

Developing Multi-Sided Markets in Dynamic Electronic Commerce Ecosystems - Towards a Taxonomy of Digital Marketplaces

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Abstract

Multi-sided markets (MSMs) have proven to be a successful business model in the dynamic electronic commerce environment. There exists a variety of MSMs differing in their provided features and services for their participants. Existing taxonomies often focus on value creation and business-to-business transactions. We apply Nickerson et al.'s taxonomy development approach. We especially incorporated aspects of orchestrating the distinct market sides and governance dimensions. The developed taxonomy for MSMs consists of 21 dimensions and 99 characteristics in total. We have applied our taxonomy to 44 MSMs and identified asymmetries between the market sides concerning Monetization, Network Effect Amplifiers and Provided Services. We emphasize that the taxonomy is not only an artifact for classifying the current situation of an MSM but can also be used by MSM owners to derive directions for the future development. We illustrated how these developments can be conducted by examples for five dimensions of our taxonomy.

1. Introduction

As electronic commerce (ecommerce) is accountable for 16.1 percent of total retail sales in the US in the second quarter of 2020 [1], it seems to be a profitable sales channel for trading companies. Despite the continuously increasing total sales, the ecommerce itself represents a highly competitive environment [2]. To gain competitive advantage, trading companies establish digital multi-sided marketplaces (MSMs) [3] in which the owner acts as an intermediary between two or multiple distinct market sides enabling trading transactions between them making use of the economic effects of MSMs, mainly network effects (NEs) [4, 5, 6, 7]. Companies operating MSM business models matching suppliers and consumers in ecommerce have up to four times higher valuations than traditional businesses [8]. For example, Amazon's revenue

generated with its MSM is already accountable for nearly 60 percent of Amazon's total ecommerce revenue [9]. Exploiting NEs [10], these MSM form the core of emerging digital business ecosystems with networks of independent participants [11] who may profit from the success and dissemination of the MSM among demand-side participants [12]. The value of the MSM-mediated business ecosystem for each participant increases with more participants within the network [12]. These digital business ecosystems are subject to continuous and dynamic change caused by participants joining and departing [13]. Thus, decisions regarding the future development of an existing MSM or the positioning of a new MSM within these ecosystems are crucial to reach and exceed a critical mass of participants in the dynamic ecommerce networks [14, 15]. With many retailers and wholesalers developing from reseller mode to MSM [16, 17] and winner-take-all dynamics in platform ecosystems [18], the positioning of a MSM in an available niche and future development gets even more complicated. Thus, the owner's governance decisions should aim at locking in participants and disabling multihoming while offering a variety of boundary resources and standardized processes [14]. Additionally, MSM owners need to decide on which further additional services to offer to participants to differentiate from competing MSM-mediated ecosystems [19]. Previous literature on ecommerce mainly focuses on B2B marketplaces when deriving common characteristics and developing taxonomies [20, 21, 22]. Täuscher and Laudien [14] develop a taxonomy for general digital marketplaces that takes a business model perspective focusing on value generation, delivery and capture excluding markets on which the owners appear as competitors. We will address this literature gap by conceptually and empirically developing a taxonomy for MSM for B2B, B2C and C2C transactions exchanging (physical) merchandise in ecommerce. It can be used for analyzing the current state of an MSM and suggest steps for designing and refining the business model. We draw

on the economic literature on MSMs and NEs focusing on the matchmaking between and orchestration of the distinct market sides [4, 6] added by aspects of platform governance as major building blocks of MSMs [23, 24]. From a research perspective we serve the description goal [25] by providing a classification scheme for digital marketplaces in information systems (IS) research. Following a design science approach with the taxonomy as an artifact [26] we support MSM owners with an overview on potential governance decisions to foster NEs for an increase in the number of participants. For researchers, we propose a classification for further analysis of MSM. The remainder of this research is structured as follows: firstly, we outline related literature on MSMs. Secondly, we introduce our research methodology for developing taxonomies in IS research according to Nickerson et al. [27]. Next, our developed taxonomy for classifying MSMs is described, followed by an elaboration on its application by MSM owners for designing the future operation of the MSM. Finally, we discuss and summarize our findings.

2. Related literature

Since the ignition of the internet several business models for the ecommerce have been developed [28, 29, 30]. In ecommerce “electronic means and technologies [are used] to conduct commerce” [31]. The degree to which the transaction is carried out digitally varies in the literature on a continuum between a completely digital transaction [32] and only a small part of the procurement process [33]. Introducing MSMs in ecommerce, we draw on the concept of MSMs [4, 34, 16, 6, 7]. MSMs emphasize the economic effects inherent to electronic marketplaces [35]. They differ from the traditional value chain of (offline) retailers and electronic shops insofar, as that MSMs match manufacturers on the supply side with end customers on the demand side. Other retailers or wholesalers may also interact with a MSM as a supplier or may also demand goods from the MSM that is controlled by the MSM owner. The MSM owner can be either one (e.g. Walmart Marketplace) or a conglomerate of the aforementioned parties (e.g. Opodo) or even an independent third-party (e.g. eBay). MSM subsume procurement-, sales-side and additional participants acting as intermediaries between these sides without acquiring property over the traded articles [29]. Although we introduce MSM in ecommerce, we focus on the two dominant market sides in ecommerce namely suppliers and customers. The core value proposition of the MSM owner thus is the facilitation of the matchmaking between participants from demand- and supply-side and the enabling of (retail) transactions

between them [36]. Hagiu and Wright [16] argue that participants of a MSM require some affiliation with the MSM. However, the way in which participants must affiliate with the MSM is not further defined and can be interpreted differently (e.g. contract, registration, cookies). Although the concept of MSMs is also present in stationary trading with shopping malls or some variants of trading such as agency trade [37] and commission business [38], NEs for participants (lower transaction costs for search and initiation) and economies of scale for MSM owners (marginal costs for adding another supplier or article are almost zero) are even stronger in the context of the internet. MSMs offer a digital representation of the diverse assortment of articles offered by supply-side participants. We focus on MSMs transacting (physical) merchandise excluding the exchange of services. The assortment can be described as the periphery of the MSM while the core is the MSM itself offering merchandise related services to supply- and demand-side participants as described analogously in the platform literature [39, 40]. From a customer’s point-of-view MSMs “resemble retail agglomerations” [35, p. 155] integrating the range of articles of a network of participating suppliers, retailers and wholesalers through a single digital channel [41]. MSMs match two or more previously distinct markets (gatekeeper) [6] and form the center of a digital business ecosystem connecting dynamic networks of independent suppliers and customers that share a common interest that is the success of the ecosystem [11, 13]. Thus, they are able to exploit direct and indirect NEs to further propel the ecosystem to reach and exceed critical mass [7, 42] making the ecosystem more valuable for each participant [12]. Applying graph theory, NEs can be described as triadic closures (focal or membership) in social affiliation networks on one side or on multiple sides involving the MSM at the core [43]. The ecosystem dynamically evolves as actors join or depart while creating new or interrupting prior stable triadic closures. The participants in digital business ecosystems are interdependent. They both cooperate to achieve common objectives while competing for scarce resources [13]. With direct (or same-side) NEs the value of a MSM for a (demand- or supply-side) participant increases with the size of the network on the same side. This is due to the higher potential of exchange between these participants (e.g. of product review, of knowledge) [44, 10]. An indirect (or cross-side) NE in MSMs arises if the benefit to participants from supply side depends on the number of participants on the demand side and vice versa (e.g. supply side of the MSM subsidizing the demand side) [45, 6]. Indirect NEs require the presence of the cross-group side NEs in both directions [16, 10].

3. Scientific Approach

A taxonomy can be both an artifact for classification and the process of developing the artifact [46]. Taxonomies as an artifact are multidimensional classification systems in which objects are categorized into complete and disjoint groups by applying decision rules [47]. The benefit of developing a taxonomy is that it creates an artifact for comparing and contrasting the objects of a given domain so that common properties of the objects can be discovered [25]. Furthermore, taxonomies are considered helpful for the analysis of complex research areas [27]. For the taxonomy development we apply the methodology as proposed by Nickerson et al. [27] using a hybrid approach including both conceptually and empirically derived dimensions (Figure 1). Thus, we can include already established dimensions from literature while deriving dimensions from our sample of 44 MSMs. This method is based on the “Three-Level Measurement Model” developed by [48]. According to the definition of Nickerson et al. [27], a taxonomy consists of a series of dimensions consisting of mutually exclusive and exhaustive characteristics. The characteristics within each dimension must be complete and disjunct. The development of the taxonomy begins with

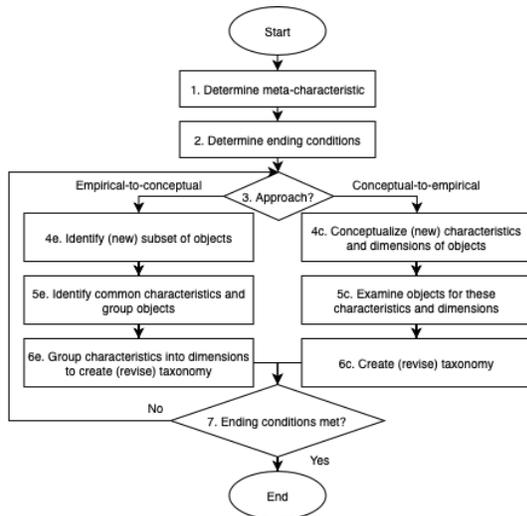


Figure 1. Method for taxonomy development [27]

the definition of the meta-characteristic (1) [27]. The meta-characteristic is superior to the other characteristics and all other characteristics are derived from it. The purpose of the meta-characteristic is to ensure that the characteristics presented in the taxonomy are related to each other and have not been loosely collected. Thus, the meta-characteristic must be chosen in such a way that it can be derived from

the purpose of the taxonomy. In this way it should be ensured that the taxonomy follows its purpose and benefits the chosen target group [27]. From a research perspective we serve the description goal [25] by providing transparency about MSMs in ecommerce. We aim at supporting owners and developers of MSM in making decisions in the development process regarding business model and measures to increase the number of participants. The taxonomy should enable researchers to classify MSMs in ecommerce from a MSM and governance perspective. Next, the ending conditions are determined (2). This step is necessary due to the iterative development process [27]. The ending conditions are divided into subjective and objective ending conditions. As soon as each of the defined ending conditions applies, the development of the taxonomy is completed [27]. We apply the ten objective ending conditions as proposed by Nickerson et al. [27]. These are all relevant objects analyzed, no merge or split of an object, each characteristic of the taxonomy must be assigned at least once, no dimension or characteristic added, no dimension merged or split, every dimension has to be unique with unique characteristics, and the characteristics have to be mutually exclusive as well as collectively exhaustive. Although we have defined mutually exclusive as an objective ending condition, it is possible that several characteristics are simultaneously fulfilled in the dimensions by one MSM in figure 2. These combinations form an additional characteristic in the formal taxonomy tuples that are not represented for reasons of graphical simplification. For the subjective ending conditions we also follow Nickerson et al.'s [27] proposal. Thus, our taxonomy should be concise, robust, comprehensive, extendable and explanatory. Before each iteration, in the third step (3) we choose between an inductive empirical-to-conceptual (represented with (e) in figure 2) and a deductive conceptual-to-empirical (represented with (c) in figure 2) approach for the development of the taxonomy [48]. In the empirical-to-conceptual approach, a selection of (new) objects is determined (4e) followed by the identification of common characteristics of these objects and classification of the objects according to the identified characteristics (5e). Then, the characteristics can then be assigned to dimensions that are added to the taxonomy (6e). If the conceptual-to-empirical approach is chosen, we set up the characteristics and dimensions of the objects based on a literature research and existing knowledge (4c). Next, the objects are examined according to these characteristics and dimensions (5c). The characteristics and dimensions are added to the taxonomy if necessary (6c). After each iteration the taxonomy is checked for

the fulfillment of the defined ending conditions (7). Further iterations are performed and steps three to seven are repeated until all ending conditions are met [27]. Our taxonomy fulfilled all ending conditions after two iterations of each approach. Once the development of the taxonomy is complete, it must be evaluated to ensure that it is useful for the target group [27]. To evaluate the usefulness of our taxonomy we classified 44 MSMs mainly operating in the US and Europe using publicly available data from articles and web pages. The numbers in brackets in figure 2 represent the number of classified MSMs for each characteristic. Unlike the formal taxonomy tuples, the characteristics are not always mutually exclusive in this graphical representation. Thus, they may exceed the column sum of 44.

4. Taxonomy

Our taxonomy for classifying digital marketplaces in ecommerce consists of 21 dimensions with 99 characteristics in total (Figure 2). Overall, we have grouped the dimensions following the MSM approach [6, 4] to the participants they relate to (supply- and demand-side) and general marketplace dimensions [18]. We will briefly introduce each dimension with its related characteristics and mention examples from our classification for each characteristic. The **Article Type** dimension relates to the aggregated assortment of articles offered on the MSM. It describes the articles that are either *Physical Merchandise* (e.g. Wish) or *Digital Merchandise* (e.g. Bonanza) [31, 49]. Digital articles consist of data, information and knowledge without any form of physical representation (e.g. music downloads) [50]. Digital articles are special in terms of indestructibility, transmutability and reproducibility and pose different requirements for storage and distribution on the MSM [31]. The name of the second dimension is **Business Orientation**. This dimension aims at the choice of the mode of ecommerce and describes the type of participants on the MSM [49]. This results in the characteristics *B2B* (e.g. Alibaba), *B2C* (e.g. Cratejoy) and *C2C* (e.g. Facebook Marketplace), all of which can be used in combination with each other (e.g. Amazon as B2B and B2C, eBay as B2C and C2C). The dimension **Industry Scope** distinguishes MSMs according to their market orientation. A distinction is made between *horizontal* MSMs (e.g. Walmart Marketplace) and *vertical* MSMs (e.g. Discogs, Zalando). While horizontal MSMs cover a variety of product groups from different industries, vertical MSMs focus on a single domain or a few industries [14]. The degree of **Centralization**

describes the elements of the purchase process that are executed or supported by the MSM [22]. This dimension is part of the governance structure dimension [24]. *Passive* MSMs focus on the matching between demand- and supply-side participants and providing article information (e.g. Craigslist, Kijiji). In contrast, *Active* MSMs offer additional merchandise-related services for the participants and depict nearly the whole purchasing process including clearing, purchase processing etc. (e.g. Amazon, Walmart Marketplace). The characteristics of the **Owner Behavior** dimension distinguish between *Competitive* owners who sell their own articles on the MSM and *Neutral* owners who do not offer their own articles or compete in single product groups. While the former are often MSMs that developed from online shops that opened-up themselves to include external supply-side participants (e.g. Amazon, Otto Market), the latter are MSMs on which the owner does not sell own products and solely acts as an independent intermediary (e.g. Alibaba, Etsy). [14] have identified three characteristics regarding the **Price Discovery** on the MSMs. Either the supply-side participant may set *Fixed Prices* for the articles (e.g. Zalando), the price is determined during an *Auction* process (e.g. eBay), or the discovery is a *Negotiation* between supply- and demand-side participants (e.g. mercateo.com). The negotiation characteristic also includes price on request in B2B marketplaces as prices can be set individually for each customer. The **Geographic Focus** dimension describes the geographic reach of a MSM and also gives a hint on the heterogeneity of participants [51, 49]. *Local* MSMs focus a very small region such as a single city center (e.g. mercato). *Domestic* MSMs are only available in one country and/or a single language [49] (e.g. Best Buy). *Multinational* MSMs reach multiple countries and also match participants globally (e.g. Amazon). MSMs usually implement asymmetric pricing policies with market sides that are being subsidized by the other(s) [6, 34]. This dimension relates to the pricing policy governance dimension (**Subsidy-Side**) of MSMs [4] and distinguishes MSMs that either subsidize *Demand-Side* (e.g. Yatego), *Supply-Side* (e.g. JOOR), or try to equally charge (*None*) the market sides (e.g. Craigslist, Facebook Marketplace).

The following dimensions will be described for demand- and supply-side participants individually as the governance mechanisms are usually asymmetric [23, 24]. With the **Market Access Demand-Side** dimension, the access prerequisites for demand-side participants are analyzed. If a MSM is assigned to the characteristic *Open*, participants on the demand-side can join a market freely or after an initial registration

	Dimension	Characteristics						
Marketplace	Article Type (c)	Physical Merchandise (44)			Digital Merchandise (9)			
	Business Orientation (c)	B2B (16)		B2C (31)		C2C (9)		
	Industry Scope (c)	Vertical (14)			Horizontal (30)			
	Centralization (c)	Active (31)			Passive (13)			
	Owner Behavior (c)	Neutral (35)			Competitive (9)			
	Price Discovery (c)	Fixed Prices (42)		Auction (4)		Negotiation (14)		
	Geographic Focus (c)	Local (2)		Domestic (8)		Multinational (34)		
	Subsidy-Side (e)	None (3)		Demand-Side (38)		Supply-Side (3)		
	Market Access (c)	Open (39)			Closed (5)			
	Fee Structure (e)	Free (41)			Fee-Based (5)			
Demand-Side	Affiliation Type (e)	Direct Interaction (9)			Registration/Contract (42)			
	Review System (e)	None (16)		Supply-Side Review (22)		Article Review (25)		
	Network Effect Amplifiers (e)	None (17)		Blog / Magazine (20)	Customer Q & A / Forum (12)		Social Events (4)	
	Provided Services (e)	None (18)		Information Services (24)		Loyalty Services (11)		
	Market Access (c)	Open (18)			Closed (26)			
	Sales Channels (c)	Brick-and-mortar Commerce (41)			Electronic Commerce (41)			
	Fee Structure (e)	Free (16)	Commission Fee (26)		Listing Fee (5)	Access Fee (8)	Subscription Fee (22)	Cost per Click (4)
Supply-Side	Review System (e)	None (23)			Demand-side review (21)			
	Boundary Resources (e)	Website (44)		Personal Support (31)	File Upload (16)	API (19)		
	Network Effect Amplifiers (e)	None (34)		Comparison with Competitors (6)		Demand-Side Newsletter (10)		
	Provided Services (e)	None (9)	Sales Processing (23)	Payment Handling (13)	Fulfillment Services (12)	Marketing and Analytical Services (22)	Infrastructure Services (4)	Training Services (4)

Figure 2. Taxonomy for Digital Marketplaces

(e.g. Amazon, Facebook Marketplace). For a MSM with the characteristic *Closed*, a participant must pass an application process to join the marketplace (e.g. Walmart Marketplace). The dimension **Demand-Side Fee Structure** refers to the pricing policy used for the demand-side. We have identified MSMs that are *Free to Use* for users on the demand-side (e.g. Facebook Marketplace, Walmart Marketplace) and MSMs that are *Fee-Based* (e.g. Restposten.de). Furthermore, we identified MSMs that use both free to use options and fee-based options on the demand-side (e.g. Amazon, eBay). As participants have some **Type of Affiliation** with the MSM [36], we have identified *Direct Interaction* and *Registration/Contract* as possible affiliation types for demand-side participants. For the direct interaction characteristic information is exchanged between demand-side participants and MSM (e.g. product description or price). This is especially true for price comparison websites (e.g. idealo). More formal instances of the affiliation are registration with an agreement to the terms and conditions (e.g. Atalanda) that result in preliminary contracts between the MSM and demand-side participants. Trust is an important governance-dimension in MSMs [23, 24]. For the implementation of a trust-building review system (**Review System Demand-Side**) [14], we identified MSMs that either have *None* review system (e.g. Stylight), demand-side may review supply-side participants (e.g. eBay) or demand-side participants review the merchandise traded (e.g. Amazon). As NEs are inherent to MSM [16], we have derived characteristics implemented by the MSM owner to increase NEs for demand-side participants under the

Demand-Side Network Effect Amplifiers dimension. We have derived *None* (e.g. Rakuten), *Blog/Magazine* (e.g. Reverb), *Customer Q&A / Forum* (e.g. Best Buy), and *Social Events* as characteristics from our sample of MSMs. The former foster the interaction among demand-side participants and make it more valuable for them to join or remain on the MSM. With social events (e.g. virtual shopping show) the MSM tries to enhance the matching (e.g. Alibaba). The **Demand-Side Provided Services** dimension includes further services provided by the MSMs or its owner for the demand-side participants. These services go beyond the pure matchmaking [35]. For this dimension we have identified *None*, *Information Services*, and *Loyalty Services* as characteristics. If no additional services besides the matching are offered the MSM focuses on its core value proposition (e.g. Hood.de). With information services further and more detailed article information is provided that extends those provided by the supply-side participants (e.g. Alibaba.com). Loyalty services offer (paid) bonus programs for parts of the demand-side participants (e.g. Wayfair). The **Supply-side Market Access** dimension examines MSMs from the perspective of how supply-side participants can enter the market. The characteristics of this dimension are *Open* (e.g. Etsy) and *Closed* (e.g. Wish) analogous to the demand side. According to [49] the **Sales Channels** of the supply-side participants aggregated on the MSM can be *Brick-and-Mortar* (e.g. gearbest.com) and *Electronic* (e.g. Discogs). A combination of both characteristics is also possible with physical stores operating an online shop as an additional sales channel (e.g. Atalanda). The

dimension **Supply-Side Fee Structure** distinguishes marketplaces according to the structure for pricing the supply-side participants. We identified the following pricing methods as characteristics of this dimension: *Free*, *Commission Fee*, *Listing Fee*, *Access Fee*, *Subscription Fee* and *Cost-per-Click*. These characteristics also appear in combination with each other. The characteristic *Free* includes all MSM that offer a free option to use the marketplace on the supply-side (e.g. Craigslist). MSMs using commission fees deduct a certain percentage from the turnover of a transaction (e.g. Amazon, eBay). Listing fees are paid once by the supply-side participant when initializing the offer (e.g. eBay, Etsy). Access fees are paid once upon registering a membership for accessing the MSM (e.g. Rakuten, Yatego). A subscription fee is an amount that is paid monthly or annually (e.g. Alibaba, Bonanza, Cratejoy). *Cost-per-Click* means the payment of a fixed amount each time a link to the supplier-side user's shop is called by a demand-side user (e.g. idealo, everysize). We have examined *None* (e.g. eworldtrade.com) and *Demand-Side Review* (e.g. wucato.de) as characteristics for the trust-building **Review System Supply-Side** mechanism. **Boundary Resources** enhance the interaction with the MSM by providing technical and social interfaces [52, 53]. Besides, we have derived *Website*, *Personal Support*, *File Upload*, and *API* as characteristics from our sample of MSMs. Every MSM from our sample offers a dedicated back-end on its website for supply-side participants for listing articles and managing transactions. Personal support is also offered via a number of channels ranging from product-related to technical inquiries (e.g. mercato.com). For the interaction between the IS of the MSM owner and supply-side participants simple file uploads (e.g. everysize) or sophisticated APIs (e.g. Amazon.com) are possible. The latter boundary resources also include a technical documentation as file or API specification. **Supply-Side Network Effect Amplifiers** subsume artifacts implemented by the MSM owner to propel NEs for supply-side participants. They focus either on the interaction between supply-side participants (direct NEs) or the improvement of the matching with demand-side participants. If *None* further artifacts are implemented, the MSM focuses on reaching critical mass (e.g. Yatego). Offering a *Comparison with Competitors* for supply-side participants, they are able to adjust prices and assortments based on the market environment (e.g. Zalando Connected Retail). *Demand-side Newsletter* is a customized newsletter for demand-side participants, including merchandise offered by supply-side participants (e.g. Etsy). The **Supply-Side Provided Services** dimension includes

further services provided by the MSM or its owner for the supply-side participants. These services go beyond the pure matchmaking [35]. For the provided services for the supply-side we have derived seven characteristics from our sample of MSMs. Besides the matchmaking *None* additional services are offered by some MSMs (e.g. Craigslist). *Sales Processing* are executed by other MSMs to support supply-side participants in the communication with the demand-side participants (delivery dates, invoicing) (e.g. Walmart Marketplace). With *Payment Handling* the MSM coordinates the whole payments process or even offers a marketplace specific payment method (e.g. eBay). Offering *Fulfillment Services* the MSM takes on the logistics for the supply-side participants at least for part of their assortment (warehousing, order picking, shipping) (e.g. eBay) [54]. This may also include goods return processes (e.g. Amazon). *Marketing and Analytical Services* offer supply-side participants product highlighting on the MSM or further advertising campaigns. Additionally, supply-side participants are provided with analysis of sales, prices and fraud alerts (e.g. Newegg). With additional *Infrastructure Services* the MSM owner offers innovation platform services for the marketplace participants (e.g. Amazon) not associated with the core trading business (compute power, storage or development environments) [55]. *Training Service* offers introduction to the functionalities of the MSM, to enable supply-side participants to sell their assortment through the MSM (e.g. XOM Materials).

5. Evaluation and Application

For the selection of the sample of MSMs, special attention was paid to ensuring a wide range of MSMs and a high degree of diversity. From a maturity model perspective [19, 42], we have selected MSMs from the ignition stage (e.g. Otto Market is expected to launch 2020) to the mature stage (e.g. Amazon Marketplace was launched in 2000). We take into account huge MSMs with regards to annual sales revenue (e.g. Alibaba) and smaller ones (e.g. Bonanza). Our sample includes pure online players (e.g. eBay, Zalando) and former brick-and-mortar retailers (e.g. Walmart) starting their own MSM. The MSMs offer physical (and partially digital) merchandise. However, MSMs trading services are out-of-scope of our analysis. Although the developed taxonomy resembles an artifact for analyzing a static point in time, it can be used by MSM owners to plan the future development of the MSM. Thereby, MSM owners ought to focus on governance decisions aiming at increasing the number

of participants on both sides of the MSM as a key driver for increased revenues [11, 4, 10]. In the following we emphasize the importance of five exemplary dimensions for fostering competitive advantage of MSMs through increasing NEs. Firstly, the classification of our MSM sample revealed that **Network Effect Amplifiers** are not implemented by 39% of MSMs for demand-side participants. 77% of the analyzed MSMs have not implemented additional amplifiers for supply-side participants. As NEs in general and their strength in particular are key to the success of MSMs [11], amplifiers ought to be implemented to propel triadic closures and thus increase NEs resulting in a higher number of participants. While for the demand side additional loyalty services can be offered, for the supply side customized newsletters for demand-side participants that integrate selected supply-side content can be implemented. Secondly, the role of the MSM as a trustworthy intermediary can be augmented by additional **Review Systems** rating either demand-, supply-side participants, or the merchandise sold. Additional mechanisms for creating trust are useful especially when the brand of the MSM does not per se create enough traction. However, 36% of MSMs under investigation do not implement review systems in which demand-side participants can engage. 52% of MSMs do not use review mechanism for supply-side participants rating consumers. Hence, adding the possibility for reviewing the opposite side or merchandise bought increases the level of trust on the MSM and for the transaction partner. Including this participant generated content will also foster (direct and indirect) NEs. Next, to acquire additional supply-side participants a MSM owner can extend the range of **Provided Services**. 79% of our MSM sample already provide additional services. These extra services can simplify the retail transaction for supply-side participants by taking on responsibility for retail functions such as transaction processing or payment handling. This reduces barriers for entry for supply-side participants as these functions do not have to be implemented by themselves. Acquiring further supply-side participants will positively affect the demand side because of indirect NEs and enabling focal closures via the MSM. While MSMs mature they typically provide additional services to participants on both sides to improve their competitive positioning and establish a further source of revenues. The MSMs take on (parts of) the trading functions formerly executed by retailers [16]. eBay has introduced fulfillment services in response to Amazon and is also planning to offer return handling. Fourthly, all MSMs within our sample provide a dedicated website as **Boundary Resource** for supply-side participants on which the

merchandise information and orders can be managed. However, only 36% of the analyzed MSMs offer the possibility of file upload and 43% provide an API to create and update this information. Granting further levels of MSM openness to supply-side participants significantly increases number of complementors and additional merchandise on the MSM [56]. Exploiting indirect NEs, this will further increase the number of demand-side participants and thus the number of transactions between the market sides. After opening the MSM, it may take some time for participants to adopt the changes in the boundary resources as technological shifts in MSM may cause difficulties [57, 58]. Otto Market offers an additional REST-API for order processing and merchandise master data management that is currently available in version three. Lastly, a MSM owner can open or simplify the **Market Access** for supply-side participants by decreasing barriers for entry to foster participation on the supply-side. The application procedure required by 59% of MSM under investigation can be shortened or eliminated. Hence, more supply-side participants are attracted that increase competition among supply-side participants, widen the range of merchandise and can also increase the number of demand-side participants applying indirect NEs. On the down-side, this may cause more potential fraud merchandise and may result in negative NEs for demand-side participants. Thus, MSM owners can use our taxonomy as an artifact to augment their base of supply- and demand-side participants to increase NEs and (potentially) achieve competitive advantage.

6. Discussion

Besides the proposed suggestions for MSM owners, the application of our taxonomy on the sample of 44 exemplary MSMs revealed further implications for researchers and practitioners. We propose a taxonomy for analyzing and describing MSMs in ecommerce considering economic concepts of MSMs, NEs and governance. Partitioning the taxonomy in marketplace, supply- and demand-side centered dimensions, we identified several asymmetries regarding the market sides. In line with [6] 86% of the analyzed MSMs monetize the supply side while subsidizing the demand side. Beyond the value capture the asymmetric design of the MSMs privileges supply-side participants regarding the dimensions fee structure, boundary resources, network effects facilitators and provided services. The asymmetry results in a total of 47 characteristics for the supply side and only 23 for the demand side. Moreover, ecommerce is introduced as an highly competitive

environment with dynamically changing ecosystems [2, 13]. We identified winner-takes-all-dynamics and strong NEs of incumbent MSMs which requires a thorough positioning of new entrants in an available niche [11]. Jet.com, a formerly independent MSM that became a subsidiary of Walmart, was shut down during our analysis by Walmart that wants to pool activities and participants on its own MSM. Rakuten recently announced to shut down its MSM in Germany. Another example of the dynamics in ecommerce ecosystems are MSMs (e.g. Zalando, Atalanda) that introduced reduced commission fees in the peak period of COVID-19. Hence, these MSMs not only attract more supply-side participants and increase the number of transactions but also accelerate NEs that may have positive effects on the competitive positioning. Our taxonomy is designed both as an artifact for analyzing the current situation of a MSM and as guidance for MSM owners providing directions for the future development. It can be applied in several stages of MSM maturity [19, 42]. In the ignition stage it can be used for designing or positioning a new MSM while it can be applied in the maturity stage for evolving and refining the positioning of an already existing MSM. Implementing further characteristics of a dimension can potentially attract additional participants. This increases the number of triadic closures as well as NEs and will result in additional transaction that will enhance the number of transaction with increasing revenues. The identified dimensions in general and the specific manifestation of their characteristics pose additional requirements for the IS of the MSM. A major example is the introduction of additional services for supply- or demand-side participants. While pure MSMs merely focus on the digital matching between the market sides [35], a majority (80%) of MSMs within our sample already provided additional services. When introducing these additional services, further IS components are required by the MSMs (e.g. logistics modules for fulfillment services). The services provided by a MSM are key to the success and may form a competitive advantage. Thus, additional services are provided by MSMs as they mature to compete in the dynamic ecommerce environment [59]. Besides the provided services, MSMs as intermediary between supply- and demand-side participants have an important role as trusted third-party in ecommerce [16]. Especially because merchandise that is purchased digital cannot undergo a sensorial screening a priori to the transaction by customers. MSMs implement review systems for the participants or the traded merchandise to offset this drawback and further propel the role of a trustee. In addition to these review systems, the reputation of the MSM and the trust in the brand of the merchandise

are further factors for establishing trust [60]. Review systems are especially important for MSMs in the ignition stage for building reputation and for products with a low brand recognition. As the brand of the supply-side participants are often masked (intentionally or unintentionally) by the MSM, closing the access to the MSM by implementing a more sophisticated application process (Market Access dimension) and increasing product quality will potentially increase the reputation of the MSM [61]. This research work also has its limitations. Although our sample of 44 analyzed MSM covers a variety of different MSM, we neither claim to have a representative sample nor to analyze all MSM available. We have randomly selected the analyzed MSMs with focus on MSMs operating in Europe and the US. Because of the existing number of incumbents and newly established MSMs, a complete analysis was not possible for this research. The classification of the 44 objects represent a snapshot as the MSMs continuously evolve [40]. Our taxonomy is extendable to cope with the dynamics of ecommerce ecosystems as proposed by [27]. In line with existing literature we considered NEs as black box [11] and do not analyze their specifics and strength dependent on the mentioned amplifiers. Future research may investigate the strength of NEs exploited by a MSM. We also consider the availability of participants a “construct that could be strategically manipulated” [62]. Following literature on ecosystems, their participants are considered as independent [13]. Nevertheless, participants deciding to sell and/or purchase through a MSM as the center of such an ecosystem adhere to the terms and conditions set by the MSM owner(s).

7. Conclusion

Our taxonomy for MSMs consists of 21 dimensions with 99 characteristics in total grouped according to the MSM participants. While ten of the dimensions were derived conceptual-to-empirical, the remaining eleven were derived empirical-to-conceptual. Our taxonomy for MSMs contributes to the body of literature by integrating the concepts of MSMs and NE with platform governance dimensions in the context of ecommerce. We developed our taxonomy based on an already proofed taxonomy development method in the IS discipline [27] and include aspects of matchmaking between and orchestration of the distinct market sides. The classification of 44 MSMs using the developed taxonomy revealed directions for future development of MSMs that can be used by practitioners (i.e. MSM owners) to attract additional participants and further propel their marketplace (as illustrated

by five examples). Future research may evaluate additional MSMs using our taxonomy and may enhance the existing taxonomy with additional dimensions and characteristics reflecting future developments in ecommerce [27]. We also suggest future research to take the strength of NEs into account and also make an in-depth analysis of the influence of network effect amplifiers on the strength of both direct and indirect NEs. Another important avenue for future research is to analyze the implications of the decision by the MSM owner to include further features and services into the MSM and thus take on tasks previously executed by other participants. Especially with regards to additional requirements for IS caused by the addition of further services. We will interview software architects from selected MSMs and analyze the role and composition of IS to derive a software architecture for MSMs. As the architecture may vary across MSMs, we will derive archetypes based on our classification and developed architectural patterns for types of MSMs.

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