Article

Ride On! Mobility Business Models for the Sharing Economy

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Abstract

The public perception of shared goods has changed substantially in the past few years. While co-owning properties has been widely accepted for a while (e.g., timeshares), the notion of sharing bikes, cars, or even rides on an on-demand basis is just now starting to gain widespread popularity. The emerging "sharing economy" is particularly interesting in the context of cities that struggle with population growth and increasing density. While sharing vehicles promises to reduce inner-city traffic, congestion, and pollution problems, the associated business models are not without problems themselves. Using agency theory, in this article we discuss existing shared mobility business models in an effort to unveil the optimal relationship between service providers (agents) and the local governments (principals) to achieve the common objective of sustainable mobility. Our findings show private or public models are fraught with conflicts, and point to a merit model as the most promising alignment of the strengths of agents and principals.

Keywords

sharing economy, business models, sustainability, carsharing, ridesharing, bikesharing, agency theory, Uber, Zipcar

Introduction

Over the past several years, a number of altogether new and different businesses have emerged. What their underlying business models have in common is that they operate in "sharing economies" of collaborative consumption(Botsman & Rogers, 2010), where people offer and share underutilized resources in creative, new ways. Airbnb lets people rent out part or all of their homes for short stays, and Uber allows for real-time, location based ridesharing. An increasing number of individuals who may not have considered ridesharing or renting a room in private residence as their vacation domicile a few years ago now prefer such sharing models to mainstream alternatives.

While some of these sharing models might have resulted from a need for frugal spending after the global economic recession of 2008, their success was also driven by a growing environmental consciousness combined with the ubiquity of Internet and associated information and communication technologies which make sharing possible at scale. Together, these developments have started to challenge traditional thinking about how resources can and should be offered and

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consumed, supporting arguments that incremental improvements in our existing production and consumption systems are insufficient to transform our global economy toward sustainability (Lovins & Cohen, 2011; Stead & Stead, 2013).

The potential sustainability benefits associated with such sharing economies are interesting from an organizational and environmental perspective, particularly in the context of the increasing urbanization many countries experience today. Especially in growing cities, numerous drivers support the introduction of such sustainability-oriented innovations (Hansen, Grosse-Dunker, & Reichwald, 2009), ranging from market imperfections (Cohen & Winn, 2007) and environmental regulations (Rugman & Verbeeke, 2000) to emerging demand for sustainable solutions from consumer, corporate, and government stakeholders (Hart, 1997).

Due to its relative newness, research on the relationship between business and sustainability theory in the context of a sharing economy, as "an economic model based on sharing underutilized assets from spaces to skills to stuff for monetary or non-monetary benefits" (Botsman, 2013) is scarce. More specifically, despite the growing demand and opportunity for sustainable mobility solutions from the private sector, there is a surprising dearth of research in the public policy and management disciplines regarding factors influencing the adoption and success or failure of collaborations between the private sector and cities in solving urban sustainability challenges (Alexandrescu, Martinát, Klusáček, & Barke, 2014).

The aim of this research is to explore emerging sustainability business models for one segment of the sharing economy, shared mobility. An interesting aspect of shared mobility solutions is that multiple agents, including public and private providers, seek to develop business models which address deficiencies in public infrastructure (e.g., streets, parking) and public transit systems, historically the exclusive purview of local and regional governments. However, the common interest in sustainability among these different types of agents does not always lead to harmony, instead giving rise to agency conflicts that can reduce the positive sustainability impact of their individual and collective initiatives.

There are literally dozens of unique business models in the shared mobility arena. We have chosen to focus on three broad segments of shared mobility, carsharing, ridesharing, and bikesharing, to explore our core research question: *In the context of shared mobility business models, what is the optimal relationship between the service provider and the local government to achieve the common objective of sustainable mobility?*

In order to address this research question, we employ agency theory to understand the relationships between different actors and the degree of alignment of incentives to support the achievement of mutual objectives.

Agency Theory and Sharing Economy

Management and public policy scholars have long struggled with the distinction between private and public institutional forms to address different societal needs (Perry & Rainey, 1988). Agency theory provides a useful theoretical lens in exploring the interplay between private and public organizations in the provision of goods and services (Dharwadkar, George, & Brandes, 2000). Agency theory leverages the metaphor of a contract to explore the relationship between a party (principal) who delegates work to an agent (Jensen & Meckling, 1976). The primary focus of agency theory research is "relationships that mirror the basic agency structure of a principal and an agent who are engaged in cooperative behavior, but have differing goals and differing attitudes toward risk" (Eisenhardt, 1989, p. 59).

With this understanding, agency theory has been a controversial but frequently applied theory not only across disciplines such as economics, finance, marketing political science, and organizational behavior (Eisenhardt, 1989) but also entrepreneurship. For example, Knight (1921) suggests that entrepreneurs bear the risks of organization and failure as an agent for the consumer.

Subsequently, entrepreneurship scholars have applied agency theory to explore conflicts in the relationship between investors and entrepreneurs (Arthurs & Busenitz, 2003).

Across all of these disciplines, agency theory is addressing conflicting goals between the principal and the agent (Eisenhardt, 1989). Management scholars pursuing sustainability challenges among actors with conflicting agendas have also shown interest in the application of agency theory since it provides an appropriate lens to explore alignment, or lack thereof, between the public sector's environmental objectives and the private sector's profitability objectives (McLaughlin, 2012).

In this article, we extend this well-established history of agency theory by applying it in sustainable mobility research. In a sharing context, we contend that the private sector has developed business models to address a market failure in the private and public mobility market place. This failure has arisen due to the increased congestion in cities, the lack of sufficient access to quality transit alternatives as well as the lack of affordable private and clean vehicles for consumers. In response, the private sector seeking to address the gap has begun to introduce a plethora of different business models in the shared mobility market place, which include bikesharing, carsharing, and ridesharing segments. These solutions propose interesting challenges for agency scholars. Who are the principals of a shared mobility business: investors, the municipal government, or regional transportation authority, or the consumer? Even referring to consumers is arguably a misnomer in the context of the shared economy since one of the objectives is to share resources among members in the form of a service as opposed to selling a product to a customer. Who are the agents? Aside from individuals looking for better options for navigating cities, shared mobility providers themselves could even be seen as an agent (of the natural environment) given that one of the objectives of shared mobility projects is to reduce local transportation's environmental footprint (Martin, Shaheen, & Lidicker, 2010) and support the transition toward the sustainable mobility paradigm (Banister, 2008). To help answer these questions, and discuss the relationships between principals and agents, we first provide a brief introduction to the shared economy and present a literature review of business models for sustainability (BMfS). Next, we introduce the range of business models currently present in carsharing, ridesharing, and bikesharing around the globe (Tables 1-3). We then develop a Shared Mobility Agency Matrix for shared mobility business models based on previous empirical research. Finally, we conclude with some insights regarding the future of shared mobility business models, the appropriate role for governments in supporting such projects, and future research opportunities arising from this work.

"Shared Mobility" Business Models for Sustainability

As cities continue to grow in population and land use, increasing pressure is being placed on the reliability of urban transportation systems (Noland & Polak, 2002). Although traditional transportation public policy focused on "minimizing congestion" and commute times, supported by the consumer's desire for the shortest drive time, emerging transportation research challenges such a stance. Minimizing commute time for people in single occupancy vehicles only exacerbates the use of private vehicles and the need for parking and street maintenance. Single occupancy vehicle use also leads to health issues such as obesity by minimizing exercise and increasing air contamination (Pucher & Dikstra, 2003).

Scholars and public policy makers now increasingly promote a new sustainable mobility paradigm (Banister, 2008) based on "optimal congestion," not minimal congestion (Urry & Lyons, 2005). This is to be achieved through four key objectives: fewer trips, modal shift, distance reduction, and increased efficiency. Fewer trips is associated with a reduction in total trips required or taken by a citizen which can be achieved through solutions such as the ability to make online purchases for locally and regionally produced goods and services. Modal shift is the idea of altering the transportation hierarchy from single occupancy vehicles to walking, public, and

shared transit alternatives. Through increased densities and better mixed-use development, cities can achieve a reduction in aggregate distances travelled by residents. Finally, increased transport efficiency is associated with reduced environmental impacts of the transportation system through more energy efficient public transportation services and the encouragement of lower footprint personal vehicles (Banister, 2008).

Then again, the rapid urbanization occurring around the globe is challenging the capacity of local governments to achieve these sustainable mobility objectives. Adding additional public transit capacity is costly, time-consuming, and often fraught with NIMBY (not-in-my-backyard) citizen activism. While smarter and more compact urban development, along with efficient and affordable new public transit options like bus rapid transit contribute to more sustainable transit, cities are challenged to keep up with demand.

Consider one of the largest sustainable mobility challenges faced by municipal transport authorities today. While mandated to serve even outlying areas with lower density, doing so leads to significant deficiencies in public transit. When people live further away from transit stops, local authorities cannot economically deliver service. When this is coupled with insufficient stops in the city, commuters see less reason to opt for public transit. When the overall transit system fails to solve this so-called "first mile, last mile" problem, many residents in outlying areas opt for driving vehicles for the entire commute, thus reducing overall public transit usage and resource efficiencies. Shared mobility operators present a potential solution to this complex challenge (DeMaio, 2009).

Recently, numerous shared mobility services have emerged, with or without local government support, to address the gap in the supply and demand for sustainable mobility in cities (Firnkorn & Mueller, 2011). Although these shared mobility business models have existed for decades (Orsatto & Clegg, 1999), recent enhancements due to improved information and communication technologies have made them possible at scale. For instance, first-generation bikesharing models emerged in the 1960s in Amsterdam and as of December 2013, there were nearly 700 programs in cities around the globe, most of them aided by significant advances in bikesharing technology. Carsharing has also been expanding at an exponential rate. At the start of 2013, there were approximately 2.3 million members in carsharing programs globally and Navigant research estimates that number will climb to as many as 12 million by 2020.[1] Similar growth rates have been found in ridesharing.

Business sustainability scholars are increasingly interested in extending business model research to explore new sustainability-oriented business models (Boons & Lüdeke-Freund, 2013; Stead & Stead, 2013). While there is a lack of consensus on the definition of what a business model actually is (Arend, 2013), a useful definition for the purposes of this research is that of Teece (2010):

> the design or architecture of the value creation, delivery and capture mechanisms. The essence of a business model is that it crystallizes customer needs and ability to pay, defines the manner by which the business enterprise responds to and delivers value to customers, entices customers to pay for value, and converts those payments to profit through the proper design and operation of the various elements of the value chain. (p. 179)

Based on the aforementioned definition and prior work in the field (Doganova & Eyquem-Renault, 2009), Boons and Lüdeke-Freund (2013) established a framework of BMfSs, consisting of four business model building blocks: a value proposition, supply chain, customer interface, and financial model. Their operationalization of the four elements of a BMfS is provided below (Boons & Lüdeke-Freund, 2013, p. 45):

1. *Value proposition*: provides measureable ecological and/or social value in concert with economic value

2. *Supply chain*: involves suppliers who take responsibility toward their own as well as the focal company's stakeholders
3. *Customer interface*: motivates customers to take responsibility for their consumption as well as for the focal company's stakeholders
4. *Financial model*: reflects an appropriate distribution of economic costs and benefits among actors involved in the business model and accounts for the company's ecological and social impacts

In the following discussion, we apply these four BMfS elements (Boons & Lüdeke-Freund, 2013) to emerging business models in the shared mobility space to develop a summary of each major business model within the carsharing (Table 1), ridesharing (Table 2), and bikesharing (Table 3) segments.

It is important to note that although there are commonalities within specific shared mobility business models, it is probable that most operators will make unique strategic decisions in framing their value proposition and service to shared mobility users. For example, we provide two examples of peer-to-peer (P2P) carsharing services in Table 1. While Relay Rides and Flight Car belong to the same business model, the specific choices they have made with respect to key aspects of a business model ranging from the value proposition and target customers to key partners and resources differ. Therefore, we summarize some of the agency concerns for each category of shared mobility (carsharing, ridesharing, bikesharing) at the conclusion of each section. These agency insights were then utilized in the construction of the Shared Mobility Agency Matrix (Figure 1).

Carsharing Business Models

Carsharing has experienced a significant boom in recent years, with estimates suggesting there are now more than 600 different carsharing providers around the globe. These firms usually offer turnkey solutions, whereby drivers do not pay for insurance, gas, maintenance, or parking in designated spaces, but are charged for the time the vehicles are used, for the distance covered, or a combination of the two.

Carsharing business models provide significant value to members and can also have a profound effect on local transportation networks. For instance, for every shared vehicle, between 9 and 13 private vehicles are removed from the roads, either by members selling a personal vehicle or postponing a planned purchase (Martin et al., 2010). Yet not all carsharing business models are created equally. The following section delineates three unique carsharing business models, which are summarized in Table 1.

Business-to-Consumer (B2C) Carsharing. In B2C carsharing business models, the company acquires vehicles and supplies them at key points throughout a city. B2C models are driven not only to support sustainable mobility objectives but also to generate or even maximize profits. In terms of the customer interface, members usually use their smart phones to geolocate the nearest available vehicle, open the vehicle up with their membership card, and drive it only for the time needed. This ensures that the idle time of a vehicle is kept to a minimum, and that the economic cost and benefits of carsharing are distributed appropriately. Frequently, B2C carsharing companies seek to develop relationships with the cities where they operate in order to obtain preferential parking spaces at a discount or for free, as well as other privileges such as reduced tolls or use of high-occupancy vehicle lanes.

The B2C carsharing business models can also be further categorized by roundtrip models and point-to-point models. Roundtrip models require members to return the vehicle to the same location where it was picked up (e.g., Zipcar), whereas point-to-point (also known as one-way) models allow members to leave the vehicle parked on the street near their destination (e.g., Car2Go).

Table 1. Carsharing Business Models for Sustainability.

Segment	Value proposition	Supply chain	Customer interface	Financial model	Examples
B2C point to point	Reduces emissions and congestion A vehicle when you want/need one and no requirement to return to same location	OEM vehicles; some programs using EVs and hybrids	Shift from vehicle acquisition to shared use	More affordable access to a vehicle than owning and maintaining Potential for profitability and exit	Car 2 Go
B2C roundtrip	Reduces emissions and congestion A vehicle when you want/need one	OEM vehicles; some programs using EVs and hybrids	Shift from vehicle acquisition to shared use	More affordable access to a vehicle than owning and maintaining Potential for profitability and exit	Zipcar
Nonprofit/ cooperative	Reduces emissions and congestion A vehicle when you want/need one	OEM vehicles; some programs using EVs and hybrids	Shift from vehicle acquisition to shared use	More affordable access to a vehicle than owning and maintaining Member revenue, sponsorship, government subsidies/grants	Modo
P2P	Reduces emissions and congestion	P2P models are unique in that they require virtually no additional production or suppliers; instead P2P firms serve as intermediaries between owners and renters; that is, generally more environmentally sustainable than B2C models	P2P models encourage vehicle owners to share a resource	Provides additional income to vehicle owners to offset the high cost of ownership	Relay Rides
	A vehicle when you want/need one and no requirement to return to same location Usually more variety of vehicle types for renters For the owner, a way to generate extra income from a subutilized resource		For the renter it also shifts from acquisition to shared use	For renters it provides more affordable access to a vehicle for than owning and maintaining a personal vehicle Scalable revenue model based on a percentage of transaction without need to acquire vehicles	Flight Car

Note. EV = electric vehicle; OEM = original equipment manufacturer; B2C = business to consumer; P2P = peer-to-peer.

Table 2. Ridesharing Business Models for Sustainability.

Segment	Value proposition	Supply chain	Customer interface	Financial model	Examples
Carpooling	Reduces emissions and congestion	Personal vehicles	Colleagues or neighbors	Small fees charged for users	Carpooling.com, Liftshare
	Subsidize driver costs			Many nonprofit intermediaries charge no fees to riders	
Flexible carpooling	Reduces emissions and congestion	Personal vehicles	Designated meeting spots	Small fees charged for users	Seattle
	No requirement to prearrange pickup	Designated meeting spots		Many intermediaries charge no fees to riders	
Vanpooling	Reduces emissions and congestion	Vans offered by private vanpool operator, companies for use by employees, or government agencies	Business-to-consumer (B2C) interaction; corporation to employee or public service to citizens	Fees charged to riders	WSDOT
	Able to support larger amounts of riders				
Ridesharing	Extra revenue for private drivers	Private vehicles and drivers	Smartphone applications and social network	Drivers earn extra money while intermediaries earn up to 20% of each transaction	Uber
	Cheaper and faster than taxis and social networking	Smartphone applications with location-based service			

Nonprofit/Cooperative Carsharing. In cooperative carsharing, with its roots in Europe in the 1960s and 1970s, members collectively contribute resources and manage the carsharing organization (e.g., Modo), without the expectation of financial gain.

P2P Carsharing. One of the most disruptive types of business models in the sharing economy, including the carshare segment, is the P2P business model. The P2P model relies on some form of intermediation using web and/or mobile technology to connect owners (i.e., private individuals, not firms) of suboptimized products with potential drivers. Several P2P carsharing startups have emerged in recent years including Relay Rides and Flight Car (which rent out private cars that departing passengers drop off at airports).

Table 3. Bikesharing Business Models for Sustainability.

Segment	Value Proposition	Supply Chain	Customer Interface	Financial Model	Examples
Street furniture contract	Provides affordable access to a bike on demand	Largest supplier is associated with bike producer and docking station	Encourages customers to exercise and use a bike instead of a car	Primary revenues from third-party advertisers (could incent greenwashing)	JCDecaux
	Promotes more cycling which leads to health benefits and reduces traffic congestion	Also in some cases integrated with public transit supplier	May use public transit more frequently	Attractive fees for members	Clear Channel
Publicly owned	Provides affordable access to a bike on demand	Local or international bike producer (and docking stations when utilized)	Encourages citizens to exercise and use a bike instead of a car	Usually highly subsidized with low fees for users	Capital Bikeshare (Washington, DC)
	Promotes more cycling which leads to health benefits and reduces traffic congestion	Usually requires a third-party operator	May use public transit more frequently		Providencia
	Improves perception of city's brand	Significant potential for integration with other forms of public transit			
Sponsorship based	Provides affordable access to a bike on demand	Largest supplier is associated with bike producer and docking station	Encourages customers to exercise and use a bike instead of a car	Significant financial support from sponsor	Banco Itau (Santiago)
	Promotes more cycling which leads to health benefits and reduces traffic congestion	Usually requires a third-party operator	May use public transit more frequently	Additional financial support from city	Citi (NYC)
		Also in some cases integrated with public transit supplier		Attractive fees for members	Barclays (London)
Nonprofit	Provides affordable access to a bike on demand	Largest supplier is associated with bike producer and docking station	Encourages customers to exercise and use a bike instead of a car	Frequently relies on subsidies from transit authorities and donations	BCycle (Boulder)
	Promotes more cycling, which leads to health benefits and reduces traffic congestion	More potential for integration withpublic transit supplier	May use public transit more frequently	Attractive fees for members	Nice Ride (Minneapolis)
					BIXI Toronto

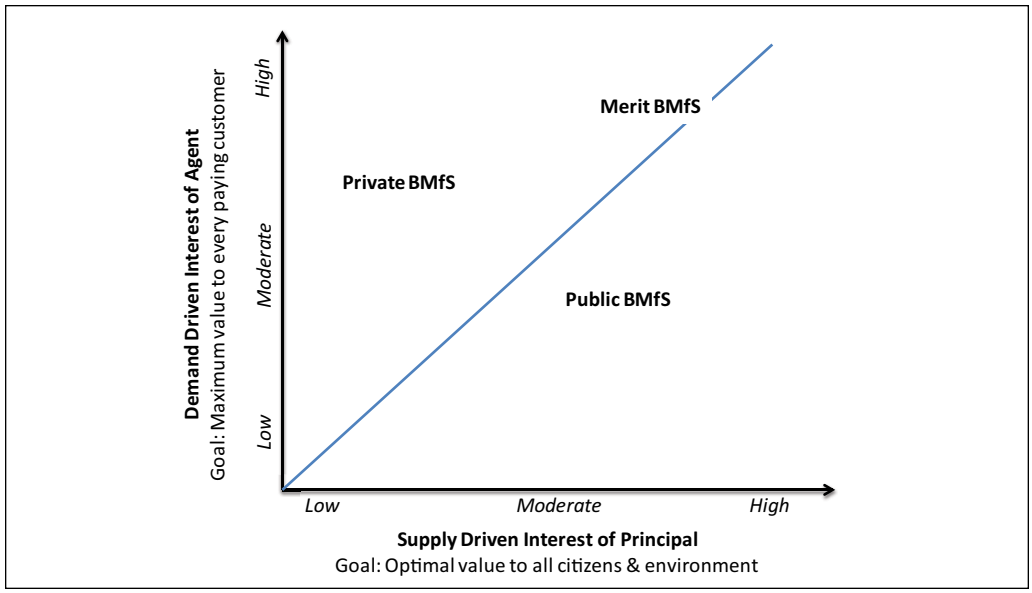

Figure 1. Shared Mobility Agency Matrix.
Note. BMfS = business models for sustainability.

Outside of P2P models, carsharing is a highly capital intensive business. Most of the business models involve the acquisition of significant numbers of vehicles and the development of robust mobile and web technologies for supporting reservations, payments, and keyless entry of carsharing vehicles. While most carsharing schemes are for-profit, carsharing companies are often dependent on support of local governments to provide incentives related to parking, discounts on tolls, and access to designated high-occupancy vehicle lanes. Below we refer to this hybrid, for-profit model with tangible government support as a form of merit good. Insights gleaned from these carsharing case studies have been incorporated in the BMfS framework (Boons & Lüdeke-Freund, 2013) and are summarized in Table 1.

Agency Theory Reflections on Carsharing Business Models. At their core, all carsharing business models seek to reduce the need for individual ownership of personal vehicles. Carsharing's proven ability to reduce passenger vehicles on the road (Martin et al., 2010) underscores an agency alignment between carshare operators and cities seeking to address congestions and air contamination. The extent to which a city provides tangible support for carshare operators through copromotion, designated parking spaces, high-occupancy vehicle and toll benefits, as and the extent to which the operator embraces collaboration with the city will directly affect the potential for agency conflicts. For example, Carrot, a B2C carshare operator based in Mexico, developed a collaboration with Mexico City and the bikeshare operator to support the integration of both shared mobility services in the greater transit scheme for the city. This direct collaboration with the city and other shared mobility service providers seeks to provide enhanced, multimodal transit support for the city and its residents. Throughout this research, as exemplified in Figure 1, the insights from the different business models consistently suggest that further integration between shared mobility operators and cities has the potential to minimize agency conflicts and increase the sustainability of the business model.

Ridesharing Business Models

The first forms of ridesharing emerged during World War II as the U.S. Office of Civil Defense urged carpooling in an effort to conserve rubber for military uses (Columbia Law Review, 1942). Since then technologies and business models have evolved significantly. Ridesharing consists of carpooling, flexible carpooling, vanpooling, and P2P ridesharing (Chan & Shaheen, 2012). A summary of the following ridesharing business models is provided in Table 2.

Carpooling. Carpooling is associated with vehicle owners allowing other passengers to ride in the same vehicle to and from the same or similar destinations. While early versions relied on word-of-mouth and company bulletin boards to connect drivers with passengers, improvements in information and communication technologies have allowed for a more efficient approach to support modern carpooling schemes (e.g., Carpooling.com). The majority of carpooling schemes are not associated with drivers seeking to profit, but rather supporting the subsidizing of the vehicle owner's costs while contributing to reduced traffic congestion and pollution.

Flexible Carpooling. Instead of prearranged door-to-door carpooling, flexible carpooling involves the use of designated meeting places, whereby drivers and potential riders can meet and make carpooling arrangements. Despite the promise of optimizing resources, today, flexible carpooling is rare, and the only current example isa project in Seattle, funded by the State of Washington in 2010.

Nonprofit/Cooperative Carpooling. The majority of carpooling service providers are nonprofit, community-based services (Chan & Shaheen, 2012). For example, Liftshare, founded in 1999 as a social enterprise, is "mission-driven rather than profit-driven."[2]

Vanpooling. Vanpooling focuses on supporting larger numbers of passengers sharing a van. Vanpooling got its start in the 1970s, backed by forward-thinking companies like 3M and often with the encouragement and support of the Federal-Aid Highway Act (Kircher & Wapensky, 1978). Today, a range of vanpools exist including, corporate-sponsored vanpools for employee use, privately operated vanpools for commuters or trips to airports and hotels, and publicly subsidized vanpools (Chan & Shaheen, 2012).

P2P Ridesharing. With the advent of new Internet and mobile technologies, P2P ridesharing has emerged as an important mobility alternative in cities around the globe. P2P ridesharing commonly leverages the power of social networks (Kietzmann, Hermkens, McCarthy, & Silvestre, 2011) and mobile geolocation technology to enable real-time ridesharing among network members (e.g., Lyft and Uber).

A summary of the rideshare business models is provided in Table 2.

Agency Theory Reflections on Ridesharing Business Models. Ridesharing has a long history around the globe. Older business models such as traditional carpooling and flexible carpooling schemes have primarily been provided by nonprofits or subsidized through local and regional governments. While emerging business models such as P2P ridesharing have gained substantial market share in a short amount of time, the disruptive nature of their services, and arguably their failure to collaborate with local governments has threatened the longevity of these business models as currently constituted. Insights from this analysis suggest that an agency conflict has clearly arisen between cities and P2P carshare operators. The P2P operators are motivated to maximize profits by avoiding regulation and engagement with cities and taxi operators. In contrast to the Carrot B2C carshare example alluded to above, P2P rideshare companies have primarily avoided collaborations with cities and public transit agencies to support service integration or enhancement.

Bikesharing Business Models

Similar to carsharing, bikesharing involves providing hourly access to bikes stationed throughout a city. Most bikesharing programs have some membership fees as well as usage fees. In some cases bikesharing programs are only accessible to local residents whereas in other cities, the service is available to visitors and residents alike.

The first-generation bikesharing program, White Bikes, was a failed experiment that started in 1965. Hopes that the community would share and maintain the 50 unlocked white bikes that were placed throughout Amsterdam were dashed when the bikes were continuously stolen or destroyed. Second-generation bikesharing was first launched in Denmark in 1991 (DeMaio, 2009). Operated as a coin-deposit system, it used distinguishable bikes and designated parking stations with locks (Shaheen, Guzman, & Zhang, 2010). The third-generation bikesharing programs offered today are characterized by four unique features (Shaheen et al., 2010): distinguishable bicycles, docking stations for security, kiosks for user interface, and advanced technology such as radiofrequency identification (RFID) cards for bike tracking and checkout. A summary of the following bikesharing business models is provided in Table 3.

Street Furniture Bikesharing. In 2005, France-based JCDecaux a leading global outdoor advertising company, launched the largest third-generation bikesharing program at that time in Lyon, France. This was a major breakthrough in the evolution of the bikesharing marketplace, with advertising placed on bikes and docking stations positioned "like furniture" within the city. JCDecaux entered into a collaboration with Lyon, and later with dozens of cities around the globe none of which incur direct financial costs for this additional transportation service, but help jointly promote bikesharing as a complement to existing public transit. While the street furniture business model for bikesharing has penetrated the European bikesharing market, at the time of writing, there were no such models present in the United States or Canada.

Publicly Owned Bikesharing. In some cases, cities themselves have decided to fully fund and take responsibility for the operation of local bikesharing programs. Some cities have opted for publicly owned models with private operators (Capital Bikeshare in the Washington, DC area, operated by Alta Bicycle Sharing Company).

Sponsorship-Based Bikesharing. Instead of using the bikes and the stations as vehicles for generating additional advertising revenue as in the street furniture business model, sponsors of bikesharing systems use the space to enhance their public image and brand in the target markets where they operate bikesharing systems. In some cases sponsorship-based models are publicly owned and managed by a third-party operator whereas in others, a private company gains sponsor support for implementing a local bikesharing project. For example, in 2010, Barclay's Bank became the title sponsor of a bikesharing system in London, England; however, the Transport for London government agency incurred more than £65 million in costs to support the system rollout.

Nonprofit Bikesharing. Not all current bikesharing programs rely on advertising or sponsorship. Some programs, such as most of those supported by B-Cycle, a Trek subsidiary, primarily rely on government subsidies, and membership and usage fees of their members. With more than 30 bikesharing programs in the United States and South America, B-Cycle is one of the largest developers of bikesharing programs worldwide. While B-Cycle offers significant support to the bikesharing programs using their bikes and technology, in most cases, a local nonprofit has been formed to be the operator in each of the cities where they operate. For example, in Boulder, Colorado, a nonprofit called Boulder B-Cycle was formed to fund and operate the local program. Boulder B-Cycle relied on grant funding, donations, and municipal financial support to get the

program off the ground. Boulder B-Cycle has a goal of attaining self-sustainability through membership and usage revenue within 5 years. The bikesharing business models presented here are summarized in Table 3.

Agency Theory Reflections on Bikesharing Business Models. As bikes represent a much lower capital investment than cars do, there are more nonprofit and direct government supported bikesharing programs than carsharing programs. Clearly one of the benefits of the publicly owned bikesharing model is it virtually eliminates the agency conflicts between the private owner and the local authority since they are one and the same. Yet it may generate other business model challenges such as scaling a competitive service to the broader population. Bikesharing business models based on revenues from advertisers and sponsors are clearly incented to position the bikes and the stations in areas of high density. While this is consistent with other forms of public transit such as metro stations, it does pose potential agency problems in enabling bikesharing to serve as a complement to other forms of public transit, particularly in the context of addressing the first mile/last mile challenge. Cities and bikesharing operators may need to explore specific mechanisms to support and/or subsidize the provision of service in lower density peripheries and suburbs.

Shared Mobility Agency Matrix

The mobility alternatives (carsharing, ridesharing, and bikesharing) to traditional transportation choices discussed above are examples of the different degrees of principal–agent relationships in shared economies.

While some shared mobility models, such as P2P carsharing, have limited interaction with municipal government, other models such as advertising-based bikesharing programs involve contractual agreements and the provision of resources between the private sector operator and the municipality. The amount of touch points and financial support between the local government and the shared mobility service provider not only create the opportunity for agency conflicts but may also lead to enhanced service delivery.

One major challenge for achieving success for private firms entering government markets is the potential lack of alignment relating to the desired project outcomes (Mahoney, McGahan, & Pitelis, 2009). This is particularly true for sharing economies. Agency theory provides an optimal lens for exploring the challenges to successful implementation of urban sustainability projects between private firms and the municipality or government agency. A shared mobility provider may in fact have numerous agency relationships including those with customers, investors, and the local government.

Based on the previous discussion of BMfSs and the review of key shared mobility business models, here we elaborate the Shared Mobility Agency Matrix. The matrix has two axes, the *x*-axis reflects the supply-driven interest of the *principal* (e.g., the municipality or public transit operator) whereby the goal is to *optimize value to all citizens and the environment*. In the context of shared mobility solutions, we consider the *x*-axis to be directly linked with the sustainable mobility paradigm. That is, the further right a business model fits on the matrix, the more aligned it is with the sustainable mobility paradigm. The *y*-axis reflects the demand-driven interest of the *agent*, whereby the goal is to *maximize value to paying customers*. Therefore, the higher a business model fits on the matrix, the more aligned it is to creating customer value and presumably more financially sustainable business models.

Shared Mobility BMfS on the Matrix: Public–Merit–Private Goods

There are three broad types of goods offered in society: public, merit, and private (Fiorito & Kollintzas, 2004). Public goods (e.g., national defense, emergency services, and the criminal

justice system) are offered free of charge to citizens and usually paid for via the collection of taxes. Public goods are nonrivalrous (Laux-Meiselbach, 1988), implying that access or enjoyment of a public good is not affected by additional users and nonexclusive, suggesting that public goods cannot be withheld from nonpayers.

Merit goods, regardless of an individual's willingness or desire to pay, are seen by governments or society as important to provide due to the associated positive externalities (Musgrave, 1959). In contrast to public goods, it is possible to exclude users even if the fees for use are below market. Classic examples of merit goods include health care, affordable housing, and education. Merit goods generally meet two criteria: They are undervalued by the users and they provide a positive externality in their community or society as a whole. The full value of a merit good at the time of consumption cannot be fully evaluated due to imperfect information available to the consumer, such as the case of education. Continuing with the education example, society as a whole likely benefits from the collective educational goods provided to individuals as this poses the potential to increase economic output and reduce poverty rates (Besley, 1988). Most public transit systems could be classified as merit goods in that fees are charged to users but the majority of transit systems are subsidized by the government to allow for individuals with a range of income levels to have access to the system.

Private goods are essentially the opposite of public goods. That is they are excludable and rivalrous. A user may be rejected for inability or lack of desire to pay (excludable). Furthermore, the consumption of the private good by one user may minimize or inhibit the availability of that good for another. A third characteristic of private goods is rejectability (Haignere, 1999). Rejectability implies that individual consumers have the right to forego the use or purchase of an item.

In exploring different business models associated with addressing health and associated ecological causes, Haignere (1999) developed a public/private health matrix with the degree of perception of health concerns being privately or publicly supplied as a continuum on the *x*-axis. Leveraging a similar approach, we have categorized all of the shared mobility BMfS into either public-, private-, or merit-based business models in order to conceptualize which shared mobility business models minimize agency conflicts while ensuring optimal impact.

Private BMfS. As discussed in the summary of the different business models, shared mobility service providers have opted for a range of business models in order to achieve their objectives. The P2P ridesharing platforms like Uber and Lyft have opted for a seemingly infinitely scalable, pure, for-profit business model. As these rideshare platforms have no need to hire drivers or acquire vehicles, Uber and Lyft and others like them, rely on the power of social networking to scale their service. As evidenced by their rapid growth and high valuations, it is clear these rideshare companies have achieved some early success in maximizing value to their customers. This places private shared mobility BMfS high on the *y*-axis of our matrix.

However, the private rideshare operators, to date have opted to avoid interaction with local governments. As mentioned earlier, this has resulted in significant challenges to the longevity of their business models due to legal action and other threats posed by local governments and taxi operators. We suggest that this can be explained, in part, by the failure to consider more active engagement with local governments from the beginning. While the go-it-alone approach and avoiding local government and regulation has been a historical modus operandi in other sectors (Konefal, 2013), we suggest that shared mobility service providers would be better served by finding ways to collaborate with local governments if they want to achieve long-term viability. Not only would this entail adhering to regulations in areas such as vehicle and driver safety requirements but also seeking to optimize the citizen and environmental goals to achieve active city support. Any direct financial support, or incentives that promote the use of these P2P networks, such as embedding the ridesharing data into transit applications, could result in a reduction in costs for riders. This would shift P2P ridesharing BMfS further toward merit models and

potentially serve to minimize agency conflicts and improve the social license to operate (Tregidga, Kearins, & Milne, 2013).

Public BMfS. On the other extreme from private shared mobility BMfSs are public shared mobility BMfSs. There are a limited number of examples of such purely public good offerings in the shared mobility space. The White Bikes first-generation bikesharing business models are perhaps the clearest example of a public good in the shared mobility arena. Whether provided by a nonprofit, a city council, a university, or a local transit provider, the first-generation bike programs aimed to offer free-of-charge use for any passerby. Yet even the first-generation model never truly met the criteria of a public good because they failed to meet the nonrivalrous requirement of public goods. The use, and frequently misuse of the bikes by some individuals limited and eventually eliminated access to the bikes for other users. The failed first-generation bikesharing projects are prime examples of the tragedy of the commons, first introduced by Garret Harden (1968). The tragedy of the commons, which continues to be relevant today (e.g., Brownlee & Kueneman, 2012), depicts how individuals tend to act in their own self-interest at the detriment of society and the environment as a whole and eventually diminish resource access to those same self-interested individuals. Given the costs for acquiring bikes and cars and the additional cost of operating these systems, most shared mobility services do not lend themselves to a full public good model. Due to their inability to scale and sustain themselves, we suggest that public-based BMfSs also fail to optimize value for citizens and the environment.

Merit BMfS. The majority of shared mobility business models discussed above and summarized in Tables 1 through 3, represent some degree of merit good. Of course there is a sizable range of involvement of local governments in the merit-based BMfS. In some cases like the street furniture bikesharing programs and most B2C carsharing programs, cities at least provide free or discounted access to parking spaces to service providers. This of course is done as many local governments see the potential complementary value of these shared mobility solutions with their overall transit offerings.

Other business models such as nonprofit, publicly owned, and sponsorship-based bikesharing programs commonly rely on public funding to support all or a portion of the capital acquisition and operational costs. The Capital Bikeshare in Washington, D.C. and the Barclay's Cycle programs have been successful services that have received substantial public funding which support subsidized pricing in order to optimize access and use by residents and tourists.

Until the emergence of Uber and Lyft, Zipcar was considered the most successful shared mobility company in the world. While it was a for-profit company before being acquired by Avis, Zipcar had elements of merit goods in that its collaborations with local governments led to free parking spaces offered to Zipcar as a means of promoting the service and keeping costs lower for users. For example, until 2011, Zipcar was allotted free use of 86 curbside parking spaces in Washington, D.C.[3]

Analyzing the numerous different business models for shared mobility and plotting them on the Shared Mobility Agency Matrix suggests that in many cases viewing shared mobility as a form of merit good has the potential to optimize access and environmental impact while also minimizing agency conflicts commonly found with the strictly private business models. Next, we present a discussion of the implications of this research and recommendations for future research.

Discussion and Future Research

The sharing economy is growing at an impressive rate across the globe. Yet management scholars working in the organizations and natural environment field have barely scratched the surface on shared economy business models and their implications for companies, cities, and the natural

environment. We hope that this research starts a conversation among scholars who can explore the various, and often contradictory roles the different agents and principals play in sharing economies. In this pursuit, this research perhaps opens up more questions and issues than it actually resolves. Yet we are hopeful that by shedding light on the topic of public and private collaboration in the delivery of shared mobility services, this research can serve to stimulate other scholars to pursue interesting theoretical and empirical lines of research. Some possible directions for future organizations and natural environment research are discussed below.

Minimizing Agency Conflicts to Improve Environmental Impact

Some cities seem to be optimistic that new private-sector BMfSs may help address gaps in transit delivery without incurring any additional financial responsibility. This research suggests that in many instances complete privatization of transit services may lead to agency conflicts and insufficient service extension. For decades scholars have suggested that a more efficient use of tax dollars may be to combine government support for the delivery of private goods via the private sector (Pack, 1987). Our research suggests that a pure reliance on the private sector may fail to optimize transit service and to achieve the desired environmental impacts and that some economic and noneconomic incentives to private operators may reduce agency conflicts and, as a result, improve overall system performance.

Similarly, how might governments and the private sector further align their interests to support sustainable mobility objectives? For example, the eco-efficiency goals discussed by Banister (2008) would imply that positive externalities could arise from the incorporation of eco-friendly carsharing vehicles such as electric vehicles (EVs) and hybrids. Yet the additional costs of those vehicles for carsharing services providers, including the installation of a charging station network in the case of EVs, make eco-friendly vehicles more difficult to incorporate into carsharing fleets.

Firm Failure and Impacts on System-Wide Sustainability

As alignment improves between shared mobility providers and municipal sustainable mobility objectives, shared mobility service providers will become an increasingly important and integrated component of the local transportation system. Case in point: the Public Bike System Company (PBSC) mentioned previously is the supplier of bikesharing systems from the bikes to the docking stations for 15 cities around the globe. In January of 2014, PBSC filed for bankruptcy. The Alta Bicycle Share Company is the primary operator of PBSC systems. At the time of this writing, the bikesharing industry, and the local governments that have supported PBSC system rollout, are all casting a concerned eye toward the outcome of PBSC's bankruptcy. The failure of a critical cog in a sustainable mobility system could result in major service disruption and system failure. How can local governments and shared mobility providers integrate contingency plans to minimize the risk of service outage?

Toward Smart and Sustainable Cities

The scope of this research was narrowly focused on agency conflicts in the relationship between BMfSs and local government in the context of shared mobility and the sustainable mobility agenda. While our analysis suggests that a move toward merit goods may result in an optimal solution from the perspective of cities, more research needs to be conducted to understand the relationship between municipal sustainable objectives and interactions with the private sector. Increasingly cities are seeking to become smarter through the use of new information and communication technologies, causing cities to rely even more on public–private collaborations to implement a wide array of technology solutions (Krassimira, 2011). How can cities ensure proper

alignment of incentives to achieve sustainability objectives while allowing for sufficient profit-making with private sector partners is an important area of research. It is not clear how our Matrix applies in these other areas of public–private collaboration.

Toward a Sharing Economy

This research opens up a plethora of questions regarding the sharing economy and its impact on the global sustainability agenda. *Natural Capitalism*, a seminal book in business sustainability, was among the first to sound the call for researchers and the private sector to embrace the service economy as a way to reduce environmental impacts of the consumption-based economy (Hawken, Lovins, & Lovins, 2009). It seems the sharing economy may be the next stage in the evolution of fundamentally restructuring how economies work. Sharing business models have emerged in key sectors of the economy, including (Owyang, Samuel, & Grenville, 2014) goods (e.g., Rent the Runway), professional services (e.g., Elance), transportation (e.g., Uber), space (Airbnb), and money (e.g., Kickstarter). The sharing economy has the potential to move the needle in assisting a radial shift in global and local economies toward sustainability. Yet there is a dearth of research of how sharing economy business models work, what their sustainability impacts are, and how they are able to align incentives with key stakeholders to ensure longevity of their operations. Similarly, the sharing economy has seen entrants from startups and multinational corporations. How do sharing economy business models differ among startups and corporations? In the case of corporations, what motivations do they have for engaging in sharing models and what impacts do they have on their environmental impacts and on profits? We expect researchers to begin uncovering answers to these and similar questions in the coming years.

In conclusion, shared mobility BMfSs hold significant promise in assisting the transition toward more sustainable mobility systems. The Shared Mobility Agency Matrix developed herein contributes a useful extension of agency theory by demonstrating that the wide range of shared mobility business models employed vary in their ability to achieve the goals of the new sustainable mobility paradigm based on the extent to which the business models minimize agency conflicts. Our analysis suggests that a move toward merit-based business models may offer a more optimal alignment between service provider and local government objectives. Given the rapid growth of the sharing economy, particularly in municipal environments, insights from this research may help shed light on the future evolution of the sharing economy in smart and sustainable city initiatives around the globe.

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Notes

1. http://www.navigantresearch.com/newsroom/carsharing-services-will-surpass-12-million-members-worldwide-by-2020
2. https://www.liftshare.com/content/aboutus.asp
3. http://www.tbd.com/blogs/tbd-on-foot/2011/08/zipcar-loses-more-than-80-of-its-d-c-curbside-parking-spaces–12326.html

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