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Analysis of the Bicycle-Sharing Economy : Strategic Issues for Sustainable Development of Society

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Abstract

Purpose - This study posits that sustainable mobility of the sharing economy plays a key role to consider environment benefits. The purpose of this study is to investigate the bicycle-sharing economy as an emerging and alternative mode of transportation service and provide managerial and policy implications. The bicycle-sharing economy is still at an early stage of introduction as a transportation mode, while the governmental sector is promoting public bicycle-sharing to encourage bicycle as a substitute for private cars.

Research design, data, and methodology - This study analyzed the current status of bicycle sharing programs through a survey that was distributed randomly to users and non-users across the country. Using factor analysis, satisfaction and loyalty for the existing users and intention to use and expected satisfaction for the potential users were examined in relation to utility factors.

Results – The results show that economic utility affects satisfaction for user, while storage, mobility, and economic utility affects intention to use for potential users. The findings of this study indicate that in order to promote a bicycle-sharing scheme, it would be better to focus on the scheme's economic advantage to be truly effective.

Conclusions - The findings of the study could be applicable to future directions of the sharing economy as a means to achieve the sustainable development of society.

Keywords: Sharing Economy, Bicycle Sharing, Utility, Satisfaction, Sustainable Development.

JEL Classifications: M31, M15, L97, L28.

1. Introduction

Consumption has long been believed to be a necessary prerequisite to fulfill basic human needs and enhance quality of life. The industrialization and automation brought by Industrial Revolution stimulated competition resulted in reduced prices for a product, thus, more consumption followed. Taking into account the swelling global population, the level of production and consumption may continue to rise going forward, while traditional consumption and production patterns were revealed to carry huge environmental burdens. Some have called for a transformation to a "less-material intensive" way of living, such as "collective use of resources" (Mont, 2004). This way, individuals are sharing materials to satisfy their needs, but without compromising the same functions, values, or services delivered. Lamberton and Rose (2012) also noted that consumer responses to sharing were found to be positive when costs of sharing are reduced and benefits from sharing increase.

The sharing economy has witnessed its scale and size growing over the past years, with its value estimated at over US$100 billion (Heinrichs, 2013). Böcker and Meelen (2017) mentioned that the sharing economy can also be considered as one of the pathways to sustainable development with its perceived positive benefits in the society and the environment. Consequently, a growing body of literature has examined the nature and impacts of the sharing economy (Martin, 2015). Böcker and Meelen (2017) observed that those who participate in the sharing economy have environmental concerns and are conscious of the scarcity of natural resources. Out of concerns about climate change, energy, and fuel prices, governments around the world have examined the need for cleaner and sustainable transportation strategies (Shaheen, Guzman, & Zhang, 2010).

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Yang, Shu, Cheng, Chen, and Moscibroda (2016) mentioned that shared transportation has grown tremendously in recent years as a result of the rise of the sharing economy and growing environmental, energy, and economic concerns. Lamberton and Rose (2012) stated that bicycle-sharing has spread worldwide, which accounts for around 2.2 million bicycle-sharing trips per month. The emergence of the theme of bicycle -sharing can be noted in line with sustainability and sustainable transportation, which would result in CO2 reduction, air quality improvement, the use of alternative fuels, and so on (Banister, Pucher, Lee-Gosselin, & Lee, 2007; Fishman, 2016).

Based on these considerations, this study aims to look at public bicycle-sharing programs through the lens of the sharing economy. With this in mind, and given that both the sharing economy and bicycle-sharing are relatively current issues to be studied in connection with each other, this paper aims to provide answers to research questions by applying utility and satisfaction theories. In particular, this paper attempts to address how mobility, storage, technology, economic, trust, and sustainable utility affect the satisfaction of users with bicycle-sharing. Research questions include i) how do utility factors including mobility, storage, technology, economic, trust, and sustainable affect satisfaction of users on bicycle-sharing? ii) how do utility factors affect the intention of potential users to use bicycle-sharing? iii) how does satisfaction of users on bicycle-sharing affect loyalty? and iv) how does the intention of potential users to use bicycle-sharing affect the level of expected satisfaction?

2. Literature Review

2.1. Definition of Sharing Economy

Researchers still debate the definition of the sharing economy. Some take an economic approach to define the sharing economy, pointing to economic benefits such as reduced costs. The financial crisis in 2008 caused people to give a second look to consumption behavior and the concept of ownership and found that users of car and accommodation sharing are motivated to participate in sharing because the cost-saving utility increased their satisfaction (Böcker & Meelen, 2017). The social aspect of sharing that is interactions between users and service providers (Böcker & Meelen, 2017) is also important aspect for the sharing economy. Interactions such as getting to know new people and socializing are claimed to serve as a key driver for people who participate in the sharing economy (Botsman & Rogers, 2011). By considering environmental issue, sharing can be a way to address problems arising from energy- and resource-intensive consumption. Examples are material sharing and renting or leasing rooms with a view to increase the intensity of product use (Mont, 2004). As the term sharing economy can refer to a number of different ways in which it has been used in practice (Martin, 2015), it is worth listing in a chronological order the various usages of the sharing economy in this paper (<Table 1>).

<Table 1> Summary of Terms and Definitions of Sharing Economy

Names	Author(s) & Year	Definition
“Prosumption”	Toffler (1980) Ritzer & Jurgenson (2010)	The reintegration of production and consumption that rejects the binary distinction between the two, with the emergence of Web 2.0, turning consumers into prosumers.
“Consumer participation”	Fitzsimmons (1985)	Consumer involvement in the service process can enhance productivity (e.g., fast food restaurant, manufacturing sector with technological innovation).
“Product-service systems”	Mont (2002)	Providing utility to consumers through the use of services rather than products by “dematerializing” in production and consumption in an environmentally-friendly way, which are often connected with ownership structure change.
“Online volunteering”	Postigo (2003)	Post-industrial concept of collaborative efforts by consumers to reduce costs and maximize benefits.
“Value co-creation”	Prahalad & Ramaswamy (2004)	Consumer interaction with companies, co-creating value and personalized experience that suit their needs.
“Co-creation”	Lanier & Schau (2007)	Value shift from being embedded in products to one co-created by both producer and consumer.
“Co-production”	Humphreys & Grayson (2008)	Consumer collaboration with producers or other consumers in the value chain to create “exchange value” for companies as opposed to “use value”.
“The mesh”	Gansky (2010)	An information-based and network-enabled sharing service that allows people to be connected to others, businesses and things.
“Collaborative consumption”	Bostman & Rogers (2010)	“Sharing, swapping, trading or renting products and services” that give users access over ownership, so collaborating for consumption and production at the same time.
“Commercial sharing systems”	Lamberton & Rose (2012)	Consumers enjoying the benefits of a product without owning it, where consumers compete each other for a limited supply of the shared product.

Source: Belk (2013), Bocker and Meelen (2016), Ritzer and Jurgenson (2010).

2.2. Development of Bicycle-Sharing

It is a relatively new idea to share bicycles, which has sharply increased just from a decade ago (Bachand-Marleau, Lee, & El-Geneidy, 2012; Fishman, Washington, & Haworth, 2013). The second-generation bicycle-sharing program (or "Coin-Deposit Systems") was designed to address the shortcomings of the previous program and came with enhanced security and a paid docking station (Jang, Gim, & Lee, 2016). What sets the third generation apart from the previous two generations is more sophisticated security, varied bicycle design, and the associated use of websites and apps for making real-time information available to the users (Shaheen, 2012). The latest fourth generation of the bicycle sharing program, called a demand-responsive multimodal system, builds upon the third with innovative features like mobile and solar-powered docking stations, and so on (DeMaio, 2009; Shaheen, Guzman, & Zhang, 2010). However, the basic principle underpinning the bicycle-sharing system that stood out throughout the generational evolutions remains undifferentiated: people use bicycles as they need, free of charge and without responsibilities of ownership, and the basic premise of the system is sustainable transportation (Shaheen, Guzman, & Zhang, 2010; Parkes, Greg Marsden, Shaheen, & Cohen, 2013; Midgley, 2009; Murphy & Usher, 2015).

It is estimated that there are approximately 100 programs in about 125 cities around the globe with more than 139,300 bicycles on four continents, and 45 more to be introduced in 22 countries in 2010 (Shaheen, Guzman, & Zhang, 2010). European countries are the early adopters of the public bicycle-sharing systems, with the Netherlands, Germany and Denmark witnessing an increase between 20 to 43% from 1975 and 1995 (Pucher & Buehler, 2008). According to Fishman, Washington, and Haworth (2013), Paris initiated Europe's largest bicycle-sharing system in 2007 with over 20,000 bicycles, whereas in North America, New York launched its bicycle-sharing scheme with 10,000 bicycles in 2013. However, China is fast catching up with its European counterparts to claim the world's largest public bicycle-share programs in terms of the number of available bicycles with 70,000 and 65,000 bicycles in Wuhan and Hangzhou, respectively (Kwon, 2014). China introduced bicycle-sharing in an attempt to mitigate traffic congestion, while the U.S. and Canada did so to improve public health (Fishman, Washington, & Haworth, 2013). Although the forms vary from country to country, the bicycle-sharing programs ultimately pursue the integration of cycling into mainstream transportation systems, making it readily available for daily transportation (Shaheen, Guzman, & Zhang, 2010). In a response to the Paris Agreement, given that CO_2 emissions are particularly high in transportation, the Korean government has implemented multiple policy measures including tax benefits and subsidies for environmentally-friendly and low-carbon vehicles (Jang, Kim, & Lee, 2016).

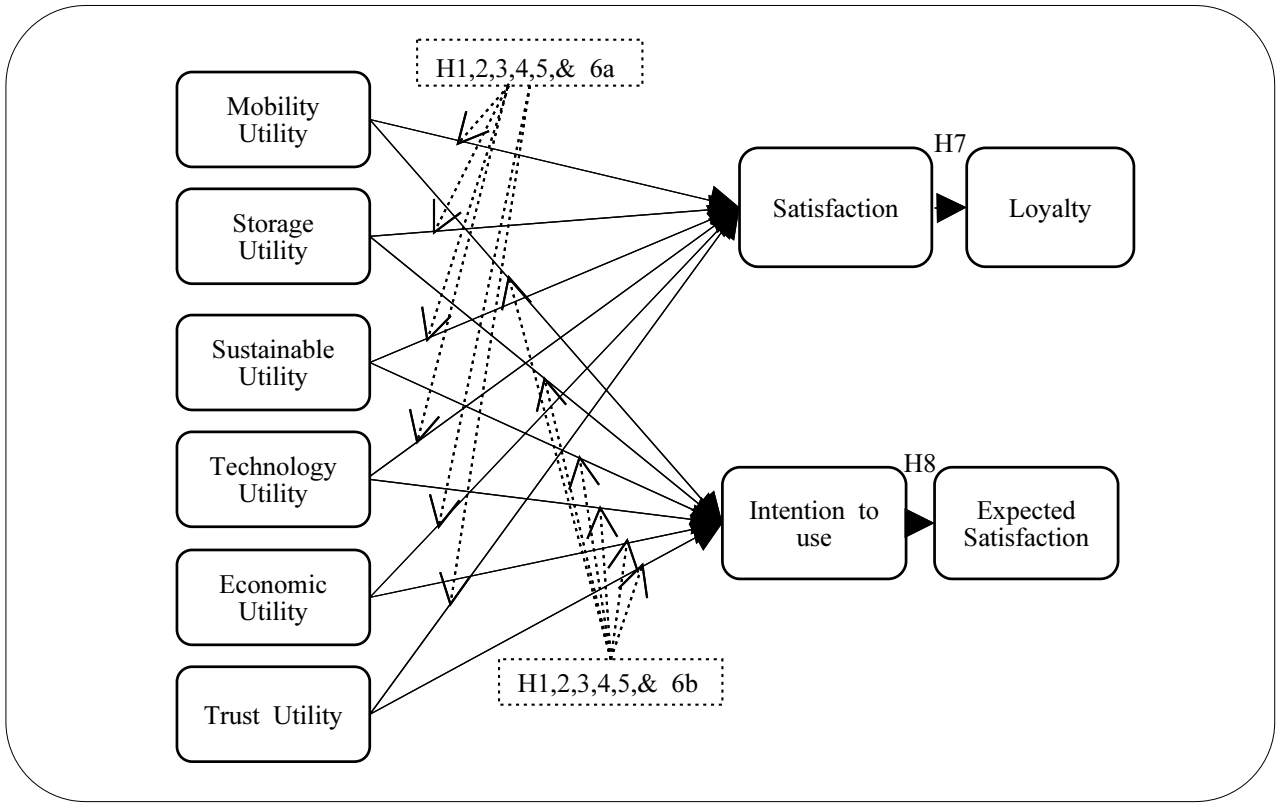
3. Theoretical Background

Self-efficacy theory can be also relevant to the research on the sharing economy because self-efficacy is affected by prior exposure to a similar situation (experience), cognitive comparison between oneself and others with regard to a certain behavior (modelling), social encouragement by others (social persuasion), and various signs of and responses to an action (physiological factors) (Hung & Wong, 2007).

This study is supported by theories including satisfaction theory and loyalty (Picón, Castro, & Roldán, 2014). Picón, Castro, and Roldán (2014) analyzed the relationship between satisfaction and loyalty, with satisfaction being the crucial ingredient in customer loyalty. According to Oliver (1997), customer loyalty is defined as a deeply held commitment to rebuy or repatronize a preferred product or service consistently in the future, despite situational influences and marketing efforts potentially causing switching behavior. It comes before affective loyalty, which entails a positive attitudinal commitment toward the provider (Oliver, 1996).

4. Hypotheses Development

This study explored utility factors, namely mobility, storage, technology, economic, trust, and sustainability that are assumed to affect satisfaction of users with bicycle-sharing, and the intention of potential users with bicycle-sharing, with hypotheses that satisfaction is related to loyalty for the users, and intention is related to expected satisfaction of potential users (Figure 1). The proposed variables are drawn from literature on consumer satisfaction (Picón, Castro, & Roldán, 2014; Hung & Wong, 2007; Venkatesh, Thong, & Xu, 2012; Oliver, 1996). Based on the usage experience of bicycle-sharing programs, the effect of overall utility on bicycle-sharing on satisfaction and loyalty will be explored for the existing users, while those on the intention to use and expected satisfaction for the potential users. Satisfaction is applied for usage experience as it defined as the consumer's fulfillment response and consequences (Oliver, 1996) after the consumption, while intention to use is applied for non-usage experience. Therefore, this study did not hypothesized relationships of satisfaction and intention to use as those psychological constructs.



Note: Modified from Picón, Castro, and Roldán (2014), Hung and Wong (2007), Venkatesh, Thong, and Xu (2012), Oliver (1996).

<Figure 1> The Proposed Model of Factors that Affect Satisfaction and Intention to Use for Bicycle-Sharing

4.1. Effects of Mobility Utility on Satisfaction and Intention to Use

This study assumes that if one gets more flexibility in mobility in choosing any mode of transport, it would give the person greater utility. Based on such an assumption, “freedom of flexibility” can also be applied in the case of bicycle-sharing program which offers transportation-related merits such as a low-carbon and environment-conscious solution to the “last-mile (i.e., the short distance between home and public transit and/or transit stations and the workplace)” problem (Shaheen, Guzman, & Zhang, 2010). Shaheen, Guzman, and Zhang (2010) also explain that bicycle-sharing has the potential to provide the missing link in existing transportation networks, and gives a convenient option to potential users. Based on these considerations, this study hypothesized on the effects of mobility utility (Hennig-Thurau, Henning, & Sattler, 2007) on satisfaction and intention to use.

<H1a> The perception of mobility utility affects satisfaction of users with bicycle-sharing services.
<H1b> The perception of mobility utility affects intention to use of potential users of bicycle-sharing services.

4.2. Effects of Storage Utility on Satisfaction and Intention to Use

Previous studies (Hennig-Thurau, Henning, & Sattler, 2007, Lamberton & Rose, 2012) stated storage utility as a product storage advantage obtained through sharing products. Bicycle-sharing has an advantage over owning a bicycle, as it eliminates the attached responsibilities of parking while providing multiple unattended docking stations for pick-up and drop-off (available at different stations) (Shaheen, Guzman, & Zhang, 2010). Parkes et al. (2013) argued that storage aspect and no responsibility for parking spaces for bicycle sharing could encourage users who may otherwise not ride a bicycle. This study hypothesized regarding the effects of storage utility on satisfaction and intention to use.

<H2a> The perception of storage utility affects satisfaction of users with bicycle-sharing services.
<H2b> The perception of storage utility affects intention to use of potential users to use bicycle-sharing services.

4.3. Effects of Sustainability Utility on Satisfaction and Intention to Use

Sustainable utility implies environmental advantages with emphasis on the sharing economy (Böcker & Meelen, 2017). Böcker and Meelen (2017) state that the sharing economy, as an alternative economic model contributes to environmental sustainability. Shaheen et al. (2010) presents data on the notable effect of greenhouse gas (GHG) emissions reduction from bicycle-sharing that would otherwise be produced if the same distance were travelled by car. Majumdar and Mitra (2015) indicate that both bicycle riders and the users of other transportation modes are aware of the environmental benefits bicycles may provide. This study hypothesized about the effects of sustainability utility on satisfaction and intention to use.

<H3a> The perception of sustainability utility affects the satisfaction of users with bicycle-sharing services.
<H3b> The perception of sustainability utility affects intention of potential users to use bicycle-sharing services.

4.4. Effects of Technology Utility on Satisfaction and Intention to Use

Intelligent transport systems (ITS) facilitates the transportation system (Jarašūnienė, 2009) facilitates the transportation system. Technology-enabled services support better use of bicycle sharing economy. The rapid growth and expansion across Europe and other continents of public bicycle-sharing programs started to be noticed with better and improved technology (DeMaio, 2009). More innovative approaches include movable docking stations, solar-powered docking stations, e-bikesm and real-time availability application (Midgley, 2011). This study hypothesized about the effects of technology utility on satisfaction and intention to use.

<H4a> The perception of technology utility affects the satisfaction of users on bicycle-sharing services
<H4b> The perception of technology utility affects intention of potential users to use bicycle-sharing services.

4.5. Effects of Economic Utility on Satisfaction and Intention to Use

Users of bicycle-sharing program can save parking costs, maintenance, and insurance. Majumdar and Mitra (2015) stated that cost was a key factor in bicycle mode choice. Fishman et al. (2014) also found that financial saving can be a motivating factor that encourages bicycle-sharing. The perceived merits of using a bicycle-sharing program can result in enhanced users' economic utility, as it is linked to the user satisfaction of gaining a financial advantage by purchasing a service (Hennig-Thurau, Henning, & Sattler, 2007). This study hypothesized about the effects of economy utility on satisfaction and intention to use.

<H5a> The perception of economic utility affects satisfaction of users with bicycle-sharing services
<H5b> The perception of economic utility affects intention of potential users to use bicycle-sharing services.

4.6. Effects of Trust Utility on Satisfaction and Intention to Use

Morgan and Hunt (1994) defined confidence as an exchange partner's reliability and integrity, which can also be associated with the notion of willingness to rely on the other party, confidence in the trusting party, and behavioral intention (Morgan & Hunt, 1994). In the sharing economy, trust plays a crucial role between participating users and service providers to enhance service reliability. Experts also identified safety, security, and other physical factors as important criteria in promoting bicycle-sharing programs (Majumdar & Mitra, 2015). Majumdar and Mitra (2015) explain that the low speed of bicycles contributes to making people feel generally safe, and that bicycle riders are concerned with the "presence of motorized vehicles on the road." Karki and Tao (2016) mentioned that bicycle safety improvements affect the bicycle rider population. This study hypothesized about the effects of trust utility on satisfaction and intention to use.

<H6a> The perception of trust utility affects the satisfaction of users on bicycle-sharing services.
<H6b> The perception of trust utility affects intention of potential users to use bicycle-sharing services.

4.7. Effects of Satisfaction on Loyalty

Paul, Modi, and Patel (2016) describe attitude as the degree to which a person has a positive or negative evaluation of a particular behavior. Attitude toward the environment is the direct predictor of whether one would behave pro-environmentally (Paul, Modi, & Patel, 2016; Wu, 2015; Steg & Vlek, 2009). Dick and Basu (1994) mentioned that a consumer would respond to a product or a service based on the combination of his/her own prior expectation and perceived performance, and the resulting degree of satisfaction is considered an antecedent to loyalty. This study hypothesized about the effect of satisfaction on loyalty of the actual use of bicycle-sharing.

<H7> Satisfaction of users with bicycle-sharing affects loyalty.

4.8. Effects of Intention to Use on Expected Satisfaction

This study measures how intention to use for those who have never experienced a bicycle-sharing program affects expected satisfaction. Ilgen (1971) stated that satisfaction as a function of the initial level of expected performance. Oliver (1996) mentioned that an expectation is more than an anticipation of consequences. The term expected utility (Schoemaker, 1982) is also applied to describe how products or services fulfil customers' desires to satisfy needs. Utility factors combined with the resulting attitudes contribute to determining potential customers' intention to use bicycle-sharing. This is because intentions are a general measurement of commitment, meaning that for people to have the intention to use a bicycle-sharing program, they should be at least aware of the attributes of the program, and the factors influencing the level of utility (Passafaro, Rimano, Piccini, Metastasio, Gambardella, Gullace, & Lettieri, 2014). This study hypothesized on the effects of intention to use on expected satisfaction.

<H8> Intention of potential users to use bicycle-sharing service affects expected satisfaction

5. Methodology

This study seeks to analyze the utility factors, level of satisfaction and loyalty (for users), and intention to use and expected satisfaction (for potential users). This study conducted a survey through an online channel. The online survey was conducted based on the platform called Qualtrics, which creates an online link so that the questionnaire can be easily distributed through such means as messengers, SNS, email, and so on. The survey comprised 54 questions that ask respondents questions randomly regarding bicycle-sharing programs and demographic information. The questions were divided into different parts based on respondents' previous experience of bicycle-sharing services. A 5-point Likert scale was applied with 1 = Strongly Disagree and 5 = Strongly Agree. This study conducted the survey in Korea, where the bicycle-sharing economy is launched recently. This study compared how users and potential users perceived utilities of the bicycle-sharing economy differently.

The constructs used to develop survey questions including utility factors were based on previous studies (Lamberton & Rose, 2012; Venkatesh, Thong, & Xu, 2012; Fishman, Washington, Haworth, & Mazzei, 2014; Majumdar & Mitra, 2015; Möhlmann, 2015; Lee & Cho, 2015) and adjusted to serve the purposes of this study. The study developed variable items for measuring attitudes towards bicycle-sharing, following the items explored by Paul, Modi, and Patel (2016), Majumdar and Mitra (2015), and Möhlmann (2015).

This study conducted a pilot study to establish the validity of the survey questionnaire. This study also applied back translation and reliability test by examining Cronbach's alpha for each construct. Cronbach's alpha values were 0.77 for mobility, 0.80 for storage, 0.82 for sustainability, 0.89 for technology, 0.81 for economic, and 0.74 for trust utility. For satisfaction and loyalty, the Cronbach's alpha values were 0.96 and 0.77 respectively, and for intention to use and expected satisfaction, the Cronbach's alpha values were 0.92 and 0.90 respectively.

6. Data Analysis

Out of 210 respondents in total, 152 completed the survey with 72.4% response rate. Among the respondents, 44.7% were female and 55.3% were male, while 55.7% were unmarried and 16.7% were married. By age groups, 37.6% were 21-30 years old, 31.4% were 31-40 years old, 2.9% were 41-50 years old, and 0.5% were greater than or equal to 61. With regard to their education level, 25.7% had an undergraduate degree, 20.5% had a master's degree or beyond, 14.8% were attending university, 7.6% were attending vocational university, and 1.4% had high school degree. In terms of occupation, students comprised 25.2%, office workers comprised 21.4%, civil servants comprised 9%, housewives comprised 1.4%, and other occupations took up 14.8%. This study found that 67% respondents had heard about bicycle-sharing services (117 out of 175), while 23% of those have actually used such a service.

To check the validity of each construct, this study conducted factor analyses that used principal component analyses as extraction method, and Varimax rotation with Kaiser Normalization. It shows that the factor analyses represented the major constructs in a successful manner, with Eigen values being greater than 1.00. This study conducted factor analysis for existing bicycle-sharing users and for non-users, respectively. <Table 1> and <Table 2> summarizes the results of the factor analysis for the utility construct for existing and potential bicycle-sharing users.

<Table 2> Component Matrix: Utility Factors of the Existing Users of Bicycle-Sharing

Items		Components					
Factors	Scale Items	1	2	3	4	5	6
Mobility Utility 3	I think I would use bicycle sharing because of its travel flexibility.	.910					
Mobility Utility 1	Bicycle-sharing service gives me more freedom of mobility.	.887					
Mobility Utility 2	I would like to use a bicycle-sharing service, if I want to go somewhere close but not connected by public transportation.	.883					
Storage Utility 3	I like bicycle-sharing because I can easily access transportation without concerns about storage.		.888				
Storage Utility 1	One great thing about a bicycle-sharing service is not being responsible for finding space to store the bicycle.		.887				
Storage Utility 2	I like that I don't have to waste my time looking for storage because the docking stations are closer to work and home.		.824				
Sustainability Utility 2	I like that if I use bicycle sharing, I can make a contribution to protecting the environment.			.928			
Sustainability Utility 1	I would use bicycle sharing because bicycle-riding is more pro-environmental than automobiles because it does not emit toxic chemicals.			.914			
Sustainability Utility 3	I would use bicycle sharing because it will help to protect the environment.			.870			
Technology Utility 1	The Internet and smartphone is useful for using bicycle-sharing service.				.947		
Technology Utility 2	The Internet and smartphone provide me quick and easy access to the docking station and to use the service.				.897		
Technology Utility 3	I like that Internet and smartphone enable me access the bicycle without owning it.				.893		
Economic Utility 2	I like the fact that bicycle-sharing services save my time: searching for parking lots, driving unnecessary distances, and suitable for getting to the final destination.					.875	
Economic Utility 1	I believe that bicycle -haring service save my money in many different aspects such as owning and parking, oil price, maintenance, insurance, and so on.					.848	
Economic Utility 3	I believe I can save more money when I use bicycle sharing than when driving a car.					.844	
Trust Utility 2	I will be happy that users of bicycle-sharing services are truthful in dealing with one another.						.929
Trust Utility 1	I will be happy if drivers of motorized vehicles make bicycle riders feel safe on the road.						.918
Trust Utility 3	I trust that the service provider will give enough safeguards to protect me from liability for damages.						.337

<Table 3> Component Matrix: Utility Factors of the Potential Users of Bicycle-Sharing

Items		Components					
Factors	Scale Items	1	2	3	4	5	6
Mobility Utility 3	I think I would use bicycle-sharing because of its travel flexibility.	.924					
Mobility Utility 2	I would like to use bicycle-sharing service, if I want to go somewhere close but not connected by public transportation.	.884					
Mobility Utility 1	Bicycle-sharing service gives me more freedom of mobility.	.585					
Storage Utility 3	I like bicycle-sharing service because I can easily access a transportation without concerns about storage.		.859				
Storage Utility 1	One great thing about bicycle-sharing service is not being responsible for finding space to store bicycle.		.843				
Storage Utility 2	I like that I don't have to waste my time for looking for storage place because the docking stations are closer to work and home.		.799				
Sustain-ability Utility 1	I would use bicycle-sharing because bicycle-riding is more pro-environmental than automobile because it does not emit toxic chemicals.			.903			

Sustain-ability Utility 2	I like that if I use bicycle-sharing, I can make a contribution to protecting the environment.			.831			
Sustain-ability Utility 3	I would use bicycle-sharing because it will help to protect the environment.			.820			
Technology Utility 1	The internet and smartphone is useful for using bicycle-sharing service.				.948		
Technology Utility 2	The internet and smartphone provide me quick and easy access to the docking station and to use the service.				.916		
Technology Utility 3	I like that internet and smartphone enable me access the bicycle without owning it.				.843		
Economic Utility 2	I like the fact that bicycle-sharing service because it saves my time: searching for parking lots, driving unnecessary distance, and suitable for getting to the final destination.					.870	
Economic Utility 1	I believe that bicycle-sharing service save my money in many different aspects such as owning and parking, oil price, maintenance, insurance, and so on.					.859	
Economic Utility 3	I believe I can save more money when I use bicycle-sharing than driving a car.					.800	
Trust Utility 1	I will be happy if drivers of motorized vehicles make bicycle riders feel safe on the road.						.895
Trust Utility 2	I will be happy that users of bicycle-sharing service are truthful in dealing with one another.						.873
Trust Utility 3	I trust that the service provider will give enough safeguards to protect me from liability for damages so that I am not responsible for.						.684

<Table 4> Effects of Utility Dimensions on Satisfaction and Intention to Use

Variable (Independent -> Dependent)	Standardized Coefficient (t-value-Sig)	
	Users	Potential Users
Mobility Utility -> Satisfaction/Intention to Use (H1a~b)	0.380 (1.505)	0.479 (5.119***)
Storage Utility -> Satisfaction/Intention to Use (H2a ~b)	0.208 (1.113)	-1.99 (-2.152**)
Sustainable Utility -> Satisfaction/Intention to Use (H3a~b)	-0.170 (-1.043)	0.051 (0.508)
Technology Utility -> Satisfaction/Intention to Use (H4a~b)	-0.081 (-0.425)	0.009 (0.088)
Economic Utility -> Satisfaction/Intention to Use (H5a~b)	0.550 (2.951**)	0.353 (2.956**)
Trust Utility -> Satisfaction/Intention to Use (H6a~b)	0.058 (0.329)	0.050 (0.505)

** Significant at 0.05 level (2-tailed).

Regression analysis was applied to test the hypotheses using factor scores. <Table 4> represents the results of multiple regression analyses for utility factors on satisfaction and intention of existing and potential users of bicycle-sharing services. Overall, the ANOVA analysis showed that the models were significant at 0.01 level with F = 7.066 for users and 18.996 for potential users (r-square = .669 for users and .495 for potential users). The findings indicate that hypothesis <H5a> is accepted. Economic utility of bicycle-sharing service was the only independent variable related to satisfaction for the existing users of the service. The findings indicate that hypotheses <H1b>, <H2b>, and <H5b> are accepted. Therefore, for those who have never experienced bicycle-sharing, mobility, storage and economic utility were related to their intention to use.

The study applied factor and regression analysis for the effects of satisfaction on loyalty and intention to use on expected satisfaction. <Table 5> shows the results of the analysis. The ANOVA finds the models significant at 0.01 level with F = 31.568 for <H7> and 67.349 for <H8> (r-square = .530 for <H7> and .359 for H8). Therefore, hypotheses <H7> and <H8> were accepted.

<Table 5> Effects of Satisfaction on Loyalty of Users

Variable (Independent -> Dependent)	Standardized Coefficient (t-value-Sig)
Satisfaction -> loyalty (H7)	0.728 (5.619***)
Intention to Use -> Expected Satisfaction (H8)	0.600 (8.207***)

*** Significant at 0.01 level (2-tailed).

The findings of this study on bicycle-sharing are intriguing in that they are consistent with other previous studies in some ways, but divergent in other ways. People who had not used bicycle-sharing service yet were found to appreciate the mobility utility that bicycle-sharing service would entail. If bicycle-sharing could maximize the freedom of mobility as a possible “last mile” (Shaheen, Guzman, & Zhang, 2010) transportation mode, it can attract more bicycle riders to become bicycle-sharing users and present

one solution to urban traffic problem. However, for bicycle-sharing to be a viable substitute for driving a car and to succeed in achieving a modal shift, the mobility advantage should have a direct relationship with attitudes of not just potential users, but also existing users.

Storage utility was another contributing factor that affects the intention to use bicycle-sharing services for people with no previous bicycle-sharing experience. The reduced responsibility that follows non-ownership of a product was appreciated by potential users of the survey, which is one of the core features of the sharing economy. In spite of the obvious environmental advantages of bicycle-sharing, as presented in the studies by Shaheen, Guzman, and Zhang (2010) and Möhlmann (2015), this study found that the environment has an indirect relationship with overall attitudes such as satisfaction and intention to use a bicycle-sharing services. Looking at the development history of global bicycle-sharing programs, technologically improvement has always allowed the introduction of an enhanced version of the service. This study, however, produced findings divergent from those of previous studies. Both the existing users and potential users of the survey found technology utility insignificant in influencing their attitudes.

Economic drivers for bicycle-sharing were found to be valid for both users and non-users. The hypothesis that economic utility affects satisfaction was accepted, which is in line with other literature on the sharing economy. These studies found economic reasons behind the motivation to use accommodation sharing (Tussyadiah, 2015), increasing satisfaction from cost savings (Möhlmann, 2015), and economic concerns in participating in collaborative consumption (Bardhi & Eckhardt, 2012). It is interesting to note that economic utility was the sole determinant that affects attitudes of bicycle-sharing service users in this study.

7. Conclusion

The rise of the sharing economy is inevitably followed by a behavioral change from ownership to sharing. This study analyzed the sharing economy in transportation, in particular bicycle-sharing, taking an approach based on user satisfaction and intention with a view to facilitating government policy efforts to promote bicycle-sharing. This is in line with the recent adoption of the Paris Climate Agreement and Sustainable Development Goals that governments at central and local levels initiated policy measures for environmental purposes. Bicycle-sharing has been promoted as a plausible solution to address environmental problems in modern society, where air pollution has increasingly become a threat around the world. The findings of this study indicate that in order to promote a bicycle-sharing scheme, it would be better to focus on the scheme's economic advantage to be truly effective. The fact that many people who responded to the survey still have not heard about bicycle-sharing programs and have not used bicycle-sharing services, even though the docking stations were nearby, shows a possible need to adjust the policies.

This study also provides policy and social implications. A number of studies have already stated the potential benefits associated with bicycle-sharing (Jang, Gim, & Lee, 2016; Kwon, 2014). The benefits include reduced toxic chemicals in the atmosphere, health benefits, less congestion, and cost saving, among others. Economic utility-focused policy would be able to achieve the intended goal of expanding the user base, and at the same time, indirectly contribute to meeting environmental goals. If bicycle-sharing is promoted as a substitute for cars, it should be also noted that the transit effect is actually limited (Gössling, 2013; Kwon, 2014). Previous studies on transportation behavior change found that people ride bicycles as a substitute for walking, but not for private cars (Kwon, 2014). As suggested by Murphy and Usher (2015), it may need to be followed by hard policies with more stations and more bicycle units available, with bicycle-only lanes that are in close proximity to public transportation stops. This is also supported by Fishman et al. (2014) in that limited docking stations was one of the barriers to bicycle-sharing memberships, as convenience emerged as a key driver of using bicycle-sharing. Furthermore, the linkage between bicycle-sharing and sustainable development could be strengthened. Sustainability arguably contributes to developing the sharing economy, and vice versa (Heinrichs, 2013). Earlier experience with Denmark's bicycling policy showed that soft policies can create positive images of bicycle use relating to fun, convenience and safety (Gössling, 2013). Therefore, policy designed for the development of a bicycle-sharing scheme has broader implications for a mature sharing economy and sustainable development for the broader society.

This study provides a number of managerial implications. First, the bicycle-sharing program currently operated should make full use of the available technology to target a wider population. This study found that some users experienced difficulties using the application, depending on their operating system. Thus, the bicycle-sharing program may need to be compatible with different operating systems or smartphone devices so that a wider population can conveniently access the service. Second, among the respondents surveyed, about 33% answered that they are not aware about bicycle-sharing programs. Unlike other sharing economy services such as car sharing and accommodation sharing, where representative brands are already well known (e.g., Zipcar, Uber, & Airbnb), recognition of bicycle-sharing services was relatively low. A strong brand image may be required for the bicycle-sharing services provided in many countries to attract more users and achieve its initial aims. Paris' Vélib can be a model to learn and follow to enhance

brand value. Third, the increased flexibility would overcome the inconvenience that users have to find nearby docking stations for pick-up and drop-off. In line with the fourth industrial revolution, the innovation combined with the new payment, operation, and reservation technologies of bicycle-sharing services may enable technology transfer (Parkes et al., 2013) to other sharing economy services. This technology diffusion is likely to accentuate a demand-responsive system and integration of data with public transportation, and to allow collaboration between different authorities including finance, information security, transportation and private entities.

Future studies may use an increased sample size, especially of actual users, focusing on the demographics including gender, income, age, and area of residence that are may have a substantial influence on the attitudes of users. Another study might focus on the barriers to bicycle-sharing schemes. Future studies might also consider a comparative analysis across countries. Since there are many areas in which the sharing economy is working, including transportation, bicycle-sharing alone cannot represent the overall sharing economy. Recognizing the difference between public and private bicycle-sharing schemes, future research could also undertake to compare the designs, operation and effectiveness of publicly provided and privately operated services. In addition, users' perception and attitudes towards bicycle-sharing services would differ depending on the service provider. For the purpose of offering insights for management and policy, this study lacks the integration of experts' perspectives.

References

Bachand-Marleau, J., Lee, B. H., & El-Geneidy, A. (2012). Better understanding of factors influencing likelihood of using shared bicycle systems and frequency of use. *Journal of Transportation Research Board, 2314,* 66-71.

Banister, D., Pucher, J., & Lee-Gosselin, M. (2007). Making sustainable transport politically and publicly acceptable: lessons from the EU, USA and Canada. *Institutions and Sustainable Transport: Regulatory Reform in Advanced Economies,* 17-50.

Bardhi, F., & Eckhardt, G. M. (2012). Access-based consumption: The case of car sharing. *Journal of Consumer Research, 39*(4), 881-898.

Belk, R. (2007). Why not share rather than own?. *Annals of the American Academy of Political and Social Science, 611*(1), 126-140.

Belk, R. (2014). You are what you can access: sharing and collaborative consumption online. *Journal of Business Research, 67*, 1595-1600.

Böcker, L., & Meelen, T. (2017). Sharing for people, planet or profit? Analyzing motivations for intended sharing economy participation. *Environmental Innovation and Societal Transitions, 23*, 28-29.

Botsman, R., & Rogers, R. (2010). *What's mine is yours: The rise of collaborative consumption*. New York: Harper Business.

Blau, P. M. (1964). *Exchange and power in social life*. New York: Wiley.

DeMaio, P. (2009). Bike-sharing: History, impacts, models of provision, and future. *Journal of Public Transportation, 12*(4), 41-56.

Dick, A., & Basu, K. (1994). Customer loyalty: Toward an integrated conceptual framework. *Journal of the Academy of Marketing Science, 22*(2), 99-113.

Eckhardt, G. M., & Bardhi, F. (2015). The sharing economy isn't about sharing at all. *Harvard Business Review.* Retrieved January 2, 2018 from https://hbr.org/2015/01/the-sharing-economy-isnt-about-sharing-at-all

Fishman, E., Washington, S., & Haworth, N. (2013). Bike share: A synthesis of the literature. *Transport Reviews, 33*(2), 148-165.

Fishman, E., Washington, S., Haworth, N., & Mazzei, A. (2014). Barriers to bikesharing: An analysis from Melbourne and Brisbane. *Journal of Transport Geography, 41*, 325-337.

Fishman, E. (2016). Cycling as transport. *Transport Reviews, 36*(1), 1-8.

Fitzsimmons, J. (1985). Consumer participation and productivity in service operations. *Interfaces*, *15*(3), 60-67.

Gansky, L. (2010). *The mesh: Why the future of business is sharing*. New York: Penguin.

Gössling, S. (2013). Urban transport transitions: Copenhagen, city of cyclist. *Journal of Transport Geography, 33*, 196-206.

Hardin G. (1968). The tragedy of the commons. *Science*, *163*(3859), 1243–1248.

Heinrichs, H. (2013). Sharing economy: A potential new pathway to sustainability. *GAIA, 22*(4), 228-231.

Hennig-Thurau, T., Henning, V., & Sattler, H. (2007). Consumer file sharing of motion pictures. *Journal of Marketing, 71*(4), 1-18.

Humphreys, A., & Grayson, K. (2008). The intersecting roles of consumer and producer: A critical perspective on co-production, co-creation and prosumption. *Sociology Compass, 2*(3), 963-980.

Hung, H., & Wong, H. Y. (2007). Organizational perception of customer satisfaction: Theories and evidence. *The Service Industries Journal, 27*(4), 495-507.

Ilgel, D. R. (1971). Satisfaction with performance as a

function of the initial level of expected performance and the deviation from expectations. *Organizational Behavior and Human Performance, 6*, January, 345-361.

Jang, J., Gim, T. H. T., & Lee, M. Y. (2016). A study on the Seoul public bikes use characteristics - A case of the districts of Yeouido and Sangam. *Seoul Studies, 17*(4), 77-91.

Jarašūnienė, A. (2009). Research on advanced technologies and their efficiency in the process of interactions between different transport modes in the terminal. *Transport, 24*(2), 129–134.

Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica, 47*(2), 263-292.

Karki, T. K., & Tao, L. (2016). How accessible and convenient are the public bicycle sharing programs in China?. Experiences from Suzhou city. *Habitat International, 53*, 188-194.

Kwon, Y. H. (2014). The civic revitalization through the public bicycle: Focused on Changwon PBS. *Journal of Korea Service Management Society, 15*(4), 171-189.

Lamberton, C. P., & Rose, R. L. (2012). When is ours better than mine? A framework for understanding and altering participation in commercial sharing systems. *Journal of Marketing, 76*(4), 109-125.

Lanier, C. D., & Schau, H. J. (2007). Culture and co-creation: Exploring consumers' inspirations and aspirations for writing and posting on-line fan fiction. In Russell, W., Belk, J., & Sherry, F. (ed.). *Consumer Culture Theory (Research in Consumer Behavior), 11*, Emerald Group Publishing Limited, 321-342.

Lee, S. M., & Cho, Y. C. (2018). Exploring utility, attitude, intention to use, satisfaction, and loyalty in B2C/P2P car-sharing economy. *Journal of Marketing Thought, 4*(4), February.

Majumdar, B. B., & Mitra, S. (2015). Identification of factors influencing bicycling in small sized cities: A case study of Kharagpur, India. *Case Studies on Transport Policy, 3*(3), 331-346.

Martin, C. (2016). The Sharing Economy: A pathway to sustainability or a nightmare form of neoliberal capitalism?. *Ecological Economics, 121*, 149-159.

Midgley, P. (2009). The role of smart bike-sharing systems in urban mobility. *Journeys, 2*, 23-31.

Midgley, P. (2011). *Bicycle-sharing Schemes: Enhancing Sustainable Mobility in Urban Areas.* New York: United Nations, Department of Economic and Social Affairs.

Millard-Ball, A., Murray, G., Schure, J. T., & Fox, C. (2005). Car-sharing: Where and how it succeeds. *Transit Cooperative Research Program Report,* 10.

Möhlmann, M. (2015). Collaborative consumption: Determinants of satisfaction and the likelihood of using a sharing economy option Again. *Journal of Consumer Behavior*, *14*(3), 193-207.

Mont, O. (2002). Clarifying the concept of product-service system. *Journal of Cleaner Production, 10*(3), 237-245.

Mont, O. (2004). Institutionalization of sustainable consumption patterns based on shared use. *Ecological Economics, 50*(1), 135-153.

Morgan, R., & Hunt, S. (1994). The commitment-trust theory of relationship marketing. *The Journal of Marketing, 58*(3), 20-38.

Murphy, E., & Usher, J. (2015). The role of bicycle-sharing in the city: Analysis of the Irish experience. *International Journal of Sustainable Transportation, 9*(2), 116-125.

Oliver, R. L. (1996). *Satisfaction: A Behavioral Perspective on the Consumer*. New York: McGraw-Hill.

Olson, M. (1965). *The Logic of Collective Action. Public Goods and the Theory of Groups.* Cambridge, MA: Harvard University Press.

Passafaro, P., Rimano, A., Piccini, M. P., Metastasio, R., Gambardella, V., Gullace, G., & Lettieri, C. (2014). The bicycle and the city: Desires and emotions versus attitudes, habits and norms. *Journal of Environmental Psychology, 38*, 76-83.

Parkes, S. D., Marsden, G., Shaheen, S. A., & Cohen, A. P. (2013). Understanding the diffusion of public bikesharing systems: Evidence from Europe and North America. *Journal of Transport Geography, 31*, 94-103.

Paul, J., Modi, A., & Patel, J. (2016). Predicting green product consumption using theory of planned behavior and reasoned action. *Journal of Retailing and Consumer Services, 29*, 123-134.

Picón, A. B., Castro-Abancéns, I., & Roldán, J. (2014). The relationship between satisfaction and loyalty: A mediator analysis. *Journal of Business Research, 67*(5), 746-751.

Porter, M., & Karmer, M. R. (2011). Creating shared value. *Harvard Business Review, 89*, 62-77.

Postigo, H. (2003). Emerging sources of labor on the Internet: The case of America online volunteers. *International Review of Social History, 48*(S11), 205-223.

Prahalad, C. K., & Ramaswamy, V. (2004). Co-creation experiences: The next practice in value creation. *Journal of Interactive Marketing, 18*(3), 5-14.

Pucher, J., & Buehler, R. (2008). Cycling for everyone: Lessons from Europe, transportation research record. *Journal of the Transportation Research Board, 2074*, 58-65.

Rapoport A., & Chammah, A. M. (1970). *Prisoner's Dilemma.* Michigan: University of Michigan Press.

Ritzer, G. & Jurgenson, N. (2010). Production, consumption, presumption: The nature of capitalism in the age of the digital 'prosumer.' *Journal of Consumer Culture, 10*(1), 13-36.

Schoemaker, P. J. H. (1982). The expected utility model: Its variants, purposes, evidence, and limitations. *Journal of Economic Literature, 20*(6), 529-563.

Shaheen, S., Guzman, S., & Zhang, H. (2010). Bikesharing in Europe, the Americas, and Asia: Past, present, and future transportation research record. *Journal of the Transportation Research Board, 2143*, 159-167.

Shaheen, S. (2012). Public bikesharing in North America: Early operator and user understanding. *MTI Report,* 11-19.

Shin, H. C., Kim, D. J., & Jeong, S. Y. (2012). Impact analysis on bike-sharing and its improvement plan. *Research Collection,* 2012-12.

Steg, L., & Vlek, C. (2009). Encouraging pro-environmental behavior: An integrative review and research agenda. *Journal of Environmental Psychology, 29*(3), 309-317.

Toffler, A. (1980). *The Third Wave*. London: Pen Books.

Tussyadiah, I. P. (2015). *An Exploratory Study on Drivers and Deterrents of Collaborative Consumption in Travel.* In I. Tussyadiah, & A. Inversini (Eds.), *Information and Communication Technologies in Tourism,* Switzerland: Springer.

Venkatesh, V., Thong, J. Y. L., & Xu, X. (2012). Consumer acceptance and use of information technology: Extending the unified theory of acceptance and use of technology. *MIS Quarterly, 36*(1), 157-178.

Wood, R., & Bandura, A. (1989). Social cognitive theory of organizational management. *Academy of Management Review, 14*(3), 361-384.

Wu, C. L. (2015). Using the theory of planned behavior to explain and predict behavior intentions in Taiwan. *Journal of International Education Research, 11*(3), 153.

Yang, Z., Hu, J., Shu, Y., Cheng, P., Chen, J., & Moscibroda, T. (2016). Mobility modeling and prediction in bike-sharing systems. *ACM, 6,* 165-178.