CONTEMPORARY COMMONS: SHARING AND MANAGING COMMON-POOL RESOURCES IN THE 21ST CENTURY

ANNA ŠESTÁKOVÁ, JANA PLICHTOVÁ

Abstract: In her groundbreaking work, Elinor Ostrom suggested that communities are able to self-organize and develop rules which allow them to effectively manage common-pool resources while avoiding the “tragedy of the commons”, as proposed by Hardin. Based on empirical case studies of how forests, irrigation, grazing land and fisheries are organized all over the world, Ostrom suggested several principles that can serve as guidelines for managing common-pool resources. In the 21st century new initiatives have been based on sharing. There are various examples such as car and bike sharing in cities, internet platforms such as Wikipedia, community gardens and many others. There is a reason to believe that these efforts will continue to grow and become more popular as people realize the economic, social and ecological benefits. The aim of this paper is to analyse to what extent Ostrom’s findings are relevant to these new, often urbanised or digitalised forms of sharing. Can the famous design principles for which she won the Nobel prize be applied or do we need to search for a different set of principles that are more suitable for these new emerging forms of ‘the commons’? Our findings suggest that although Ostrom’s framework needs to be adapted before being applied to the reality of urban and digitalised environments, some of her findings remain relevant.

Key words: sharing; shared economy; collaborative economy; the commons; design principles; Elinor Ostrom

Introduction

In the 21st century, there have been many social, economic and environmental changes. Environmental concerns are changing attitudes to consumption, while technology opens up new possibilities for the creation of more sustainable economic models. This process is manifested in social practices that are largely based on sharing. They have various names and labels: the sharing economy, collaborative consumption, consumer participation and access-based consumption, to name a few (Mittendorf, 2017). According to Botsman (2013), the sharing economy is an economic model based on the sharing, swapping and trading of services and products. Of course, practices such as sharing, collaboration, reciprocity or gift-giving are hardly new. In fact, they define humans as social beings and have likely contributed to the survival of humankind throughout history.
But what does sharing really mean? In the broader sense, the *Oxford Dictionary* defines sharing as using, possessing or enjoying something jointly with others\(^1\). Sharing, as a social process, is not prosocial out of necessity (Davies, Donald, Gray, & Knox-Hayes, 2017). What is dominant in this definition—they say—is the primacy of acting or using in conjunction with others, or experiencing things or feelings with others. In the *Cambridge English Dictionary* (2017), the sharing economy is described as an economic system based on people sharing possessions and services, either for free or for payment, usually organised and mediated through the internet. The reason behind this is to achieve the optimal use of resources and reinforce social networks.

It is clear that the sharing economy is a broad term referring to a wide range of activities. Davies et al. (2017) distinguish between transactional or transformational sharing, where transactional activities are mostly profit-oriented and aimed at increasing the efficiency of a system, while transformational activities try to alter power relations and redistribute resources. While transformational sharing may also incorporate efficiency-seeking practices, it is more concerned with social justice and the development of social capital and social bonds. The sharing economy is strongly associated with the use of digital technology, so much so that some authors speak about a ‘digital platform economy’ or just a ‘platform economy’ (Kenney & Zysman, 2016).

To further illustrate the diversity of the different types, we borrow the typology presented in Davies et al. (2017). They suggest that there is a ‘matrix of sharing’ (Table 1) with different modes of sharing (gifts, barters, reciprocity, selling) and different organisational forms of sharing (for-profit, not for-profit, social enterprise, collective, co-op, association). Table 1 shows how sharing economy platforms can be organised in different ways: as for-profit corporations, for-benefit organisations, charities, cooperatives and community groups or through informal networks.

**Diverse examples of the shared economy—what are the impacts?**

Although these innovations are becoming increasingly popular, they are still quite new. A lot of them are designed for urban environments and rely heavily on the use of modern technology. For example, Drivenow is a paid car-sharing service in Berlin where users can book any of the cars randomly distributed throughout the city. Services such as Swapstyle or ReSecond help users to swap unwanted clothes (Hamari, Sjöklint, & Ukkonen, 2015). Airbnb is a platform connecting people who want to rent a place with those looking for someone to rent to. There are also many examples of bikesharing, where the user can use a bike for a small fee paid online. Wikipedia, currently the biggest and most popular encyclopaedia in the world, shares knowledge and information created by tens of thousands of contributors.

The existing evidence on the social and environmental impacts is mixed. Some studies claim that sharing activities have benefits for the environment as well as for the lower strata of the society (Smorto, 2016). Creating a system based on letting people use someone else’s under-utilised resources means that they no longer need to buy

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1. https://en.oxforddictionaries.com/definition/share
Table 1.

<table>
<thead>
<tr>
<th>Organisational form</th>
<th>For profit: commercial ventures which seek to create a financial profit</th>
<th>Social enterprise: organisations that seek to create good with trade</th>
<th>Co-op: organisations that are owned and governed by their members</th>
<th>Charity: not-for profit: registered charities and nonprofits</th>
<th>Association: formal clubs, associations and networks that require membership</th>
<th>Informal: no formal structure or membership requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mode of sharing</td>
<td>Collecting: (for e.g. food rescue)</td>
<td>Gifting: stuff, skills or spaces given for free</td>
<td>Bartering: stuff, skills and spaces are swapped without money</td>
<td>Borrowing: using stuff without the need or ability to buy it</td>
<td>Selling: (NFP) exchanging or renting stuff, skills, spaces for money but not for profit</td>
<td>Selling: (FP) exchanging or renting stuff, skills, spaces for money and for profit</td>
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</table>

Note. Davies et al. (2017) (edited by the authors of this paper)

The sharing economy is seen as a means to avoid over-consumption and pollution while providing access to resources for the less well-off, the poor, people with disabilities and low-income communities. On the other hand, studies have also shown that the majority of customers and users of the shared economy are young, well-educated and have good IT skills (ING Bank, 2015). Many of these platforms require internet access and ownership of a smartphone, not to mention a certain skill level. Combined with the fact that these practices often remain largely unregulated, sharing platforms are accused of discriminating between customers (for example, Uber drivers might take only the richer city districts). Some scholars worry that these new opportunities will only be open to an elite of digitally connected young citizens, excluding the rest (Rauch & Schleicher, 2015).
Sharing economy as the new ‘commons’

Even though some of these practices might be useful, it is still unclear what is needed for them to work and to survive the test of time. Before we dive deeper into this topic, we need to clarify what ‘the commons’ really means and how it is related to sharing. According to Smichowski (2016), for a common to exist, there must be:
1. a shared resource (material or immaterial);
2. rights and rules that specify how the resource is shared between the commoners which can be rooted in a legal property regime (contract law, patent law, copyright law, etc.) or in customary law;
3. a governance system for the resource which assures respect of the rights and obligations of the commoners and outsiders.

Making a resource a common means that it is shared and nonexclusive. However, it does not automatically imply shared ownership (Erickson & Sørensen, 2016). Sharing platforms are often based on access to ownership rather than common ownership. According to Davies et al. (2017), modern commons do not consist of shared resources only, but also of environmental spaces and products. Lan, Ma, Zhu, Mangalagiu, & Thornton (2017) add services to this list. There is some confusion between scholars whether a ‘commons’ has to be entirely self-governed. Even though it is not a necessary condition (see the above-mentioned definition by Smichowski (2016), many of the sharing initiatives are highly decentralised and depend on strong user self-organisation. Of course, the opportunity to self-organise means that the survival of the system is based on the rules the actors are able to create and follow. Even if the rules are not created by the consumers/users, it is well-known that property which is not privately owned is vulnerable to theft, vandalism and free-riding (Hardin, 1968).

This problem was most famously described in Hardin’s essay “The Tragedy of the Commons” (1968). He argued that rationally acting individuals will always try to maximise their own benefit. It is in their best interest to use as much of the resource as possible. Hardin was convinced that all of the actors will think this way and so, inevitably, the capacity of the land will be exceeded and the resource destroyed by overuse. Rational individualistic behaviour thus leads to irrational group behaviour, with a tragic outcome for all. If this is so, what is needed to create a system that will last and how can these forms of misbehaviour and system abuse be eradicated?

To answer these questions, we must return to the work of Elinor Ostrom, the only female Nobel prize winner in economics. The question that Ostrom poses is what factors will most likely lead to a solution to the common-pool problems and what factors are likely to hinder it. To find the answer, Ostrom and her colleagues conducted empirical research which was—according to many—extraordinary in scope, depth and significance. This research resulted in a large database of case studies including diverse cases from, for instance, the USA (irrigation arrangements in California, fisheries in Maine), Nigeria, Nepal, Indonesia, the Philippines, Japan, Bolivia, Australia, Mexico, Spain, Poland, Switzerland and Sweden (Ostrom, Chang, Pennington, & Tarko, 2012).

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What she found out is that although it is not possible to identify concrete rules that could be applied to different settings, there were certain basic guidelines—so-called design principles—which characterized the majority of the successful, ‘robust’ institutions. By contrast, fragile institutions tended to be characterized by only some of these design principles. Failed institutions were characterized by very few of these principles (Ostrom, 1997). Some of the successful communities were able to manage their common resources for a very long period of time. For example, the Valencian irrigation system in Spain is more than 1,000 years old. The mountain-grazing institutions in Switzerland extend back to the thirteenth century (Ostrom, 1994). The successful cases not only survived droughts, floods, wars and so on but also major economic and political changes. So what made this possible?

The 8 design principles

The principles identified by Ostrom and her colleagues are as follows (Ostrom, 1990; 1994; 1997; 1998; 2007) (Table 2). The first principle is that the boundaries of the common resource and those who are allowed to use it should be clearly defined. Without it, the resource will be fully open to ‘outsiders’, meaning that any benefits of the collective efforts could be accessed by those who did not contribute. If the benefits are of a high value, the resource itself faces the risk of being destroyed very quickly.

Second, unless the number of individuals involved is so small that they do not affect each other while using the resource, rules need to be put in place about when, how and how much the resource can be used by those authorised to do so. The rules must be well adapted to local conditions and considered fair and legitimate by the participants themselves.

Third, if the rules are supposed to be considered legitimate by all, the users should be able to participate in creating and modifying them. According to Ostrom (1990), rules can be based on a legal system or an informal practice where the community creates informal rules without help from the legislator.

Fourth, compliance with the rules is monitored, often by the users themselves. Agreement on the rules does not guarantee that users will follow them, especially when strong temptations are present. Cheating can quickly lead to the collapse of the whole system since the cheater gains disproportionate benefits at the expense of the others. In such a case, the best strategy is to stop collaborating and also cheat. Since no one wants to be ‘the sucker’, cheating that is not punished is especially dangerous to the survival of the management of common-pool resources.

Fifth, observed cheating behaviour should be punished. The punishment does not need to be extremely harsh. Graduated sanctions (depending on the seriousness of the offense) work best. They are sufficient to show the deal-breakers that their behaviour did not go unnoticed and if continued will be followed by more serious actions. Repeated rule breakers are eventually excluded from the group. The sanctions can come from other users or from officials.

Sixth, the users have access to arenas for discussion and conflict resolution. Ostrom’s empirical work showed that while rules are often unambiguous in theory, this is rarely the case in reality. If the disagreements are not resolved, then the actors may lose their willingness to follow them, simply because the others interpret the rules in a different way.
Seventh, there should at least be minimal recognition of the right of the actors to organise from the external authorities (e.g. the government). Otherwise, the local system of rules can be overturned by the external government.

The eighth principle, of so-called nested enterprises, is applicable to larger resources. All the activities in common-pool resources including appropriation, monitoring, conflict resolution and sanctions are often organised in multiple layers of nested enterprises. The smaller problems should be resolved in smaller groups while the externalities from one group to others can be addressed in larger organisational settings.

Ostrom’s work has shown the importance of communication, reputation and trust for successful collective action. Communication is crucial because it allows individuals to make promises to one another and potentially build trust that others will reciprocate. Trust means believing that others will behave a certain way before the situation happens. When people keep promises, they have an opportunity to develop a reputation as being trustworthy. From an evolutionary point of view, trustworthiness and reputation in human societies is a valuable asset. Trustworthy individuals can engage in mutually productive social exchanges, as long as they limit their interactions to those with a reputation for keeping promises (Ostrom, 1998).

### Table 2.

<table>
<thead>
<tr>
<th>The design principles</th>
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<tbody>
<tr>
<td>1. The resource has clearly defined boundaries.</td>
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<tr>
<td>2. Use and provision of the resource is adapted to local conditions.</td>
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<tr>
<td>3. Rules and decisions are made through collective choice arrangements that allow most resource users to participate.</td>
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<td>4. Rules are enforced through monitoring by monitors accountable to the users.</td>
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<tr>
<td>5. Violation of community rules is punished with graduated sanctions.</td>
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<tr>
<td>6. Conflict and issues are resolved through low-cost and accessible conflict resolution mechanisms.</td>
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<td>7. The right of resource users to govern is recognised by higher level authorities.</td>
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<td>8. In the case of larger common-pool resources—rules are organised and enforced through multiple layers of nested enterprises.</td>
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Note. Ostrom (1990)

No matter how useful when managing natural common-pool resources, it is still unclear whether these principles can be applied to the activities of a shared economy. Moreover, the practices of sharing are so diverse that it is not possible to analyse them as a whole. Therefore, we will focus our attention on one example. We have chosen bikesharing as it is often cited as an example of a popular sharing practice. While not self-governed, it follows the criteria of a ‘digital platform economy’ since it takes place in the urban and digitalised
environment. Bikesharing was chosen in part because of the interest and attention it has attracted in both the mainstream and social media but also because of the problems that followed its instalment. We pay special attention to these problems in our analysis and suggest some improvements based on Ostrom’s findings.

The case of bikesharing in Bratislava

In Bratislava, a bikesharing service called “Slovnaft BAjk” was launched in September 2018. The project is a result of cooperation between city officials and a private company (Slovnaft). The idea was borrowed from the many existing bikesharing schemes all around the world. Like many of them, Bratislava’s bikesharing is based on a system of docking stations. Users pay for the service through an online platform. After payment has been made, the user receives a PIN code to unlock the bike. The price is intentionally low – one euro for an unlimited number of rides under 30 minutes. If the ride takes more than 30 minutes, a few cents will be deducted from the user’s credit. However, it is possible to continue using the bike for free, if the user brings it to the docking station within 30 minutes. Every bicycle contains a GPS system which makes it possible to localise it in cases of theft.

In spite of local government authority claims of success after the initial launch, a quick overview of published articles and social media discussions tells a different story. Aside from the fact that the roads in Bratislava are not generally suitable for bicycles (which makes riding them very dangerous), people complain about the dock stations being empty\(^4\) and the bicycles being damaged or stolen\(^5\) (activists recorded that at least a quarter of all the bicycles in the existing stations were either not working, broken or missing). Users often complain about the non-intuitive website as well as the lack of easy access through smartphones\(^6\).

A common problem is the locking system – some users do not lock the bike properly making it impossible for other users to borrow it. On social media, some people complained that other users do not return the bikes within the 30 minute limit. They park them in the docking station so they can take them again and continue cycling for free. This complaint is especially interesting considering the company itself suggests such practices on its website. Some users, however, deem this kind of behaviour to be damaging to the idea of ‘sharing’. We consider this a sign of an informal rule developing which contradicts the formal rules of the providers.

Application of design principles

Let us begin by saying that there are obvious differences between the cases that Ostrom studied and most contemporary sharing practices. The communities she studied were often small-to-medium groups. For example, most of the farmers in Nepal were relatively culturally homogeneous, with similar preferences. On the other hand, activities such as car or bikesharing take place in urban environments with culturally heterogeneous and diverse


\(^5\) https://bratislava.sme.sk/c/20909987/bikesharing-v-bratislave-niektore-bicykle-poskodili.html

groups. Digital commons such as Wikipedia and other online communities are potentially open to users with even more diverse cultural backgrounds. It is important to keep in mind that the smaller the population of resource users, the easier it will be to detect people who are abusing the rules. Similarly, a culturally homogeneous and relatively stable community where people have strong social ties is less likely to suffer from free-riding and opportunistic behaviour (Ostrom, 2007).

Secondly, in Ostrom’s case studies, the users’ livelihoods often depended on preserving the resource. Bikesharing, carsharing, clothes swapping, community gardens and digital libraries can be extremely useful for many but it is difficult to imagine how anyone’s life could depend on their existence. However, their relevance may vary for different groups of people (for example, those who do not own a bike will value the bikesharing service much more than those who do).

Both of these findings relate to the first principle of establishing clear boundaries between those who can use the resource and ‘outsiders’. Unlike natural resources, the entrance barriers are kept intentionally low in the sharing activities (Bradley & Pargman, 2017). For example, bikesharing is very cheap (one euro for an unlimited number of rides). In online communities, the only thing the users need do is sign up. Initiatives such as community gardening, bike repair workshops and co-working spaces are often welcoming and open to strangers. Even though there are groups that have much stricter rules of access (e.g. online groups involved in digital piracy or file sharing, such as The Pirate Bay), we can conclude that in most cases, entering (and of course, exiting) the system is much easier in today’s sharing activities. The principle of setting clear and strict boundaries contradicts the philosophy of sharing, which is about trying to democratise access to resources.

It should be noted that the resource itself has different characteristics. Considering its human-made nature, the units are not replaced by natural forces (like trees in the forest or fish in a lake). Furthermore, in the case of natural resources, the water used by one farmer or the fish caught by one fisherman cannot be used or caught by another. A bicycle used by one person cannot be used simultaneously by another, but it does not disappear (unless destroyed or stolen). However, since the number of units (bikes) is limited, the way they are used affects other users—hence the complaints about the small number of bikes in the streets and undisciplined users who do not park them properly or use them once the time limit is up. An even more interesting case is Wikipedia, since it does not really matter how many visitors ‘use’ the knowledge. In fact, new users can become editors and also contribute, thus increasing the volume of content (although the quality may potentially suffer) (Hess & Ostrom, 2005).

The second and third principle concerns matching the rules to the local conditions and making sure that those affected by them can participate in modifying the rules. We consider both of these principles relevant to bikesharing. Models that work in one country need not work in the same way in a different cultural environment. The second principle may not be relevant to those sharing practices with a global reach, such as the aforementioned Wikipedia, since the sharing does not take place in the physical setting of one country.

The relevance of the third principle is especially interesting. Many of the sharing economy practices do not rely on the users themselves creating the rules. Instead, the initiators are mostly those who create the rules—the board in Wikipedia’s case, the
owners of the Uber and Taxify platforms, administrators in online communities and so on. According to Bradley and Pargman (2017), it is typical for sharing practices to have two distinct groups of members: contributors (or ‘managers’, e.g. volunteers, hosts, providers, editors) and ordinary users. The providers are the ones offering the product or service (often through a digital platform) which is then consumed by ordinary users.

The fourth and fifth principles deal with monitoring and sanctions and are very relevant to bikesharing. Bratislava’s bikesharing users complain all over social media about theft, vandalism and improper behaviour. So much so that the company appealed to its users not to use the bikes in a way that damages them7. Ostrom’s findings show that effective monitoring is crucial in any situation where the benefits of one user depend on the behaviour of others. We are convinced that frequent misuse of the service is related to the fact that, for the most part, it is not effectively monitored. As Ostrom stated, monitoring by the users themselves can be especially effective while not being costly. There is also empirical evidence that the users are willing to engage in monitoring behaviour despite the costs (Ostrom, 1997). The company realises this, since they asked users to report any form of misbehaviour on their website. However, a lot of users complain that officials do not react sufficiently or in a timely manner.

The fifth principle is based on the fact that gradual sanctions are most effective. Online communities/platforms acknowledge this rule by warning problematic users several times before deactivating their accounts. However, many informal initiatives do not apply any sanctions at all (Bradley & Pargman, 2017). As far as we know, sanctions are rare in the case of bikesharing. Since monitoring is basically useless without sanctions, a more effective (and possibly graduated) system of sanctions could be recommended (see the recommendations section).

The sixth and seventh principles (providing a low-cost means of resolving disputes, making sure that the system is respected by outside authorities) would be relevant if there was a set of informal rules besides the formal, official ones. The only informal rule that we noticed on social media—riding for free long after the 30 minute period is over—is frowned upon by some users even though the formal rules on the official website suggest this behaviour to users. However, there is a high probability that this would change if the number of bikes increased. The eighth principle concerns nested enterprises and could be relevant to sharing in the sense that many sharing practices and efforts are in fact ‘nested’ within the local government and its institutions. Our analysis is briefly summarised in Table 3.

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### Table 3.
The application of Ostrom’s principles to bikesharing and other sharing initiatives

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>The resource has clearly defined boundaries.</td>
<td>Relatively applicable – more recent sharing activities are more easily accessed.</td>
</tr>
<tr>
<td>2.</td>
<td>Use and provision of the resource is adapted to local conditions.</td>
<td>Relatively applicable – very relevant to local, ‘physical’ sharing activities such as bikesharing, not relevant to digital sharing such as Wikipedia.</td>
</tr>
<tr>
<td>3.</td>
<td>Rules and decisions are made via collective choice that allows most resource users to participate.</td>
<td>Relatively applicable - sharing practices have two distinct groups of members; contributors and ordinary users. Rules are often made by the contributors/providers; however, there are often informal rules in the community.</td>
</tr>
<tr>
<td>4.</td>
<td>Rules are enforced through monitoring by monitors accountable to the users.</td>
<td>Relevant. A system where monitoring is performed by the users could be very useful in the bikesharing scheme. Monitoring is also necessary in online communities. However, there are initiatives where it is of less importance, for example co-working spaces.</td>
</tr>
<tr>
<td>5.</td>
<td>Violation of community rules is punished by graduated sanctions.</td>
<td>Relevant since users of sharing systems are prone to abuse rules or misbehave. For example, online platforms acknowledge this rule by warning problematic users before deactivating their accounts. It is less relevant to informal sharing initiatives which often do not apply any sanctions at all.</td>
</tr>
<tr>
<td>6.</td>
<td>Conflicts are resolved through low-cost and accessible conflict resolution mechanisms.</td>
<td>Relatively applicable – only useful for those initiatives that are self-governed (the rules are made by the participants – see also principle number 3). Many urban sharing practices, including bikesharing, are not entirely self-governed since the number and heterogeneity of users would make the conditions for such an arrangement very difficult.</td>
</tr>
<tr>
<td>7.</td>
<td>The right of resource users to govern is recognised by higher level authorities.</td>
<td>Relevant for those sharing practices that are self-governed (see also principle number 3 and 6).</td>
</tr>
<tr>
<td>8.</td>
<td>Rules are organised through nested enterprises.</td>
<td>Relevant—many sharing practices and efforts are ‘nested’ in the local government and its institutions.</td>
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### Recommendations

In this section, we offer some suggestions for improving the bikesharing scheme. This system is not self-governed, nor should it be. The number and heterogeneity of users would make the conditions for such an arrangement very difficult and costly. Government regulation or private ownership is more likely to be effective in contexts where there are no clear resource boundaries, and where there is a large-scale, highly mobile and diverse
population of resource users. Ostrom stated that purely self-governed resource systems are extremely rare in modern societies. Many of the most successful models that she cites are in fact ‘mixed regimes’ (Ostrom, 1990).

However, a more active role could be given to participants. Overall, some scholars suggest that the practices of the sharing economy will require more active participation from both potential users and affected citizens. According to Smorto (2016), the self-governing capacity of the platforms could be encouraged while leaving the main responsibility for regulation and sanctions to municipal authorities. As studies have shown, the users of Bratislava’s bikesharing scheme are willing to engage in monitoring behaviour; in fact, they do so without any kind of government incentive. Needless to say, if city officials do not respond to these efforts, users will probably stop wasting their time and energy. Many projects and institutions have failed because few rewards go to those who take on the burden of trying to improve the system, while those who free-ride or break the rules benefit the most.

Ostrom’s framework recognises that even though humans are not purely rational, they respond to incentives. Her findings on the importance of reputation and trust are also relevant here. There is evidence that reputation works well in online platform systems. For example, simple trust systems based on seller feedback work well on several e-commerce websites, such as eBay (Hamari et al., 2015). Smichowski (2016) argues that a good digital reputation opens the door to peer-to-peer relations with other users that may be harder or impossible to achieve if the reputation is bad. Since reputation creates trust, it is a condition on which many sharing economy business models rely: for example, people would not trust strangers with their apartments or their cars if they did not have a reliable platform telling them the interested person has a reputation that makes them trustworthy.

In the case of bikesharing, an online platform could be created where registered users received symbolic rewards for reporting issues to officials (e.g. free tickets to city events, since the service is already cheap). Users who engage the most in monitoring behaviour could build up a reputation in the bikesharing online community. When comparing existing bikesharing schemes all over the world, we found there was a very similar system already in use in China (Lan et al., 2017). To incentivise users into helping, a Chinese bikesharing service called Mobike implemented a credit-scoring system for user self-regulation and to report on the violation of rules by users. The credit scheme rewards good sharing behaviour, such as photographing and reporting broken bikes, and punishes bad sharing behaviour, such as inappropriate parking. Moreover, every registered user is given 100 Mobike credits initially but if the user’s credit is reduced (for rule violation) to less than 80, they have to pay more for the service. Alternatively, a user who enhances the system by reporting broken or incorrectly parked bikes may earn credits above 100 to put towards the price of future rentals. By making the system more similar to the ‘collaborative commons’ through user value co-creation, it was possible to strengthen behaviours that helped both the company and consumer community and the sharing improved (Lan et al., 2017).

**Conclusion and directions for future research**

In this paper, we attempted to apply Ostrom’s principles for common-pool resources management to urban and digital sharing practices, specifically to a bikesharing service
in Bratislava. For many reasons, Ostrom’s findings cannot be used in the same way as they were in the management of natural resources. Our analysis suggests that Ostrom’s framework needs to be adapted before being applied to the reality of urban and digitalised environments. Moreover, existing forms of sharing are so diverse that it does not seem possible to create a modified set of principles that would be equally useful to all cases. Any attempt to formulate or adapt the design principles to the 21st century urban commons must differentiate between different types of sharing.

Further research should provide a comparative assessment of their social, economic and environmental impacts as well as their advantages and disadvantages in diverse cultural, political and socioeconomic contexts. Many of these initiatives are still new and have not yet been affected by problems nor undergone crises. There is still a lot we need to learn about the social dynamics that lie behind their development, success or failure. Considering the fact that sharing practices could be improved if participants were to take on a more active role, it is important to know which factors influence user willingness to contribute. Future research should try to describe how passive service receivers could be transformed into active value co-creators. Quantitative research should provide answers about the role and relationships between different variables such as trust, reputation, self-efficacy and the motivations of the providers and users of a shared economy. Longitudinal studies could be used to study how user motivation to follow the rules changes over time. Lastly, qualitative research should include a comparative analysis of the long-term success and failure of sharing initiatives and determine the obstacles and barriers to a better performance.

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Institute of Applied Psychology,
Faculty of Social and Economic Sciences,
Comenius University in Bratislava,
Mlynské luhy 4,
821 05 Bratislava,
Slovakia
Email: sestakova.anka@gmail.com
Email: jana.plichtova@fses.uniba.sk