

Ibert, Oliver; Oechslen, Anna; Repenning, Alica; Schmidt, Suntje

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ORIGINAL ARTICLE

# Platform ecology: A user-centric and relational conceptualization of online platforms

Oliver Ibert<sup>1,2</sup> | Anna Oechslen<sup>1,4</sup> | Alica Repenning<sup>1,3</sup> |  
Suntje Schmidt<sup>1,3</sup> 

<sup>1</sup> Dynamics of Economic Spaces,  
Leibniz-Institute for Research on Society and  
Space, Erkner, Germany

<sup>2</sup> Department of Spatial Transformation and  
Social Research, Brandenburg University of  
Technology Cottbus-Senftenberg, Cottbus,  
Germany

<sup>3</sup> Applied Economic Geography, Humboldt  
Universität zu Berlin, Berlin, Germany

<sup>4</sup> Institute for Anthropological Studies in  
Culture and History, University of Hamburg,  
Hamburg, Germany

## Correspondence

Suntje Schmidt, Leibniz-Institut für Raumbeg-  
zogene Sozialforschung, Flakenstraße 29–31,  
15537 Erkner, Germany.

Email: [suntje.schmidt@leibniz-irs.de](mailto:suntje.schmidt@leibniz-irs.de)

## Abstract

Online platforms provide a technological infrastructure allowing social actors to enact and utilize networks with a global reach. They play important roles as intermediaries and algorithm-based curators of social interaction. This paper addresses two knowledge gaps: First, while a growing number of empirical studies has deepened our insights into the social dynamics characterizing single platforms, little is known about the multiple ways in which users or user groups combine diverse online offers according to their preferences. Second, the empirical focus has mainly been on online interaction. However, in everyday practices, the online is always situated in offline practices. It is thus necessary to understand the complex interdependencies of online and offline spheres. This paper therefore aims to develop an ecological heuristic that positions the user(s) and their practices center stage in the analysis and to elucidate the on/offline opportunity spaces and the affordances and constraints they provide for user agency.

## KEYWORDS

ICT, knowledge networks, networks, network society, transnationalism, transnational social relations

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## INTRODUCTION

Sarah is watching a video on YouTube showing how to play the chords to a song she wants to learn on her guitar. The video description links to a Kickstarter page where the artist hopes to raise enough money to produce her first album. Sarah sends the link to a friend via Facebook Messenger. On her Facebook timeline, she sees an advertisement for a jacket just like the one the artist in the YouTube video was wearing. She clicks on it and subsequently buys the jacket from an online marketplace. It is sent to her by courier service from Spain and reaches her a couple of days later. While waiting for the parcel to arrive, Sarah arranges on WhatsApp to meet with a friend for coffee in the afternoon. In the café, she asks the friend to take a photo of her in the new jacket and immediately uploads it to her Instagram account.

This vignette highlights several aspects of how everyday life interweaves offline activities with online platforms. Although fictitious, the story describes a course of events that could have happened in exactly the way depicted, and which does happen every day in similar ways. It illustrates several important issues related to platform society that are relevant to this paper.

First, online practices and virtual spaces permeate almost every possible aspect of our life. Different platforms are directly interlinked to afford the seamless transition between different functionalities (e.g. from watching a music video to visiting an online shop). A fast-growing number of empirical studies on single platforms (Niederer & van Dijck, 2010 on Wikipedia; Wang, 2016 on Kickstarter; Wachsmuth & Weisler, 2018 on Airbnb) or types of platforms (Graham et al., 2017; Langley & Leyshon, 2017a; Oechslen, 2020) provide deep insight into the complexities and social dynamics characterizing individual functions. Moreover, these studies demonstrate how individual platforms include a magnitude of highly diverse users and user types (Schor et al., 2020) for creating and supporting online communities (Dobusch & Kapeller, 2018). Yet, at the same time, this line of research almost exclusively takes the perspective of platforms and platform providers, their business models, and their attempts to guide users' behaviour through algorithms. Little is yet known, however, on how users or user groups embrace the multiplicity of online platforms and combine selected offerings according to their individual preferences. Users may have a number of alternatives online and may seek advantages gained by a combination of the different online possibilities. Against this background, we understand online platforms as the technical infrastructure of globe-spanning networks of economic production and social interaction. Our particular focus is on platform users and their practices, which actively constitute these networks by utilizing platforms and integrating them into their daily lives. We address this knowledge gap by exploring a user-centric approach to online platforms.

Second, the vignette illustrates that online and offline practices are tightly interwoven. In assessing the new qualities of virtual interaction, the majority of existing empirical work primarily focuses on the new qualities and particular affordances of online interaction (Gillespie, 2010; Langley & Leyshon, 2017b), yet often neglects the offline situation in which users access the virtual world. With this paper, we seek to develop a heuristic to foreground exactly these interdependencies and the choices between different options related to them. Today, the online and the offline no longer represent separate spheres allowing activities to be done in alternative ways. Rather, online content augments the offline world (Graham, 2013), and an increasing number of offline activities are incentivized by online offers. In short, online and offline practices do not just co-exist, they overlap and interact in such complex ways that both spheres actually form an inseparable amalgam. In the remainder of this paper, we use the neologism 'on/offline' to acknowledge exactly such synthetic (Knorr Cetina, 2009) qualities of practices related to online platforms while also acknowledging the frictions involved.

To address these conceptual gaps, the paper employs an ecological terminology, building on previous work that uses a similar terminology to foreground the interrelations between multiple platforms (P. G. Evans & Gawer, 2016; Kenney & Zysman, 2016; Langley & Leyshon, 2017b; van Dijck, 2013), but tends to undervalue the user as a central agent.

An ecology perspective is well suited for focusing on particular agencies – in our case platform users – and for exploring the manifold interactions these focal agencies have with their surrounding environment – in our case – the on/offline opportunity spaces (Leyshon, 2020). The aim of this paper is to unfold the term ‘platform ecology’ as a heuristic that puts user practices and agency centre stage, accentuates the application of different platforms as an integral part of everyday life (Kitchin & Dodge, 2011; van Dijck et al., 2018), and highlights the complexities of on/offline practices.

In the first section, we review the extant literature in order to derive definitions of the paper’s key terms and to carve out the main dimensions of a platform ecology. We highlight fundamental features of platforms and online platforms before introducing related macro-perspectives such as ‘platform economy’, ‘platform capitalism’, and ‘platform society’, from which we distil elements that we consider crucial to our approach. Subsequently, we sketch the main features of a platform ecology: user centrality, the functional interdependency of different platforms, and on/offline opportunity spaces. On this basis, we supplement our conceptual ideas with some stylized, exemplary empirical insights into the complex geography enacted through user practices. We map the platform ecology of a fashion designer and illustrate how her creative work processes make use of the on/offline opportunity space depicted. In the concluding section of the paper, we reflect on the limitations of our approach and point to future research agendas.

## SITUATING THE PLATFORM ECOLOGY

### Platforms and online platforms

Rochet and Tirole (2003) define platforms from an economic perspective as intermediating entities that create two-sided markets with very diverse actors. Examples are shopping malls, which provide a shared space for retailers and consumers, or the advertising section of a newspaper, which connects readers and sellers. These platforms create zones of intermediation to allow heterogeneous entities or agencies to make transactions (Rochet & Tirole, 2003, p. 992). As many platforms connect more than two types of stakeholder, the term ‘two-sided markets’ has recently been replaced by ‘multi-sided markets’ (D. S. Evans & Schmalensee, 2016; Trabucchi & Buganza, 2020). Platforms devote much attention to how they court each side of the respective multi-sided market while gaining an overall revenue (Rochet & Tirole, 2003). Most assets remain in the ownership of the market participants, while the platform itself is little more than the arena in which multiple supplies and demands are matched.

The development of online platforms has brought about significant changes in the spread and character of platform-based businesses. D. S. Evans and Schmalensee (2016, pp. 39–51) point out how digital technologies have catalyzed the development of platform business models since these technologies excel at fast and efficient handling of data, making it easier to connect economic actors in ever more fields of interaction. Online platforms can thus be defined as ‘a programmable digital architecture designed to organize interactions between users’ (van Dijck et al., 2018, p. 4). Airbnb is a prominent example: The platform matches those who own living space with those who need a place to stay and facilitates transactions between them. Like traditional platform business models, online platform organizations own hardly any physical assets. Airbnb owns neither guest rooms nor apartments, nor does it employ service staff such as cleaners or desk clerks. Instead, its main asset is a digital interface that attracts providers of rentable space and travellers alike and that matches and mediates supply and demand. Furthermore, the platform is ‘geared toward the systematic collection, algorithmic processing, circulation, and monetization of user data’ (van Dijck et al., 2018, p. 4), addressing the needs of parties not at all involved in the hospitality end of the business.

Gillespie (2017) argues that the platform metaphor highlights some important contrasts between online and physical platforms while at the same time obfuscating others: The term suggests that platforms are a flat, open surface that enables users to interact on equal terms. In practice, however, most platforms are neither flat nor neutral arenas of interaction. They are primarily designed to serve the interests of the platform organization and thus govern ‘interaction possibilities’ (Srnicsek, 2017, p. 48) equipping them with ‘generative’ (Langley & Leyshon, 2017b) or ‘performative’ (van Dijck, 2013) capabilities that provide unequal access to data, possibilities to upload content, and opportunities to

extract value. As Gillespie (2017) critically points out, the platform metaphor helps providers to disguise their agency when mediating interaction and creating incentives for users to return to their platform. Moreover, the term does not account for the diversity of platform users and obfuscates both the underlying economic interests and the amount of labour and effort necessary to use, build up, and maintain the digital infrastructure.

## Platform economy, platform capitalism, and platform society

The growing role of online platforms has received increasing academic attention from diverse disciplinary perspectives: they are studied by media and communications scholars (Couldry & van Dijck, 2015; Gillespie, 2010), sociologists and political scientists (Kenney & Zysman, 2016), economic geographers (Frenken & Schor, 2017; Graham et al., 2017; Langley & Leyshon, 2017a, 2017b), economists (Parker et al., 2017; Srnicek, 2017), and management studies scholars (Kornberger et al., 2017; Trabucchi & Buganza, 2020). While some authors stress the opportunities presented to businesses and society (Parker et al., 2017), others highlight the detrimental effects of platforms, for example, regarding privacy and data protection (Srnicek, 2017). Moreover, there are various taxonomies and classifications delineating different platform types (P. G. Evans & Gawer, 2016; D. S. Evans & Schmalensee, 2016; Langley & Leyshon, 2017a). From this rich body of studies on online platforms, we consider three main perspectives vital for the heuristic of a platform ecology: *platform economy* (Kenney & Zysman, 2016), *platform capitalism* (Langley & Leyshon, 2017b), and *platform society* (van Dijck et al., 2018).

The terms platform economy (Kenney & Zysman, 2016, p. 61) and platform capitalism (Langley & Leyshon, 2017b; Srnicek, 2017) are used to analyse business practices related to digitally enhanced socio-technological arrangements that act as mediators in multi-sided markets. In these debates, the economic mechanism and impacts of online platforms are of primary concern. Kenney and Zysman (2016), for instance, argue that digital platforms hosted by multinational companies such as Amazon, Etsy, Facebook, Google, Salesforce, or Uber increasingly structure human activities and are thereby radically changing practices of revenue gain, socializing, value creation, and competition at a global scale. Formerly small and novel platform businesses have grown substantially and at incredible speed in recent years to become a much larger part of the global economy (P. G. Evans & Gawer, 2016). While the term platform economy is used with a neutral, analytical gesture, platform capitalism represents a more critically engaged approach. It is meant to counter the frequently euphemistic use of the term 'sharing economy', which tends to disguise the hard-nosed economic motivations of online platform providers (Frenken & Schor, 2017; Gillespie, 2017). Platform capitalism interprets 'the platform' as 'an extractive apparatus for data' (Srnicek, 2017, p. 48) defined by socio-technical features and exploitative business practices (Langley & Leyshon, 2017b).

In their eponymous book, van Dijck et al. (2018) claim that we live in a 'platform society', in which not only economic transactions but most other social activities, too, are increasingly mediated by online platforms. The authors sketch a digitally interconnected world in which online platforms have 'penetrated the heart of societies – affecting institutions, economic transactions, and social and cultural practices' (van Dijck et al., 2018, p. 2). Such a perspective highlights the performative qualities of online platforms, which 'produce the social structures we live in' (van Dijck et al., 2018, p. 3).

Recent discourses on platform economies, platform capitalism, and platform societies also manoeuvre the spatial perspectives of platforms away from online–offline dichotomies and towards a more complex perspective that appreciates their multi-layered interdependencies and agents' increased leeway to act. How these novel practices and spatial constellations are created, used, and integrated into economic and social processes by economic actors has not yet been fully addressed, however.

## Online platforms as socio-technical infrastructures

Star and Ruhleder define infrastructure as 'a fundamentally relational concept' (1996, p. 113) in which technological artifacts are conceived as integral parts of organized social practices. Along these lines, both online platforms and

platform users belong to a complex socio-technical ensemble in which people use technologies for their own purposes while, at the same time, the technology actively shapes interaction (Barns, 2019; Langley & Leyshon, 2017b; van Dijck, 2013, p. 29). Hence, in a platform ecology, agency is distributed between human and non-human actors (van Dijck, 2013, p. 26).

Such distributed agency suggests not only that online and offline spheres are overlapping. Rather, online platforms enable and shape novel socio-spatial practices that from the very outset emerged from a recombination of elements in both spheres. Even if users 'just' post a video online, they physically interact with a platform via an interface and possibly form relations with servers located at some distant location, while content moderators, for example, in East Asia check their upload for prohibited material (Roberts, 2015). Online platforms as infrastructures of distributed agency are rarely restricted to single territories or physical places, but are instead accessible from different locations, spatial contexts, systems of cultural meaning, and institutional norms. This creates considerable ambiguity and enables unprecedented opportunities for strategic and reflective action.

The performative qualities of online platforms are evoked at the technological level through visible interfaces as well as invisible protocols and algorithms. Furthermore, the design of a platform includes an array of things users can do or are prohibited from doing (functionalities) and a range of people that can be accessed (matching). Facebook's protocols, for instance, guide users, often along their preferred pathways. Facebook thus mediates social practices by imposing a veiled logic (van Dijck, 2013, p. 31).

Shifting the perspective towards practices of using and making use of platforms, we can better understand the performative character of platforms and the multifaceted socio-technical as well as socio-spatial assemblages associated with them. This allows for a more user-centred approach towards understanding how platforms and their on/offline practices shape time-spatial economic activities. Furthermore, it allows for a conceptual heuristic of online platforms that acknowledges the diversity of and interplay between platforms engaged within human activities.

## STUDYING ONLINE PLATFORMS AS A USER-CENTERED ECOLOGY

While a large part of the existing research studies platforms from a business or macro-political perspective (Kenney & Zysman, 2016; Parker et al., 2017), we argue for a complementary analytical perspective that focuses on individual users and their practices. This is a crucial departure from the predominance of studies on platforms that focus on the technological features of platforms or their underlying business models, and that thus tend to overlook users and their reflective agency. For the purposes of this paper, we found the works of Gibson (2014), who applies an ecology approach to studying visual perception, particularly interesting. With the term platform ecology, we build on Gibson by putting platform users centre stage in our heuristic and focus on the multiple interrelations they create with their on/offline environments.

Ecology was originally a branch within biology dedicated to studying the relations between species and individual organisms and their physical environments. The application of the term 'ecology' to research fields outside biology has a long tradition. Such 'metaphorical redescription' (Leyshon, 2020) is driven by the desire to provide new insights or deeper understanding by 'drawing similarities between something that is known and something that is not' (Barnes, 1996). Moreover, such redescriptions of widely shared metaphors can also support dialogue between academics and practitioners.

Ideas borrowed from ecology became popular in the field of economics with the increasing interest in innovation, which was seen as a driver of economic development and competition but could no longer be understood well within the framework of equilibrational thinking (Leyshon, 2020). More recently, and located at the intersection of business studies and economic geography, redescriptions of ecological ideas have promoted the study of complexity and interdependency. Here, the term ecosystem, which has experienced a boost most recently within entrepreneurship studies (Stam & Spigel, 2018), is prominently used in approaches to studying complex adaptive systems in a holistic fashion (Cooper, 2011). The term ecology, in contrast, represents a set of bottom-up approaches that focus on a focal set of business

practices, such as temporary organizing ('project ecologies'; Grabher & Ibert, 2011) or financial citizenship ('financial ecologies'; Leyshon, 2020), and is much concerned with the multiple interdependencies these practices enact.

## Ecology perspectives and users

According to van Dijck et al. (2018), in platform-centred studies the term 'user' remains a general one. It incorporates such diverse actors as service and product providers, consumers, content providers, enthusiasts, user communities, and organizations. Against this background, we argue that any empirical application from an ecology perspective has first to specify the user. By putting the user centre stage, we aspire to reduce the term's prevailing vagueness. Yet platform ecologies are not primarily about individual users, but rather about types of users, such as designers, managers, politicians, or tourists – groups of people who share some interests or needs but remain heterogeneous in other ways. By focusing on a specified user group, the vast amount of possible platform applications can be limited to those relevant to the selected user type and their specific needs and practices. Moreover, users can choose from a spectrum of platforms and integrate them into their daily practices at different times and in different combinations (or refuse to do so). Building on the basic premise of user centrality, the concepts of affordances and constraints, on the one hand, and ecological niches, on the other, further elucidate the platform-ecology heuristic.

## Affordances and constraints

Gibson (2014) coined the term 'affordances' in psychology to describe visual perception in relational terms. He argues that humans and animals conceive of their environment based on what possibilities for action it offers or *affords* them: 'I mean by it something that refers to both the environment and the animal in a way that no existing term does. It implies the complementarity of the animal and the environment' (Gibson, 2014, p. 119). Affordances encompass a multitude of possible relationships between actors and their environments. The affordances of a tree, for example, might be shade for a lion but a place to build a nest for a bird. Moreover, these affordances have to be enacted in practice, they require an active and inventive agent to make use of their opportunity. Affordances thus invite social practices to be performed, and means and ends to be connected. Analogously functional features of online platforms are only offerings in this sense. They can be used in many different ways, depending on the predispositions, interests, capabilities, and needs of the users.

Returning to the example from the beginning of this paper, we saw the user take the opportunities provided by different platforms to learn something, to buy something, and to communicate with friends. This implies that the respective user has a desire and ability to consume, create new or maintain existing social relations, and acquire new skills. Moreover, affordances do not include only human–technology relationships, but also user–user interaction or user–platform provider interaction, which involve 'mutual and reciprocal affordances at extremely high levels of behavioural complexity' (Gibson, 2014, pp. 128–129). It is important to note that the meaning of affordances is not restricted to supportive offerings, but encompasses threatening or delimiting aspects, too, depending on the perception and predisposition of the respective users.

Applying Gibson's idea of affordances to human–technology relations, Hutchby (2001) argues that looking at affordances almost automatically implies also looking at their constraints, that is, the limitations inherent in the technological offerings: '[D]ifferent technologies possess different affordances, and these affordances constrain the ways that they can possibly be "written" or "read"' (Hutchby, 2001, p. 447). Within the platform ecology heuristic, this means that the affordances and constraints of a platform together create a structured opportunity space. While predefined categories and default settings on the platform interface afford a range of possibilities for action, at the same time they prevent or impede action beyond the predefined boundaries. Ettlinger (2018) conceptualizes the digital environment as a dynamic socio-technical assemblage that encompasses complex, reciprocal interdependencies between

human actors, such as platform users and designers, and non-human actors, such as software or algorithms. Platforms do not only provide possibilities for action to users but depend on contributions made by users: The value of Airbnb, for instance, comprises not only its mediating of transactions but is also created by users proving information (such as on the area, style, and price of venues offered, or reviews of the service quality).

Through affordances and constraints, platforms shape, but do not determine, what can and cannot be done. In some cases, inventive users might even detect and utilize gaps in the programmable infrastructure to widen their own opportunity space. 'Airline hackers', for example, find ways to reap the benefits of frequent-flyer programs way beyond what was intended by airlines (Zook & Graham, 2018). In a similar vein, platform cooperatives use the technological setup and the matchmaking principles of conventional platforms 'to accommodate digital subjects who have been compromised in the digital economy [...] by self-organizing, pursuing cooperative ownership and democratic governance, and finding ways to self- and crowd-fund to avoid dependence on the venture capital sector' (Ettlinger, 2018, p. 7). However, digital technologies are based upon design decisions made with an intended usage in mind (Nagy & Neff, 2015). Facebook, for instance, lets users select from a range of different gender options and thereby suggests a deliberative, diverse, and non-binary idea of gender, but the underlying heuristic model consists of a hierarchical branch tree of binary distinctions that allows personalized data to be processed for purposes of algorithmic ranking and third-party marketing (Cirucci, 2017). Against this background, Nagy and Neff (2015) speak of 'imagined affordances' to stress the fact that users' perception of technologies is contingent upon prior knowledge and expectations, while the underlying code is not fully accessible.

The proposed platform heuristic acknowledges that platforms and their affordances and constraints are neither static nor neutral and that the practices of platform users can affect the system as a whole. In doing so, users create socio-technical niches.

## Socio-technical niches

Gibson uses the term 'ecological niche' for 'a set of affordances' or 'a setting of environmental features that are suitable for an animal, into which it fits metaphorically' (Gibson, 2014). He derives the concept from its origin in ecology, where a species' niche is defined by the total set of conditions, resources, and interactions it needs (or can make use of). Correspondingly, socio-technical niches encompass all the affordances and constraints that are specific to the needs and interests of the respective user types and usually are distributed across several platforms.

Socio-technical niches vary by user type. A study by Amit and Han (2017), for example, examines how firms create value through resource configurations in a digitally enabled world. Looking at firms' strategic decisions, they illustrate how some firms make use of online platforms as a means to market their products or services and to engage with their customers and partners for co-creational purposes. They find that the combination of respective online resources that a firm mobilizes is highly individual and depends on distinct affordances and needs. Another study of refugees' social-media interactions demonstrates how refugees separated by distance mobilize connections via Instagram, Facebook, and/or WhatsApp to share information, provide support, and exchange resources (Marlowe, 2020).

The ecological niche accentuates the particular conditions and resources an animal needs. The relationship between the animal and its environment is characterized by mutual fit, complementarity, and reciprocity. In socio-technical niches, however, the designed and mediated nature of the environment needs to be taken into account (Nagy & Neff, 2015). In a socio-technical assemblage, niches, too, are dynamic and subject to negotiation. Platform users seek to adapt the digital environment to their needs – to return to the original metaphor, unlike most other animals 'the human animal can alter the affordances of the environment' (Gibson, 2014, p. 135) in intended and unintended ways. Hence, socio-technical niches may provide opportunities for bottom-up agency. We have observed entrepreneurial designers, for instance, who enact new socio-technological niches by including creative content and novel types of connections between existing platforms in their design projects (Repenning & Oechslen, 2021). At the same time, this agency cannot be enacted on a level playing field, as even a reflective agent 'is still the creature of his or her situation'

**TABLE 1** User practices in a relational platform environment

User affordances and constraints	Similar affordances	Different affordances
Resource synergies	Parallel practices Example: Posting the same story on Instagram and Snapchat; using similar content on similar platforms to increase the reach or number of work tasks (Blanche et al., 2019; Schor et al., 2020)	Bridging practices Example: Advertising and interlinking a Kickstarter campaign on Instagram (Wang, 2016); organizing an Airbnb booking via PayPal (Simon, 2013)
Resource mismatches	Parasitic practices Example: Investing time and/or money to establish a profile on multiple courier or other gig platforms (Schor et al., 2020)	Sequential practices Example: "Supplemental earners" use Airbnb for renting out apartments; other work-related or leisure-related platforms for other purposes (Franken & Schor, 2017; Schor et al 2020)

Source: The authors.

(Gibson, 2014, p. 135). Users may thus discover surprising opportunities for action, yet, at the same time, the performative qualities of the underlying socio-technical infrastructure, usually provided by economic actors with their own interests, cannot be circumvented. A socio-technical niche may thus change surprisingly, for example, when platform providers decide to adapt features that are no longer regarded as beneficial to their business.

## Modes of co-existence and interdependence in socio-technical niches

The proposed platform-ecology heuristic builds on existing studies that use an ecology terminology to envisage the 'result of the interconnection of platforms' (van Dijck, 2013, p. 4). Kenney and Zysman (2016), for instance, refer to a 'platform ecosystem' to denote the technical integration of complementary platforms usually orchestrated by large ecosystem integrators. In comparison, the notion of 'platform ecologies' introduced elsewhere (Langley & Leyshon, 2017a; 2017b) describes groups of platforms with similar business logics, such as social-media platforms, online market places, or crowdfunding. While Langley and Leyshon (2017b) provide a universal platform typology from a bird's eye view, we seek to explore socio-technical niche constructions that encompass a multiplicity of on/offline offerings from the user's standpoint. From this perspective, only those platforms appear on the radar that are relevant for a particular user type and her practices as she uses platforms not as separate entities but as offerings within a broader environment of affordances. This implies the option of seamlessly switching between different media offerings based on the match between the user's needs and the platforms' respective affordances. Madianou and Miller (2012) call such environments 'polymedia'.

The platform-ecology heuristic extends this concept in three dimensions. First, we take into account a broader range of possible platform-based activities. This reveals everyday practices to be permeated by platforms, making them relevant for almost all aspects of social and economic life. Second, we acknowledge the designed nature of platforms and thus integrate them as actors in a socio-technical assemblage. Third, we consider different constellations of platform combination practices to explore the unprecedented opportunities provided by the co-existence and interdependence of several platforms (see Table 1).

The most obvious possible means of shifting between platforms is to arrange them for different affordances sequentially (see Table 1), for instance, renting an apartment via Airbnb before going on a business trip, during which the user would then rely on professional social-media platforms such as LinkedIn or Twitter (Frenken & Schor, 2017). In this case, the platforms mentioned are part of the user's practices of connecting platforms that otherwise remain rather disconnected from each other in functional terms.

Platforms with different affordances can be combined in complementary ways to perform one task. We refer to such integration practices as '*bridging*' (see Table 1; Lange & Schmidt, 2021). For instance, an artist may accompany her crowdfunding campaign with simultaneous posts on Facebook or Instagram and thereby try to mobilize followers to support the campaign (Wang, 2016). In other cases, integration is already built into the setup of the platform: booking a room through Airbnb, for instance, includes locating offers on Google Maps and payment via PayPal (Simon, 2013).

Platforms with similar affordances are often used for the same task. Their integration into user practices depends on resource synergies: if their use does not require a lot of resources, such as time or money, platforms are often used in *parallel* (see Table 1). Posting an event on both Twitter and Facebook does not require tremendous extra effort. Users may thus easily reach a wider audience by posting information on both platforms (Belanche et al., 2019).

However, platforms with similar affordances may also compete for scarce resources. In many cases, users have to make significant initial investments before enjoying the benefits of a platform, such as paying membership fees and investing the time and attention required to establish a meaningful user profile. Moreover, platform utilization often requires ongoing effort and continuous, unpaid work to keep multiple accounts updated, attract attention with new content, and to accumulate a reputation on past achievements. For instance, income-oriented crowdwork-ecology workers (e.g., bike couriers, taxi drivers) need to utilize multiple platforms to increase the number of job offers they receive.

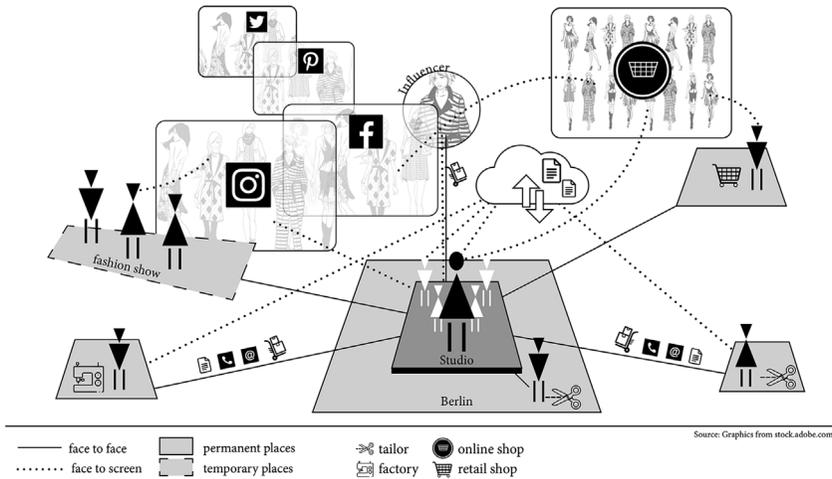
The use of psychological triggers to establish addictive on/offline practices has recently become a widely discussed issue, especially in relations to social-media sites (Cao et al., 2020). Such addictive attachment limits the individual's agency in switching swiftly between offers. Here, platforms with similar affordances compete for users' attention and thus engender *parasitic* dynamics (see Table 1).

## ON/OFFLINE OPPORTUNITY SPACES

From the user's viewpoint, on/offline environments increasingly overlap and create complex entanglements between both spheres. It thus becomes difficult to clearly differentiate between online and offline interactions or to find sequential patterns of shifting between the two domains. With her concept of spatial 'media/tion' Leszczynski (2015) moves beyond the traditional duality of online and offline spaces. She postulates that 'spaces of everyday life are produced at the moments or sites of multiple conjunctions of code, content, social relations, technologies, and space/place' (Leszczynski, 2015, p. 732). Applying the perspective of media/tion, she considers GPS-tagged spatial media, such as Google Maps or Instagram, to actively shape, constrain, and constitute the socio-material environment (Leszczynski, 2015, p. 736).

Social-media platforms play an integral part in organizing users' daily lives to an extent that 'the worlds of online and offline are increasingly interpenetrating' (van Dijck, 2013, p. 4). Along similar lines, Knorr Cetina (2009) advances the concept of *synthetic situations* to emphasize that digital media create situations defined equally by sets of physically co-present people and objects and simultaneous stimuli from the digital world represented, for instance, through projection onto screens. Accordingly, audio-visual stimuli received from online interaction cause emotional, bodily responses offline. Any participation in digital worlds is therefore grounded in the human body and in concrete local situations (Knorr Cetina, 2009). Based on this thinking, Grabher et al. (2018) argue that social interaction is seamlessly and constantly transitioning between 'being aware', characterized as the mutual awareness of social actors who are present either in the same room or online, and 'being there', representing the set of involved actors (and passive bystanders) and objects, consciously perceived or not, that together constitute the local, offline situation.

Our platform-ecology heuristic denotes a relational space of variegated forms of overlapping and intermingling online and offline dimensions. We suggest merging the terms 'online' and 'offline' into the single term 'on/offline' to highlight the inseparability of both elements in every synthetic experience. At the same time, we introduce the slash to acknowledge, too, the remaining incommensurability of both constitutive elements. Despite all technological progress, on/offline is not (and will probably never be) a seamless experience, but one that is ripe with technical frictions, social



**FIGURE 1** Platform ecology: The conceptual understanding of a user-centred perspective. Source: The authors. Graphical realization: Henrika Prochnow

conflict, and sensual and emotional irritation (Vertesi, 2014). Just as 'black/white' is different from 'grey', on/offline thus highlights the fact that synthetic experiences might vary greatly with respect to the proportions in which both aspects are added (creating different metaphorical shades of grey) as well as the means by which they are mixed.

User practices may also take advantage of co-existing and related online and offline practices: Music by one's favourite band might be streamed from an online provider or heard in a live performance at a local concert hall or club. At the same time, the experience of a live concert can be shared with friends via a social-media platform, extending the live performance into an on/offline space. In a comprehensive study of online communities of user innovators, Grabher and Ibert (2014) demonstrate that offline practices (such as wedding photography, tinkering with furniture, or motorbike riding) are inspired by online practices of sharing and co-creating knowledge. Both spheres thus offer distinct affordances, constraints, and forms of accessibility and exist in their own right, but are at the same time closely intertwined. From the perspective of the user and her capability to act within and across virtual as well as physical spaces, the platform ecology represents an on/offline opportunity space.

## EMPIRICAL IMPLICATIONS OF THE PLATFORM ECOLOGY HEURISTIC

What kind of spatial analysis can be undertaken within the framework of platform ecology? To start with, the heuristic can be utilized to map the on/offline opportunity spaces of selected users or user groups. The framework can incorporate any user-type, be it professional designers, teachers, or consumers, yet the focal user group must first be defined. Once a user or user group has been determined, the platform-ecology heuristic will guide data collection to identify the pertinent platforms, typical combinations of platforms, and characteristic overlaps, combinations, fusions, and new constellations of on/offline worlds. In addition, such an empirical strategy seeks to specify the main affordances and constraints of the respective platform ecology, unveiling those structural preconditions that are inscribed into the performative infrastructures that support the respective practices.

Like a situational analysis (Clarke et al., 2018), the on/offline opportunity space can be mapped by examining situated, relational connections between people and places. Figure 1 illustrates the platform ecology of a fashion designer, providing one example of how the platform ecology may be applied to produce a spatial analysis. It is a stylized case, taken from a preliminary analysis of qualitative data collected in semi-structured interviews with fashion designers

in 2019/2020. Though it is far from comprehensive, it gives an impression of the possibilities of empirically exploring platform ecologies.

In this particular case, the focal user (fashion designer) is based in Berlin, where she heads a team of four fashion designers. Their studio is located in a warehouse in the district of Kreuzberg. It provides a large tailor's table, a sewing machine, different fabrics, clothes rails with the current collection, laptops, and a dress form where the designer drapes, forms, or pleats the fabric during work on the latest collection.

The designer works with specialized tailors in Berlin and Italy who prepare the fabric and sew the prototypes. Developing a prototype involves a string of communication, done partly by e-mail or telephone but also including face-to-face meetings. In the course of the process, tailors will also send materials by post. Once prototypes are finished, the designer begins promoting the collection. She cooperates with agencies that provide showrooms throughout fashion weeks in Milan, Paris, Copenhagen, and Oslo, where she travels to present the collection to invited buyers. The detailed sketches, fabric templates, and indications are then sent to Poland, Hungary, Romania, or Italy to be produced in factories according to the orders gained. The production site is typically contacted via e-mail and telephone. Sometimes, the designer visits the production sites as well – especially in the case of a newly established co-operation.

While many stages of the creative work practice are situated in physical, permanent, or temporary places (e.g. in the studio or at fashion shows), a wide array of online interaction connects the fashion designer to multiple online platforms. Interaction here is undertaken face-to-screen. In the designer's everyday situation, traditional communication tools such as the telephone are used alongside platform-mediated interactions. An important platform for the fashion designer is Instagram. As a visual platform, it affords the fashion designer with the opportunity to post and view videos and pictures related to her professional practice. Moreover, it is used to connect with essential gatekeepers in the fashion industry. Pictures or videos on Instagram are often posted in parallel on Facebook. In addition to fashion shows, the designer connects with a network of fashion influencers to whom she sends selected collection pieces that the influencers then post online. The designer describes the online network as a community whose members have never met face-to-face, but which is grounded on mutual assistance. The influencer receives a sample of the coat, the designer gains connections to customers abroad and is supported with marketing photos that are later posted on Instagram. The example indicates how a platform can mediate translocal interactions and connections that stand alongside localized practices such as sending out fabric or taking a photo at a particular location.

In addition, the designers connect their Instagram page and its posts to their online shop in order to sell the advertised products. We previously referred to such synergetic ways of interlinking multiple platforms with different functionalities as 'bridging'. Furthermore, the collections can be bought from traditional retailers located in different European cities while, at the same time, pieces of the collection are sold via online marketplaces. Accordingly, online and offline retails are entangled, and a daily interconnection of local and translocal customers and business partners is usual.

Furthermore, many seemingly local transactions can no longer be understood by investigating face-to-face interaction as physical co-presence only. Even when the designer interacts with a colleague in the same studio, communication is partly mediated by platforms, for instance, when using digital tools such as Google Docs to support collaboration, for example, by clarifying team members' tasks or their status with the intern. Digital technologies orchestrate interaction that takes place between distant actors, play a part in localized interaction in the studio, and lead to the complex spatial entanglement of translocal and local interactions.

Within a broader perspective, prevalent business models in the platform economy (Langley & Leyshon, 2017b) seek to take advantage of brokering positions that mediate formerly local transactions. Despite the spatial spread of value-creating places, only few players in the industry have the capability to extract value, and these players are highly concentrated in very few clusters worldwide, most prominently in Silicon Valley (Zook, 2008). In contrast to the imaginary of a platform as flat, open, and democratic (Gillespie, 2017), global hierarchies, be they formed in terms of wage inequalities (Graham et al., 2017) or reputation (Poorthuis et al., 2020), influence the augmented opportunity space. The fashion designer in our example argues that she could work from anywhere. While being Berlin based, she attends international fashion shows and takes part in an international online community. In these settings, she

downplays her affiliation with Berlin as the city's image does not fit well with her ambition to be perceived as a highly professional designer. On Instagram, she connects to international peers or customers and posts pictures of international fashion shows while constantly feeding the platforms' appetite for data. She thus co-creates value for the platform owners located in Silicon Valley.

The proposed heuristic can also be used for a process-based approach (Ibert et al., 2015) to unveil how actors use perceived and imagined socio-technical affordances and constraints, for instance, to advance creative projects. A time-spatial analysis can thus foreground temporal dynamics, for instance by investigating sequences of shifting between different on/offline settings or combining offerings that are distributed across different platforms. In addition, this view helps to analyse how user practices create new interactions between platforms (Ettlinger, 2018) or enact on/offline constellations that form novel socio-technical niches to support the actors' businesses and interests (Repenning & Oechslen, 2021).

The designer in our example highlights four main steps in her design process. First, she describes how she combines hard facts such as data on last season's sales with soft facts that she describes as accessing 'what is in the air'. To find out about the latter, she recollects how she combines inspiration gained from surfing pertinent Internet sites with observations in her daily life. She outlines how she sequentially and almost seamlessly goes from different Instagram pages to websites and combines them with offline observations made in her neighbourhood or during travels. The platform Pinterest is accessed frequently in this process. It affords different options and is used for different purposes than Instagram or Facebook. For example, the designer uses Pinterest to create 'mood boards' – collages of photos, colours, and graphics – to trigger feedback from the community and to archive the progress of her creative process. In a further step, the designer refers to the process of prototyping. This iterative process goes back and forth between the tailors and designer working on the dress form. During this phase, interactions via post, telephone, and e-mail stand alongside practices of working with the material and vernacular on/offline observations, as depicted above. In a third phase, the collection samples are presented at rounds of fashion shows and through networked marketing on Instagram. These marketing activities enact complex on/offline practices. For instance, when the designer posts a picture from a fashion show on Instagram to build her international image, the local activity is largely motivated by the need to create fresh content for the online representation. Moreover, consumers who attend the fashion show are pointed to the brand's Instagram account. Even though online and offline interactions have individual qualities and affordances, the boundaries between them become blurred, and complex on/offline situations emerge. In the final phase, the production process is orchestrated via e-mail, telephone, and post. Interaction via telephone affords synchronous communication; e-mail arrives instantly, but is often read and answered later. These interactive practices combine different time-spaces. Interaction across time zones adds another layer of time-spatial complexity.

## CONCLUSIONS

In this paper, we have set out to explore online platforms not only as a technical infrastructure for global connectivity, but also as a complex on/offline opportunity space that constitutes a socio-technical context for social actors to enact and utilize networks with a global reach. We unpack the term 'platform ecology' as a heuristic framework to study social practices incorporating online platforms from users' perspectives. This approach foregrounds the integration of digital platforms in everyday practices, highlighting the interdependencies between several platforms as well as the locally situated and embodied nature of online mediated interaction. Moreover, a platform-ecology perspective conceives platform users as social actors possessing agency, albeit of a kind afforded by a programmable technological infrastructure and constrained by power asymmetries that are inscribed into the technological infrastructure. We suggest conceiving the emerging relational geography as an on/offline opportunity space. We identified two strands of possible research that could be guided by the proposed heuristic and illustrated some implications for future research by referring to the stylized example of fashion designers as a focal user group. The first approach is to

map the on/offline opportunity spaces that arise around users and user groups. The second approach takes a process perspective and focuses on new modes of agency afforded and constrained by socio-technical infrastructures.

A platform-ecology heuristic does make some omissions, however. Shifting focus from individual platforms to complexes of multiple, interacting ones entails a trade-off. It studies a broad field of everyday platform applications at the expense of an in-depth analysis of each individual platform involved. Such an endeavour can, however, build upon decades of prior empirical research to better understand the logics of individual platforms and platform types. The more comprehensive view proposed here thus appears to be a logical step forward.

Furthermore, redescribing metaphors from ecology has proven helpful in establishing a user-centric and relational perspective on online platforms, as well as in grasping the socio-technical assemblages of on/offline spaces surrounding platform users. Such redescrptions always run the risk, though, of overstressing the analogies between biological and social systems. One potential blind spot is that ecological thinking possibly goes too far in emphasizing agency. It is thus necessary to depart from biological metaphors when critical reflection on the power relations inscribed in code are at stake, for instance, the asymmetrically distributed capabilities of value extraction, geographically unequal access to platforms, or the emergence of new forms of discrimination. The platform-ecology heuristic is therefore not intended to replace political-economic analyses but needs to be used in a complementary manner alongside and in close dialogue with such approaches.

While we understand the user perspective to be our key contribution to the discourse, it has to be noted that the analysis runs a risk of highlighting 'imagined affordances' (Nagy & Neff, 2015), while important mechanisms might remain obscure. The focus on users' agency accentuates their reflective behaviour, particularly in combining different online offerings to their advantage. It also foregrounds users' assumptions about platform providers' intentions and possibilities. At the same time, though, the strategic behaviour of the provider can only insufficiently be grasped by such an approach. The majority of users are only partly aware of the business models that underlie the platforms they prefer to use or the regional adaptations of the user interface they are familiar with. Similarly, the algorithms that structure the opportunity space are most typically inaccessible to users, particularly as most providers frequently shift algorithms and user conditions. Such problems become even more serious with the emergence of artificial intelligence (AI) technologies that equip platforms with self-learning algorithms. Subconscious, sometimes addictive mechanisms to attach users to particular platforms are also difficult to grasp. Hence, the platform-ecology perspective cannot replace technological, economic, and psychological expertise, but needs to consider viewpoints from other approaches.

We find the platform ecology particularly conducive for exploring two important topics lying beyond the scope of this paper. While we conceptually acknowledge on/offline spheres as having synthetic qualities, the appropriate empirical methods for applying this perspective to different cases remain to be explored. This conceptual framework thus needs to be supplemented with a discussion of approaches to networked-field studies (Lingel, 2017), ethnography for the Internet (Hine, 2015), or other empirical approaches from workplace studies that analyse online and offline practices in an integrated manner (Grabher et al., 2018; Knorr Cetina, 2009). Second, the paper mentions spatial implications inherent in the platform ecology, with a focus on the implications for value capture and value creation, the increasing translocality of interactions and practices, and the connectivity (or lack thereof) of different places. This opens up questions about how the concept of relational space is challenged and extended by the platform ecology and what further spatial implications a platform ecology might pose.

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## ORCID

Suntje Schmidt  <https://orcid.org/0000-0002-4680-5387>

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