What's in a word? Platforms Supporting the Platform Economy

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This paper aspires to develop a deeper understanding of the sharing/collaborative/platform economy, and in particular of the technical mechanisms upon which the digital platforms supporting it are built. In surveying the research literature, the paper identifies a gap between studies from economical, social or socio-technical angles, and presentations of detailed technical solutions. Most cases study larger, 'monotechnological' platforms, rather than local platforms that lend components from several technologies. Almost no literature takes a design perspective. Rooted in Sharing & Caring, an EU COST Action (network), the paper presents work to systematically map out functionalities across domains of the sharing economy. The 145 technical mechanisms we collected illustrate how most platforms are depending on a limited number of functionalities that lack in terms of holding communities together. The paper points to the necessity of a better terminology and concludes by discussing challenges and opportunities for the design of future and more inclusive platforms.

CCS Concepts: • **Human-centered computing** → **Social networking sites**; • **Information systems** → **Web services**;

Additional Key Words and Phrases: Platform economy, sharing, technological platform

1 INTRODUCTION

While there is a lot of ongoing research around the collaborative, sharing, or more generally speaking, platform economy (and related types of communities), there is surprisingly little work addressing the collaborative economy phenomenon from a socio-technical point of view. In particular, there is little work in HCI or CSCW looking at the technology behind existing platforms, why it was defined the way it is, what its impacts are, and what it would mean to offer technology that would support local sharing economies in their cooperative activities. More broadly, there is a consensus in the literature that design knowledge is lacking as regards digital platforms: *"We need design theories that take into account the iterative shaping and redefinition of what is the platform by multiple distributed actors with divergent goals"* [21].

Adopting a socio-technical point of view allows for studying both the social processes and set of governance mechanisms, and the technological architecture constituted of software modules, interfaces, and infrastructure. Following Orlikowski and Iacono [46], we claim that, with CSCW and HCI research, we have the opportunity and responsibility to influence what future is enacted with the technological architecture on which platforms are based. We must then engage with this technological architecture.

Our interest in this technological layer is based on the five premises offered by Orlikowski and Iacono [46] to carefully engage with technological artifacts:

IT is not neutral or universal: IT is shaped by a variety of communities of developers, investors, users, etc.

IT is embedded in time, place, discourse, community;

IT is made up of a multiplicity of components that require bridging, integration and articulation to work together.

IT emerges from practice, it can be used in different ways, adapted, expanded to accommodate different and evolving interests.

IT is dynamic; materials evolve, functions fail, standards are defined.

The current research is part of Sharing & Caring (http://sharingandcaring.eu/about-sharing-and-caring), a COST action (European network funded by the European Commission and the COST association) aiming at developing a European network of actors to discuss and critique elements of the current discourse and offer a richer definition and characterisation of the phenomenon, including the role of technological platforms. Sharing & Caring focuses 'on the development of collaborative economy models and platforms and on social and technological implications of the collaborative economy through a practice-focused approach'. The Action also has the objective of formulating a European research agenda for the socio-technical aspects of the collaborative economy, including specifically the design of future technological platforms, the technical infrastructure, their legal, ethical and financial implications. The action counts members coming from 35 countries, and is organized in four working groups. The first one develops a deeper understanding of the collaborative economy phenomenon through a collection of ethnographic cases. The second one, in which the authors of this paper are involved (the second author leads it), aims to understand the platforms and infrastructures upon which the collaborative economy is built, and suggests ways that platforms may be better utilized. The work presented here is based on the reflections and the collective work conducted in this working group. Whereas the action addresses all kinds of sharing economy initiatives, we aim at understanding the challenges and opportunities for the design and development of future and inclusive platforms while focusing on grassroots initiatives and local communities. Indeed, we are interested in the "development of digitally-mediated technologies that value social cooperation as a common good rather than as a source of revenue and accumulation" [7, p. 256]. In this work, we seek inspiration from e.g. [13, 23], or [6] which discuss the potential of technological platforms for communities.

In our attempt to survey and understand the sharing–or platform–economy from a socio-technical perspective, we have done an extensive search of the literature from areas of Information Systems, Economics, Management Science, Innovation, HCI and CSCW. Adding and grouping 46 papers in Zotero, we learned first of all that this is difficult to do, in particular because most of the literature does not actually tackle the technical side, but rather economics, entrepreneurship, etc. under the headline of platforms (e.g. [30, 35, 47]). At the other end of the spectrum, the technical literature focuses very much on specific technologies such as peer-to-peer architectures or blockchain (e.g. [22, 34, 39]). We found almost no papers that discuss the technological hopes and hindrances of particular communities. We have tried to ask researchers in this field for recommendations without much success either.

However, we have identified a number of central surveys that set the scene for our work. Dillahunt et al. [24] do a careful survey of the sharing economy in the ACM literature (HCI and not). The paper leads to a number of themes that are very general, with *trust* being one such theme that the paper shares also with Sutherland and Jarrahi [52], and Gheitasy et al. [32]. Kenney and Zysman [37], a bit further afield, provide an overview of the economical and employment aspects of the platform economy, discussing various socio-economical settings and cases/examples. Among

their themes are the relationship between the value of these kinds of companies and the value for/income for those who do the job (e.g. Uber).

Gheitasy et al. [32] is a good example of a case study among the many we have found. They discuss online collaborative consumption using the Etsy community as a case. Among their contributions is a heuristic set of questions to ask a community, with a categorization of these heuristics as such. The same goes for Sutherland and Jarrahi [52] who focus on categorizing the characteristics of the digital platforms they have identified in literature into what they call the *"technological affordances which support sharing and collaborative exchange"* (p. 332).

It is, however, often larger, 'monotechnological' platforms that are studied in the wider literature, rather than smaller, local platforms that do perhaps lend components from other technologies and infrastructures. This has the consequence that it is mostly commercially owned and managed platforms that are studied. Since our interest in the current paper is oriented towards the practices of everyday activity in sharing economy communities, and their everyday use of possibly several technologies, it is not part of this paper to discuss alternative business models, but rather that the main contribution is to *map out what design possibilities communities may have*. By doing so, we contribute to the ongoing critique of platform capitalism and its sharing economy narrative, questioning the commodification of collaboration [3], and engaging in building platforms for a caring economy that values cooperation as an emancipatory practice [7].

The remainder of the paper is organized as follows: First, we acknowledge the need for further conceptualization of the term "platform", and take position. Then, we present the systematic approach that we have followed when studying existing platforms. By comparing our results to the existing literature, we identify gaps that we discuss further, in order to finally identify how a collection of functionalities could be used to inform the practitioners and designers about the design space when working with communities and technologies. By design space we mean the possibilities and constraints caused by the different technologies.

2 PLATFORMS: A NEED FOR FURTHER CONCEPTUALIZATION

In the discussion of the sharing/collaborative/platform economy, the term "platform" is usually used broadly in the sense of *"a set of digital frameworks for social and marketplace interactions"*, which *"organize and structure economic and social activity."* [37].

In this understanding, platforms serve as mediators for sharing goods and providing services, and they provide mechanisms such as payment or reputation management to support these transactions: For instance, Airbnb or Uber allow people to broker flats or rides and the platform acts as an intermediary between users (consumers and producers) of services.

However, these definitions have not been very helpful in our attempt to address the technologies involved. When looking at existing platforms, we started to use the term "platform" when talking about the technological basis, infrastructure or functionality underlying a particular sharing economy community, but we soon acknowledged that this was less straightforward and our quest for useful definitions started. From a technical point of view, a platform might be understood as a framework of libraries, services and APIs on which new services can be built. Examples would be Android as a generic mobile platform for building Apps, or Amazon Web Services as a back-end for building cloud-based services. For instance, Gazawhnez and Helfriedsson [31] quote Tiwana et al. [54, p. 676] and refer to software platforms as *"the extensible codebase of a software-based system that provides core functionality shared by the modules that interoperate with it and the interfaces through which they operate"*.

In Information Systems and other socio-technical literature, definitions are supplementary and slightly less technical. For instance [53] define digital infrastructures as: *"the constitutive information technologies and organizational structures, along with the related services and facilities necessary for an enterprise or industry to function"* (p. 1324).

While the latter part of this points to the usefulness of also considering organizational and other elements, it seems to also point to more formal organizations, which is less appropriate for our community cases. Nonetheless, the definition also points to a distinction between digital and non-digital platforms, the latter being called sometimes, confusingly, technological platforms. These elements are indeed also relevant for our cases, in which e.g. community members make use of particular places to meet, in addition to which communities make use of a variety of technical infrastructures, from roads and heating, to money and other forms of payment.

The definition of technological platforms for the sharing or platform economy is hence different from what is considered a platform in most technological definitions, leading us to the title of this paper, and to a wish to refine and discuss the definitions in this overlapping field.

We realize, however, that sharing economy communities are in essence quite different when it comes to how they are technologically supported: For some, the community comes first and one or several technologies are meshed together to support the joint activities of the community. This is true when particular communities organize themselves through e.g. Facebook (groups). Or when others combine Facebook with Google docs and email distribution lists (e.g. the local organic food community case below). Other forms of communities are entirely bound to a particular technological platform: For instance, the Wikipedia community developing and using Wikipedia, or food recirculation happening mainly through Toogoodtogo, or ridesharing through blablacar, and the like. For these, the purpose of the community and the functionality of the platform are deeply interwoven. For the purpose of our study, we adopt a broader understanding of platforms as **mediators** that provide certain functionalities for communities around the sharing of digital or physical goods.

3 A SYSTEMATIC TECHNICAL ANALYSIS OF EXISTING PLATFORMS FOR THE COLLABORATIVE ECONOMY

With the above analyses of technologies and other platforms, based on the literature we have surveyed, we move on with presenting our alternative way of studying existing platforms. Contrary to what we have seen so far in the literature, we decided to systematically collect features of existing platforms (big and smaller) across various domains impacted by the collaborative economy. By this exploratory approach, we are aiming at an understanding of how the platforms function, mapping out what means of interaction they offer (the functionalities that those platforms share), how those functionalities are implemented in the particular cases we studied (the mechanisms of the platforms), and what consequences this might have for the communities that are using them. Our ultimate interest (driven by the aims of the COST action) is to create a catalogue of functionalities and mechanisms that helps communities to better reflect their options and make design decisions towards improving their technical infrastructures, where groups of features can be explored as alternatives and possible means of achieving a certain objective. When building this catalog listing mechanisms grouped by the functionalities they provide, we aim at better understanding the state of the technology and identifying patterns as well as areas for future research. Since our interest is oriented towards the practices of everyday activity in local communities, and their everyday use of possibly several technologies, we foresee the result of our analysis as useful to support a local community in exploring the design space and making design decisions.

Our approach is close to existing work from the literature that is interested in design patterns as building blocks for software development processes. The concept has been inspired by works from architecture, where buildings show

structural similarities that are shared across various implementations (see [2]). Those patterns have gained a fair deal of interest within Software Engineering communities, especially the field of software architectures [50], but also within more design oriented works within CSCW/HCI on how to design community support within Groupware applications [42, 51].

By working our way from concrete mechanisms found in various case studies towards higher levels of functionalities, and by providing links between generic concepts and different forms of implementations, our catalogue is supposed to serve as a boundary object between community members and designers in a similar way as design patterns (see e.g. [41]). However, the content is less focused on informing architectural decisions and re-use of code and modules, but rather meant to serve as an end-user design toolkit for empowering communities to reflect on their tools and find possible future directions [28]. Thus, the identified patterns generally remain on a higher level as compared to similar works [42][1]

In order to help the reader understand the domains and challenges that we have been working on, we present below a couple of examples of local communities with whom we are involved.

Local organic food community is active in the Danish city of Aarhus, where it organizes local, organic food items. Members can order a bag of vegetables and eggs via the community who is in touch with local farmers [12, 14]. The 900 members are mostly people in their 20's to 40's. The community was originally organized by two women with inspiration from a similar community in Copenhagen, and after having been in contact with a couple of local farmers following recommendations of getting 'a farmer, a place and at least 20 members' ([12]). This community is depending on a number of web platforms that change over time. Its members are dependent on the technical insight and support of various volunteer members, who often pull the technical solutions in particular directions independent of the more long term needs and wishes of the community.

UTT Covoit' ("covoiturage" is the French term for ridesharing) is a ridesharing initiative launched by Ulisse, a student association of UTT, in Troyes, France, gathering students identifying themselves as sharing values such as solidarity, ecology, and ethics who conduct actions locally and internationally. The ridesharing initiative focuses on daily rides from the Campus to the city center, so that students who are driving back home could pick up other students, lessen their carbon-print and share their expenses. Ulisse has managed to obtain a "ridesharing shelter" outside the students' common room, where students who need a ride can wait just outside the parking space where students with a car pass are passing when going out of the parking. The shelter is a first step, but not sufficient for the initiative to be a success.

3.1 Method

In the collective work of the COST Action Sharing & Caring, we established a catalog of mechanisms and functionalities. This was based on our proposed definitions of functionalities as general types of interaction that a platform provides for specific purposes and mechanisms, as more specifically describing how a functionality is implemented in particular ways. These definitions were made collectively during the kick-off meeting of our working group, during which we also decided that, for the collection of the mechanisms, we would use Agorae, an online tool dedicated for social tagging of items with multiple viewpoints [18]. Then, during one year and a half (May 2018 - November 2020), we alternated face to face and remote activities in order to build the catalog. The face to face activities took the form of five workshops

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[1]A similar approach could be seen in the case of Design Patterns for Hacker Spaces that have been collected by the Chaos Computer Club, see https://wiki.hackerspaces.org/Design_Patterns, but that have a less technical focus.

gathering fifteen people and lasting five hours on average. Figure 1 depicts the main activities and decisions that took place during these face to face workshops.
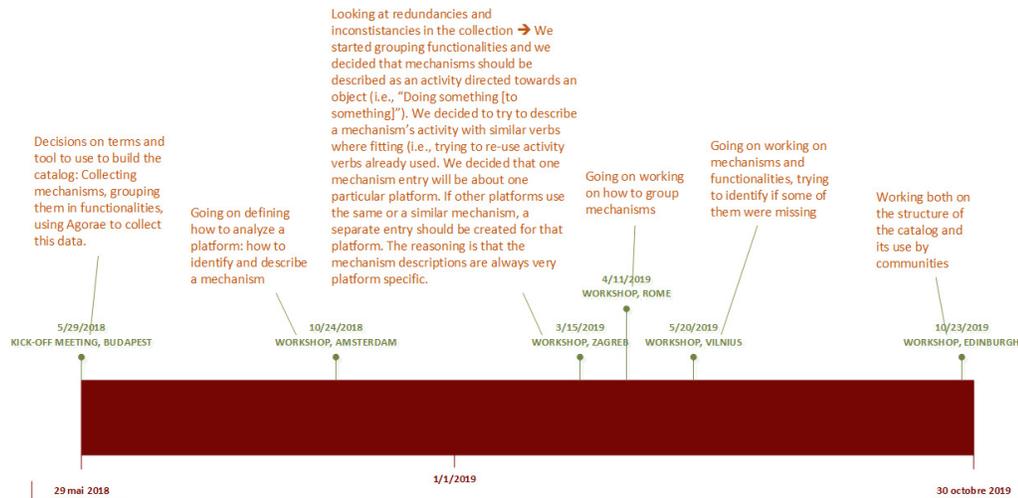

Fig. 1. Timeline of the collective building of the catalog

The online Agorae tool allowed us to collectively collect mechanisms and to organize them by tagging them according to different topics, or points of view. Figure 2 is a montage of the different parts of the user interface of Agorae and the way we used it. We followed a systematic approach: Looking at platforms one at a time in all their different parts, and listing every action a user could perform. For all these actions, we identified the mechanisms embedded in the platform, grouping them in functionalities. Mechanisms were described as activities, which most of the time are also directed towards an object (i.e., "Doing something [to something]"). By collecting and grouping mechanisms across different platforms, we identified sixteen recurrent functionalities, each of which being implemented by different mechanisms. For instance: Rating can be done by giving stars, giving marks, or by liking (three different mechanisms). In figure 2, we see in the top left corner that when entering the online catalog (*the corpus*), we can decide to access directly the 145 mechanisms (*items*), or to access one of the categorizations (*topics*) of these mechanisms (here the functionalities).

This collection of mechanisms grouped into functionalities was built from the perspective of consumers and producers of the platforms, not from platform owners or other stakeholders, which means that we did not deal with underlying "invisible" mechanisms and functionalities related to collecting and making use of data, for instance. Whereas technological mechanisms could be identified at different levels, e.g. features of a system, interface elements, software modules, infrastructure, data management, and even the interfaces between different systems, we focused on features and interface elements. Our approach was also explorative in the way that we did not select platforms to study beforehand, but worked iteratively, extending our analysis until we reached theoretical saturation as a collaborative approach within our project. Our intention was to get an understanding of the technological mechanisms that support the platforms, to identify if some functionalities were more prominent than others, and if they were implemented in very diverse ways or not. As we will discuss later in the paper, we also envision that the tool could serve as a design resource for other researchers, as well as for practitioners and developers.
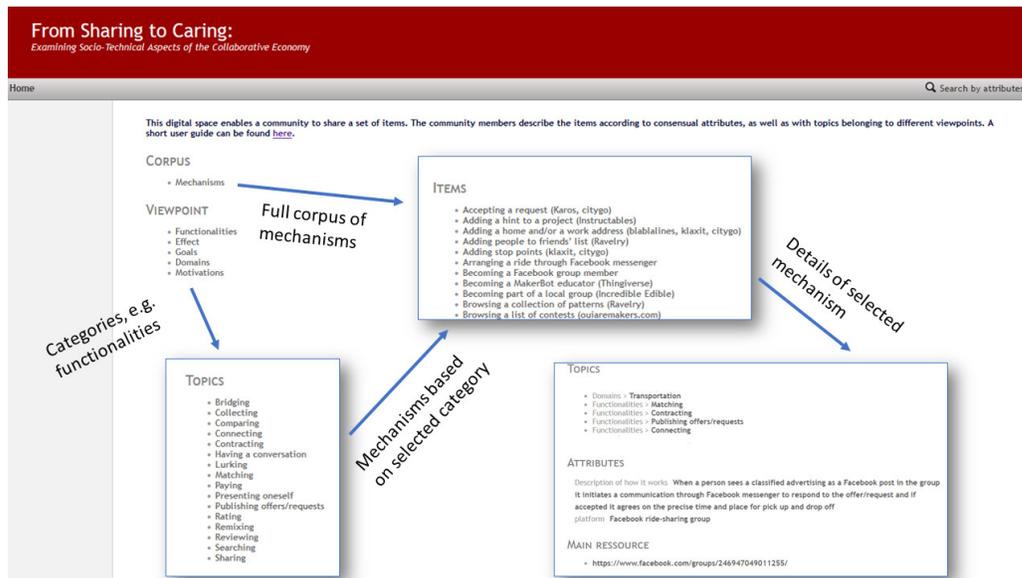
Fig. 2. Our catalog offers different viewpoints on the corpus of collected mechanisms based on categories such as functionalities or goals.

3.2 Functionalities

We collected 145 technical mechanisms identified in platforms operating in six domains: Citizen science, food, making/DIY, short-term accommodation, second-hand goods, and transportation. Each mechanism was described, and tagged to indicate its domain and the functionality(ies) it supports. For instance:

Mechanism: Browsing tutorials
Description: Tutorials are organized by groups (technology, deco, Art&Craft, Beauty, Cooking, DIY, outdoor, ...), with the most popular ones coming first.
Platform: ouiaremakers.com
Domain: Making/DIY
Functionality: Lurking

As showed in Figure 1, the list of functionalities was created step by step, by tagging mechanisms with existing functionalities and adding a new one when no one was fitting. Following this process, we were able to identify 16 functionalities: *Bridging, Collecting, Comparing, Connecting, Contracting, Having a conversation, Lurking, Matching, Paying, Presenting oneself, Publishing offers/requests, Rating, Remixing, Reviewing, Searching, Sharing.*

Presenting oneself gathers all the mechanisms related to the enrolment of a new user. Some mechanisms include an identity check (to verify that you really live in a specific neighborhood, or that you are using a real identity for instance), and some mechanisms allow the users to decide which part of their personal identity they would like to disclose (for instance, a user of a second-hand products platform has to indicate an address and a phone number but could decide to disclose publicly only the email address).

Connecting gathers all the mechanisms that allow several users of the platform to connect to each other: it could be becoming a member of a forum, or adding several stop points to a ride so that more people can join it.

Having a conversation gathers all the mechanisms that allow a conversation to actually take place (whereas "connecting" created the possibility to have a conversation): posting a message on a forum, chatting, sending a private message, …

Lurking gathers the numerous features that allow a (logged in or anonymous) user to have a look at what is available in the platform without engaging in a conversation or a transaction: browsing available places, looking at existing local shops, …

Publishing offers/requests gathers all the mechanisms through which the match between peer producers' offers and peer consumers' requests will be made: the description of the offers and the requests, whether they are plans, rides, food, job …

Matching gathers the mechanisms that allow users to find services/items/places that match their locations (for instance all the places where you can borrow a tool in your neighborhood), or their "preferences" (for instance all the patterns that are close to the patterns you are used to looking for). In the latter, the matching mechanisms resemble recomender ones.

Searching gathers all the mechanisms that allow a user to indicate criteria to look for specific items in the platform: it could be searching for helpers, projects to contribute to, hosts, and/or filter a list of items by preferences. The mechanisms can support location-based, criteria-based, or text-based search.

Collecting gathers all the mechanisms that allow a user to collect "things" on the platform: Selecting a group of people and identifying them as a pool of helpers, selecting different tutorials under a certain theme in order to be able to see them later on, …

Comparing gathers the mechanisms that allow a user to compare offers, prices, products.

Contracting gathers the mechanisms that support a transaction. We mainly saw this functionality in the transportation domain, for instance accepting a request for a ride, as in many of the platforms in other domains, transactions are finalized face to face. The mechanisms support the transaction from the beginning to the end (including payment), including the potential modification of the first agreement.

Paying gathers all the mechanisms that allow a user to pay a transaction online, whereas this transaction concerns a service (for instance a ride), products that will be delivered (materials from a partner vendor to make a product), or products that will be picked up (vegetables from local farmers that are chosen and paid online but collected in a local place). It could also be a tip that you give a producer of the platform (a tip to a designer for instance).

Rating gathers the mechanisms that allow a user to assess an item: rating a service by giving stars, voting for one entry in an online contest, liking a comment / a post / a drawing, …

Reviewing gathers the mechanisms that allow users to give feedback to a service that was provided offline or to an entry in the platform. For instance, it could be ways of writing a review about a stay or a ride, or reviews on a shared tutorial, pattern, …

Sharing gathers the mechanisms that allow users to share things on the platform that are not offers or requests: for instance sharing a tutorial, adding collected data when participating in a citizen-science project.

Remixing gathers the mechanisms that allow users to post a new version of an existing item on the platform. We mainly observed these mechanisms in the Making/DIY domain in which users could customize an existing model, or could comment a tutorial by suggesting alternative ways of doing.

Bridging gathers the mechanisms that allow users to communicate about activities of the platform to outsiders of the platform; for instance when a user shares a tutorial on social networks.

3.3 A Catalog of Functionalities as a Design Space

Going back to the two example cases that we presented above, we now describe their existing use of technology, showing the functionalities this diverse technology supports, and identifying the issues these communities are facing. By doing so, we aim at showing how a catalog of functionalities may be useful to support the local communities in defining the technological support they need to support their activity.

The local organic food community first decided to copy the wiki (wikispaces combined with Google Drive) and procedures of the organic food community from another Danish city (for overview of different stages of different uses of technology, see [12]). This provided the main means for *searching* (for activities/work groups to engage with), for *connecting* (becoming member), for *having a conversation* (both within working groups and with new members), and for *matching* (work tasks with members).

They also created a Facebook page which helped *connecting* with both members and farmers. Various attempts were made to handle email distribution lists, for better control over *having a conversation* (both within working groups and among members), for *matching* (work tasks with members) and for *sharing* of information regarding the foods and cooking inspiration.

The community moved away from the wiki, because they needed a stronger separation of members and non-members who could be *lurking* in all parts of the community wiki.

Paying food items (described in detail in [12]) has been an item for negotiation and practical concern for much of the community lifetime: Handling cash provided one set of problems, credit cards (on the web or when picking up food) had other challenges and expenses, which is why ultimately a cheap phone-based payment scheme, secured by banks came in handy and was combined with a webshop.

A community webpage had been a (largely unfulfilled) wish and desire, and under constant development throughout the lifespan of the community, in the hands of several different volunteer web developers with numerous Content Management Systems problems in tow. The frustrations show in [12]: *"The fact that the first website was hosted on a server owned by the volunteer member who created the website, and the fact that this member eventually lost interested in the community, led to frustrations and resorting to hacks and workarounds."* This particular community is in other words depending on a number of CMSs that they make do with and change over time.

We can only speculate, but one way of breaking away from this idea that eventually a webpage would solve all problems [12] could be by systematically exploring the catalog of functionalities, and in this manner being able to ask questions of how to do things by borrowing from other platforms, even if they are not organizing local foods, but e.g. perhaps citizen science projects.

In order to ensure trust and reach more students, **UTT Covoit'** started to organize the trips beforehand through a Facebook page where students can *connect* with each other, some *publishing their offers*, and the others indicating their interests. In order to reach students who are not on Facebook (*bridging*), a paper-based table and a hanging pen is taped on the wall outside the students' room. This table includes cells for students to *present themselves* (name, phone number, short message). UTT Covoit' is thinking of sharing a digital version of this sheet on GoogleSheet to offer a better structure and less spam than the Facebook page, and so that students can *search* for rides without having to come to the students' room.

The student in charge of this initiative would like to offer an app developed by other students in order to help (in her words) "establishing a ridesharing culture", and be able to expand the experience to other universities. She thinks it is important that the app is developed by students so that they have ownership of their tool, and she thinks it will be an incentive to use it, which is why they have decided to not use an existing app.

However, she would need support to define and develop the app, as students are already overwhelmed by their mandatory projects, and each semester they move out of the university, either for a training period or studying abroad. Hence, it is hard to envision a project team that would last longer than a semester. She was very interested in the possibility to have access to examples of existing features for short-distance ridesharing in order to get inspiration.

This discussion on the potential use of a catalog of functionalities to support the design of a platform for a local community obviously needs more empirical work to be pursued. This is an ongoing work taking place in the framework of the COST Action Sharing & Caring around several cases (farmers, makers, food sharing and ride sharing) where working group 2 aims at understanding 'the challenges and opportunities for the design and development of future and inclusive platforms'. We envision this future work in the following way: The catalog presents a set of design patterns in the sense of pattern-oriented development processes [42, 51] but aimed at a higher level that is more easily accessible for practitioners as 'meta designers' of their own technical infrastructures [28], showing some examples of implemented mechanisms for each functionality (illustrated with screenshots for instance), the possibility for members of these local initiatives to navigate these functionalities, and to select the ones that seem pertinent for their situation. This is how this online catalog could support the identification and the narrowing of the design space for the technology supporting the particular local initiative. By enabling members to understand the available technology, they may act as *bricoleurs* [16], building their infrastructure.

However, for the moment this catalog only reflects existing platforms, and if we envision to use it to inform practitioners and designers about the design space, we need to figure out if this empirical collection is covering all the potential aspects of the sharing economy or if some were overlooked. The next section is therefore dedicated to the comparison of this empirical work with the different characteristics of platforms for the sharing economy communities identified in the literature surveys we mentioned above. In particular, we decided to analyse the results of our collective work on the identification of the core functionalities of platforms through the results of the extensive literature review (435 publications from 10 research areas) conducted by Sutherland and Jarrahi [52], who define 'technology' in the sharing economy *"by describing its emergence from interactions with humans strategies and goals"* (p. 332).

4   PLATFORMS AS MEDIATORS OF COMMUNITIES - WHAT DO OR DON'T THEY?

Facing the mix of terminology and practices, Sutherland and Jarrahi [52] use the term "sharing economy mediator" as to point to specific technologies that mediate interactions that serve the sharing economy. They also use the term affordances to point to a series of interim-level functionalities that these mediators have and that they serve to their users. The choice of the term affordances is theirs. While the affordance concept has been discussed in HCI from Gaver [29] and Norman [44] (see also [4, 48]), to Houben and Bardram [5], it is not a very central concept in the current setting and our interest is, with Sutherland and Jarrahi [52], to pursue the ways actors envision their relationship with the platform(s) in order to achieve their sharing and collaborative exchange: Generating flexibility, match-making, extending reach, managing transactions, trust building, facilitating collectivity.

> **Generating flexibility** describes how platforms provide access to resources, and if this is possible in a rapid, ad-hoc fashion, or not. It also means flexibility in terms of roles that participants can take in contributing (from

consumers to producers for instance). This is also related to workers' flexibility and the potential negative impacts of functionality pushing people to work at certain times.

Match-making refers to how platforms bring participants together, based on their needs and offers. It usually refers to functionalities such as algorithmic assignments, as well as means for filtering, evaluating or searching. It also covers the reputation systems based on profile representations of the platforms' members.

Extending reach is related to scale (reaching more people and reaching across distance) and network effect. It is concerned with the depth of the platform in terms of how many resources can be accessed, internally or by reference to external connections. It thus also describes the heterogeneity of the provided resources and peers.

Managing transactions describes how well a platform supports the logistics of exchanging goods and services, for instance by providing means of payment, insurance or security, and if the platform also serves as a bookkeeper for transactions, or even as a digital workspace.

Trust building refers to functionalities of a platform for cultivating confidence between peers, usually by providing legitimacy systems that help participants in building trust with each other as well as the platform, either by technical features (rating, reviews) or by means of policies (deanonymization, code of conduct). It also refers to the trust in the platform, in particular trust in the searching and matching algorithms that usually lack transparency.

Facilitating collectivity is concerned with the role of platforms for community building. Social capital plays an important role here, as well as connections with social movements and providing a feeling of collective action among the participants. The only digital feature mentioned in this category is badge systems that can encourage people to participate in causes.

Sutherland and Jarrahi [52] were mainly concerned about the way affordances can provide dimensions along which to define a model of mediation: From top-down centralized platforms such as Uber of Mechanical Turk that manage the whole transaction process between people who do not know each other, to decentralized mediators in which platforms–that tend to be non-profit–do not support transactions, but only offer match-making services in order for participants to reach others (usually belonging to an existing community). Sutherland and Jarrahi have identified that the decentralized model of mediation is considerably less studied, which is aligned with our observation that literature often focuses on large capitalist platforms that tend to automate interactions and transactions, whereas we are more interested in local communities which can also benefit from platforms to support their sharing and collaborative activities (see the two examples we described earlier).

As we are aiming at supporting these local communities in exploring the design space for supporting their collaborative activities, we found it useful to map digital platforms (from [52]) and the functionalities we identified empirically by looking at existing platforms. This mapping (table 1) is an attempt to identify existing functionalities and potentially discover design opportunities to support local communities.

Table 1 shows how the functionalities that we have identified and outlined above can be mapped into the dimensions identified in [52]. Here, we identify that most of the functionalities support accessing resources, and managing transactions, including the match-making step and trust building, whereas none supports **collectivity**, and few mechanisms support is **extending reach**.

Going back to the cases we presented above, *extending reach* is a strategy that we can notice in the two communities: The local organic food community was a copy/paste from a similar local community, and the Uni association aims at spreading the Uni experience in a lot of universities in France. However, it is not clear how any digital infrastructure could support this extending strategy.

Affordances	Notes	Functionalities
Flexibility	Ways of accessing resources.	Connecting, Searching, Sharing, Lurking, Remixing
Match Making	Ways of bringing people together.	Publishing offers/requests, Collecting, Comparing, Matching
Extending Reach	Ways of reaching more people and reaching across distance.	Bridging
Transaction Management	Ways of supporting the logistics of exchanging goods and services	Publishing offers/requests, Contracting, Paying
Trust Building	Ways of cultivating confidence between peers.	Presenting oneself, Rating, Reviewing, Having a conversation
Collectivity	Ways of building and sustaining the community.	-

Table 1. Affordances identified in [52] (left) mapped to identified functionalities (see section 3.2) (right).

In the local organic food community, *collectivity* is very tied to meetings on Thursdays where members pick up their groceries, and the working groups are in function. In a way, this weekly time and place is where *presenting oneself*, and *having a conversation* happen, but with a physical dimension in mind that is not covered well by the current mechanisms in the catalog, even though such could be added. However, many members are not particularly caring about collectivity as such: A bit bold, they want cheap, organic foods and do not take the duties they are supposed to (helping a particular number of Thursdays). For key members to 'police' this, it seems that the community would need a much more organized and structured form of membership. As a matter of fact, it seems there could be room for further consideration regarding boundary 'control' and entrance barriers for new members, e.g. also such as verified identity of members instead of e.g. (random) Facebook names, or for that matter up-front member fees. A different perspective on *collectivity* is the one offered by the Ulisse association: The association is facing a situation where students are committed and active, but for a short period of time: as their studies are organized in semesters, including studying abroad and internships, they may only be present on site 15 weeks in a row. Therefore, defining functioning rules, structuring their activities and roles, and maintaining involvement, would benefit from a digital infrastructure also supporting this collectivity, and not only the access to resources and transactions.

In this section, we compared our empirical work in the form of a catalog of existing functionalities of platforms for the sharing economy (see section 3) with affordances of mediation of platforms for the sharing economy identified in the literature. By doing so, we identified two affordances that seem to be missing in the platforms that we studied in different domains: *Extending reach* and *collectivity*. As showed when discussing our two cases, local communities would benefit from features helping them to reach more members (or people in general), and to build and sustain their collective. This observation ties in with the work on community-oriented technologies from Cabitza et al [17] that identified specific design principles for "conviviality", and in the work from Bassetti et al [7] that raises the importance of supporting relational and social values when designing for autonomous cooperation ("cooperation that has not (yet?) been disciplined by capital and that can point to forms of social change" p. 258). In the next section, we are building on the gap that we identified and discuss what it would mean to particularly support collectivity.

5 DISCUSSION - SUPPORTING COLLECTIVITY

Collectivity highlights a sense of belonging together within communities as well as of shared values. It is based on a shared identity and interests [27] and can result from experiences of *collective effervescence* in the sense of an elated

feeling of togetherness in collective experiences (see [25]). While the literature highlights collectivity as an important aspect of the sharing economy phenomenon [52], we hardly found any mechanisms and functionalities in our survey of existing platforms that explicitly support communities in collectivitization into larger social movements. While arguably some of the identified mechanisms support aspects of collectivity implicitly (such as building trust and enabling participation), the 'social' aspect of the participation is something that often is not directly enhanced by the design (see for example [43]).

On the one hand, this could be a consequence of a certain focus on the transactions that are enabled by the platforms and their main purpose, from an economic perspective. On the other hand, it might be reasoned that the aspect of collectivity is an inherent property of the technology, which enables social interactions and thus a feeling of participation just by providing free access and matchmaking functionalities (in a way, early examples of community platforms such as Lee Felsenstein's "Community Memory" from the 1970s where targeted at enhancing collectively just by allowing people to interact with each other digitally, see [26]).

Looking at smaller sharing communities, as we have done in the examples above, shows that such communities are dependent on a certain level of pre-existing trust and social capital, and benefit from their local focus. However, when such communities attempt to scale beyond the level of a very basic technological platform, this might not work as well. Also, in the light of the wish to establish sharing communities as a more sustainable alternative to classical models of consumerism, driven by more altruistic and community-driven motives rather than profit-oriented ones, there is the argument to be made that supporting collectivity should be a central premise. This is something that is still lacking in current implementations, at least from a design perspective—or sometimes even explicitly hindered, as the example of Mechanical Turkers starting their own platforms to self-organize illustrates [55].

As examples from the literature on distributed collaboration show, collectivity is not easily supported and obtained by digital means (see [1, 8, 45]). At the same time, there can be different sides to collectivity, that need to be taken into account and adapted to the context. As the long-standing discussion of "social capital" as network ties of *"goodwill, mutual support, shared language, shared norms, social trust and a sense of mutual obligation that people can derive value from"* [36] has shown, such concepts can be paradoxical and contradictory: On the one hand, social capital can be seen as an asset, a sort of "social glue" holding together communities, thus promoting cooperative behavior in general [20, 49]. On the other hand, it can also exclude people from access in the first place, and even become a liability if it hinders open discourse about divergent ideas [9].

As we have stated in the introduction, we would argue that HCI and CSCW are especially equipped to contribute towards this aim of getting from sharing to caring. Caring can be seen as the way *"people relate to and shape their own tools, shape and are shaped by their objects of care at the interface level, and co-create/negotiate meanings on the surface of the artifacts"* [15, p. 122].

Praxeological approaches [38, 56] as well as interactionist perspectives [46], that are sensitive to the multi-perspectivity, historic [10] and sometimes contradictory nature of socio-technical systems [40], offer a solid foundation for the attempt to design for collectivity. They are acknowledging the inherent contradictions and challenges of this endeavour, while drawing from a rich pool of socio-technical design studies that could be a useful resource for communities, for instance serving as illustrating examples in our catalogue. In our future work, we envision the role of a *facilitator* [11, 33] who would present the catalog to communities' members, who could then identify recurring functionalities, and define the pieces that they would like to assemble, in a *logic of bricolage* [16].

6 CONCLUSION

With attention to the gap between studies from economical, social or socio-technical angles, and presentations of detailed technical solutions found in the literature, we have presented the work to systematically map out functionalities across domains of the sharing economy. The 145 collected technical mechanisms illustrate how most platforms are depending on a limited number of functionalities that lack in terms of holding communities together.

Where most literature cases study larger, 'monotechnological' platforms, we participated in the few researches that focus on small-scale platforms, discussing examples of local communities that have needs for platforms that borrow components from several technologies. We have illustrated how a catalog of existing functionalities may be used in designing such platforms with the involved communities.

However, there are also downsides of compiling an overview of functionalities and mechanisms based on available example technologies. We have found the catalog to focus too much on transactions for the needs of the discussed cases when comparing the catalog with other frameworks. In particular, the cases, and we suspect many other bottom-up, local communities, need better support for collectivity when they work to design their technological platform. Hence support for collectivity is needed in the catalog, and as such both the catalog and the way we address parts of it needs extending.

Hence, the paper points to the necessity of a better terminology for ways of grouping functionalities, and in particular to address that platforms are many things and that we may need to distinguish between the platform economy, the sharing economy that is often focusing on viable businesses (for somebody), and the bottom-up communities that we discuss in the cases, that belong more specifically in the area of the *caring* economy and platform collectivism, that "regulates direct peer-to-peer collective activity and enables emergent local social structures" [19], p. 280.

With an improved catalog, we believe that communities will be able to make batter use of the technological possibilities that are there, without becoming 'monotechnological.' It is however part of future work to develop design methods that help communities activate the catalog in this manner.

This also leaves a quite speculative challenge to those building technological platforms, namely to make them more open to be appropriated by communities, and to recognize that support for collectivity is needed as many communities are developed that are not primarily in it 'for the money'.

What's in a word? Platforms Supporting the Platform Economy

NordiCHI '20, October 25–29, 2020, Tallinn, Estonia

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