
RESEARCH ARTICLE

Urban Commons in Active Mobility Experiences

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Our study focuses on the challenges facing sustainable urban mobility in the megacity of Sao Paulo. We aim to explore the panorama of active mobility initiatives, proposing to analyze the relationship between urban commons and innovation in public services. We selected the Reduced Speed Zone and Complete Street initiatives, which aim to improve road safety conditions (public services focused on common infrastructure), active mobility and access to public transport, and may also potentially help to reduce noise levels, improve air quality (social dilemmas/common issues/negative externalities) and reduce greenhouse gas emissions (global commons). Based on an analytical model for interpreting innovation in services, considering competences and techniques originating from the provider (municipal government) and users (through civil society organizations), our findings identified innovations at a local level within infrastructure treatment for pedestrians. These public services were introduced in a participatory process and a collective re-appropriation of urban space. The projects contribute to the development of service provider competences, related to various interactions with civil society, resulting in a systemic view with regard to the uses, local dynamics and behavioral aspects of the users themselves. Service provider techniques may be both temporary and permanent intervention methodologies, besides methodologies for project impact evaluations. These techniques are associated with tactical urbanism as a technique for temporary urban interventions. User techniques were identified for application of the propensity score-matching method, which aims to evaluate the impacts of an instance of intervention through the comparison of groups, as well as through technical inspections and local interviews. The relationship management generated relational and organizational competences for civil society organizations. However, despite the advances indicated by the analyzed experiences of active mobility – highlighting the role of civil society organizations – and by some progress made in the regulatory framework, innovative practices have been restricted to the treatment of infrastructure for pedestrians, a change of speed limit for vehicles, and horizontal signaling to mark the perimeter of these areas. Therefore, there is a large-scale potential for the continued introduction of innovations regarding the improvement and scale gains of public services for pedestrian mobility, promoting participatory restructuring as a form of (re)appropriation of urban public spaces by its own users, improving the current negative externalities and social costs of urban mobility.

Keywords: Infrastructure Commons; Urban Public Spaces; Innovation; Services; Active Mobility

1 Introduction

Hardin (1968) initiated the debate on the “tragedy of the commons”, arguing that common resources are subject to overuse and destruction, drawing attention to the selfish character of human activity, based on its civilizing and cultural processes. Despite its great scientific and political impact, his work has received criticism for the perceived over-simplicity of its thesis, which assumes that users of natural resources are limited to acting out of mere selfishness, which makes it impossible for them to create collective solutions (Ostrom, 1990). Kornberger and Borch (2015) draw attention to the limits of Hardin and Ostrom’s similar views on the notion of commons when applied to the city, emphasizing different governance mechanisms, in various contexts of political and social frameworks. They simultaneously propose to readdress commons discussions, however, utilizing them in the urban context, in order to reflect upon cities and commons.

More recently, a broadening of the debate has included an understanding of the notion of 'spatialization' and urbanization from the commons approach, as resources accessible to all members of a society, and as complex socio-political spaces that articulate practices, relationships and different forms of governance (Kornberger and Borch, 2015; Parker and Schmidt, 2017; Nikolaeva et al., 2019). Based on publications that have appeared over the last 50 years, Van Laerhoven et al. (2020) also show that urban issues are gaining growing interest within commoning, with these being named 'new commons issues' (Hess, 2008).

We may understand governance as the field of relations between governments, civil society, the private sector and the community, and specifically the governance of urban space comprises processes by which decisions are developed, implemented and communicated to interested parties. If, on the one hand, an urban common good has the potential to catalyze democratic and participatory dynamics in cities, on the other, there exist the challenges of dealing with negotiations and possible conflicts between actors (Kornberger & Borch, 2015). It is important to note that the results of this process can often be similar to those of traditional government actions, though the process itself differs, given a search for the active involvement of various agents. In this way, participatory governance can help to ensure that different values and perspectives for sustainable development should be taken into account.

We investigated the participation of third party and public sector organizations (municipalities) in public road space interventions, emphasizing the opportunities for innovations in public services for active mobility in the local context, proposing to analyze the relationship between the urban commons (road space) and innovation in active mobility public services, with a multi-agent perspective.

In 'new commons issues', and specifically in 'urban commons', transport systems may be categorized as 'infrastructure commons', which describes physical resource systems developed by human beings for public consumption: the road space. This also includes public services that use a common infrastructure to be provided to society (Hess, 2008). In addition to this perspective on commons, mobility can be studied from the social dilemmas related to speed reduction issues and occurrences with pedestrians and cyclists, congestion of streets, land use and occupation, environmental impacts (air and noise pollution) and other common problems (Combes et al., 2016). Finally and more broadly, from the perspective of climate change, mobility also integrates with global commons studies (Hess, 2008).

Mobility is one of the main issues for analyzing cities; commons are accurately conceptualized in the urban mobility context and the relevance of the theme of mobility and cities is recognized by Pojani and Stead (2015), Larranaga et al. (2016, 2019), and Guzman et al. (2019). In particular, active mobility is stressed, i.e. walking and cycling for commuting. This importance is attributed to several aspects, in terms of health, environmental considerations, energy savings, economic benefits and contributions toward car-use reduction.

In the world's megacities, despite ongoing discussions and attestations of the impacts on the environment and health connected to urban mobility, our dependence on fossil fuels continues to grow, endangering the future of urban transport, as well as that of energy security. As for the case of megacities in developing countries, Zhao (2010) stresses that the central issue to be addressed is sustainable urban expansion, which requires measures to manage metropolitan development. One important step in this direction is to promote sustainable transport (Cruz and Paulino, 2019). Rapid and exponential population growth, coupled with a lack of urban planning, both bring negative consequences, exemplified within urban mobility. In the context of megacities, there is an even greater necessity to develop a transport system that provides access to users, and connects active mobility with collective public transport (Gomide and Galindo, 2013).

The pursuit of Sustainable Development Goals (SDG), then, requires radical changes in order to reach the ambitious targets established in Agenda 2030 (IPEA, 2018), demanding cooperation between actors, disciplines and perspectives, besides the generation and application of new knowledge (UNescap, 2017). Considering this, on the assumption that sustainability transitions represent a valuable opportunity to stimulate innovation in services (one of the most prominent types of innovation here considered) a holistic approach is required, involving a variety of stakeholders and all the environmental, social and economic issues (Calabrese et al., 2018).

The theoretical approach of innovation in services proposes that a service may be defined as the mobilization of internal or external competences, and internal or external techniques (tangible or intangible), to produce the final characteristics of the product (goods or services) (Gallouj and Weinstein, 1997; Gallouj, 2002, Gallouj et al., 2013). The incorporation of a broader concept of innovation promotion and policies is important for exploring the potential of innovation in services, in order also to encompass mobility and transport. The adoption of a service logic assumes that multiple stakeholders are engaged in value creation whilst achieving sustainability. Similarly, in shaping the quality and sustainability of urban commons Ling

et al. (2019) write about a complex framework system composed of various components, multi-stakeholder perspectives (i.e. public users, land officers, local authority, and managers/private suppliers) and the governance regimes/systems involved.

Regarding services based on the integration of active mobility and public transport, these depend on the conditions available for walking and cycling, which can be better understood through the innovation in public service approach. Improving the quality of the environment for pedestrians is one of the main objectives related to alternative urban design strategies, which may lead to a more efficient use of public space, and therefore to an increase in walking and cycling as two sustainable means of displacement within cities. This study provides a broad perspective to explain innovation in active mobility services, allowing us to address technological and non-technological innovations, and taking into consideration all actors involved in the service. Non-technological innovations – organizational, relational, and social, among others (Djellal & Gallouj, 2013; Desmarchelier et al., 2019; Cruz and Paulino, 2019) – play a relevant role in innovation in public services. The proposed analysis applies the characteristics-based model, representing an innovation in terms of service characteristics, adopting it as a multi-agent approach (Windrum & García-Goñi, 2008; Gallouj & Weinstein, 1997; Gallouj, 2002; Gallouj et al., 2013; Gallouj et al., 2018).

In our context, the Brazilian population made 65.3 billion trips in 2016. Walking and cycling accounted for the majority (43%), followed by individual motorized transport (cars and motorcycles, 29%) and by public transport (28%). Thus, Brazilians use essentially active and/or public transport modes (ANTP, 2018). In line with this data, the National Policy on Urban Mobility (NPUM) (Law 12,587/2012) defines guidelines by giving priority to non-motorized forms of transport and to the collective public transport service. This is the first national law that addresses the issue of mobility in a more comprehensive approach, from a perspective of the equity, sustainability and participation of society (ANTP, 2017). It achieves this through collegiate bodies, ombudsmen in those institutions responsible for the management of the NPUM, public hearings and consultations, and systematic procedures for communication – all aiming to evaluate user satisfaction and improve public accountability (Brazil, 2012). However, despite the ambitious strategies outlined by the NPUM, positive results will rely on interaction involving different bodies, institutions and individuals, which encompasses permanent social participation from the elaboration and management, to the monitoring and evaluation, of plans and programs related to urban mobility on a large scale.

In Sao Paulo, within the active mobility context, one may mention some recent achievements. In 2015, the Municipal Council of Transport and Traffic of São Paulo created thematic chambers for cycling and pedestrian mobility, in a bottom-up process, which emerged out of civil society. Their project aim was to increase participation for the construction of public policies focused on active mobility through dialogue between representatives of citizens, technicians and advisors of the Municipal Mobility Secretariat and Traffic Engineering Company (CET and SPTrans). In June 2017, also featuring the active participation of civil society, the Pedestrian Statute of the city of Sao Paulo gained approval¹ with the main objectives of consolidating the concept of a pedestrian mobility network and of determining the sources of funds for the infrastructure required for walking, such as sidewalks, boardwalks and crossings. However, despite the sanction, to date (May 2020) the Statute has not yet been regulated by the municipal government, thereby preventing its practical application within the law.

Our study focuses on the challenges of sustainable urban mobility in the megacity of Sao Paulo. We aim to explore the panorama of active mobility initiatives, analyzing the relationship between urban commons (road space/infrastructure) and innovation in public services for active mobility. The city has about 12 million inhabitants (IBGE, 2017) and 8.6 million cars, bikes, buses or trucks, which means 7.4 motor vehicles for every 10 inhabitants. In Sao Paulo, despite transporting only 30% of all passengers, cars are responsible for 73% of total GHG emissions (IEMA, 2017). In addition to pollutant gas emissions, the excessive and poorly planned use of private motorized transport also over-occupies urban space on the roads or in parking spaces, causing degradation to the quality of urban vitality (Barczak & Duarte, 2012). While the individual motorized transport fleet continues to increase, investments in the improvement of urban mobility services – especially in high-capacity public transport – are still insufficient to meet the demand for travel in the city and its metropolitan region (Cintra, 2014; FGV, 2018).

Since 2011, the city of Sao Paulo has been implementing road safety policies and projects through programs such as Reduced Speed Zones and Complete Streets. We selected three cases in the city of Sao Paulo – the Sao Miguel Paulista and Santana Reduced Speed Zones, and the Joel Carlos Borges Complete Street. The initiatives adopted in Sao Paulo applied tactical urban practices (temporary interventions) to test places

¹ Pedestrian Statute, Law 16,673/2017 (2017).

for different uses, and may subsequently receive permission for permanent interventions (Cloutier et al., 2018). In the Reduced Speed Zone initiatives, a perimeter is defined where the maximum speed permitted is 40km/h, aiming to improve road safety for vulnerable users, pedestrians and cyclists, reducing injuries and improving environmental quality. The Complete Street program grounds itself on the equitable distribution of space, which should ideally provide security and comfort to every person, of all ages, using every means of transportation.

The remainder of this paper follows this sequence: Section 2 presents the road space as infrastructure commons, section 3 focuses on the methodology used, Section 4 displays the results and discussion, and finally, our conclusions appear in Section 5.

2 The notion of commons for analyzing service innovation opportunities in the urban road space

In the literature on new commons, property rights and the nature of goods are still important, but there is a growing emphasis on issues of governance, participatory processes and trust; and increasing interest in values and morals, emphasizing collective actions, voluntary associations and collaborations (Hess, 2008). The growing body of work related to urban commons stresses that instead of conceptualizing the city as a mere aggregation of private property rights, it is important to identify and protect common resources and interests in the city through limited access rights and strategies of collaborative governance. Strategies that preserve and use existing social networks to manage common city resources (Jain & Moraglio, 2014; Foster & Laione, 2016).

Active mobility is defined as “any form of human transport, such as walking, cycling, wheelchair use, use of crutches; in short, all movements made autonomously by citizens, even with the use of auxiliary devices” (Ministério das Cidades, 2007 p.88). Based on Combes et al. (2016), Jain and Moraglio (2014), and Ling et al. (2019), we propose that road space as commons is characterized as rivalrous and non-excludable, susceptible to various social dilemmas and also results in negative externalities resulting from its activities (**Table 1**).

Table 1: Road space as a Common Pool Resource (CPR): characteristics.

| | |
|---------------------------------|--|
| Rivalrous | Quantity and quality subtractible and exhaustible |
| Non-excludable | Open-access to public users for access and consumption |
| Common dilemmas | Commons overexploitation, mismanagement and misdistribution |
| Negative externalities | Social and environmental local/regional impacts such as air and sound pollution; collision and traffic deaths; unfair land use and occupation; restricted access and right to the city; at a global level: climate change issues |
| Sustainable commons achievement | Requires effective governance/control of consumption and consistent management |

Source: Authors' own.

Active mobility plays an important role in the urban context in order to promote social inclusion and equitable urban development, i.e., it is an important part of sustainable urban mobility. However, in Brazil and other developing countries, infrastructure and policies related to non-motorized transport have been neglected in the formulation of public policies. Decision makers still consider active mobility to be a sign of delay and not consistent with their goals and aspirations for economic growth and competitiveness (Jain & Moraglio, 2014; Pojani & Stead, 2018).

The National Policy on Urban Mobility (NPUM; Brazil, 2012) explicitly mentions the “priority of non-motorized forms of transport over motorized and collective public transport services in individual motorized transportation” and the “mitigation of environmental, social and economic costs of movements of people and cargo throughout the city”. When comparing the data of air pollutant emissions and road occupation (commons) with Origin-Destination (OD) surveys in Sao Paulo, discrepancies in the use of commons have been identified (**Figure 1**).

Figure 1 clearly indicates a social dilemma and negative externalities when two thirds of the population uses active and collective modes of transport; and the one third that uses motorized individual transport is responsible for about 80% of pollutant gas emissions, also occupying about 80% of the road space. In the logic of commons, this perspective can assist in the critical analysis of mobility scarcity in urban political agendas, highly unequal effects on the population, and debates about shared travel, deepening the theme of addressing the central issue, the public's right to the city (Hess, 2008; Jain & Moraglio, 2014; Ling et al., 2019).

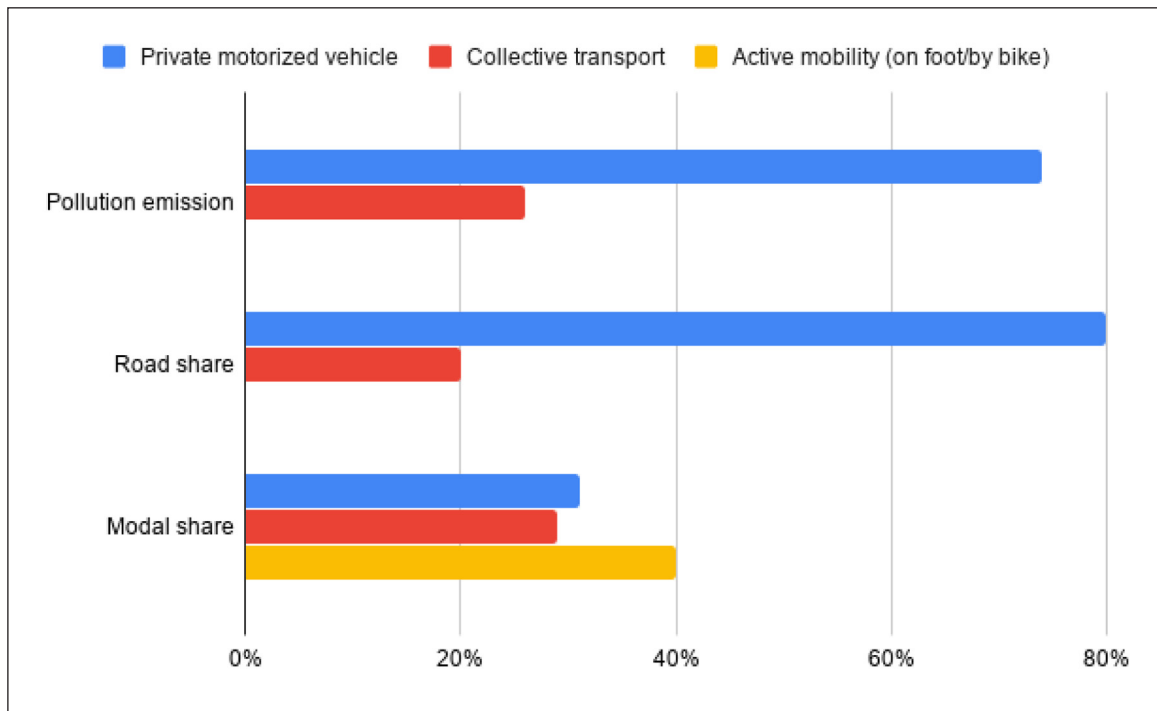


Figure 1: Social dilemmas: relations among Origin-Destination (OD) surveys, pollutant gas emissions and road share in Sao Paulo (%).

Source: Authors’ own, based on ANTP (2017), IEMA (2017).

Table 2: A proposition of approach combinations.

| Approach | Commons | Innovation in Services |
|--|--|---|
| Subject | Urban commons: infrastructure commons – road space as a common pool resource (CPR) | Innovation in services of urban mobility/active mobility |
| Multi-agent | Systemic framework composed of several actors | Innovation in services bases itself, by definition, on interactions between different actors |
| Participation | Common resource users: vibrant collaboration and cooperation | Service users: participation is essential |
| Governance/ institution systems | Organizations and laws governing and regulating the management and consumption rights of active mobility services and infrastructure | Organizations and Urban mobility laws governing and regulating the services provision related to active mobility |
| Common dilemmas and externalities | Externality internalizations; transaction costs distribution, directing stakeholder behavior | Internalization of negative social and environmental impacts in the transport sector, favoring dissemination and investments for active and collective mobility |

Source: Authors’ own.

Focusing on the relationship between the commons and innovation in services approaches, with a multi-agent perspective, we can emphasize the following aspects (**Table 2**).

As **Table 2** shows, the multi-agent conformation in both approaches is emphasized, with innovation in services, by definition, being based on interactions between different actors. This allows the approach – far beyond the traditional concept of competitiveness – also to include environmental and social problems (Stare, 2013; Cruz et al, 2017, Cruz and Paulino, 2019). It is a complex, multiform, systemic and often conflicting issue (Djellal and Gallouj, 2015). Stare (2013), and Cruz and Paulino (2013), have shown that the challenges are even greater within contexts of developing and emerging economies, in a situation substantially marked by a bias towards technological innovation, in addition to a lack of accountability and government responses.

The main solutions must involve citizens in decision-making on the distribution of public funds among communities, the shaping of public policies, and on monitoring and evaluating government expenditures.

Based on new commons studies, there has been a growing emphasis on voluntary associations, collective efforts and collaborations, embodying issues of governance, participatory processes and trust (Hess, 2008). According to Dietz et al. (2003) and Jain and Moraglio (2014), some of the key challenges in governing commons is related to differences in power between actors, allowing some groups to dominate others, local groups being especially subject to this; and policy makers who are unaware of the full range of governance tools that may involve such local groups.

3 Methodology

For the data collection, our research methodology was spatiotemporally restricted to the city of Sao Paulo, in the period from 2015 (due to the Sao Paulo Mobility Plan) until July 2019, inclusive. It is based on four steps (Table 3).

Table 3: Research methodology proposed.

| 1 | 2 | 3 | 4 |
|--|---|---|---|
| Identification and mapping of active mobility initiatives → | Case studies selected: Sao Miguel Paulista and Santana Reduced Speed Zones; Joel Carlos Borges Complete Street → | Data collection: reports and forms → | Data analysis: The characteristics-based approach model to services |

3.1 Case Studies

The concentration of initiatives studied in the city of Sao Paulo is justified, as it is a Brazilian megacity, retaining great challenges for urban mobility. As in other spheres of influence, Sao Paulo was a pioneer in the use of tactical urbanism in Brazil; the technique later spread to a number of other cities. Finally, it is one of the cities selected for the Bloomberg Philanthropies Global Road Safety Initiative (a Bloomberg Initiative), which aims to reduce injuries and fatalities resulting from collisions worldwide. The development of Reduced Speed Zone and Complete Street projects are part of the initiative. It has been renewed for the 2020–2025 period and Sao Paulo continues as one of the cities encompassed by the initiative. From the initiatives mapped, in line with the principles for innovation in services approach (a multi-agent one, the prominent position being taken by the third sector, driven by principles of inclusion and well-being); we selected case studies adopted in the research through the criteria below.

- Developed in the city of Sao Paulo, under the Bloomberg Philanthropies Global Initiative Program for Road Safety;
- Multi-agent participation;
- In line with the National Policy on Urban Mobility's principles;
- Considering benefits for quality of life: reduction of pollutants, reduction of noise pollution, reduction of accidents involving pedestrians and cyclists;
- Adoption of tactical urbanism practices.

From the criteria adopted, we selected the following cases: two Reduced Speed Zones (Sao Miguel Paulista and Santana), and a Complete Street (Joel Carlos Borges) (Table 4).

Table 4: Selected cases.

| Case | Historical | Urban Mobility Services |
|---|--|---|
| Santana Reduced Speed Zone | Year of implementation: 2014 Temporary intervention: 2017 Permanent intervention: 2018 | Metro station and bus terminal; in total, there are 87 bus lines running on almost every surrounding street; there are also three sections of cycle paths |
| Sao Miguel Paulista Reduced Speed Zone | Year of implementation: 2015 Temporary intervention: 2016 Permanent intervention: has not occurred | Train station; more than 50 municipal bus lines pass in the surroundings. |
| Joel Carlos Borges Complete Street² | Year of implementation, temporary and permanent interventions: 2017 | Train station; municipal bus lines pass through the surroundings |

3.2 Data collection: reports and forms

The secondary data sources used are: the Traffic Engineering Company (CET)'s database of Reduced Speed Zones and the Life Protection program; diagnoses and reports of Impact Evaluation Studies; and reports from Nacto, Metropole 1:1, *Cidade Ativa* (Cidade ativa, 2018a; 2018b) and the Institute for Transportation and Development Policy (ITDP) (ITDP, 2016; 2018). For the primary data collection, eight agents were asked (in an interview) to complete forms: representatives of civil society (World Resources Institute (WRI), ITDP and Bloomberg), start-ups (Urb-i), universities participating in impact evaluation diagnostics (FGV and LabMob/UFRJ), and the public sector (Secretariat of Urban Mobility). They were selected because of their close involvement in the implementation of selected cases. In order to apply the characteristics-based approach, the categorization we performed is a result of the systematization and analysis of data from the vectors of service characteristics (Y), techniques (T) and competences (C). These belong to the agents involved, allowing detailed techniques and internal or external competences (tangible or intangible), for a better understanding regarding the characteristics of the service under scrutiny.

3.3 Data analysis

The innovative aspects introduced in a public service for active mobility is analyzed through the application of the characteristics-based model, thus acting as an innovation in terms of service characteristics. Gallouj and Weinstein (1997), and Gallouj (2002), understood products (goods or services) from a set of characteristic and competence vectors represented by the 'characteristics-based approach' (Figure 2). More recently, Djellal et al. (2013) have added vectors into the model in order to better integrate the different agents, especially in the cases studied, where the users are considered as associations of civil society that represent interests in the active mobility issue.

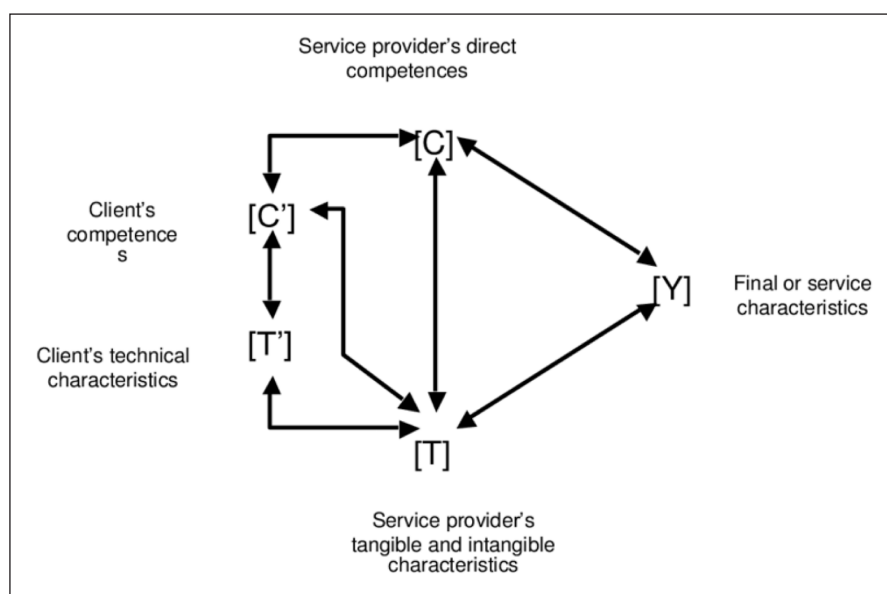


Figure 2: The product as a conjunction of vectors of characteristics and competences (characteristics-based approach).

Source: Djellal et al. (2013).

Competences and techniques, according to different agents, refer to:

Competences

Service provider competences (C) and users (C') relate to knowledge (theoretical and practical) and routines, which may be scientific, technical, operational and relational

Techniques

The (*T*) *service provider techniques* and (*T'*) *users* refer to tangible (computers, machinery, equipment, and other infrastructure items) or intangible techniques (mathematical methods, working methods)

We then explored these sets of data obtained in order to identify the following topics: project descriptions, introduction of services after implementation of initiatives; participation of stakeholders; stakeholders

² Taking the whole concept into consideration, despite the pioneering initiative, to be regarded as a complete street, Joel Carlos Borges still needs to consider elements that were not included in the project, such as improved access to collective public transport, bicycle lanes etc.

involved; development of technical training; new competences and techniques acquired; and environmental improvements.

4 Results and Discussion

Public services, as in the case of urban mobility services, may be produced through different organizational arrangements: the public sector, as that sector responsible for providing the service, must ensure that this production occurs in an appropriate manner; the State assumes the responsibility for the regulatory, supervision, incentive and planning roles. In this adaptation of the characteristics-based model for the interpretation of innovation (**Figure 3**), users appear as civil society organizations (local user resources). There also exist the connections between public services and urban commons; common dilemmas and externalities from the researched context; the governance and institutions systems represented by the National Policy on Urban Mobility, Decrees and laws on a municipal level; and SDG 11.

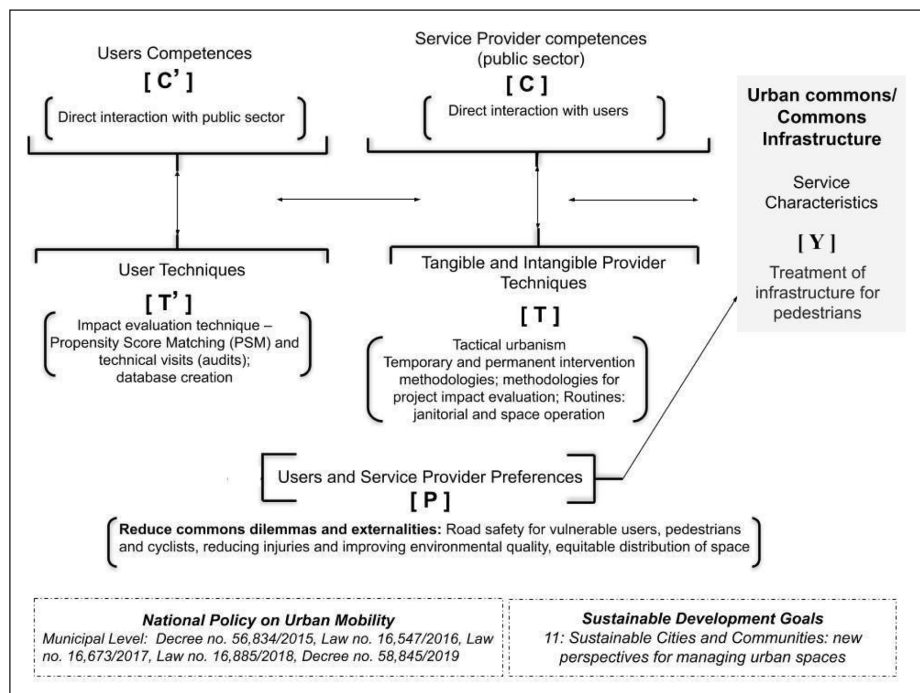


Figure 3: The characteristics-based approach model adapted to the studied context.

Source: The authors.

The service relationships between producers/providers and users can expand to include the organization responsible for providing the service, the regulatory system (Desmarchelier et al., 2018), and the agents' preferences (Windrum & García-Goñi, 2008). According to Windrum and García-Goñi (2008), interactions between the competences and preferences of users and of service providers is essential for this process, hence the final set of service characteristics. The preferences relate to the reduction of commons dilemmas and externalities. For example, road safety for vulnerable users, pedestrians and cyclists reduces injuries, improves environmental quality and promotes an equitable distribution of space. According to Villamayor-Tomas et al. (2019), local resource users tend to act together, as a group with common interests, when they desire to improve their individual welfare. In the cases studied, associations of civil society that represent interests in the active mobility issue play an important role in shaping the model, based on characteristics for the interpretation of innovation in services. The protagonism of civil society, related to the cases studied, is underlined by the conducting of audits and impact evaluations; by supervising public bodies; by working together to develop the temporary intervention project; by analyzing, along with municipal bodies, those sites that could receive temporary intervention; and by the holding of workshops in partnership with the community (general users).

a) The service characteristics vector (Y) of active mobility

In the *service characteristics vector (Y)* we identified the treatment of infrastructure for pedestrians, aiming for the maintenance and re-qualification of infrastructure for walking and integration with public transport, covering the following aspects: sidewalks; crossings; accessibility; horizontal and

vertical signaling in public spaces; traffic light systems suitable for non-motorized transport; and traffic moderation. We identified no new types of cycling treatment. In order to generate an improvement in service quality level, and an enhanced performance of the combined urban public transportation system and active transportation, the initiatives studied sought to increase safety and comfort for pedestrians by reducing speed, and redesigning and expanding sidewalks. Through an analysis of the data on types of fatal occurrence by regional government (sub-prefecture), and by linking the road space of studied experiences, we observed that collisions with pedestrians occurred at the highest rates in Santana, Sao Miguel Paulista and Pinheiros. These locations coincide with the Santana and Sao Miguel Paulista Reduced Speed Zones and Joel Carlos Borges Complete Street (Sao Paulo 2018a, Sao Paulo 2018b, and Sao Paulo 2018c).

In this study, it is posited that 'scarcity' is not necessarily ameliorated by the mere addition of 'more space', but that it can be tackled by rethinking and managing the need for mobility itself, with the redistribution of spaces, emphasizing active mobility. In other words, we highlight the need for a better redistribution of common spaces linked to compliance with legislation, in order to share or limit access to a scarcer resource, since two thirds of the population use active and collective modes of transport; and the one third that uses motorized individual transport occupies about 80% of the road space (**Figure 1**). By using an innovation-in-services approach for infrastructure commons – related to the improvement of current negative externalities and social costs – the case studies aim to improve road safety conditions (common infrastructure and public services), active mobility, and access to public transport. Additionally, the improvements may also help to reduce noise levels, improve air quality (negative externalities and social costs) and reduce greenhouse gas emissions (global commons).

b) Service provider competences vector (C)

The *service provider competences (C)* highlighted are fundamentally the result of direct interactions between public agencies and civil society organizations. In all cases, they are an attempt to establish new communication routines with users, and in Sao Miguel Paulista and Santana, a development of training workshops and a gathering of ideas. Civil society organizations coordinated these workshops, with support from the public sector.

The mapping of key civil society organizations involved in the initiatives and modes of participation appears in **Table 5**.

Table 5: Key stakeholders and modes of participation.

| Sao Miguel Paulista Reduced Speed Zone | Santana Reduced Speed Zone | J.C. Borges Complete Street |
|---|--|---|
| Key civil society organizations – local resource users | | |
| <i>Civil society:</i> Bloomberg Philanthropies; ITDP; NACTO; World Resources Institute Brazil; Vital Strategies; and iRap/GRSF | <i>Civil society:</i> Bloomberg Philanthropies; NACTO; World Resources Institute Brazil; and Vital Strategies | <i>Civil society:</i> World Resources Institute, Brazil |
| <i>Impact Evaluation Studies:</i> Getúlio Vargas Foundation (FGV); and ITDP | | <i>Impact Evaluation Studies:</i> Cidade Ativa; WRI; Labmob UFRJ; and Metr pole 1:1 |
| Modes of participation | | |
| <i>2016:</i> An open meeting took place entitled 'Urban design and road safety: a requalification of low speed areas'. The activity brought together participants in a presentation open to the public. A workshop subsequently occurred, with experts and technicians called upon to collaborate with the urban requalification project and road safety of Sao Miguel Paulista Reduced Speed Zone. The city of Sao Paulo launched the project in 2016, having as its objective to test the project for the Sao Miguel Reduced Speed Zone, together with local residents in the temporary intervention area | <i>2017:</i> The investigation stage for solutions to the identified conflicts considered meetings with the local populace, with the goal of identifying priorities and demands for the surroundings around the intervention points. A lecture took place, and at a later moment, participants were invited to attend the workshop together with local schools | <i>2017:</i> The idea of holding workshops with the community arose, before the implementation of a temporary project, with the purpose of informing the population about said intervention and collecting suggestions. However, the project went ahead without clear communication with the local population (Guido et al., 2017; URB-I, 2019) |

Regarding the initiatives approval rate (percentage) by general users, largely, the inhabitants agreed with the proposal for withdrawing a circulation range of cars, with a view to broadening sidewalks, with interventions to create more bike lanes, and reduce local speed limits. This gives us an indication of a significant demand for more comfortable, more pleasing, and safer spaces for walking and cycling, in accordance to the preferences related to reduce commons dilemmas and externalities.

c) Service provider techniques (T)

The *service provider technique (T)* relates to urban reading, which influences evaluation methodologies. The projects here exceed the CET 'business as usual' approach (volumetric counts, signaling and road operation). In order to make the adoption of tactical urban practices feasible, in the cases studied, the development of new techniques followed the implementation of the projects. In the cases studied, the applied urban reading methodology directs towards the collection and analysis of data from the shape of public spaces and manner in which people use them. This then goes beyond the merely quantitative, performing geometric surveys, carrying out mapping of permanence activities, and making behavioral observations, such as of pedestrians crossing inside and outside the corresponding range, or pedestrians walking off the sidewalk at bottlenecks. In addition, *ex-ante* and *ex-post* interviews occur in temporary and permanent interventions in order to evaluate user perceptions regarding the redesign of road geometry, safety and comfort, interference in user displacements and economic impacts on the local market. The urban reading method thus allows a systemic view of the place, ensuring that tactical urbanism techniques identify and analyze the main aspects that need to be reformed, adapted or constructed.

Tactical urbanism uses low-cost temporary materials, public-private partnerships, civil society, and local communities that together enable faster delivery and more flexibility of design. The service provider technique (T) relates to the introduction of tactical urbanism practices in order to test places for different uses; subsequently, these locations may go on to receive permanent intervention. These short-term and low cost interventions aim to promote grassroots restructuring, in a participatory approach, towards the re-appropriation of urban spaces by their own users, in line also with the broad view of innovation in services, which extends potential forms of participation to specific actors. Civil Society plays an important infrastructural role for supporting urban commons projects. Dellenbaugh and Schwegmann (2017) demonstrate that the urban commons framework show a way for citizens to contemplate and potentially adapt existing actions for limited resources with high demands and conflict potentials. In this manner, urban commons projects can serve as a tool to decide, engage and articulate important issues and then self-organize them in a way that will affect the change that they want and need. Thus, urban commons may be viewed as representing a new opportunity for civic engagement in urban planning and urban resource use from the bottom up (Dellenbaugh and Schwegmann, 2017).

d) Users competences (C')

Regarding *users competences (C')* the interaction between actors involved during the development of the Joel Carlos Borges, Santana, and Sao Miguel Paulista projects occurred, in general, under the coordination of non-profit organizations such as the Bloomberg Philanthropies Initiative for Global Road Safety, World Resources Institute (WRI) and Institute for Transportation and Development Policy (ITDP). It was reported that the relationship between the parties involved was complex, and at times, attritional. This relationship management generated relational and organizational competences for the proponent organizations. The experience gained through these interventions resulted in a closer relationship with CET-SP technicians, increasing the engagement and understanding of the organizations' mandates and greater recognition of the technical capacity of the teams involved. However, despite indications, it is not a consensus among users that new relational or organizational competences were developed. It is also highlighted that the proponent organizational teams have less operational experience than CET, and during the implementation of a temporary intervention, they were able to strengthen their technical and operational capacity (Gallouj and Weinstein, 1997) with CET-SP technicians, responsible for the implementation of these projects.

e) User Techniques (T')

User techniques (T'), in the cases of Sao Miguel Paulista and Joel Carlos Borges street (FGV, 2017a, 2017b, Labmob and WRI, 2018), were applied in a propensity score-matching method which aims to evaluate the impacts of an intervention through the comparison of groups: the group which receives the intervention (factual) and the group that remains unchanged (counterfactual). The method seeks to increase the study's credibility by strengthening the attribution of results obtained to the intervention itself and not to other factors. In the cases studied, the counterfactuals are (Table 6).

Table 6: Impact evaluation method – factual and comparison groups.

| Factual | Counterfactual (comparison/control group) |
|---------------------|--|
| Sao Miguel Paulista | Lapa market (Surrounding region) |
| Joel Carlos Borges | Gomes de Carvalho street, next to Vila Olimpia train station |

In addition, we identified technical inspections after intervention, aiming at measurements of flow, permanence activities, road safety, waste management issues, furniture, and project perceptions. It was gathered data through local interviews, with the local population and frequenters from further afield. The interventions are also an opportune time to increase our documentation of the processes (images and research), which must be consistent. Then, through field data collection (before, during and after the interventions), a database was created by the civil society involved to convince and assist in decision making with regard to changes in the initiatives' urban redesign, and additionally to support future interventions.

5 Conclusion

We aimed to explore the panorama of active mobility initiatives, proposing to analyze the relationship between urban commons and innovations in public services. We selected the following as case studies: Sao Miguel Paulista and Santana Reduced Speed Zones, and the Joel Carlos Borges Complete Street.

The principles of NPUM, and the Urban Mobility Plan of Sao Paulo, were considerations that directed the choices made, in order to establish our prioritization of active modes of transport over motorized, and collective modes over individual ones, as well as the adoption of traffic calming measures. Regarding the Sustainable Development Goal 11, we emphasized the promotion of new perspectives for managing urban public spaces, which also stimulates decision-making in favor of a sustainable urban mobility system. As for the concept of urban commons, its governance implies the design of new forms of collaboration and partnerships among public, social, economic, knowledge and civic actors. Furthermore, any design initiative must continue engaging with public authorities and institutions throughout the development of urban commons. In this manner, socially focused design processes, engaged in exploring openings for different types of public in urban settings, benefit from a positive relationship with public sector actors. Additionally, it is important to stress that negotiating conditions, responsibilities, empowerment, and linkages between agents from different sectors vary widely; thus, one may recognize that attention to the arbitration of public sector actors is part of the design process. Within this perspective, we identify commons as a theoretical framework supporting critical and constructive ways of approaching collaborative development and governance.

The application of the characteristics-based approach to services developed by Gallouj & Weinstein (1997) and Windrum & García-Goñi (2008), adapted to the studied context, demonstrates that innovation in services (Y) provided by the public sector occurred in the introduction of new manners of infrastructure treatment for pedestrians. This aimed at the maintenance and re-qualification of infrastructure for walking and integration with public transport, attempting to improve negative externalities and social costs generated by the current urban mobility system. The improvement of urban mobility, which responds to the needs evidenced by society, requires services that result in new ways for people to occupy the city road space. It is about not only expansion, but also the creation and requalification of services for active mobility. It demonstrates the importance of paying attention to forms of non-technological innovation, and that the deliberate structuring of innovation networks does not necessarily support innovative processes and results verified in the local context.

We can consider 'users' here to be civil society organizations that represent interests in the issue of active mobility. Through the work of third sector organizations, we have also highlighted the role of volunteers and collectives in the creation and introduction of innovative solutions for active mobility in the local context, which meet social needs based on the inclusion of pedestrians as a priority in the use of urban road space (related to user and service provider preferences). Organizations draw attention to the interests of individual citizens and use their experiences to interact with the public service provider (local government); this process occurs in the identification of areas for intervention and the establishment of evidence bases for the effectiveness of techniques used in the requalification of road space.

With regard to new service provider competences and techniques, projects contribute to the development of competences (C) related to various interactions with civil society, resulting in a systemic view on the uses, local dynamics and behavioral aspects of the users themselves. Service provider techniques are (T) temporary and permanent intervention methodologies, and methodologies for project impact evaluations. Methodologies for urban interventions affect the evaluation and enlargement of the scope for urban reading

methodologies, beyond pedestrian and vehicular volumetric counts. These techniques are associated with tactical urbanism as a technique (T) for temporary urban interventions. In addition, we highlight a strengthening of the technical and operational capacity of proponent organizations, with regard to project implementations.

However, despite the advances indicated by the experiences of active mobility here analyzed (highlighting the role of civil society organizations), and by some progress made in the regulatory framework, at the time of writing innovative practices in the local context have been limited. These are currently restricted to the treatment of infrastructure for pedestrians, to changing the speed limit for vehicles, and to horizontal signaling to identify the perimeter of these areas. There exists, therefore, a considerable potential for the continued introduction of innovations towards the improvement and scale gains of public services for pedestrian mobility, and the promotion of participatory restructuring as a form of (re-)appropriation of urban space by its own users.

Urban spaces as commons is based on the logic of new ways of identifying mobility rights, on awareness of the ways in which urban mobility is shaped by the city and the power and interest relations inherent in this spatial design, on the commitment to achieve equity, and on guaranteeing freedom of movement; thereby allowing universal access to the city. In addition to working on issues related to infrastructure, congestion overuse and degradation of urban streets and roads, we must transcend and incorporate social and environmental issues linked to management and shared-space governance, such as road safety, public safety, availability, accessibility, the social environment, and economic concerns, amongst others. Finally, several questions remain that future research will do well to address, since these projects are still relatively recent and are limited to very particular spatiotemporal boundaries. A maturation of results from the projects studied remains necessary, as well as a deepening of analysis for projects of a similar nature in other urban and social contexts.

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Competing Interests

The authors have no competing interests to declare.

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