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Review

# Understanding the sharing economy and its implication on sustainability in smart cities

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ABSTRACT

The purpose of this article is to evaluate the main drivers of the sharing economy through an exhaustive weighting and meta-analysis of previous relevant quantitative research articles, obtained using a systematic literature review methodology. The authors analysed 22 quantitative studies from 2008 through. Out of the 249 extracted relationships (independent – dependent variable), the paper identifies the "best" predictors used in theoretical models to study the sharing economy. These include: attitude on intention to share, perceived behavioural control on intention to share, subjective norm on intention to share, economic benefit on attitude, and perceived risk on attitude. Geographically, Germany and the United States of America were found to be the nations with the highest number of respondents. Temporally, an increasing trend in the number of articles on the sharing economy and respondents was observed. The consolidation of the drivers of the sharing economy provides a solid theoretical foundation for the research community to explore existing hypotheses further and test new hypotheses in emerging contexts of the sharing economy. Given the different conceptual theories that have been used to study the sharing economy and their application to different contexts, this study presents the first attempt at advancing knowledge by quantitatively synthesizing findings presented in previous literature.



**Contents**



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## 1. Introduction

The recent push for smart sustainable cities has driven the exploration of various ways technology can enable the efficient use of limited resources and "idling capacities" (underutilized physical assets), which in turn will help to reduce waste and improve the environmental sustainability of cities (Bernardi and Diamantini, 2018). One of such approaches is the "sharing economy" concept, which is a new economic model based on the peer-to-peer "activity of obtaining, giving, or sharing access to goods and services, coordinated through community-based online services" (Hamari et al., 2016). It is sometimes referred to as collaborative consumption (Belk, 2014), access-based consumption (Bardhi and Eckhardt, 2012), peer-to-peer economy (Einav et al., 2016) and platform economy (Langley and Leyshon, 2017).

Sharing is a communal concept that has been practised for many decades (Belk, 2010). Hence, it is not new. However, only recently have there been renewed conversations on sharing being a part of the broader circular economy concept in light of the unsustainable exploitation of global resources (Geissdoerfer et al., 2017). Furthermore, the rapid expansion and adoption of digital platforms and other large-scale mediating technologies have made sharing evolve from a simple communal concept to a large economy with various implementations (Sutherland and Jarrahi, 2018). Some of these implementations involved actors, compensation schemes, participation motives and ownership transfer (Trenz et al., 2018).

The sharing economy plays an important role in enabling sustainable communities and cities, due to the fact that its main idea perfectly fits into the three dimensions of sustainable cities: economy, environment, and society (Akande et al., 2019). Frenken and Schor (2017) succinctly highlighted the economic dimension in their definition of the sharing economy; "consumers granting each other temporary access to under-utilized physical assets ('idle capacity'), possibly for money." The sharing economy has the potential of creating new business ventures and forms of income (Bernardi and Diamantini, 2018). From an environmental viewpoint, the sharing economy helps to fight climate change by pooling resources which would otherwise duplicate climate-altering activities, e.g., carpooling (Skjelvik et al., 2017). Lastly, from a social perspective, the sharing economy facilitates the creation of new social bonds and helps in building communities (Bernardi and Diamantini, 2018).

While the sharing economy is a core concept promoting smart sustainable cities, research in the sharing economy is still emerging. Hence, there is a need to review studies that have the sharing economy and its variants as their focus. Although some studies have already done reviews on the sharing economy, they all take a qualitative approach to such appraisals (Cheng, 2016; Ryu et al., 2019; Sutherland and Jarrahi, 2018; Trenz et al., 2018). There is still a lack of a quantitative approach to consolidate existing literature on the sharing economy. This gap will be filled by doing a comparative and review study on the sharing economy in order to conceptualize a theory and create a research agenda. This paper will:

1. Comprehensively and rigorously evaluate the literature on the sharing economy through a systematic literature review.
2. Analyse the strength of the independent − dependent variable relationships obtained from the research models in (1), through a weight and meta-analysis.
3. Propose a unified theory of sharing based on the synthesis of the outcome of (2).

This paper makes two contributions. Firstly, it offers a first step towards a comprehensive understanding of existing trends in the use of theoretical models to understand the sharing economy. Secondly, it facilitates the path for the theoretical development of peer-to-peer sharing in cities by creating new hypotheses to motivate new studies.

This paper is organized as follows. In section 2, the methodology used in conducting the literature review is described. In section 3, the articles found using descriptive statistics, weight analysis, and meta-analysis are summarized. In section 4, contains our findings and highlight their implications on theory and practice in section 5. Finally, in sections 6 and 7, the review is concluded by highlighting limitations and future research directions.

## 2. Research methodology

A systematic and structured literature search was carried out, adopting the "Preferred Reporting Items for Systematic Reviews and Meta-Analysis" (PRISMA) guidelines to identify relevant knowledge on the sharing economy and related concepts (Moher et al., 2009). PRISMA, which originates from medical science, has been extensively used in the information science field to write and appraise systematic literature reviews and is particularly suited for combining systematic reviews and meta-analyses, as in this paper (Mardani et al., 2017; Naranjo Zolotov et al., 2018; Zare et al., 2016). The data flow as recommended by PRISMA includes literature identification (i.e., a systematic search, using relevant search queries over a selection of scientific databases), screening (i.e., initial decision on which studies to include for further analysis), eligibility (an in-depth analysis and decision on included studies) and included studies (i.e., final set of included studies) (Moher et al., 2009). This data flow diagram, including results from our systematic literature search, is summarized in Fig. 1.

### 2.1. Literature search

The literature search was conducted in two steps: an initial exploratory search and a more refined structured search. Since this investigation focuses on analyzing the quality of relationships between drivers of peer-to-peer sharing, an initial search was done to identify critical literature and keywords relevant to our research problem. These keywords are called "entry terms" and serve as a foundation upon which a more structured literature search and review will be built (Bates, 1976). Next, the identified keywords were categorized into three sets; theoretical model and evaluation, quantitative methods and concepts (Naranjo Zolotov et al., 2018). The theoretical model and evaluation keywords help to identify literature where theoretical models were appraised; the quantitative methods keywords help to identify the most used statistical methods to evaluate the models; the concepts help to identify relevant literature where the concepts being studied were evaluated. The keywords associated with each of these categories are identified in Table 1. The concept keywords identified in Table 1 were also found by Trenz et al. (2018) to be the most prominent phrases used to describe the sharing economy.

Using the keywords identified in Table 1, a more refined and structured search query was constructed using the logical operators "AND" and "OR", to obtain the following search query: (((“model” OR “survey” OR ‘questionnaire”) AND (“structural equation modelling” OR “PLS’ OR “regression coefficient”) AND (“sharing economy” OR “collaborative consumption” OR “access-based consumption” OR “peer-to-peer” OR “microgrid” OR “platform economy”))). This query was subsequently launched against the Scopus and Web of Science databases, which were selected because they

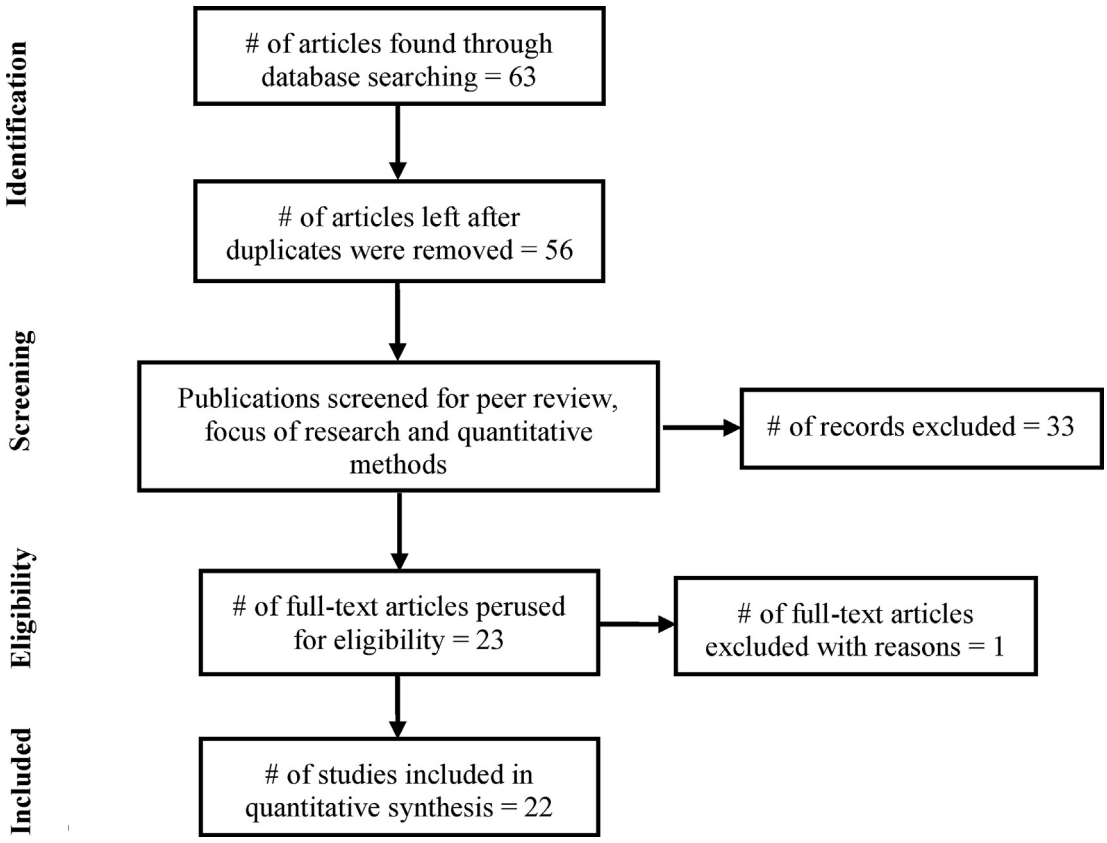


**Fig. 1.** PRISMA data flow diagram for the systematic literature review (# means 'number').

**Table 1**
Categories of keywords used to search literature database.

| Theoretical model and evaluation | Quantitative methods | Concepts |
|---|---|---|
| Model | structural equation modelling | sharing economy |
| Survey | PLS | collaborative consumption |
| Questionnaire | regression coefficient | access-based consumption |
| | | peer-to-peer |
| | | microgrid |
| | | platform economy |

form the largest abstract and indexing multidisciplinary databases, and it is thus believed that they contain a representative sample of the multidisciplinary literature on the novel concept of the sharing economy and related relevant concepts (Burnham, 2006; Harzing and Alakangas, 2016).

As a result of the search, a total of 63 scholarly papers were found (see Fig. 1 - identification). The subject areas of these scholarly papers were very diverse, ranging from social sciences and decision sciences to engineering and energy. Furthermore, 79% of these scholarly papers were research articles, and 17% were from conference proceedings. It is important to note that even though the initial search was not filtered by year, results ranging from the year 2008–2019 was obtained. Out of the initial 63 scholarly papers obtained, seven papers were duplicates and hence excluded from further analysis, resulting in 56 withheld studies in the identification phase (see Fig. 1 - identification).

### 2.2. Screening and eligibility

In line with the PRISMA guidelines, all articles in the initially identified set were evaluated for eligibility using certain inclusion and exclusion criteria. This assessment was done to ensure that each article meets certain quality standards and addresses the research topic at hand. Concretely, the inclusion criteria include: (1) publication must be in English and have been peer-reviewed; (2) factors that drive the individual adoption of peer-to-peer sharing must be the central focus of research (Trenz et al., 2018); (3) the approach must be quantitative with a statistical evaluation of effect sizes that are comparable (i.e., they have a scale that ranges between 0 and 1). Individual adoption was focused on because the sharing economy is an emerging concept whose theoretical development is still in its early stages. For objective temporal comparison, articles found in the year 2019 were excluded as this research was conducted in the middle of 2019. Through applying these criteria, 33 papers were not considered relevant for further analysis (see Fig. 1 - screening), which left 23 quantitative papers for further analysis. Each of these 23 papers was perused, and metadata was extracted, including the year of publication, source reference, theory(ies) or framework used, independent and dependent variables, path coefficients (beta), significance of paths, method of analysis used, keywords, type of survey, findings from abstract or conclusion, focus area of study, size of population

surveyed, kind of population surveyed and country of study.

Based on some of the extracted metadata, we determined that Lang (2018) and Lang and Joyner Armstrong (2018) made use of the same dataset of respondents. Hence, the article with the highest number of variables was selected for inclusion in the meta-analysis, since including articles with a duplicated dataset may bias the aggregation of results (Naranjo Zolotov et al., 2018; Wood, 2008). The article selected for further analysis is (Lang, 2018).

### 2.3. Variable synthesis

After performing the in-depth screening of the articles using the extracted metadata, 22 articles were left for further analysis. These articles and some of the extracted metadata (author, model/framework, focus area, size and country) are listed in Table 2. As mentioned in the previous section, the dependent and independent variables of the models used in each of these articles were collected as metadata. At the point of collation, overlaps and synonyms in the variable's names was noticed. For example, dependent variable names such as intention to use and intention are synonymous and were merged into a single variable. The results of these syntheses can be found in Appendix 1.

## 3. Results

This section contains a summary of the evolution of the sharing economy in terms of the spatiotemporal trend of respondents and weight analysis and meta-analysis of variables.

### 3.1. Descriptive statistics

Even though the results were obtained from the year 2008–2019 from the initial literature search, a total of 22 research articles were identified that quantitatively evaluate the sharing economy published from 2016 through 2018 after applying the inclusion and exclusion criteria discussed in section 2.2. These 22 articles had a total of 249 relationships (independent – dependent variable) which were used for the weighting and meta-analysis. The 249 relationships had been tested on 8502 respondents from various countries. The type of respondents includes university students, millennials, sharing service users and the general public.

A yearly breakdown of the number of respondents in Fig. 2 shows an increasing trend with 2018 having the largest number of respondents (6950).

Visualizing the number of respondents by country on a map in Fig. 3 shows that Germany, the United States of America and China have the highest sample sizes with 2122, 1409 and 1383 respondents respectively. The results also show that no studies have been done in Africa, Central and South America, and Australia.

### 3.2. wt analysis

Using variables from numerous IT adoption studies, Jeyaraj et al. (2006) calculated the weight of a variable by dividing the frequency of a variable found to be significant by the total number of times such a variable was investigated. However, in this study, instead of making use of individual variables, independent – dependent variable relationships with a frequency of 3 (three) or more for the

**Table 2**
List of literature used for meta-analysis (ordered by publication year, author).

| No. | Author | Model/Framework | Focus area | Size | Country |
|---|---|---|---|---|---|
| 1. | Toni et al. (2016) | TPB | Peer-to-peer accommodation sharing | 384 | Italy |
| 2. | Barnes and Mattsson (2017) | TRA | Car sharing | 115 | Denmark |
| 3. | Roos and Hahn (2017a) | TPB, VBNT | Bike-sharing | 150 | Germany |
| | | | | 18 | Switzerland |
| 4. | Wu et al. (2017) | Self-developed | Room sharing | 445 | China |
| 5. | Yang et al. (2017) | Self-developed | Sharing services | 440 | China |
| 6. | Amaro et al. (2018) | TRA | Room sharing | 98 | Germany |
| | | | | 104 | China |
| 7. | Amirkiaee and Evangelopoulos (2018) | Self-developed | Ridesharing | 300 | USA. |
| 8. | Barbu et al. (2018) | Self-developed | Ridesharing | 320 | Romania |
| 9. | Becker-Leifhold (2018) | TPB, VBNT | Fashion sharing | 1009 | Germany |
| 10. | Chen et al. (2018) | TPB, TAM | Bike-sharing | 287 | Taiwan |
| 11. | Hamenda (2018) | SERVQUAL | Ridesharing | 219 | Indonesia |
| 12. | Hawlitschek et al. (2018) | TPB | Peer-to-peer sharing | 745 | Germany |
| 13. | Huarng and Yu (2018) | Self-developed | Room sharing | 397 | Taiwan |
| 14. | Kim et al. (2018) | NAM, TPB | Sharing services | 344 | South Korea |
| 15. | Lang (2018) | Self-developed | Fashion sharing | 452 | USA. |
| 16. | Lee et al. (2018) | EVF | Ridesharing | 295 | Hong Kong |
| 17. | Lindblom et al. (2018) | Self-developed | Collaborative consumption | 752 | Finland |
| 18. | Liu and Yang (2018) | TAM | Bicycle sharing | 394 | China |
| 19. | Mittendorf (2018) | Self-developed | Room sharing | 120 | Germany |
| | | | | 100 | USA. |
| | | | | 12 | Austria |
| | | | | 7 | Switzerland |
| | | | | 6 | Sweden |
| | | | | 4 | Spain |
| | | | | 2 | Bulgaria |
| | | | | 2 | Turkey |
| | | | | 1 | Italy |
| | | | | 1 | Norway |
| 20. | Oyedele and Simpson (2018) | TAC, TEA | Car sharing, Household goods sharing, Room sharing | 345 | USA. |
| 21. | Sung et al. (2018) | Self-developed | Room sharing | 422 | South Korea |
| 22. | Wang and Jeong (2018) | TAM, DT | Room sharing | 212 | USA |

Notes: VBNT - Values-Belief-Norms Theory, TRA - Theory of Reasoned Action, TAM - Technology Acceptance Model, TPB - Theory of Planned Behavior, DT - Diffusion Theory, NAM - Norm Activation Model, SERVQUAL – Service Quality, EVF - Extended Valence Framework, TAC - Theory of Access-based Consumption, TEA - Theory of Emerging Adulthood, USA – United States of America.

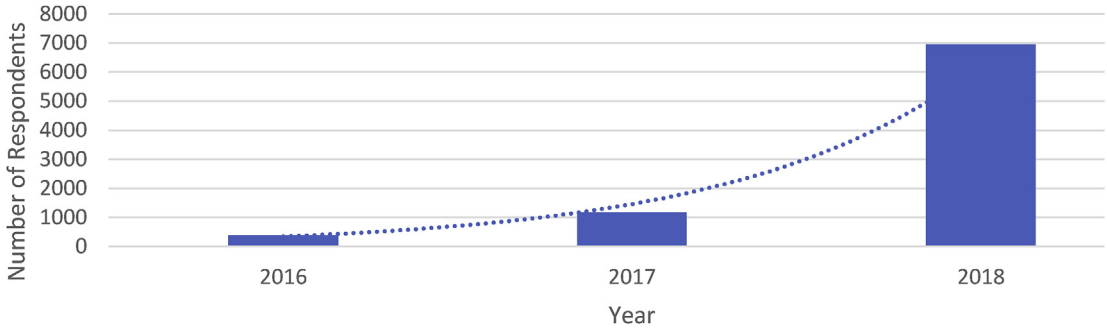


**Fig. 2.** Number of respondents in the 22 withheld articles (by year).

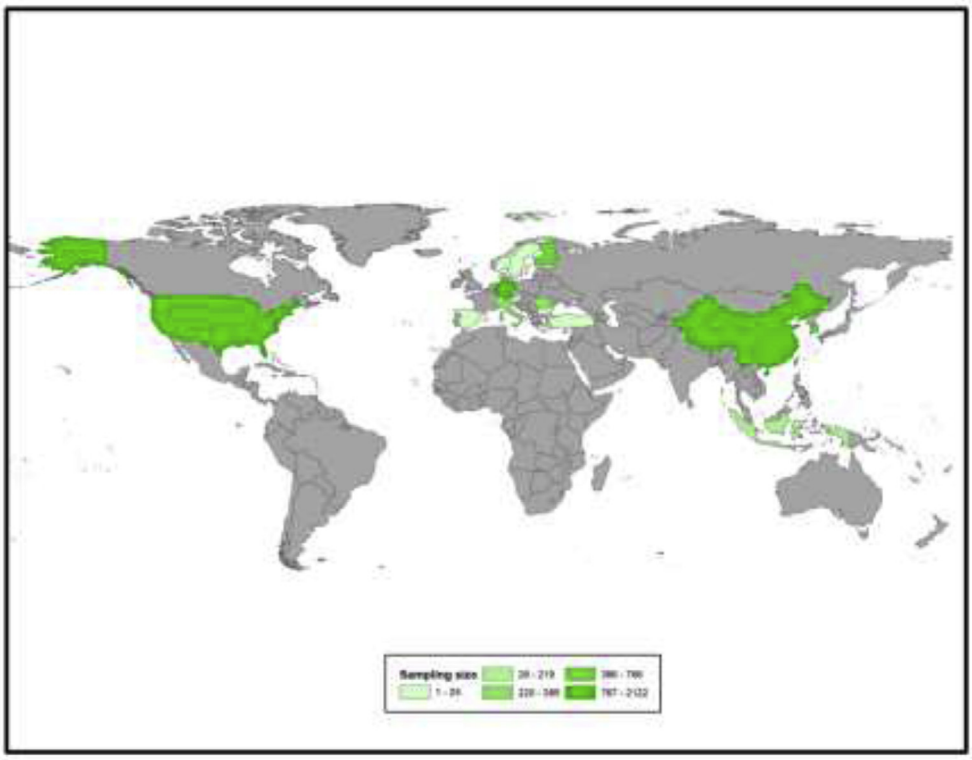

**Fig. 3.** Spatial distribution of 8502 respondents in the 22 withheld articles.

weighting analysis were considered (Naranjo Zolotov et al., 2018). As shown in Table 3, 18 (eighteen), relationships were evaluated with the resulting weights varying from 0 (zero) to 1 (one). 0 (zero) signifies that the relationship was non-significant across all studies evaluated, and 1 (one) signifies that the relationship was significant across all studies.

According to Baptista and Oliveira (2016), a relationship construct is considered to be a best predictor if it has been well-utilized (i.e., examined five times or more) in literature with a resultant weight that is greater than 0.80. Furthermore, a relationship construct is considered to be a promising predictor if it has not been well-utilized but has a weight equal to 1 (one). Following this reasoning, the best predictors of sharing in the circular economy were determined as: attitude on intention to share (1.00), perceived behavioural control on intention to share (1.00), subjective norm on intention to share (0.83), economic benefit on attitude (0.80) and perceived risk on attitude (0.80). Of the remaining relationships, the following are considered to be promising predictors of sharing; relative flexibility utility on intention to share (1.00), familiarity on intention to share (1.00) and trust on attitude (1.00). Although with potential, these relationships will still need to be further tested before they can be certified as a best predictor of sharing.

### 3.3. Meta-analysis

Meta-analysis was utilized to statistically synthesize the effect sizes of the relationships between constructs across previous studies (Zare et al., 2016). A free and open tool called Meta-Essentials was used because of its adaptability, extensibility and robust integration with the Microsoft Excel package (Suurmond et al., 2017). As input, the standardized regression coefficient (β) was used which shows the strength of the influence of an independent variable over a dependent variable, and the sample size of relationships that had a frequency of 3 or more in the articles reviewed. The option of either using a “fixed effect” model or a

**Table 3**
Summary of independent - dependent variable weight analysis results (ordered by frequency of use).

| Independent variable | Dependent variable | Non-significant | Significant | Frequency of use | Weight = Significant/Frequency |
|---|---|---|---|---|---|
| Attitude | Intention to share | 0 | 11 | 11 | 1.00 |
| Trust | Intention to share | 4 | 4 | 8 | 0.50 |
| Subjective norm | Intention to share | 1 | 5 | 6 | 0.83 |
| Perceived behavioural control | Intention to share | 0 | 5 | 5 | 1.00 |
| Economic benefit | Attitude | 1 | 4 | 5 | 0.80 |
| Perceived risk | Attitude | 1 | 4 | 5 | 0.80 |
| Perceived risk | Perceived enjoyment | 1 | 3 | 4 | 0.75 |
| Economic benefit | Intention to share | 1 | 3 | 4 | 0.75 |
| Social benefit | Intention to share | 2 | 2 | 4 | 0.50 |
| Environmental benefit | Attitude | 2 | 2 | 4 | 0.50 |
| Social benefit | Attitude | 2 | 2 | 4 | 0.50 |
| Relative flexibility utility | Intention to share | 0 | 3 | 3 | 1.00 |
| Familiarity | Intention to share | 0 | 3 | 3 | 1.00 |
| Trust | Attitude | 0 | 3 | 3 | 1.00 |
| Perceived risk | Intention to share | 2 | 1 | 3 | 0.33 |
| Prosocial utility | Intention to share | 3 | 0 | 3 | 0.00 |
| Relative transaction utility | Intention to share | 3 | 0 | 3 | 0.00 |
| Shareaids | Intention to share | 3 | 0 | 3 | 0.00 |

"random effect" model for the meta-analysis was available. The fixed-effect model assumes that the variation in effect sizes between the different studies is only due to the sampling error (Hedges and Vevea, 1998). However, this assumption does not hold in social sciences studies like the one under study (Naranjo Zolotov et al., 2018). Hence, the choice of the random effect model for this study. Furthermore, the random effect model has been used in similar meta-analytic studies such as this one (Naranjo Zolotov et al., 2018; Talò et al., 2014).

The result of the meta-analysis is visualized using a forest plot in Fig. 4. The x-axis represents the "weighted average effect" (β), which is the combined effect size from all the relationships under study. Each average relationship effect is represented by a blue dot bound by a small black line showing the lower limit and upper limit of the confidence interval at 95%. If the confidence interval is entirely on the right side of the vertical line through zero, it means that the relationship exhibits a significant positive effect. Conversely, if the confidence interval is entirely on the left side of the vertical line through zero, it means that the relationship exhibits a significant negative effect. However, if the confidence interval intersects the line through zero, it means such a relationship is not statistically significant. Following this line of thought, all relationships except for social benefit on intention to share, perceived risk on intention to share, prosocial utility on intention to share, relative transaction utility on intention to share and shareaids on intention to share are statistically significant.

Further exploring the relationships using their p-values in Table 4 shows that all relationships, except for the relationships

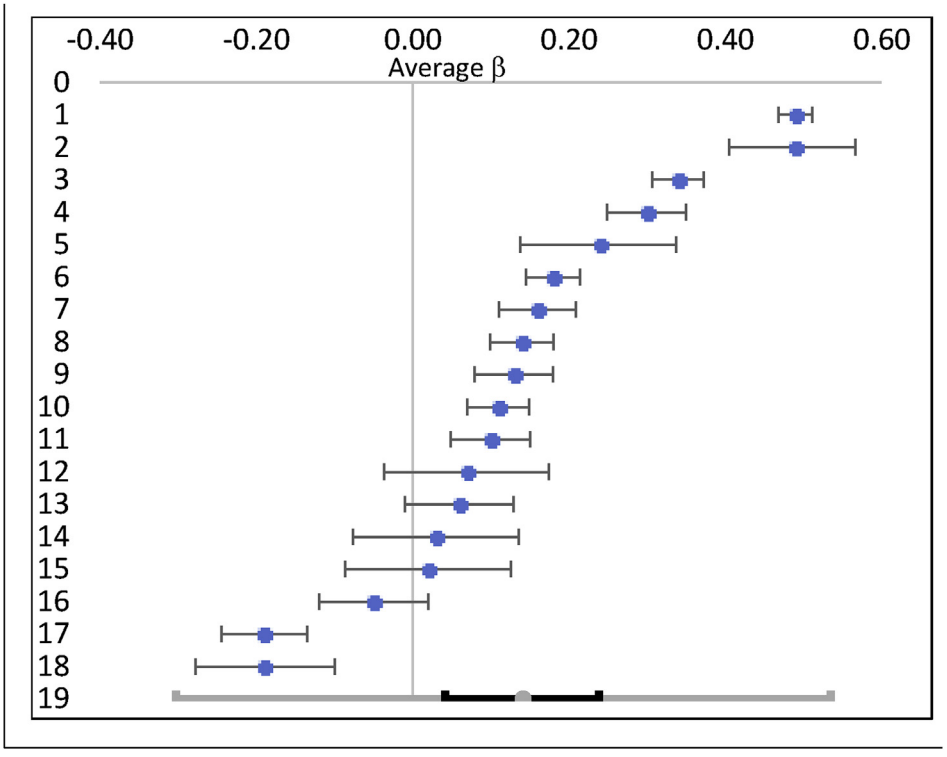


**Fig. 4.** Forest plot of meta-analysis ordered by sample size.

**Table 4**
Meta-analysis results (ordered by frequency).

| Independent variable | Dependent variable | Frequency | Average β | ∑ sample size | p-value | z-value | Confidence interval | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Lower limit | Upper limit |
| Attitude | Intention to share | 11 | 0.49 | 4809 | .00 | 37.16 | 0.47 | 0.51 |
| Trust | Intention to share | 8 | 0.16 | 1500 | .00 | 6.24 | 0.11 | 0.21 |
| Subjective norm | Intention to share | 6 | 0.18 | 2971 | .00 | 9.91 | 0.14 | 0.21 |
| Perceived behavioural control | Intention to share | 5 | 0.34 | 2769 | .00 | 18.62 | 0.31 | 0.37 |
| Economic benefit | Attitude | 5 | 0.14 | 2219 | .00 | 6.63 | 0.10 | 0.18 |
| Perceived risk | Attitude | 5 | −0.19 | 1197 | .00 | −6.65 | −0.24 | −0.13 |
| Economic benefit | Intention to share | 4 | 0.11 | 2408 | .00 | 5.42 | 0.07 | 0.15 |
| Social benefit | Intention to share | 4 | 0.06 | 790 | .05 | 1.69 | −0.01 | 0.13 |
| Environmental benefit | Attitude | 4 | 0.10 | 1467 | .00 | 3.84 | 0.05 | 0.15 |
| Social benefit | Attitude | 4 | 0.13 | 1467 | .00 | 5.00 | 0.08 | 0.18 |
| Perceived risk | Perceived enjoyment | 4 | −0.19 | 452 | .00 | −4.08 | −0.28 | −0.10 |
| Perceived risk | Intention to share | 3 | −0.05 | 784 | .08 | −1.40 | −0.12 | 0.02 |
| Prosocial utility | Intention to share | 3 | 0.02 | 345 | .36 | 0.37 | −0.09 | 0.13 |
| Relative transaction utility | Intention to share | 3 | 0.03 | 345 | .29 | 0.55 | −0.08 | 0.14 |
| Relative flexibility utility | Intention to share | 3 | 0.49 | 345 | .00 | 9.91 | 0.41 | 0.57 |
| Shareaids | Intention to share | 3 | 0.07 | 345 | .10 | 1.30 | −0.04 | 0.17 |
| Familiarity | Intention to share | 3 | 0.24 | 345 | .00 | 4.53 | 0.14 | 0.34 |
| Trust | Attitude | 3 | 0.30 | 1257 | .00 | 10.96 | 0.25 | 0.35 |

listed in the previous statement, are statistically significant because their p-values are less than 0.05. Among the statistically significant relationships, attitude on intention to share with a β values of 0.49, relative flexibility utility on intention to share (0.49), perceived behavioural control on intention to share (0.34), trust on attitude (0.30), familiarity on intention to share (0.24), perceived risk on attitude (−0.19), subjective norm on intention to share (0.18) and economic benefit on attitude (0.14) were found to be strongest. This finding is in line with the weighting analysis, which categorized these relationships into either "best predictors" or "promising predictors" of the sharing economy. Following the approach of Naranjo-Zolotov et al.(2018), a model of the best predictors was constructed, see Fig. 5.

To evaluate the amount of heterogeneity in the dataset (Table 4) on which the model in Fig. 5 is based, the $I^2$ statistics was calculated (Hak et al., 2016). The $I^2$ statistics is a relative measure of the amount of detected variance that reflects real differences in effect sizes (Borenstein et al., 2009). An $I^2$ statistic of 98.38% was obtained, which indicates that there is a high level of heterogeneity for the variables listed in Table 4.

## 4. Discussion

Seventeen (17) theoretical models and constructs in the 22 peer-reviewed literature published on the drivers of the sharing economy were evaluated. Furthermore, 249 relationships (independent-dependent variable) from the literature analysis were extracted, providing a holistic picture of all constructs used for assessing the sharing economy. A weighting analysis of these relationships helped in revealing the "best" and "promising" predictors in the investigation of the sharing economy. These findings were supported by a meta-analysis which also revealed the strength of these relationships using their "weighted average effect" (β) and confidence interval visualized in a forest plot (see Fig. 4).

"Best" predictors include attitude, perceived behavioural control and subjective norm on intention to share, and economic benefit and perceived risk on attitude. These predictors were also established to be statistically significant by the meta-analysis. This result is in line with previous findings which found that the higher the weight of a variable, the higher its probability to achieve significance in a meta-analysis (Baptista and Oliveira, 2016; Naranjo Zolotov et al., 2018). These predictors were used in creating new hypotheses highlighted in the model in Fig. 5. The resulting model was found to be similar to that of the Theory of Planned Behavior (TPB) (Ajzen, 1985), but with an extension of economic benefit and perceived risk on attitude. Economic benefit on attitude was found to be a strong positive predictor for ride sharing, product sharing and room sharing (Amirkiaee and Evangelopoulos, 2018; Hawlitschek et al., 2018; Sung et al., 2018). The importance of "saving money" as a motivation on the attitudinal beliefs of peer-to-peer sharing was also emphasized by (Hellwig et al., 2015). Furthermore, perceived risk on attitude was also found to be a strong negative predictor for product sharing and fashion sharing

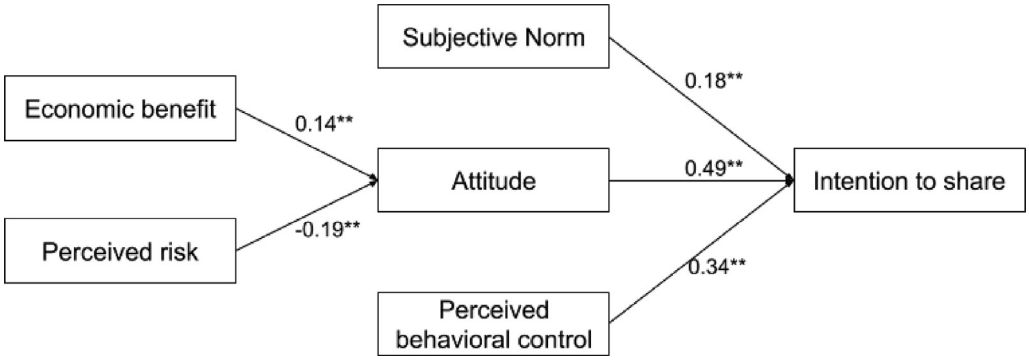


**Fig. 5.** Model of drivers for the sharing economy resulting from weight analysis and meta-analysis; **p < 0.05.

(Hawlitschek et al., 2018; Lang, 2018). There is some amount of risk involved in sharing one's properties with strangers, and this negatively influences the disposition of people to engage in peer-to-peer sharing (Belk, 2014).

"Promising" predictors from the weighting analysis include relative flexibility utility and familiarity on intention to use, and trust on attitude. These predictors are considered promising because even though their weight is equal to one, they have not been tested up to 5 times (Jeyaraj et al., 2006). Results from the meta-analysis also show that these predictors are promising in terms of the strength of their significance and average β. This finding may suggest that consumers are more willing to participate in peer-to-peer sharing if they are familiar with the service and if there is an "absence of limitations on product use within the sharing system" (Oyedele and Simpson, 2018). Furthermore, individuals with a higher level of trust in the mediating technology and other users show a more positive attitude towards peer-to-peer sharing in various contexts such as car sharing and accommodation sharing (Hawlitschek et al., 2016; Mazzella et al., 2016). However, because these predictors have not been sufficiently tested, we cannot categorize them as best predictors of intention to share. There is still a need for more literature to test the predictors to further determine their predictive power on intention to share.

Previous quantitative research on the sharing economy has made use of TPB, TRA, its variants and self-developed models and frameworks (Table 2). Hence, the most evaluated constructs originate from TPB and TRA or are adapted from them. This aspect logically explains the resulting model from the present weighting and meta-analysis being very similar to the TPB, with an extension of economic benefit and perceived risk on attitude (Fig. 5). It is important to note that the TPB itself is an adaptation of TRA created to strengthen TRA by including the perceived behavioural control construct (Ajzen, 2011). From the derived model in Fig. 5, attitude with a β of 0.49 plays the most important role in determining an individual intention to participate in the sharing economy. This finding makes sense because the sharing economy is a relatively new concept which is different from the conventional way of consuming goods and services and will largely depend on an individual's positive or negative evaluative feeling about it to adopt it. This outcome is in line with previous research which, using other theories, identified attitude and its variants as the most important driver of the individual adoption of various technologies such as mobile banking, e-commerce and e-participation (Hernandez et al., 2009; Naranjo-Zolotov et al., 2019; Oliveira et al., 2014). It is interesting to note that environmental benefit, with a β of 0.10, did not have a good predictive power on individuals' attitude about the sharing economy. This factor implies that even though the environment is a major beneficiary of the sharing economy and collaborative consumption, individuals do not consider it when evaluating their feeling about various sharing services. This correlation could be because of non-awareness of the connection between fostering a sustainable environment and the use of the sharing economy. Furthermore, social benefit was neither a good predictor of attitude ($\beta = 0.13$) nor intention to share ($\beta = 0.06$). Put in the context of smart sustainable cities, which are made up of the three dimensions of the economy, environment and society, our findings show that users of the sharing economy prioritize economic benefits over environmental and social benefits (Akande et al., 2019). This is in line with previous findings which noted that users of the sharing economy are more motivated by financial benefit than by positive social reasons or positive impact on the environment (Böcker and Meelen, 2017).

Although perceived risk had a significant predictive power of −0.19 on perceived enjoyment in the meta-analysis, it had a weight slightly below 0.80. We recommended further research on this construct and its connection with the intention to share to decisively ascertain its impact in the prediction of the sharing economy. Also, trust on intention to share was found to be significant with a β of 0.16 but obtained a very low weight of 0.50 in the weight analysis. As suggested by previous studies, this low weight may discourage the use of this construct in future studies (Naranjo Zolotov et al., 2018).

## 5. Implications

The consolidation of the aggregate effect of an independent variable on a dependent variable using a weight analysis, and the appraisal of their predictive strength and significance using a meta-analysis, allowed us to identify attitude as the most important predictor of the intention to share. Overall, these results show that all the constructs in TPB with an extension of economic benefit and perceived risk on attitude are the best predictors of intention to share. These results suggest the continued use of economic benefit and perceived risk on attitude in subsequent research of individual-level adoption of the sharing economy.

Furthermore, patterns, trends and issues with independent-dependent variable relationships used in various models to study the sharing economy were also identified. For example, even though trust on intention to share was frequently used in previous studies and had a significant β, its weight was very low. These findings can serve as a foundation for researchers to accurately evaluate previously used constructs and build on existing research, incorporating new variables in their research models. In line with previous studies, independent-dependent relationships with high use frequency, low weight and non-significant β is recommended to be excluded from further analysis while promising predictors be included in future research (Naranjo Zolotov et al., 2018).

Understanding the drivers of the sharing economy is critical for entities that aim to promote smart and sustainable urban development. The weight analysis identified attitude, subjective norm and perceived behavioural control on intention to share, and economic benefit and perceived risk on attitude as being the best predictors. These results were supported by the meta-analysis as being significant. Of these results, attitude on intention to share was established as the most important predictor. This aspect implies that city councils and governments should prioritize policies and strategies that influence citizens' positive disposition towards cleaner practices that reduce their adverse environmental impact. Some of these strategies could include supporting businesses with environmentally sustainable practices, improving public transportation and cycling infrastructures to encourage its use rather than driving and promoting waste sorting and recycling. This approach will help to promote an understanding of the connection between a citizen's resource consumption lifestyle and its effect on the environment, which will, in turn, promote a concern for the planet earth and its biosphere (Kalsoom, 2018).

Looking at the three dimensions of smart sustainable cities, the high weight and significance of economic benefit on attitude and low weight and significance of social and environmental benefit on attitude may suggest that citizens are more interested in the financial implication of sustainable practices than the societal or environmental benefit. The sharing economy has been established in literature to provide additional income for owners and providers while saving costs for users (Wu and Zhi, 2016). From the perspective of urban sustainability, this result implies that city councils and governments should also emphasize the economic benefits of adopting sustainable practices to encourage their adoption since citizens consider it more important than social and environmental benefits. Certain "green goods" such as green food, green building and electric vehicles have been established in the

literature as being more expensive up front even though they may be cheaper in the long run (Barosh et al., 2014; Egbue and Long, 2012a; Eichholtz et al., 2010). There is a need to make green solutions more competitive in terms of cost since potential financial benefit plays a major role in their adoption. Some options city councils could consider to make smart sustainable initiatives financially attractive include the use of tax incentives to (initially) subsidize costs and increased research investments in sustainable innovations (Egbue and Long, 2012b).

## 6. Conclusion

Drivers of individual adoption of the sharing economy were evaluated using a weight and meta-analysis of 249 relationships (independent – dependent variables) obtained from 22 quantitative studies and their implication on sustainability in a smart city was discussed. This research found that quantitative research on drivers of the sharing economy only started in the year 2016, and no study has been done so far in Africa, Central and South America and Australia. This research further establishes the 'best' and 'promising' predictors of the sharing economy. The identified best predictors include attitude, subjective norm and perceived behavioural control on intention to share; and economic benefit and perceived risk on attitude. Attitude was identified as playing the most important role in predicting intention to share, suggesting that city councils and governments should pay particular attention to strategies that influence the positive predisposition of citizens towards planet Earth and life on it in their quest to make cities smart and sustainable.

Furthermore, the best predictors were also found to be statistically significant in the meta-analysis, implying that they can be used for future research on the adoption of innovative sustainable solutions within cities. The identified promising predictors include relative flexibility utility and familiarity on intention to share; and trust on attitude. Although these constructs have a weight of 1, they have not been sufficiently tested in previous research. Hence, more research is needed on these constructs to ascertain their predictive power in the adoption of the sharing economy. Overall, this research critically consolidates existing quantitative literature on the sharing economy and serves as a solid theoretical foundation for all members of the academic community that are interested in the adoption of the sharing economy to foster the sustainability of cities.

## 7. Limitations and future research

Readers should be aware of two limitations to this study.

Firstly, like other literature review studies, the 22 articles that were included in the analysis were constrained by the selection criteria highlighted in section 2. There may be other studies not included in the analysis because they are either qualitative, yet to be published, published in non-peer-reviewed mediums such as books or magazines, or published in languages other than English. Hence, generalizations based on these results should be made with caution.

Secondly, studies included in the analysis are assumed to be methodologically sound. This factor means that their data were pulled from a complete probability sample, measurements are genuine, correct and reliable and appropriate statistical analysis has been rigorously used. However, in reality, this is not always verifiable. Given that the weight and meta-analysis of this study are based on the results of previous studies, the accuracy of our results is based on the accuracy of the previous research used. This facet should be kept in mind while interpreting the results.

This research synthesized outcomes from different use cases of the sharing economy such as room sharing, car sharing and fashion sharing. However, there may be slight variations between the individual adoption of each of these use cases. A comparative meta-analysis among the different contexts of use of the sharing economy is recommended. Furthermore, using the derived model in Fig. 5 as a foundation, the exploration of other constructs in emerging contexts of the sharing economy is suggested. For example, exploring the individual adoption of peer-to-peer renewable energy sharing within microgrids.

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## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## APPENDIX

| Literature | Original variable name | New variable name |
|---|---|---|
| Amirkiaee and Evangelopoulos (2018) | Attitude towards ridesharing | Attitude |
| Kim et al. (2018) | Attitude towards behaviour | |
| Lindblom et al. (2018) | Collaborative consumption attitude | |
| Barnes and Mattsson (2017) | Renting intention | Intention to share |
| (Wu et al., 2017) (Chen et al., 2018) (Liu and Yang, 2018) (Sung et al., 2018) | Behavioural intention | |
| Amaro et al. (2018) | Intention to use Airbnb | |
| Amirkiaee and Evangelopoulos (2018) | Ridesharing participation intention | |
| Hawlitschek et al. (2018) | Intention to use peer-to-peer sharing | |
| Kim et al. (2018) | Intention to use sharing services | |
| Lang (2018) | Intention to fashion renting | |
| Lee et al. (2018) | Intention to participate | |
| Lindblom et al. (2018) | Collaborative consumption intentions | |
| Oyedele and Simpson (2018) | Intention to use | |

(continued on next page)

(*continued*)

| Literature | Original variable name | New variable name |
|---|---|---|
| Wu et al. (2017) | Perceived trust | Trust |
| Hawlitschek et al. (2018) | Trust in other users | |
| Lee et al. (2018) | Trust in the platform | |
| Mittendorf (2018) | Trust in the intermediary | |
| Mittendorf (2018) | Disposition to trust | |
| Mittendorf (2018) | Trust in the provider | |
| Barbu et al. (2018) | Ease of use | Perceived ease of use |
| Lee et al. (2018) | Economic reward | Economic benefit |
| Hawlitschek et al. (2018) | Financial benefit | |
| Wu et al. (2017) | Cost-saving | |
| Becker-Leifhold (2018) | Cost consciousness | |
| Lindblom et al. (2018) | Price consciousness | |
| Barbu et al. (2018) | Savings | |
| Becker-Leifhold (2018) | Environmental consciousness | Environmental benefit |
| Barbu et al. (2018) | Ecology | |
| Hawlitschek et al. (2018) | Ecological sustainability | |
| Roos and Hahn (2017a) | Biospheric value | |
| Becker-Leifhold (2018) | Biospheric values orientations | |
| Sung et al. (2018) | Sustainability | |
| Toni et al. (2016) | Sustainable behaviour | |
| Amirkiaee and Evangelopoulos (2018) | Sustainability concern | |
| Hawlitschek et al. (2018) | Process risk concerns | Perceived risk |
| Lang (2018) | Financial risk | |
| Lang (2018) | Performance risk | |
| Lang (2018) | Psychological risk | |
| Lee et al. (2018) | Security risk | |
| Lee et al. (2018) | Privacy risk | |
| Amirkiaee and Evangelopoulos (2018) | Enjoyment of being social | Social benefit |
| Hawlitschek et al. (2018) | Social Experience | |
| Oyedele and Simpson (2018) | Social utility | |
| Sung et al. (2018) | Social relationship | |
| Wu et al. (2017) | Friend seeking | |
| Becker-Leifhold (2018) | Interpersonal influence | Social influence |
| Roos and Hahn (2017a) | Altruistic | Altruistic value |
| Amirkiaee and Evangelopoulos (2018) | Altruism | |
| Hamenda (2018) | Customer satisfaction | Satisfaction |
| (Barnes and Mattsson, 2017) (Lee et al., 2018) (Sung et al., 2018) | Enjoyment | Perceived enjoyment |
| Roos and Hahn (2017b) | Egoistic | Egoistic value |
| Wu et al. (2017) | Service experience | Service quality |
| Huarng and Yu (2018) | Lodging service quality | |
| Huarng and Yu (2018) | Network platform service quality | Perceived platform quality |

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