	0; no	1; yes
		Can supply-side users conduct transactions for free on the platform (Freemium)?	Binary	0; no	1; yes
		What is the main type of price discrimination?	Selection between 4 options	Not applicable	Not applicable
	Key cost driver	What is the main source of costs?	Selection between 4 options	Not applicable	Not applicable

Fig. 15 Transformation of attributes and specifications for value capture dimension

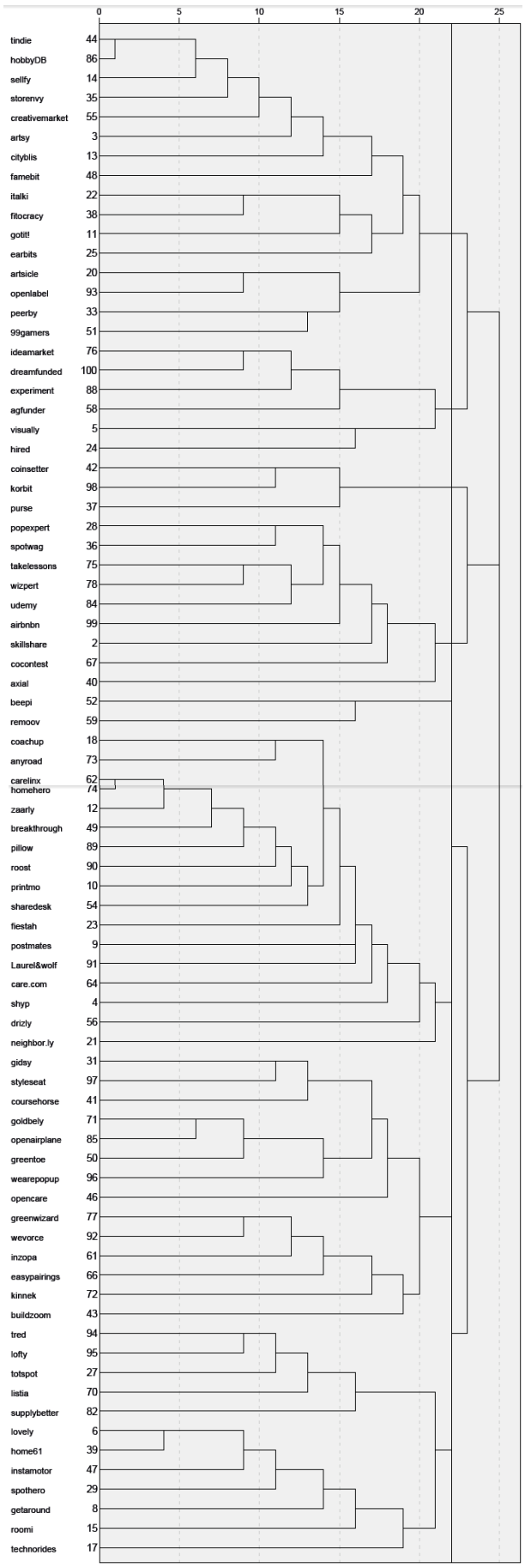


Fig. 16 Dendrogram of hierarchical clustering

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