


Peer-to-peer sharing and collaborative consumption platforms: a taxonomy and a reproducible analysis

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Received: 8 February 2017 / Revised: 23 May 2017 / Accepted: 7 June 2017 /
Published online: 26 June 2017
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Abstract Airbnb and Uber enable private individuals to share physical resources via their Internet platforms, and both have become popular subjects of information systems and e-business research. In the top dogs' slipstream resides a variety of less-known platforms that allow to share different resources or to share resources in different ways. Researchers who study these platforms and the underlying consumer behaviors face the problem of situating their findings precisely. Practitioners lack an overview of the diversity of these platforms and their characteristics too. This article suggests a taxonomy that helps to better characterize platforms for Peer-to-Peer (P2P) Sharing and Collaborative Consumption (SCC). We used the taxonomy to describe the evolution of 522 P2P SCC platforms over the period of 35 months and to demonstrate and partly evaluate its application. All descriptions taken together constitute a comprehensive data source to study P2P SCC platforms. When researchers use the taxonomy, they can describe and situate insights precisely so that stakeholders can access them more easily. Furthermore, researchers and practitioners can use our database as well as the analyses we made based on the data for their purpose. Because we deliver the computer scripts that we used in our analysis,

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our study can easily be reproduced in the future to investigate the dynamics of the P2P SCC market.

Keywords Taxonomy · Sharing Economy · Collaborative Consumption · P2P · Peer-to-Peer · Platforms · Reproducible research

1 Introduction

Today's consumers increasingly engage in economic activities that rely on shared access to various kinds of resources. Sharing of cars (Lyft)¹ and accommodations (Airbnb) among private individuals are popular examples of the rapidly growing Peer-to-Peer (P2P) Sharing and Collaborative Consumption (SCC) business that increasingly challenges conventional value chains (Chase 2013; De 2013; Walsh 2011; Owyang et al. 2013; Owyang 2015).

Beyond the well-known cases of sharing private cars or accommodations, the diversity of resources being shared is ever-growing as nowadays popular and trending offerings range from 3D printers (3D-Hubs) and gardens (Sharing Backyards) to storage space (Storemates) and parking spaces (JustPark). All these platforms are similar in representing cases where private individuals temporarily offer their physical resources to others over an Internet-based platform. For the sake of consistency, we will refer to such platforms as P2P SCC platforms.

Against the backdrop of a rapidly growing market, competitors and newcomers within the P2P SCC market are searching for profitable business cases. Naturally, this leads to an increasing range of resource types being shared between peer-providers and peer-consumers. Furthermore, the diversification leads to the emergence of rich variations in the characteristics of the P2P SCC platforms. Hence, the P2P SCC phenomenon becomes increasingly difficult to decompose as different platforms constitute different permutations of the general phenomenon.

Despite the phenomenon's momentum in practice and calls for academic studies (Kassan and Orsi 2012; Tencati and Zsolnai 2012), research on P2P SCC as part of its umbrella topic of the *Sharing Economy* is still lagging behind practice (Heinrichs 2013; Leismann et al. 2013). In academic publications, popular companies like Airbnb and Uber are predominantly in the research focus. However, practices on these platforms do not reflect the diversity and the potential of the entire domain.

In this article, we argue that research on the P2P SCC phenomenon must be based on an adequate, timely, and reproducible analysis of P2P SCC platforms. First, such analysis provides insights into the current developments in the domain of P2P SCC. Second, it allows researchers to define the exact scope of the phenomenon at hand when conducting research on P2P SCC. Third, it provides terminology and a classification scheme for the P2P SCC platforms that represent the central element in every P2P SCC practice. Ultimately, research and practice are lacking a classification of P2P SCC platforms that can be used to study the phenomenon of

¹ The "Appendix 3" provides references to all mentioned platform examples.

technology-facilitated sharing and collaborative consumption of physical resources among private individuals in a more differentiated way.

Taxonomies have been shown to be of a particular value for bringing structure into a domain and are known to be useful in IS (Williams et al. 2008; Nickerson et al. 2013; Gregor 2006). In the context of the outlined problem, “researchers need to be able to know where a new [P2P SCC platform] fits with existing ones [...] in order to determine if it is something entirely new and unique, a significant variation of an existing [platform], or just a retread of what we already have” (Nickerson et al. 2013, p. 337).

Against this background, hardly any other domain is arguably in greater need for of a taxonomy than the highly volatile domain of P2P SCC that demonstrated an increasing importance and complexity in the last few years.

Therefore, our research aims to develop and evaluate a taxonomy for P2P SCC platforms. We acknowledge that, especially in the dynamic market of P2P SCC, a taxonomy is a “moving target [...] that could change over time” (Nickerson et al. 2013, p. 337). Therefore, we construct the study and the underlying programming scripts in such a way that the analysis of the taxonomy’s application can be reproduced at any time and can also be carried out in an automated manner. Thereby, after each iteration where new objects, i.e., previously unseen P2P SCC platforms, have been classified using the taxonomy, an assessment of the overall change in the domain of P2P SCC can be carried efficiently. This allows for a continuous monitoring of the domain to identify upcoming trends and current developments as well as identifying parts of the taxonomy that should be updated.

The overall structure of the study takes the form of six further sections. In the second section, we address the research aim by presenting an investigation on the P2P SCC phenomenon and taxonomy development. Then, we introduce our research approach in Sect. 3. This section is concerned with the methodology employed for this study. We explain Nickerson et al. (2013) method for creating taxonomies as well as our process of data collection and efforts to render this research reproducible. In Sect. 4, the taxonomy of P2P SCC platforms is identified as the central element of the study. Section 5 evaluates the resulting taxonomy, in an applied longitudinal study on 522 P2P SCC platforms. The final section summarizes the main findings of this study and recognizes areas of the taxonomy’s implications for further research.

2 Research background

2.1 Peer-to-peer sharing and Collaborative Consumption

Sharing a couch with a stranger or a private car with a neighbor are examples of economic P2P activities that do not involve ownership transfer. The car and the couch remain in the possession of the peer-provider, while the peer-consumer is granted temporary access to the resource. It is common in these practices for consumers to distance themselves from ownership as an ultimate expression of personal desire (Chen 2009; Marx 2011), preferring functionality over the product

itself and the experience of using a consumption object over its permanent acquisition (Firnknorn and Müller 2012; Rifkin 2000). Sharing activities that result from this tendency are known by various names, including “collaborative consumption” (Botsman and Rogers 2010), “access-based consumption” (Bardhi and Eckhardt 2012), “product-service systems” (Mont 2002), “commercial sharing systems” (Lamberton and Rose 2012), and “the mesh” (Gansky 2010). These terms are often subsumed under the term *Sharing Economy* in the public (Baker 2014; De 2013; The New York Times 2014) and academic (Andersson et al. 2013; Kassan and Orsi 2012; Heinrichs 2013; Malhotra and Van 2014) discourse.

We set our research to focus on a subset of the Sharing Economy’s practices—the P2P SCC of physical resources and the corresponding enabling Internet-based platforms. The starting point for a precise definition of the P2P SCC phenomenon is the definition of *sharing*. Sharing is “the act and process of distributing what is ours to others for their use and/or the act and process of receiving or taking something from others for our use” (Belk 2007, p. 126). However, several different social practices with differing functions and motivations include aspects of “sharing” (Wittel 2011), in which the meaning, the connotation, and the definition of the term varies depending on the context. Among the many different contexts in which sharing takes place, Internet technologies have opened up new ways for share-and-share-alike practices to proliferate (Belk 2010; Wittel 2011; Botsman and Rogers 2010).

A significant body of knowledge has been produced on the sharing of digital content, its underlying motivations, and its implications for businesses (cf. Benkler 2004, 2007; Conrad et al. 2010; Hughes et al. 2008; Okaie and Nakano 2011). However, file sharing or sharing of unused computing power is inherently different from sharing of physical resources (John 2013). Most notably, the latter produces “social processes, social proximity, and quite likely some form of interaction, maybe even conflicts and/or social bonds” (Wittel 2011, p. 4). Therefore, we clearly differentiate between these two practices, and thus, we focus only on sharing practices that involve physical resources in order to provide specific insights instead of producing statements that are hardly applicable to either.

Using the term “shades of sharing” Belk (2014a) distinguishes true sharing from sharing-alike activities, in which expectations of reciprocity (i.e., getting something in return) exist. From a business perspective, however, it is insufficient and even misleading to address the disruptive influences of the Sharing Economy by considering only true sharing and excluding the sharing-alike transactions that involve money. Sharing platforms often enable commercial transactions that show characteristics of the true sharing. Such activities can be described as collaborative consumption, which can be defined as “people coordinating the acquisition and distribution of a resource for a fee or other compensation” (Belk 2014a, p. 1598). This combination of sharing and collaborative consumption corresponds with Bardhi and Eckhardt’s (2012) notion of access-based consumption that “is not necessarily altruistic or prosocial, as sharing is [...], but can be underlined by economic exchange and reciprocity” (Bardhi and Eckhardt 2012, p. 882). Since the discussion around the term “access-based consumption” is relatively young, we prefer not to differentiate between either “sharing” or “collaborative consumption” but rather adopt the combination of both terms, that is, “sharing and collaborative consumption” (cf. Albinsson and Yasanthi Perera 2012;

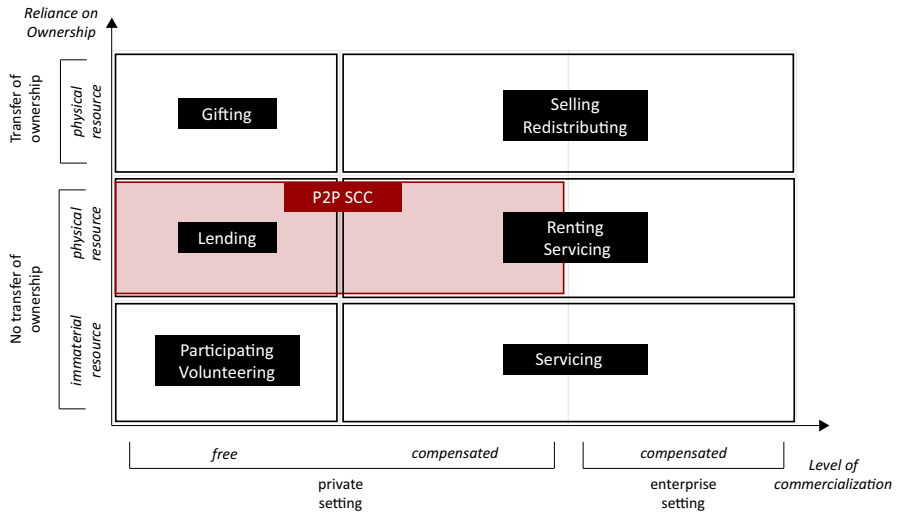


Fig. 1 Transactions

Belk 2014a; Boesler 2013). Both terms are far from being mutually exclusive Belk (2014b) and a combination of egoistic and altruistic motivations often underlies services in the Sharing Economy Gorenflo (2012).

In essence, the phenomenon of P2P SCC is therefore based on economic transaction between individuals that are enabled by IT, do not involve ownership transfer, can vary on the scale between sharing and commerce, and require a physical object, that one of the individuals possesses, to be shared or collaboratively consumed as a requirement for the transaction to take place. Figure 1 illustrates the transaction space of P2P SCC.

P2P SCC services are provided by and to individuals on what we identify as an Internet-based platform. Typically, in its basic meaning, the term platform describes the products, services, and firms that mediate transactions between groups of platform actors (Rochet and Tirole 2003). Nevertheless, there are different perceptions of what a platform refers to. From a business perspective, Internet platforms include firm-internal platforms, supply chain platforms, and industry platforms that support a network of collaborating firms (Tilson et al. 2013). The firm-centric digital platforms (e.g., *eBay*, *Spotify*, and *Google Play*) are examples of the steadily growing e-commerce sector. They allow the sale and distribution of both physical and digital goods in ways that would not be possible otherwise (Andersson et al. 2013, p. 2965). In our analysis, we focus on P2P platforms that are specifically designed to enable P2P SCC transactions.

2.2 Taxonomy as a classification instrument

The word *taxonomy* is based on the Greek words *τάξις* and *νόμος* which translate to *order* and *science*. To manage the complexity of a domain, taxonomies have proven to be an effective tool.

The purpose of a taxonomy is to provide a framework that can be used to classify objects in a domain of interest. Thereby, taxonomies are a fundamental mechanism for organizing and structuring knowledge (Wand et al. 1995, p. 291) and to understand and analyze complex domains (Nickerson et al. 2013). Wand et al. (1995, p. 85) point out that “without an organizing framework, researchers and practitioners find it hard to generalize, communicate, and apply research findings”. Moreover, “taxonomies also help us understand divergence in previous research findings” (Sabherwal and King 1995, p. 180).

The development of taxonomies has a long history in the domain of information systems research. Often, taxonomies have been used to systematize and synthesize research in different domains or to characterize a specific domain on different levels of abstraction. For the latter, Mentzas’s (1994) taxonomy for computer-based information systems provides an abstract classification, whereas Haas et al. (2014) taxonomy addresses the very specific topic of crowdfunding intermediaries. Against the background of our research, Rappa’s (2004) taxonomy for e-business models represents a prime example as it works out different characteristics thereof. It comprises different aspects of how a company can generate value, its position in the value chain, and how revenue can be extracted from its customers.

There are different types of taxonomies and approaches for taxonomy development. For brevity, we refrain from an in-depth analysis of the latter and outline two different ways of deriving a taxonomy on an abstract level. Taxonomies can be empirically derived by making use of statistical instruments like cluster analysis to identify common groupings. Such groupings provide a starting point for classifying the individual items in the domain of interest, which results in, what is sometimes called, a numerical or inductive taxonomy (Sokal and Sneath 1963). Contrary, deductive taxonomies are derived by investigating and creating a conceptualization that is informed by theory. Both approaches can also be combined in an attempt to increase the quality of the resulting taxonomy.

Existing methods for taxonomy development pursue different strategies and processes. Bailey (1994) proposes combining typical strategies of conceptualization, deduction, empiricism, and induction for taxonomy development into a single method, while Nickerson et al. (2013) extend this approach and suggest an iterative process to yield a taxonomy that is better align with the taxonomy’s goal. A specific advantage of Nickerson’s methodology is that it includes meta-characteristics for taxonomy evaluation and ending conditions that indicate when the final iteration is reached. These concepts are not explicated in Bailey’s work. The approach by Nickerson et al. (2013, p. 341) eventually promises a taxonomy that is “concise”, “robust”, and “comprehensive”.

3 Research approach

The nexus of our research approach is the taxonomy development method by Nickerson et al. (2013). The method is silent regarding the object identification that proceeds the taxonomy development. Furthermore, the main development cycle does not include the evaluation step, leaving it open for researchers. Therefore, we

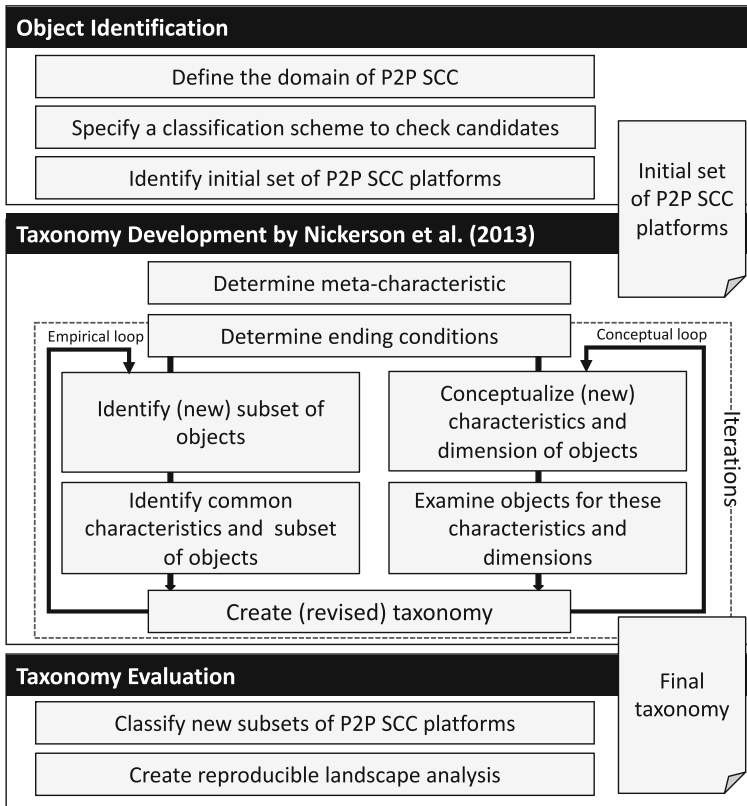


Fig. 2 Research approach based on the iterative taxonomy development method by Nickerson et al. (2013)

provide detailed descriptions of the corresponding parts in our overall approach (cf. Fig. 2). We start with a section on object identification that explains the P2P SCC platform identification process, including the data collection procedures. Second, we elaborate on the application of the taxonomy development method. The last section of the research approach is devoted to the taxonomy evaluation that is based on a longitudinal and reproducible analysis of the global P2P SCC platform landscape. As semi-automated reproducible data analyses are rarely employed in the IS domain, the utilizes techniques are briefly motivated.

3.1 Object identification and data gathering

Using empirical data for the development and evaluation of a taxonomy requires a process for identifying relevant objects of interest. Our process started with the development of a working definition for a P2P SCC platform. Based on the definition of what constitutes P2P SCC practices (cf. Sect. 2.1), four criteria must be satisfied for a P2P SCC platform to be classified as such.

Table 1 Overview of the sampling process

Sample	Date	New platforms	Ceased platforms	Total platforms	Directories
1	Jun-14	396	–	396	Mesh, CC, CaS
2	Oct-15	77	46	427	Mesh, CC, CaS
3	Mar-16	31	12	446	Mesh, CC, tPWS
4	Jan-17	18	67	397	Mesh, CC, tPWS

1. Individuals can assume the role of a peer-provider on the platform.
2. Peer-providers can offer physical resources on the platform.
3. Peer-consumers can search for resources offered by peer-providers.
4. Access to a resource is granted temporarily.

To identify P2P SCC platform candidates, we utilized open directories that contain entries of potential P2P SCC platforms. The initial set of P2P SCC platforms was generated by using computer scripts specifically developed for this problem case to extract 17,692 candidates (i.e. all platforms listed in the directory at that point in time) across three directories that are dedicated to the Sharing Economy enterprises—*Collaborative Consumption*,² *Compare-and-Share*,³ and *mesh*.⁴ After duplicates removal, Website translation, and the application of the classification scheme, 396 unique P2P SCC platforms were identified. While the Website extraction from the directories was script-based and fully automated,⁵ the application of the classification scheme was conducted via manual Website inspection. With the aim of taxonomy evaluation, the process was subsequently repeated three times during the period of 35 months (cf. Table 1 for details). A new open directory, *the people who share*,⁶ was added in the process. Ultimately, 22,770 candidates were extracted, 522 of which were classified as P2P SCC instances and were used during the taxonomy development and evaluation. Figure 3 illustrates the geographical distribution of the identified platforms' places of launch. Furthermore, to approximate the market share development in the P2P SCC market, we gathered the platforms' Web-page views during the first and the third sampling for all identified platforms. These page views were collected from the *Amazon Alexa* API.

² <http://www.collaborativeconsumption.com/>, Collaborative Consumption (last extraction on 29th of January 2017).

³ <http://www.compareandshare.com/>, Compare and Share Website (last extraction on 29th of January 2017).

⁴ <http://meshing.it/>, Mesh Website (last extraction on 29th of January 2017).

⁵ Cf. anonymized Git repository under <https://github.com/P2PSCC/ShareEco> for a more detailed description of the scripts.

⁶ <http://www.thepeoplewhoshare.com/>, the people who share Website (last extraction on 29th of January 2017).

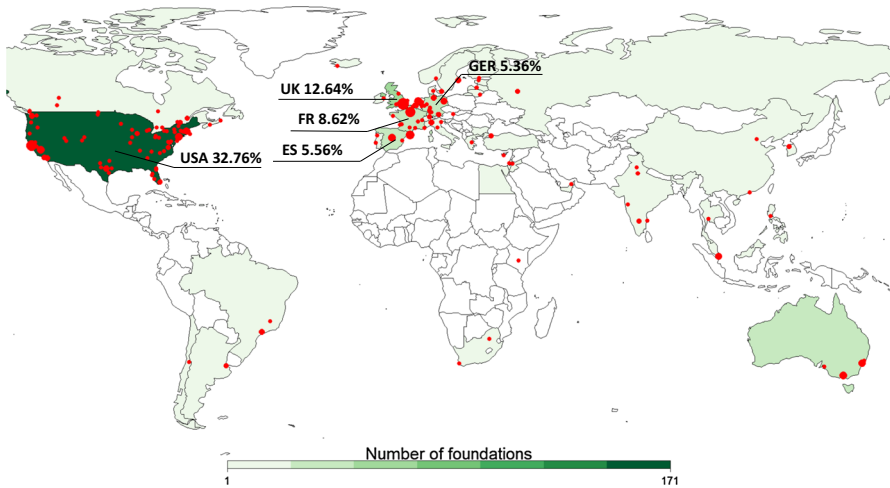


Fig. 3 Countries of origin of the platforms; cities indicated by red dots (larger dots indicate more foundations in the city)

3.2 Taxonomy development method

The method by Nickerson et al. (2013) is an iterative procedure that allows to create and refine a taxonomy using both empirical and conceptual approaches (cf. Fig. 2). In this subsection, we describe the essential elements of the method. For details on the method, the original manuscript by Nickerson et al. (2013) should be consulted.

The first step is the definition of the so-called meta-characteristics. Meta-characteristics depend on the purpose of the taxonomy. It is the lens used to look at the objects at hand. Different taxonomies can be created for the same object set given different meta-characteristics. For example, a software can be analyzed using either more technical characteristics such as the technologies used and design paradigms applied or characteristics describing the use of the software—that is the interaction of software with its users. Meta-characteristics should reflect the users' expected use of the taxonomy.

The next step is the definition of ending conditions. Every iteration, in which dimensions or/and characteristics of the taxonomy are changed, ends with the verification whether the development of the taxonomy is completed or another iteration is required. Although Nickerson et al. (2013) suggest both a list of objective and subjective ending conditions, it is the task of the researcher to determine, which of these conditions will be applied.⁷

The main iteration cycle begins with choosing whether the next iteration starts with observing the objects first and then changing the taxonomy (*empirical-to-conceptual*) or with changing the taxonomy based on conceptual input and then applying the changes to the objects (*conceptual-to-empirical*). Which choice to make depends on the knowledge of the domain and the available data. Rich data and

⁷ See (Nickerson et al. 2013, p. 344) for a list of suggested ending conditions.

less knowledge about the domain would lead to preferring the empirical-to-conceptual approach. In case of an empirical approach, a sample of objects is analyzed for characteristics that are in line with the previously defined meta-characteristics. The grouping and regrouping of characteristics into dimensions can be done using informal or statistical techniques and the result represents a revised version of the taxonomy. Different from the empirical-to-conceptual approach, the conceptual-to-empirical approach requires conceptualization of the dimensions without analyzing the object. Identified characteristics must also correspond to the meta-characteristics for the taxonomy (Nickerson et al. 2013, p. 343). Although “little guidance can be given” (Nickerson et al. 2013), we decided to ground our deductive efforts in the existing body of research on the service characteristics in general, and P2P SCC characteristics in in this step particular. Subsequently, empirical objects must be used to verify whether the conceptually identified characteristics can be observed in the empirical sample. Appropriate dimensions containing appropriate characteristics are then included in the revised taxonomy.

Once a revised version of the taxonomy is created, previously selected ending conditions must be applied to verify whether another iteration is required or not. First, the objective conditions are verified, then the subjective ones. When both are satisfied, the iterative process stops, resulting in the final taxonomy. Otherwise, the process is repeated offering the choice of conceptual or empirical approach for each iteration. Although it is not considered as an explicit step in the method overview, evaluation of the taxonomy must be performed upon completion.

3.3 Taxonomy evaluation

The evaluation of the developed taxonomy is performed by means of repeated application of the taxonomy. The purpose is to examine both the robustness of the taxonomy as well as to evaluate the taxonomy against its intended purpose. To achieve that, the reproducibility of the application should be guaranteed. The paradigm of reproducible research seeks to provide a “minimum standard for judging scientific claims when full independent replication of a study is not possible” (Peng 2011, p. 1226). Originally, this idea has been proposed for publication of findings in the domain of computational science, but its advantages also apply to other domains including physics, chemistry, and genetics and should be embraced as a leitmotiv for conducting data intensive research such as the one presented in this manuscript.

The taxonomy-based analysis can highly benefit from adopting principles of reproducible research. The reasons are manifold: first, taxonomies can help identify deviations from previous research findings (Sabherwal and King 1995). By iterative and periodic execution of the data collection process and subsequent classification of the results according to the taxonomy, these deviations can be realized in a timely manner and be used to draw conclusions about the latest developments in the analyzed domain. Second, it allows for automation of the data collection process to lower the entry barriers for scholars deciding to study and investigate Internet-based platforms for sharing and collaborative consumption. Thereby, a comprehensive list of candidate platforms can be compiled and compared to earlier iterations. The

comparison potentially allows to identify platforms that shut down, i.e., are not included in the list anymore, as well as platforms that emerged during the data collection process. Third, visualization of the results can be generated effortlessly. The side-by-side comparison of visualizations of multiple snapshots from different points in time helps to better comprehend the development of the domain.

Apart from the qualitative analysis, we assessed the qualitatively derived characteristics of the platforms by means of quantitative trend analysis, and the distribution of platform characteristics. Against this backdrop, we developed scripts⁸ that can be used to reproduce the analysis. We comply with a request to publish a “cleaned-up version of the code along with the complete data set in a durable non-proprietary format” (Peng 2011, p. 1227) and include instructions for using the data and the developed scripts for the analysis.

4 The taxonomy of P2P SCC platforms

4.1 Development process

This section is concerned with the execution of the main steps of the taxonomy development method according to Nickerson et al. (2013) (cf. Fig. 2)—determination of meta-characteristics, determination of ending conditions, as well as the iterations that were performed to come up with the final version of the taxonomy.

Meta-characteristics reflect the purpose of the taxonomy. The purpose of the taxonomy is twofold. First, it primarily contributes to the understanding of the diversity of offerings in the P2P SCC market and therefore, helping researchers in situating their findings accurately. Second, it must represent a suitable foundation for both research and practice, for an analysis of the evolution of the P2P SCC platforms, through identifying shifts in the type of P2P SCC on the market in form of trends and new business opportunities. Therefore, the meta-characteristics are the distinctive offering to the platform users and business performance of the platform.

Selected **ending conditions** aim at balancing between the taxonomy’s robustness, effectiveness of classifying unknown objects, and feasibility. If the classification of new objects led to changes or reinterpretation of the taxonomy’s dimensions, or if the classification led to misleading interpretations, then, additional iterations will be performed. Furthermore, if the assessment of characteristics is not feasible due to the difficulties of collecting the corresponding data, then the corresponding dimension will be excluded, and further iterations of the taxonomy development method will be performed.

All executed **iterations** of the taxonomy development are summarized in Table 2. For each iteration, we provide a short description and its type, i.e., either empirical or conceptual. The description states the conducted activities during the iteration, and the updated and revised dimensions, as well as the characteristics.

⁸ Cf. anonymized Git repository under <https://github.com/P2PSCC/ShareEco>.

Table 2 Taxonomy building process: documentation of conducted iterations

No.	Iteration	Description
1	Initial screening of platforms (empirical)	First screening of popular platforms like Uber, Airbnb and BlaBlaCar as well as random platforms from the initial set of platforms retrieved from the open directories was conducted Added dimensions: <i>resource type, promotion of sustainable consumerism, contribution to trust, profit orientation, and app support</i>
2	Consulting service literature (conceptual)	Extant literature on service science in general and the Sharing Economy in particular was systematically searched for relevant dimensions and characteristics Added dimensions: <i>P2P SCC pattern, service duration, global integration, type of accessed object, global integration, consumer involvement</i> Merged: <i>profit orientation with market mediation</i>
3	Directories scan (conceptual)	Open directories contained information regarding further mostly descriptive characteristics of the platforms. To make a better use of the available empirical data, a relevant subset of these characteristics was included Added dimensions: <i>payment model, funding, year of launch, place of launch, and popularity</i>
4	Independent classification (empirical)	Larger overlapping subsets of extracted platforms were classified by four independent researchers. Discrepancies in the classifications were discussed and resolved Added dimensions: <i>resource owner and money flow</i> Changed dimensions: <i>type of accessed object</i> and <i>global integration</i> Removed dimensions: <i>contribution to trust</i> and <i>funding</i>
5	Final Iteration (empirical)	After substantial changes to the taxonomy from the 4 th iteration and given a set of agreed upon dimensions and characteristics, all 396 platforms were classified exhaustively by two independent researchers. Except for dropping two dimensions that did not provide any insights, no changes to the taxonomy were required—a fact that lead to the triggering of the ending conditions Removed: <i>service duration</i> and <i>app support</i>

4.2 Final taxonomy

The final taxonomy as a result of the five performed iterations is illustrated in Fig. 4. Ten core taxonomy dimensions are supplemented by three descriptive dimensions, that are useful when analyzing P2P SCC platforms. Two core dimensions offer a selection of multiple characteristics for a single platform. We indicate which dimensions' multiple characteristics can be selected. The reason to introduce dimensions where a P2P SCC platform can have more than one characteristic is to make the taxonomy parsimonious (Bailey 1994). For example, a dimension with three characteristics, can be replaced by three dimensions with characteristics (yes/no). This would, however, result in a more complex taxonomy without improving its analytical capability.

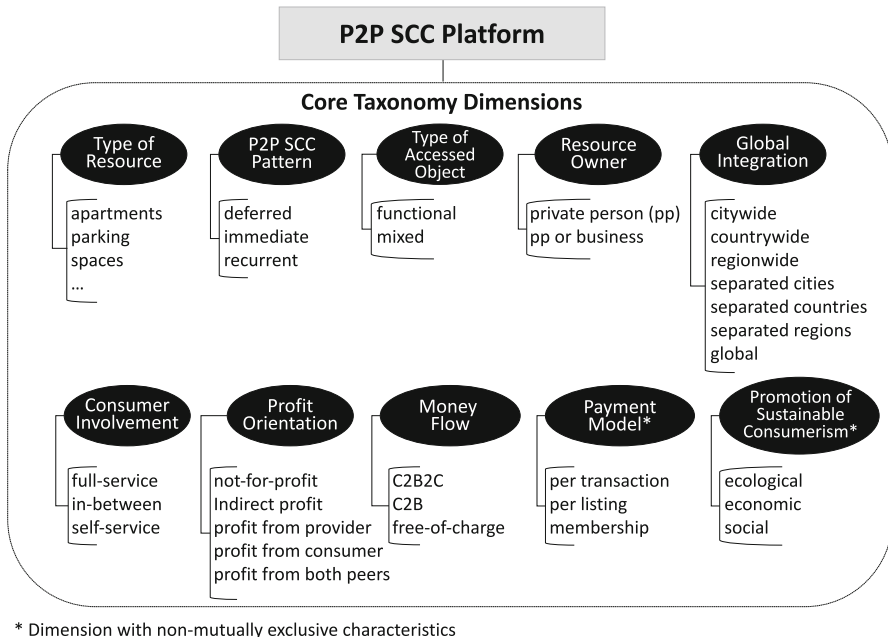


Fig. 4 Taxonomy of P2P SCC platforms

(1) *Resource type* describes the type of physical resource that a peer-provider must possess to deliver the service to a peer-consumer. The definition of P2P SCC requires a physical resource to be involved in the service delivery, such as an apartment, a car or a tool. P2P SCC is applied to a small yet growing number of resource types, so instead of using a general classification of goods, such as the International Classification of Goods and Services (World Intellectual Property Organization 2014), we used our own classification that is based on the types of resources that are currently offered on the global P2P SCC market. We believe that this classification will offer a thorough overview of the present global P2P SCC market.

(2) *P2P SCC pattern* characterizes, what Andersson et al. (2013, p. 10) call, the three “main types of peer-to-peer service sharing platforms”. Each pattern results from the combination of the planning horizon that is required for the service at hand and the degree to which each service instance becomes unique. Bardhi and Eckhardt (2012) integrate the aspect of uniqueness in their dimension *temporality*. Accordingly, each access-based service “can be of short-term or longitudinal duration. At one end of the continuum, access can be short term, characterized by a one-time transaction, such as renting a car or a hotel room. At the other end, access can be longitudinal, where consumers have a membership in a community or club, such as in car sharing” (Bardhi and Eckhardt 2012, p. 884).

The pattern *deferred* describes P2P SCC platforms with services that require a long planning phase to be set up on the platform for every service-sharing instance, so that every instance is unique. The pattern *recurrent* refers to the combination of

long planning phase for the first set-up of the sharing service on the platform, followed by multiple service instantiations. The pattern *immediate* is assigned to platforms with services that require a short planning horizon to be set up on the platform for every service-sharing instance, while every instance remains unique. Therefore, accommodation offerings as seen on the *Airbnb* platform typically follow a deferred pattern, and typical ride-sharing service like *BlaBlaCar* adopt the recurrent pattern, whereas the immediate pattern can be observed in services like *Uber*.

(3) *Type of accessed object* is a dimension that helps to clarify the nature of the access in a P2P SCC scenario by differentiating between access to a purely *functional* object like a storage space and experiential access like a visit to a museum (Sc and Li 2010). As there are no purely experiential cases, we define the characteristic *mixed*, to represent access to objects that are neither purely functional nor purely experiential. There is a tendency to include experiential components into types of service delivery that are traditionally seen as functional services (Calder and Malthouse 2013). For example, a ride-sharing service is more than transportation from one place to another, as it enables consumers to socialize; thus, transforming a ride into a social experience. A good example is the platform *BlaBlaCar*, where users are asked during the registration to indicate whether they would consider themselves “Bla”, “BlaBla” or “BlaBlaBla”, depending on their talkativeness. Correspondingly, the accessed object shifts from largely functional (Bla) to more experiential (BlaBlaBla). Testimonials and the platform-proclaimed value of the customer experience, which is also associated with the service, are other indications that the accessed object is of the type *mixed* including an experiential component. Table 3 illustrates the point clearly by providing several examples.

(4) *Resource owner* Although not included in the set of six dimensions of access-based services, the notion of the resource owner was used by Bardhi and Eckhardt (2012, p. 882) to differentiate between scenarios in which sharing or collaborative consumption can “occur from the company that owns the object of consumption rather than through sharing of personal (objects) among consumers.” We manifest this differentiation in the dimension *Resource Owner*. Given the scope of our work, we are interested in only two characteristics for the dimension: the characteristic *private person*, which refers to scenarios in which only private resources can be accessed among consumers; and the characteristic *private person or business*, which refers to scenarios in which both private individuals and companies can provide resources for SCC by individuals. For instance, the characteristic *private person or*

Table 3 Examples for the mix between functional and experiential offerings

Platform	Example for experiential component
Liftsurfer	Ridesharing service calling for “not for sharing your miserable daily commute across suburbia [...] (but) for the cross-country adventurer”
Misterbnb	An Airbnb clone with its statement “stay like a gay local”
Zimride	Published testimony from another ridesharing service, quote: “By zimriding, I met Shoshanna who is now like a sister to me”

business applies to the *Erento* platform, which allows users to “rent everything” and allows both private persons and businesses to list their resources.

(5) *Global integration of the service* denotes whether the service is offered in several silo-like markets, comprised of *separated* peer groups, or whether it is *integrated* into a single market for all peers. It also denotes whether the markets are described by geographical scope, such *city-wide*, *state-wide*, *country-wide*, or *global*. If a service is comprised of a single portal that features no specific adaptations for any separated sub-community (with the exception of a multi-lingual user interface) and it is used in multiple countries, the service is considered to be integrated and global. If a service is comprised of a single portal that is exclusive to certain potential peers (e.g., because the website is available in a certain language only or the peer group is restricted to members of a certain country), the service is considered to be integrated and country-wide. If a service is comprised of multiple portals for separated peer groups, where members of one group cannot execute transactions with members of the other groups, the service is considered separated. For example, if these peer groups are established on country-level, the service is considered separated and country-wide. The P2P SCC platform *Share4friends* illustrates the last example by welcoming an interested peer to its website with a request to select either a German or a US-based instance of the platform.

(6) The dimension of *Consumer involvement* is used to assess the extent to which the customer is involved in the consumption experience (Bardhi and Eckhardt 2012). *Full-service* corresponds to a service in which the consumer has no or limited involvement, and takes a passive role; whereas *self-service* means that the consumer is responsible for all activities involved, such as self-storage by the peer-consumer in a storage space, that is offered by a peer-provider. The concept of consumer involvement is closely related to the concept of customer participation (Bendapudi and Leone 2003), where customers may serve as “partial employees” in a service setting by sharing some of the production responsibilities (Mills and Morris 1986). An example of full-service is a P2P SCC taxi service, where a customer is only required to get into the car. Self-service is typical for a scenario, in which access is granted to a parking space. After placing the offering on a platform, no further action is required from the peer-provider of the parking space to supply the service.

(7) *Profit orientation*—a dimension Bardhi and Eckhardt (2012) originally proposed as market mediation—describes whether a P2P SCC platform is operated for profit or not-for-profit. We adopt this dimension, but we refine the original characteristic of *for-profit* and *not-for-profit*, to distinguish a for-profit orientation, where the platform generates profit in one of four ways: advertisement or customer data (*indirect profit*), charging the peer-consumers (*profit from peer-consumers*), charging the peer-providers (*profit from peer-providers*), and charging both the peer-consumers and the peer-providers (*profit from both peer-consumers and peer-providers*). If no profit is generated by the operator, the platform is classified as *not-for-profit*.

(8) *Money flow* characterizes the process of payment for a transaction initiated on a P2P SCC platform. Many forms of payment can be categorized as either a direct *Customer-to-Customer (C2C)* transaction using typical payment methods—such as wire transfer, cash on delivery/pickup/utilization of a service—or *Customer-to-*

Business-to-Customer (C2B2C), where the platform itself processes the payment and may act as trustee (Kreyer et al. 2007).

(9) *Payment model* can be considered a supplementing dimension to the money flow. It shows how a platform is charging its users. First, it can charge users *per transaction*, meaning that each successful matchmaking between a peer-provider and peer-consumer results in a fee being transferred to the platform operator. Second, it can charge *per listing*. In this case, every new object that is put on the platform by a peer-provider requires a fee. Finally, platform operators can charge its users for *membership* either periodically, or as a one-time registration fee. A combination of the three characteristics can be present in one platform. Instead of providing three dimensions for each characteristic with yes or no characteristics, we decided to combine them into one dimension with non-mutually exclusive characteristics.

(10) *Promotion of sustainable consumerism* refers to the P2P SCC platform's promotion of consumerism, that is motivated by ideological, pro-social, or environmental interests. Based on the notion of the political consumerism, and defined as "the use of market action as an area for politics, and consumer choice as a political tool" (Micheletti et al. 2004, p. vii), this dimension was introduced by Bardhi and Eckhardt (2012) as one of six dimensions to distinguish access-based services. Participation in access-based services can represent "a reflexive strategy of signaling access as a more environmentally sustainable or anti-market consumption alternative" (Bardhi and Eckhardt 2012, p. 885). We extend the notion to *sustainable consumerism*, because it enables the analysis of economic, ecological and social motivations of consumerism (Chasin 2014). Even if the consumers' true motives are unknown, we assume that the explicit promotion of sustainable consumerism⁹ can serve as a proxy for the platform users' motivations. The *Promotion of sustainable consumerism* dimension has three characteristics that can be present at the same time: *social*, *economic* and *environmental*. The mission statement of the French ride-sharing company *BlaBlaCar* illustrates the operationalization of the characteristics. The statement on the home page of the platform, "we connect people so that together they can reduce road traffic and pollution, save money, and share enriching journeys"¹⁰ explicitly promotes all three aspects of sustainable consumerism. It must be noted that, following the *Payment Model* dimension, we could assure that every dimension consists of mutually exclusive characteristics (Nickerson et al. 2013) and split the dimension into three binary sub-dimensions. However, as it would only increase the complexity of the taxonomy and not its analytical capability, we supported one dimension with three non-mutually exclusive characteristics.

In addition to the core taxonomy dimensions, following descriptive dimensions were assessed: *Year of Launch*, *Place of Launch* and *Popularity*. *Popularity* is

⁹ We searched for pro-social (social*, neighbor*, help, responsib*, community, share, experience,..., as well as adjectives related to the consumer experience such as fun and joy), environment-related (environment*, green, sustainab*, responsib*, pollution, carbon, reduce,...) and economical (monetiz*, profit*, money, earn*, business, cost,...) keywords in the texts included on the *home*, *about*, *FAQ* and *howto* sections of the platform websites.

¹⁰ BlaBlaCar, <https://www.blablacar.com/>, last accessed on 23th of October 2015.

approximated by the platform's Web page view statistics and is based on the network traffic data, that are provided by *Alexa*.¹¹ *Alexa* is regarded as a reliable source of data and is widely used in the scientific community (Bernstam et al. 2005; Gallant et al. 2007; Fogg and Iizawa 2008). *Year of Launch* is defined as the year in which the platform began operating according to the information provided on the platform's website, or—in case it is not stated—the Internet was searched for a date. *Place of Launch* describes the country and city where the platform was launched and is derived according to the information provided on the platform's Website itself, or in the media archives available on the Internet. If the information provided on the platform's Website and the Internet is not sufficient, missing information can be often retrieved by investigating the official domain name registration data for the platform via *WHOis.net*.¹²

5 Reproducible analysis of P2P SCC platforms as evaluation of the taxonomy

The evaluation of the taxonomy is twofold. First, we qualitatively validate the robustness in the sense that no changes to the taxonomy's dimensions and characteristics are required, when applied to a new set of objects. Second, we evaluate the taxonomy against its intended use, i.e., meta-characteristics. To do so, we quantitatively analyzed trends in the P2P SCC market by comparing different samples of P2P SCC platforms, using the dimensions of the taxonomy as a theoretical lens. The special focus is on tracing the active, the new, and the ceased platforms, as well as analyzing platforms' popularity, and therefore, providing a basis for a detailed analysis of the domain.

5.1 Robustness of the taxonomy

Four different samples were gathered, with the first sample being retrieved mid-year 2014 and the last sample in January, 2017 (cf. Table 1 in Sect. 3.1). The initial sample is the largest and comprises 396 platforms. Subsequent samples are smaller as they exclude previously identified platforms. Interestingly, the inclusion of a new large directory for P2P SCC platforms (*The People Who Share*) for the last two samples did not increase the number of new platforms substantially. This observation is an indication for the comprehensiveness of the sample of 473 platforms, that were identified in the first two samples. Therefore, the total of 522 platforms that form the data basis for our study can be identified as a representative of the P2P SCC platform landscape.

The taxonomy was iteratively created based on the platforms from the first sample. The application of the taxonomy to the subsequent samples revealed that no substantial modifications of the taxonomy were required. In fact, only the characteristics of the *Resource Type* dimension had to be extended by new

¹¹ *Alexa*, <http://www.alexa.com/siteinfo/>, last accessed 17th of January 2017.

¹² Whois Lookup, <https://www.whois.net/>, last accessed 17th of January 2017.

Table 4 Distribution of “popular” single resource types

	Accommo-dation	Cars	Parking spaces	Boats	Food
Occurrences	151	145	24	19	16
	Work spaces	Clothing	Land	Storage spaces	Camping vehicles
Occurrences	14	10	10	10	8

Table 5 Distribution of “less popular” resource types

	Aircrafts	Bicycles	Books	3D printers	Cameras	Dogs	Retail spaces
Occurrences	6	6	6	2	2	2	2
	Wi-Fi routers	Sport facilities	Pets	Media	Laundry machines	Agricultural machinery	
Occurrences	2	1	1	1	1	1	

Table 6 Distribution of “mixed” resource types

	Miscella-neous	Transpor-ters	Tools	Spaces	Venues
Occurrences	54	5	5	5	5
	Outdoor related	Sports gear	Motorized vehicles	Baby-related	
Occurrences	4	2	1	1	

elements, e.g., niche resources like *Agricultural machinery* or *Baby-related goods*. Such additions, however, are expected due to the ubiquitous nature of resource sharing and do not compromise the robustness of the taxonomy.

To give an idea of the spread of all platforms and their characteristics across all dimensions, we first provide the overview of different combinations of resources that are offered on the analyzed platforms. The list of all resource types can be divided into *popular* (cf. Table 4), *less popular* (cf. Table 5) and *mixed* (cf. Table 6) resource types. We consider a specific resource type to be *popular* when it occurs at least six times throughout our samples, while mixed resources combine multiple single resource types.¹³ 29% of platforms are concerned with P2P SCC of apartments, 28% of cars and 16% offer a combination of different resources. A detailed description of the different resource types and exemplary platforms can be found in “Appendix 2”. The distribution of remaining platform characteristics across all platforms can be seen in Fig. 5. It illustrates the effective application of the taxonomy to 522 P2P SCC platforms across all four samples. While providing a

¹³ As explained in Sect. 4.2, we consider every unique combination of resources offered on a P2P SCC platform as an individual resource type. Sharing of cars and boats is, therefore, one characteristic for the dimension resource type that is only given to those platforms that exhibit this particular combination exclusively.

Dimensions		Characteristics and occurrences in percent								
Promotion of Sustainable Consumerism	economic			social		environmental				
	80.65%			54.21%		27.01%				
P2P SCC Pattern	deferred			immediate		recurrent				
	79.89%			5.94%		14.18%				
Type of Accessed Object	functional				mixed					
	36.40%				63.60%					
Resource Owner	private person				private person or business					
	62.12%				37.88%					
Consumer Involvement	self-service		in-between			full-service				
	22.65%		59.31%			18.04%				
Global Integration	integrated				separated					
	city-wide	country-wide	region-wide	global	city-wide	country-wide	region-wide			
	5.03%	29.18%	5.84%	33.60%	14.69%	8.05%	3.62%			
Profit Orientation	profit from consumer		profit from provider		profit from both		indirect profit		not-for-profit	
	18.92%		32.63%		22.01%		5.60%		20.85%	
Money Flow	C2C		C2B2C		C2B		free-of-charge			
	26.36%		54.07%		7.75%		11.82%			
Payment Model	per transaction		per listing		membership		combination			
	66.60%		6.64%		19.92%		6.85%			

Fig. 5 Distribution of dimension characteristics across all analyzed P2P SCC platforms

good snapshot of the current P2P SCC landscape, it does not provide insights regarding the meta-characteristics of the taxonomy. For example, we can observe that platforms predominantly promote economic benefits, are for profit and charge consumers per transaction, but this does not result in insights regarding market trends or the emergence of business opportunities. The next section is therefore devoted to the evaluation of the taxonomy against its purpose.

5.2 Evaluation of the taxonomy against the meta-characteristics

The taxonomy should be able to identify distinctive offerings on the P2P SCC platforms as well as changes on the P2P SCC market in form of trends, business opportunities, and the platforms' business performances.

The classification of each platforms in terms of the taxonomy characteristics, including the rendering of all the different resource types that are shared on the platforms (Tables 4, 5, and 6), is a foundation for researchers to make an informed decision regarding which type of P2P SCC practices the research findings apply to. For instance, for researchers focusing on sharing behavior, *city-wide immediate* sharing of *parking spaces* where the accessed object is *functional*, and the peer-consumer is charged a *fee per each parking transaction*, while required to perform a *self-service*, cannot be treated like all other P2P SCC practices. For example, a different set of factors that control the sharing behavior can be expected for the *global 'sharing' of luxury boats*, that requires long-time planning (*deferred*), an

involvement of *both peer-consumer and peer-provider*, who pays a yearly *membership fee* to participate in the platform. The taxonomy, together with its application on a comprehensive data set, therefore, assist researchers in situating their findings precisely and helping to avoid claims that are not generalizable for the diversity of P2P SCC practices.

Regarding the ability of the taxonomy to aid the analysis of the P2P SCC platforms' business performance, we focus on two aspects. First, we compare the characteristics of active platforms against the characteristics of platforms, whose operations ceased in the last 2 years. In addition, we observe page views of different resource types over 2 years. Second, we examine the new business models and trends that can be identified by applying the taxonomy and tracing the development of the market over time.

From the four samples, we identified 125 platforms that have shut down their business. In 66% of the cases, the reason for the shutdown could not be determined precisely due to the missing media coverage and the disappearance of the platforms' Web pages, or due to the reluctance of the platform operators to disclose the true reasons. However, most platforms that do announce reasons for their disappearance, refer to the challenges to penetrate the market.¹⁴ The second most common observation is the acquisition of a business by a competitor (23%). Such acquisitions primarily occurred for the platforms that offer cars or accommodation resource types. For instance, car-riding service BlaBlaCar acquired as many as ten platforms from our sample (e.g., Carpooling and Samenrijden). A similar situation can be observed with the accommodation service HomeAway, which has been aggressively acquiring competitors in the time frame of our analysis. Other platforms changed their business concept moving away from the P2P SCC. An example is Flatclub—a business that has changed the concept from a typical P2P accommodation provider, to a provider for moving services. In addition, some platforms were removed due to other reasons, e.g. malware warnings for the Website.

The comparison of ceased versus still active platforms reveals multiple conceptual differences, shown in Table 7. A detailed view on the characteristics of ceased versus active platforms can be found in “Appendix 1”.

Drilling down to the *Resource Type* (cf. Table 8) reveals high numbers of ceased platforms for the resource types *cars* and *miscellaneous*.¹⁵ From the cars category, 27% of ride sharing, 33% of car rental, and 27% of taxi platforms ceased their operations. The over-proportionally high number of the resource type *cars* among the ceased platforms can be partly explained by acquisition strategies of the market leaders, in that group of P2P SCC platforms. The bad performance of the miscellaneous category can be attributed to the fact that businesses of this type are often smaller P2P exchange platforms, that are not-for-profit. This type of platform has become increasingly unpopular among the start-ups (cf. Fig. 6 in

¹⁴ Typical examples of platforms that reflect about their decision to shut down are GearCommons (<http://gearcommons.com>) and Fleety (<https://www.fleety.com.br>).

¹⁵ Food, land and storage spaces are not investigated further due to insignificant numbers of total occurrences.

Table 7 Comparison of characteristics of ceased vs. active platforms

Insight	Description
Reliance on business partners	Successful platforms rely more heavily on peer-providers as business partners. They offer their services to business partners in 24% of the cases (instead of 16% for ceased platforms). It might be the case that business partners attract customers, given their higher credibility. Another explanation is that successful platforms simply attract business partners more easily
Focus on service	Successful platforms provide more service to customers (only 21% self service instead of 27%). This goes hand in hand with the decline of self-service platforms like 1000Tools, as users often value the required time efforts higher than the benefits of using a self-service
Generation of direct profit	Still active platforms rarely rely on indirect profit (only 4% compared to 11%) as their only source of income. This is an indication for the indirect profit being no sufficient for the operation of the platform
Commercialization	Active platforms are also less likely to be free of charge.* Compared to the 15% of the ceased platforms, only 11% of the active platforms are free of charge—a development that is likely to continue

* A platform is only classified as free to use, if not only the service is free but also there are no transactions between users. Contrary to that, the characteristic *for-profit* identifies whether a platform earns money

Table 8 Resource types of ceased platforms in percent of total occurrences of a resource type

	Accommo-dation	Cars	Parking spaces	Boats	Food	Work spaces
Ceased %	17	29	8	26	29	21
	Clothing	Land	Storage spaces	Camping vehicles	Miscella-neous	
Ceased %	10	30	40	12	31	

Table 9 Launch years of the ceased platforms

1999	2000	2001	2002	2003	2004	2005	2006	2007
1	2	2	1	1	2	2	3	4
2008	2009	2010	2011	2012	2013	2014	2015	
2	8	13	14	27	25	12	5	

“Appendix 1”). Due to a low number of occurrences of platforms with other resource types, we refrain from interpreting the results.

A temporal analysis of the ceased platforms reveals that only a small number of platforms, that were founded before 2009, have ceased their operations (cf. Table 9). Instead, the majority of ceased platforms have just started their business recently. Therefore, the P2P SCC market does not only seem to “favor[...] the big” (Slee 2016) but also, to favor the first. This is an expected finding, as both criteria appear to be compatible. The first platforms, and by now biggest platforms

Table 10 Page views per resource category (in million views per 3 months)

	Total	Accommo-dation	Cars	Miscellaneous	Other
2014	358	297	46	3	12
2016	533	422	80	4	27

Table 11 Page views per platform (in million per 3 months)

	Airbnb	VRBO	Uber	HomeAway	SpareRoom
2014	94	39	27	26	21
2016	208	90	55	44	16

like Airbnb and Uber, make the introduction of new businesses difficult, and the failure of the latter more likely. What is interesting is that the current narrative around the Sharing Economy in both academia and practice is still dominated by the claims of its great potential, especially when it comes to capitalizing on its ubiquitous nature (PWC 2015), although it seems that after a boom between 2011 and 2014, the market began to grow rather within existing platforms and not horizontally. Fewer businesses see opportunities in the market, and thus, most decide against going into the market where the growth happens rather by the expansion of the existing platforms.

Table 10 shows the development of page views as a proxy for the market share for the four most prominent resource types. Although platforms that provide resources except cars, accommodation and miscellaneous more than doubled their share, the majority of the market still belongs to the *accommodation* and *cars* platforms. This can mostly be accredited to the P2P SCC giants Airbnb, VRBO, Uber and HomeAway. In comparison to other accommodation providers like HomeAway and SpareRoom, Airbnb was able to further substantiate its position as the market leader (Table 11).

The identified success factors lead to an overall shift in the market, which is analyzed in the following. First, we observe the dynamics of the new platform emergence. Table 12 shows the number of new platforms per year in total and split up by resource types.¹⁶ The trend of P2P SCC is shown to peak between the year 2012 and 2013 and decline afterwards. In addition, the number for new *accommodation* and *cars* platforms have declined faster than the number of remaining platforms (*other*). This indicates a level of saturation in the corresponding markets, while new resource types leave room for new business opportunities (albeit having a minuscule market share overall). E

The general shift in the market can be also detected when comparing the old incumbents of the market to the newcomers. We analyze platforms established before the first sample was taken (so before 2014) to platforms after (2014 and onwards). The most significant changes are summarized in Table 13 while a

¹⁶ Divergence from the previously mentioned 522 platforms can be explained by the removal of platforms from 2016 and incomplete data regarding the launch year of all platforms.

Table 12 Establishments per year

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Number of platforms per year	8	7	9	4	5	12	11	14	20	24	30	46	63	85	86	56	15
Cumulative number of platforms per year	8	15	24	28	33	45	56	70	90	114	144	190	253	338	424	480	495
Accommodation	5	4	4	2	4	8	7	5	6	7	13	13	23	18	13	10	3
Cars	3	2	3	1	0	1	2	4	9	10	10	16	15	22	24	16	2
Other	0	1	2	1	1	3	2	5	5	7	7	17	25	45	49	30	10

Table 13 Comparison of characteristics of new vs. old platforms

Insight	Description
Economization of platforms	Newer platforms focus less on the promotion of the social and more on the promotion of the economic consumerism. This reflects a shift towards preferring functional rather than experiential offerings. The percentage of functional objects increased from 33–47%
Focus on private peer-providers	Newer platforms focus more on private peer-providers. The share of Websites for private and business owners dropped from 42 to 21%. Presumably, new platforms try to tap into new markets, where traditional businesses already have chosen P2P SCC partners
Controlled transactions	Newer platforms focus increasingly on C2B2C transaction models (51 to 67%). These allow for more control of the money flow, easier withdrawal of fees and offer more security for their customers. Accordingly, users are increasingly charged per transaction (increased from 59 to 73%)
Focus on economies of scale	Platforms' confidence in the membership model has halved (20–10%). The platform providers seem to put more value into gaining a large user base—and thus economies of scale—quickly

detailed overview of the differences based on all dimensions and characteristics can be found in “Appendix 1”. The application of the taxonomy reveals major differences between old and new platforms, as well as between ceased and still operating platforms. Thus, it proves the ability of the taxonomy to fulfill its purpose—that is to provide a foundation for both research and practice for an analysis of the evolution of the P2P SCC platforms.

6 Discussion

Our main contribution is dedicated to the development of a taxonomy for P2P SCC platforms. The discussion thereof is approached from two different perspectives. On the one hand, individual findings that surfaced during the development of the taxonomy are discussed. On the other hand, the usefulness and applicability of the developed taxonomy is critically assessed.

6.1 Discussion of the taxonomy development

This research presents an instantiation of Nickerson et al. (2013) method for taxonomy development and supports the claim that a taxonomy is a suitable instrument in the Information Systems domain to organize complex and dynamic phenomena. The investigated phenomenon of P2P SCC within the broader domain of the Sharing Economy can be considered a prime example in this regard.

While Nickerson et al. (2013) approach served as leitmotiv, we identified useful modifications to the process. A notable finding is that the original taxonomy development process by Nickerson et al. (2013) only considers the addition and removal of dimensions and characteristics in each iteration. However, the characteristics for each dimension can also be adjusted in a set of characteristics, which remains unchanged, yet the interpretation of the characteristic is updated. For

instance, we have faced the problem in the empirical iterations of the taxonomy application, where we attempted to classify platforms according to the characteristics of the dimension *P2P SCC Pattern* — *deferred*, *immediate*, and *recurrent*. We had to tune the exact definition of the characteristics, to avoid cases where the categorization by independent researchers differed. Based on our experience, researchers that develop taxonomies will face this case more often than the case where characteristics should be removed. Of course, if the selection of characteristics is not suitable, they shall be dropped. However, our appeal is to pay more attention to a precise definition of characteristics as they are typically a subject of interpretation.

A further opportunity to improve the method lies in the explicit elaboration on the process of identifying relevant objects. Nickerson et al. (2013) method starts with the determination of the meta-characteristics of the objects. However, we would argue that the first step should guide in the definition of the taxonomy's scope. The aim should be to limit the scope to a homogeneous set of potential objects. Otherwise, there is a risk of developing a taxonomy upon heterogeneous objects. Because various objects exist that can be analyzed through a taxonomy, this process needs to be individually tailored, as we have explained in great detail regarding the identification of relevant P2P SCC platforms.

Finally, the method offers rudimentary guidance on the evaluation of the taxonomy. Nickerson et al. (2013) argue that as the taxonomy is dependent on its purpose, it is difficult to provide more detailed guidance on its evaluation. However, we argue for, at least, including the evaluation step into the overall method, and therefore, forcing a demonstration of the taxonomy's usefulness beyond an informed argument. In this context, we have opted for a repeated and longitudinal approach to vouch for the robustness of the proposed taxonomy and its ability to discriminate P2P SCC platforms, as well as to provide an instrument for an analysis of platforms business performance. Conclusively, a detailed description of the identification of objects and a conclusive evaluation are useful additions to the taxonomy development process and should be carefully considered and clarified when undertaking the development of a taxonomy.

6.2 Discussion of the taxonomy's usage

The taxonomy with its 10 dimensions serves as a starting point for describing and situating any research endeavor that is concerned with the phenomenon of P2P SCC. We repeatedly emphasize that P2P SCC practices are historically constituted by the emerging platforms—a fact that supports our argument that understanding the characteristics of different P2P SCC platforms helps to understand the characteristics of different P2P SCC practices or behaviors.

Against this background, the taxonomy allows to narrow down the scope of research to those sub-phenomena. Therefore, it helps to address the problem of research results that are claimed to be relevant for a wider range of P2P SCC practices; yet only address a subset of those practices. For example, true non-reciprocal sharing and collaborative consumption, which typically involves monetary compensation, is shown to exhibit inherently different behavior.

According to Belk (2014b), yet often no explicit distinction between both is made when research results are presented. By using the taxonomy, these practices can be distinguished, e.g. with the dimensions P2P SCC patterns, types of accessed objects, and consumer involvement. The taxonomy, therefore, represents a conceptualization of P2P SCC practices performed on P2P SCC platforms.

Our contribution to researchers and practitioners is in the use of the taxonomy as an instrument, to systematically study the P2P SCC market and analyze its participants. This is facilitated through the reproducibility of our research results by means of the script-based automatization of the analysis process, allowing both researchers and practitioners to instantiate the taxonomy with an updated sample of classified platforms and to effortlessly create all the statistics required for an extensive overview. A concrete application examples of the reproducibility could be an update of the P2P SCC landscape in future publications. The reproducible approach would help to precisely compare the future state to the current one. As a comparison for future work, we not only provide a snapshot of the characteristics of Websites, but also an overview of the geographical distribution and trends.

The developed taxonomy is intended for P2P SCC platforms exclusively, and thus, only those platforms have been analyzed. Therefore, and in order to extend the applicability for the 'sharing' platforms of other types, the scope of the taxonomy needs be broadened. Especially, the popular cases of platforms that offer generic services, e.g., errands or babysitting, are not within the scope. Even though the adaptation of the taxonomy to assess platforms that offer access to intangible resources is possible, the analysis of the business landscape is not that easily reproduced to also include platforms that have been previously excluded. This requires screening thousands of platforms—an activity that we performed as a preparation for the main taxonomy development cycle.

Through the repeated application and refinement of the taxonomy, a few borderline cases emerged that need consideration. For example, there are services, in which the actual resource required for delivering a service is made available by a company, whereas the service itself is provided through a private person. In such a scenario, it can be argued that the service provider is the company and the private person could be considered an employee. However, the alternative perspective is also reasonable—especially if the resource is made available for a fixed fee and/or the private person operates independently.

We were very strict about the dependency between a service delivery and a physical resource. However, there are other platforms where a physical resource is not mandatory, but required in many cases nevertheless. For instance, when a handyman service is offered through a platform dedicated for generic services, it requires specific tools at the service providers' disposal. Consequently, such an offering would belong to the class of P2P SCC. Therefore, platforms for generic services, e.g., TaskRabbit or Vayable, that have been excluded within our study, could also be considered to partly comply with the stated definition of P2P SCC.

Admittedly, our set of 522 platforms from open directories, albeit being quite comprehensive, is not complete. However, it is reasonable to believe that our sample reflects the state-of-the-art in the P2P SCC business landscape to a considerable degree. Although we do not believe that the inclusion of additional

platforms would change the implications of the research significantly, we recognize the limitation of our sample selection as we relied on open directories for Sharing Economy businesses.

Another notable limitation concerns the aspect of trust and trust-building. Initially, we intended to also include the different trust-building instruments employed by the platform providers. Unfortunately, due to the diversity of these instruments and the difficulty of capturing this kind of evidence, we decided to omit this dimension. Nonetheless, research on these trust-building instruments is a complex and even a more interesting component of the Sharing Economy, that can be addressed by future research.

7 Conclusion

Internet-based platforms that enable private individuals to share physical resources like cars (Uber) and apartments (Airbnb), continue to gain momentum in the global economy. However, the research on such P2P platforms is hampered by the complexity and diversity of their business landscape. The range of resources types being shared is growing and the variation of the platform characteristics is increasing. Having an incomplete understanding of the phenomenon represents a high risk of compromising the generalizability of research results. We addressed the problem by developing and partly evaluating a taxonomy of P2P SCC platforms. By doing so, we provided information systems and e-business research researchers with a framework to study the phenomenon of P2P SCC in all its diversity.

The taxonomy was evaluated by the means of a longitudinal analysis comprising, a total of 522 P2P SCC platforms that have been collected and analyzed over a period of 35 months. We acknowledged the high dynamics in the P2P SCC market by supplementing the study with computer scripts that grant reproducibility of the results by means of semi-automatization of the data analysis. Not only does it allow the reproduction of what arguably renders the most comprehensive academic analysis of the modern landscape of P2P SCC platforms and its characteristics, it also allows to replicate the study at any time using an updated set of classified platforms. Our contribution is to both research and practice, as the refined understanding of the complex P2P SCC platform landscape is of an immediate value for both.

Appendix 1: New versus old and ceased versus active platforms overview

See Figs. 6 and 7.

Dimensions	Characteristics and occurrences in percent							
Promotion of Sustainable Consumerism	economic			social		environmental		
	85.19% (79.06%)			46.91% (56.00%)		24.69% (27.76%)		
P2P SCC Pattern	deferred			immediate		recurrent		
	81.48% (80.71%)			6.17% 5.65%)		12.35% (13.65%)		
Type of Accessed Object	functional				mixed			
	46.91% (433.18%)				53.09% (66.82%)			
Resource Owner	private person				private person or business			
	79.01% (58.16%)				20.99% (41.84%)			
Consumer Involvement	self-service			in-between		full-service		
	23.46% (22.17%)			60.49% (59.67%)		16.05% (18.16%)		
Global Integration	integrated				separated			
	city-wide	country-wide	region-wide	global	city-wide	country-wide	region-wide	
	6.49% (4.67%)	28.57% (29.48%)	2.60% (6.39%)	33.77% (33.91%)	16.88% (13.76%)	9.09% (8.11%)	2.60% (3.69%)	
Profit Orientation	profit from consumer		profit from provider		profit from both		indirect profit	not-for-profit
	23.75% (17.97%)		35.00% (32.39%)		20.00% (22.93%)		5.00% (5.91%)	16.25% (20.80%)
Money Flow	C2C			C2B2C		C2B		free-of-charge
	13.92% (28.44%)			68.35% (51.42%)		6.33% (8.06%)		11.39% (12.09%)
Payment Model	per transaction			per listing		membership		combination
	78.67% (63.96%)			4.00% (7.36%)		10.67% (21.83%)		6.67% (6.85%)

Fig. 6 Taxonomy evaluation for platforms after (before) 2014

Dimensions	Characteristics and occurrences in percent							
Promotion of Sustainable Consumerism	economic			social		environmental		
	82.40% (80.10%)			60.00% (52.39%)		27.20% (26.95%)		
P2P SCC Pattern	deferred			immediate		recurrent		
	76.00% (81.11%)			9.60% (4.79%)		14.40% (14.11%)		
Type of Accessed Object	functional				mixed			
	36.00% (36.52%)				64.00% (63.48%)			
Resource Owner	private person				private person or business			
	66.94% (60.61%)				33.06% (39.39%)			
Consumer Involvement	self-service			in-between		full-service		
	27.20% (21.21%)			56.80% (60.10%)		16.00% (18.69%)		
Global Integration	integrated				separated			
	city-wide	country-wide	region-wide	global	city-wide	country-wide	region-wide	
	6.14% (4.70%)	29.82% (28.98%)	3.51% (6.53%)	32.46% (33.94%)	7.89% (16.71%)	13.16% (6.53%)	7.02% (2.61%)	
Profit Orientation	profit from consumer		profit from provider		profit from both		indirect profit	not-for-profit
	16.94% (19.54%)		33.87% (32.23%)		16.13% (23.86%)		11.29% (3.81%)	21.77% (20.56%)
Money Flow	C2C		C2B2C		C2B		free-of-charge	
	25.00% (26.79%)		54.03% (54.08%)		5.65% (8.42%)		15.32% (10.71%)	
Payment Model	per transaction		per listing		membership		combination	
	69.81% (65.69%)		6.60% (6.65%)		16.98% (20.74%)		6.60% (6.91%)	

Fig. 7 Taxonomy evaluation for ceased (active) platforms

Appendix 2: Resource types and platform examples

See Tables 14, 15 and 16.

Table 14 Popular resource types

Resource type	Description
Apartments and Houses	Any personal living space that is suitable for an overnight stay. <i>Examples</i> HomeAway, HomeSwapper, Makoondi, Onefinestay
Boats	Fishing boats, power boats, and sail boats. <i>Examples</i> GetMyBoat, Incredibblue, Sailsquare
Camping vehicles	Vehicles for camping of varying sizes and types. <i>Examples</i> JeLoueMonCampingCar, RVShare
Cars	Comprises ride sharing, taxi-like services and car rental platforms. <i>Examples</i> CarNextDoor, Freewheelers, Cabeasy
Clothing	Fashion or non-fashion clothing and shoes. <i>Examples</i> DateMyWardrobe, RentMyDress
Food	Self-grown food or food shared during a dining event. <i>Examples</i> PlateCulture, RipeNearMe
Land	Gardens for growing fruit, vegetables or gardens and fields for recreational or event purposes. <i>Examples</i> FieldLover, Shared Earth
Parking spaces	Lots, street areas, and garages. <i>Examples</i> JustPark, Yourparkingspace
Storage spaces	Storage spaces of varying sizes with digital or non-digital locks, supervised, or unsupervised. <i>Examples</i> SpareFoot, Storemates
Work spaces	Office and work spaces of varying sizes and for various purposes. <i>Examples</i> Cowo, DeskNear.Me, Hackerspaces

Table 15 Rarely offered resource types

Resource type	Description
3D printers	3D printers of varying sizes and quality. <i>Examples</i> 3D-Hubs, Makexyz
Agricultural machinery	Agricultural machinery for farmers. <i>Example</i> Mermix
Aircrafts	Private aircrafts. <i>Examples</i> Cojetage, SimpleCharters
Bicycles	Short-term renting of bikes in cities <i>Examples</i> BikeSharing, Velogistics
Books	Books, magazines, and other print material. <i>Examples</i> BookLending
Cameras	Cameras, camera drones, and camera gear. <i>Example</i> Kitsplit
Dogs	Dog pets. <i>Example</i> BorrowMyDoggy
Laundry machines	Machines for doing laundry. <i>Example</i> La-Machine-du-Voisin
Media	Various media on DVDs and CDs. <i>Example</i> FlipShelf
Pets	Like category dogs, but not restricted to those. <i>Example</i> Petsodia
Retail spaces	Office and work spaces of varying sizes and for different purposes. <i>Examples</i> PopUpBrands, Storefront
Sport facilities	Tennis courts, basketball courts, badminton courts, soccer fields, etc. <i>Example</i> OpenPlay
Wi-Fi routers	Routers that can provide public Internet. <i>Examples</i> Fon, Open Wireless

Table 16 Resource types as combination of multiple resources

Resource type	Description
Baby-related	All products related to toddlers and babies (like toys). <i>Example</i> Minivacioners
Miscellaneous	Some platforms do not restrict the type of resources at all. <i>Examples</i> AnyHire, Erento, RentMyItems
Motorized vehicles	Boats, ATV/UTV, personal watercraft, bikes, snowmobile, trailers. <i>Example</i> Fun2Rent
Outdoor- and adventure-related resources	Vehicles for traveling (e.g., cars, boats, planes, trailers) and traveling gear (e.g., bags, tents, navigation equipment). <i>Examples</i> Qraft
Spaces	Spaces for different purposes (e.g., storage, parking, office, retail, recreation, commerce). <i>Examples</i> SpaceOut, Store-at-my-house
Sports gear	Sport bicycles (e.g., road, racing, mountain), snowboards, skis, surfboards. <i>Example</i> Spinlister
Tools	Hammers, saws, blowers, air compressors, etc. <i>Example</i> Sharehammer
Transporters	Different transportation means such as cars, airplanes, trains, boats, etc. for the purpose of delivering something to a peer. <i>Examples</i> Canubring, Meemeep, PiggyBee, WorldCraze
Venues	Venues for meetings, conferences, concerts, and parties. <i>Example</i> HireSpace

Appendix 3: Subset of platforms that were discussed as examples

1000Tools http://1000tools.com	La-Machine-du-Voisin http://lamachineduvoisin.fr
3D-Hubs http://3dhubs.com	Lenderise http://lenderise.com
9flats http://9flats.com	Liftsurfer http://www.liftsurfer.com/
Airbnb http://airbnb.com	Lyft http://lyft.com
Airpooler http://airpooler.com	Makexyz http://makexyz.com
AnyHire http://anyhire.com	Makoondi http://es.makoondi.com
BikeSharing http://bike-sharing.org/	Meemeep http://meemeep.com
BlaBlaCar http://blablacar.com	Mermix http://mermix.gr/
Bookelo http://bookelo.com	Minivacioners https://sharon-jain.squarespace.com/about-us/
BookLending http://BookLending.com	Misterbnb http://www.misterbnb.com/
BorrowMyDoggy http://borrowmydoggy.com	Neighborhood Fruit http://neighborhoodfruit.com
Cabeasy http://cabeasy.com	Onefinestay http://onefinestay.com
CameraLends http://cameralends.com	OpenPlay http://openplay.co.uk
Canubring http://canubring.com	Open Wireless http://openwireless.org
CarNextDoor http://carnextdoor.com.au	Petsodia http://petsodia.com/
Carpooling http://carpooling.com	PiggyBee http://piggybee.com
Cojetage http://cojetage.com	PlateCulture http://plateculture.com
Cowo http://coworkingproject.com	PopupBrands http://popupbrands.com.au
Cycleswap http://cycleswap.nl	Propaloo http://propaloo.com
DateMyWardrobe http://datemywardrobe.com	Qraft http://qraft.com

DeskNear.Me http://desksnear.me	RentMyDress http://rentmydress.ie/
DreamFlat http://dreamflat.com	RentMyItems http://rentmyitems.com
Drivy http://drivy.com	RelayRides http://relayrides.com
Erento http://erento.com	RipeNearMe http://ripenear.me
FieldLover http://fieldlover.com	RVShare http://rvshare.com
Flatclub http://flat-club.com	Sailsquare http://sailsquare.com
Fleety https://fleety.com.br	Samenrijden http://samenrijden.nl/
FlightCar http://flightcar.com	Share4friends http://share4friends.com
FlipShelf http://flipshelf.com	Shared Earth http://sharedearth.com
Fon http://corp.fon.com	Sharehammer http://app.sharehammer.com
Fun2Boat http://fun2boat.com	Sharing Backyards http://sharingbackyards.com
Fun2Rent http://fun2rent.com	SimpleCharters http://simplecharters.com
Freewheelers http://freewheelers.co.uk	SincroPool http://sincropool.com
GearCommons http://gearcommons.com	SpaceOut http://spaceout.com.au
GetMyBoat http://getmyboat.com	SpareFoot http://sparefoot.com
GreenRiders http://greenriders.fi	SpareRoom https://spareroom.co.uk
Hackerspaces http://hackerspaces.org	Spinlister http://spinlister.com
HireSpace http://hirespace.com	Store-at-my-house http://storeatmyhouse.com
HomeAway http://homeaway.com	Storefront http://thestorefront.com
HomeSwapper http://homeswapper.co.uk	Storemates http://storemates.co.uk
Incrediblu https://www.incrediblu.com	Uber http://uber.com
JeLoueMonCampingCar http://jelouemoncampingcar.com	Velogistics http://velogistics.net
JustPark http://justpark.com	VRBO https://vrbo.com
Kitsplit https://kitsplit.com/	WorldCraze http://worldcraze.com
Kookopa http://kookopa.com	Yourparkingspace http://yourparkingspace.co.uk
Landshare http://landshare.net/	Zimride http://www.zimride.com/

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