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# Exploring adoption determinants of tax-subsidized companyleasing bicycles from the perspective of German employers and employees



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### ABSTRACT

Since 2012, when changes in German tax law were made, the purchases of tax-subsidized company-leasing bicycles (including s-pedelecs and electrically assisted bicycles) have increased in Germany. However, it is largely unknown what factors determine whether employers and employees adopt the bicycle-leasing program or not. In the case study, the authors analyzed relevant documents as well as interviewed 22 employer representatives and 22 employees and analyzed their responses to explore both the adoption drivers and barriers. Informed by Diffusion of Innovations Theory, categories of perceived innovation characteristics as well as categories that go beyond this conceptualization were identified. In particular, the study explored various facets in relation to relative advantage and complexity, providing insights into how benefit-andcost trade-offs determine the perceived value of the concept as well as how difficulties in usability may either postpone or hinder the adoption of the concept. Categories relating to compatibility, trialability, and observability as well as additional categories such as involvement of key stakeholders (employer and employee level) and seasonality (employee level) were explored. The case study derives several policy and managerial implications that should help promote the adoption of company-bicycle leasing bicycles in particular and cycling as a means of active transportation in general.

# 1. Introduction

Since cycling is a sustainable way of traveling and a factor contributing to an active and healthy lifestyle (Hendriksen et al., 2010; Humphreys et al., 2013; Martin et al., 2014; Mytton et al., 2016; Schneider, 2016), transportation policy makers are interested in promoting cycling to work in countries around the world. In Germany, for about 49% of the employees, the distance from people's home to their work is less than ten kilometers (Wingerter, 2014). If there is an appropriate infrastructure for cycling, such distance is considered acceptable for commuting to work by bicycle (Iacono et al., 2008).

Various policy tools (e.g., improvements in bicycle infrastructure and communication campaigns) have attempted to make more German residents prefer the bicycle to the car to commute to work. The tools have increased the use of bicycle in various cities, such as Munich and Berlin (Lanzendorf and Busch-Geertsema, 2014; Wingerter, 2014). However, the car still remains the most popular mode of transport to commute and only 9% of German employees cycle to work – a relatively low number compared to 26% bicycle commuters in the Netherlands (Haubold, 2014; Wingerter, 2014). Thus, there is some potential to increase bicycle commuting in

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Germany, a historically car-dominated country.

In 2012, politicians changed the German tax law through expanding the so-called "company-car privilege" so it would apply to bicycles (including s-pedelecs and electrically assisted bicycles [e-bikes]) (BMF, 2012; Wesp, 2015). Since then, German companies can participate in the bicycle-leasing program that allows their employees to purchase bicycles<sup>1</sup> for both business and private use at a cheaper price (compared to a non-tax-subsidized purchase of a bicycle that is made outside of the program). The number of companies offering and employees participating in the company-bicycle leasing program has grown since 2012. However, despite the fact that the bicycle-leasing program aims to generate a win-win effect for all employees and employees, adoption rates vary substantially between and within companies (DPA, 2017). Some companies are reluctant to adopt the program, while others embrace it; the same is true for employees.

To date, it remains largely unknown what factors determine whether companies or employees adopt the bicycle-leasing program or not. This study therefore aims to explore the adoption drivers and barriers of the German bicycle-leasing program at both the organizational level (i.e., from the perspective of employees) and the individual level (i.e., from the perspective of employees).

Research on the adoption of the German bicycle-leasing program is relevant for two reasons: (1) to inform policy makers and companies about drivers and barriers at both the organizational and the individual level so that they can act in more sustainable ways (e.g., reduce emissions from commuting employees) and develop target-group specific programs; (2) to help German employees lead a healthier lifestyle and help reduce the impact on the environment by commuting to work by bicycle; this can be done by promoting drivers and reducing barriers.

Informed by the present research, German policy makers may promote drivers and reduce barriers to reach the goal of 15% of trips done by bicycle (as opposed to 9% observed in 2016) until 2020. This would be in accordance with the goal set by the German National Cycling Plan (2013–2020), introduced by the Federal Ministry of Transport, Building, and Urban Development (FMTBUD, 2012). Policy makers in other countries may also use the findings of the study to increase cycling levels. In sum, the findings should help the working society achieve sustainability goals by informing relevant stakeholders about how the employees' commuting behaviors can be changed toward the use of bicycles as a means of active as well as sustainable transportation (and away from high-emission commuting behaviors with few health and environmental benefits).

The paper is structured as follows. First, an overview of the German company-bicycle leasing program is provided. Then the theoretical background, lending to Rogers' (2003) Diffusion of Innovations (DOI) Theory, as well as an overview of the results of previous studies are provided. The methods and results of a case study are presented that generated data from documents as well as interviews with German employees and employees. Next, the study discusses the results of the empirical work and outlines how stakeholders can influence the adoption process of the bicycle-leasing program. The study concludes by discussing the limitations of the research and providing directions for future research.

# 2. The German tax-subsidized company-bicycle leasing program

#### 2.1. Background of the concept

The idea of rewarding sustainable commuting behavior (here, cycling) through favorable tax treatment is gaining popularity in Europe. In recent years, different countries have introduced tax breaks for cycling-to-work programs, or extended existing ones. The policy instruments that are used to promote cycling to work differ between European countries. Belgium and France, for example, have introduced a tax-free reimbursement scheme based on the kilometers cycled to and from work, while Ireland, Luxembourg, and the United Kingdom offer tax benefits to companies that provide bicycles to their employees (Haubold, 2014; Haubold, 2017).

In November 2012, a fiscal reform was introduced in Germany. The so-called 1% tax rule that applies to company-leased cars (1% of the list price per month) was applied to bicycles, s-pedelecs, and e-bikes (BMF, 2012). The rise of the German tax-subsidized company-bicycle leasing program resulted from the fiscal adjustment made by federal state tax authorities (BMF, 2012). A network of companies and associations of the bicycle industry (e.g., German Cyclist's Association [ADFC] and JobRad) has worked towards the implementation of the fiscal reform between 2008 and 2012. After the German Federal Council rejected an initial amendment on July 06, 2012 (Bundesrat, 2012; Sürig, 2012), the finance ministers of the federal states passed a retroactive decree on the equal treatment of company-leasing bicycles and company-leasing cars on October 23, 2012 (BMF, 2012). To facilitate the evaluation of the noncash benefit from the leasing of company bicycles, the highest tax authorities of the federal states in Germany issued, with the approval of the Federal Ministry of Finance, identical decrees to set average values in accordance with the German income tax law (Deutscher Bundestag, 2013). The development of the program was therefore not a policy-led outcome of politicians' intentions to promote cycling to work, but the result of tax amendments that were made in Germany. As a result, various companies and employees adopted the program.

The program works as follows: Companies sign a contract with a leasing provider. Then, their employees are allowed to select a bicycle from a participating bicycle shop. The invoice is sent to the leasing providers first, which in turn send the invoice for the leasing installments to the respective employers. Since the lease payment is deducted from the employees' monthly gross salary, taxable income decreases. Employees can save up to 40% compared to a regular bicycle purchase. The possible savings from the lease depend on income level, tax class, and tax-exempt amount of the employees. Those with the highest tax burden tend to benefit most. Employees can use the bicycle both for commuting to work and for private purposes (Wesp, 2015). At the end of the 36-month lease

<sup>&</sup>lt;sup>1</sup> In what follows, s-pedelecs and e-bikes are included when "bicycles" are referred to.

period, employees can purchase the bicycle for the residual value. The program leads to maximum savings when employees lease expensive bicycles (ADFC, 2017). This might be one reason why about half of the employees who participated in the program purchased s-pedelecs and e-bikes (DPA, 2017). In total, until summer 2017, about 200,000 employees have leased bicycles via the program (DPA, 2017). Also, several leasing providers appeared on the market between 2012 and today. The market leader in the company-leasing bicycle sector, JobRad, has more than 7500 company customers, which in turn offer the possibility to participate in the program to about 1.5 million employees within these companies (JobRad, 2018).

Leasing providers emphasize the win-win situation for both employers and employees. The possible advantages can be cost savings for employers and employees, employer branding, high employee satisfaction and employee commitment, and better employee health (e.g., C2WA, 2011 for the UK; JobRad, 2017 for Germany). However, there are also some disadvantages. First, not all employees are eligible to lease bicycles. German companies do not offer the participation in the program to employees who are in training, employees with fixed-term contracts, and employees who will retire within 36 months, for example. Also, due to tariff regulations, civil servants and public servants are not allowed to participate in the program in Germany (BSW, 2017). Second, there is some legal uncertainty, because German lawmakers have not finally determined allowances for the residual value of leasing bicycles at the end of the leasing period at the time when the present study was conducted (Wehl, 2016). If there are discrepancies between use-in-practice and legal regulations, additional costs or burdens may incur. These uncertainties can be a barrier to the participation in the program.

### 2.2. Diffusion of Innovations Theory as a theoretical frame for exploring adoption drivers and barriers of the program

Rogers' (2003) concept of DOI is a well-established theory that explains the adoption and diffusion of innovations in a variety of research fields, such as transportation and eco-innovations. The theory can be used to study the adoption of innovations at both the organizational level and the individual level. The theory is grounded in sociology and takes into account various socio-cultural factors, such as social networks, cultural values, practices, and beliefs. According to Rogers (2003, p. 12), an innovation is "an idea, practice, or project that is perceived as new by an individual or other unit of adoption". An innovation may have been invented some time ago, but if individuals or organizations perceive it as new, it is still considered an innovation. According to Rogers (2003), adoption represents the "full use of an innovation as the best course of action available" (p. 177). The adoption process can be divided into five stages: knowledge, persuasion, decision, implementation, and confirmation (Rogers, 2003). Applied to the context of the present research, the adoption of the company-bicycle leasing program can be assumed when a company takes part and implements the program for the first time (i.e., the organizational level). The adoption (i.e., purchase and use) of company-leased bicycles by employees can be assumed when an employee purchases and uses a bicycle via the program but has not participated in the program (or a similar program) before (i.e., the individual level).

Rogers (2003) proposed five characteristics that determine the adoption of innovations: (1) relative advantage, (2) compatibility, (3) complexity, (4) trialability, and (5) observability. Between 49% and 87% of the variance in the rate of adoption of innovations can be explained by the five characteristics (Rogers, 2003; Sahin and Rogers, 2006). In what follows, each of the five characteristics are briefly explained.

First, relative advantage is "the degree to which an innovation is perceived as being better than the idea it supersedes" (Rogers, 2003, p. 229). The variable refers to the expected benefits and costs of an innovation. In the present context, it includes aspects such as economic profitability, low initial cost, an increase or a decrease in comfort, social prestige, and savings in time and effort (Rogers, 2003). In the context of cycling to work, health benefits have been identified (Andersen et al., 2000). Even though some of the previous studies on company-bicycle leasing programs have made references to health aspects and other aspects such as saving money and saving time (e.g., Avineri and Steven, 2011; C2WA, 2011, 2013; Caulfield and Leahy, 2011; Clarke et al., 2014), they have not been contextualized as relative advantage drivers of the adoption of the company-bicycle leasing program.

Second, compatibility is "the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters" (Rogers, 2003, p. 15). A highly compatible innovation is more certain to adopters, shows greater fit to a person's situation, and is perceived as more familiar. Previous research that has applied the DOI Theory to cycling as a means of active transportation showed that compatibility is perceived as highest in the later stages of Rogers' adoption process (Nehme et al., 2016). This indicates that learning and identification processes take place. To date, however, no studies have been published in the area of the adoption of the company-bicycle leasing program that describe the different facets that compatibility has, and what their relevance is.

Third, complexity is "the degree to which an innovation is perceived as relatively difficult to understand and use" (Rogers, 2003, p. 15). While some ideas tend to be obvious in their understanding for adopters, others are not. The former facilitate, whereas the latter hinder adoption. Therefore, Rogers (2003) suggested that the degree of complexity of an innovation is negatively related to the rate of adoption. As for compatibility, the authors of the present study are not aware of any studies in the area of company-bicycle leasing programs that referred to the construct.

Fourth, trialability is "the degree to which an innovation may be experimented with on a limited basis" (Rogers, 2003, p. 16). In general, innovations that can be tested before a purchase is made are adopted more quickly than innovations that cannot. As the possibility of personal testing can reduce uncertainty about an innovation, the trialability is supposed to be positively related to the rate of adoption. The present study therefore considers it as a relevant characteristic, which has not been explored from the perspective of the adoption of company-bicycle leasing programs yet.

Lastly, observability can be defined "as the degree to which the results of an innovation are visible to others" (Rogers, 2003, p. 16). The variable is positively related to the adoption rate. While some ideas are easily observed and communicated to people, others

Proposed adoption dri	vers a	nd barriers of company-leased bicycles in reference to the perceived ir Organizationa	novation characterist level: Emplovers	tics a	both the organizational level and the individual level.
		Adoption drivers			Adoption barriers
Relative advantage Compatibility Low complexity Trialability Observability	<b>&gt;</b> × × × ×	Employee engagement, <sup>1</sup> employee health, <sup>1</sup> lower carbon footprint <sup>1</sup> 1 No evidence No evidence No evidence No evidence	telative disadvantage neompatibility digh complexity ow trialability ow observability	****	vo evidence vo evidence vo evidence vo evidence vo evidence
		Individual I	vel: Employees		
		Adoption drivers Five perceived innovation characteristics			Adoption barriers Five perceived innovation characteristics
Relative advantage	° *	Employee health, <sup>1,2,6,7,8,9,10</sup> , financial savings, <sup>1,2,3,47,10,11,17</sup> time savings, <sup>2,3,10</sup> traffic safety, <sup>2,3,10,11</sup> convenience, <sup>2,10,11,12,13,14</sup> flexibility <sup>2,6,10,12</sup> Increase in speed, <sup>35,35,37</sup> reduction in physical exertion, <sup>35,26,37,38</sup> substitution of morized transport, <sup>35,36,37,38,39,40</sup> allowance for longer and	telative disadvantage	∼° ×°	ow safety due to crime $^{7,12,33}_{7,13,22,30}$ low safety due to inappropriate built invironment, $^{6,7,13,27,29,30,31,33}_{7,29,20,31,33}$ attural barriers, $^{24,25,36,27,33,34}_{24,25,36,38,40,45}$ image and ppearance, $^{7,81,8,33}_{7,81,33}$ physical discomfort, $^{9,13}_{9,13}$ health problem $^{9,17}_{9,13}$ for $^{26,38,40,45}_{7,64}$ fear of theft, $^{40}$ image/stigma, $^{38,40}_{3,9,045}$ road danger due to high ppearance, $^{70,13,27,29,30,31,33}_{7,9,13}$ image and $^{38,40}_{7,13}$ for $^{12}_{7,13}$ fo
Compatibility	° ×	note compres journeys Past active or inactive mobility behavior, <sup>1,3,4,5,15</sup> need for a new Diviolal <sup>1,3,4,5</sup>	ncompatibility	×	teed for a car (instead of a bicycle), <sup>8</sup> , past inactive mobility behavior, <sup>9,15</sup> injoyment of driving a ${\rm car^{14.26}}$
Low complexity	× ~	ruysteat miniatuous Cycling ability and confidence <sup>8</sup>	ligh complexity	ر بر مر	ack of skills, <sup>17</sup> lack of cycling facilities at workplace <sup>9,12,18,33</sup> tarterv ranoe anvierv <sup>38,40,45</sup> lack of sumortive infractmerine <sup>38,40</sup>
Trialability Observability	<b>ب</b> م	Possibility to try out cycling <sup>16</sup> Role models: colleagues, friends, and relatives <sup>7,8,1,3,14,17,18,19,20</sup>	ow trialability ow observability	• × ×	vice projection and the second supported to the second support of
Environmental benefit High motivation Home-work distance Sociodemographics	° ° ° ° ° <b>` ` ` ` `</b> `	Additic       Lower emissions <sup>1,2,9,18,25</sup> Higher intention to cycle <sup>4,10,15,21</sup> Low distance to work <sup>4,1,18,19,22,23,25</sup> Male gender 4,62,32,52,52,32,252       Number on a gender 4,62,32,652,54,52,522,325	nal drivers invironmental harm ow motivation fome-work distance iociodemographics	× × × > >	vo evidence .ack of interest <sup>17</sup> .arge distance to work <sup>4,18,22,23</sup> see left (opposite relationships)
Car ownership	~	younger age, No ownership,11,18,26	lar ownership	Š	see left (opposite relationship)
Notes. $\checkmark$ = Variable w cycling literature; $V^{e}$ : bicycle-leasing progra <sup>1</sup> C2WA (2011), <sup>2</sup> Caulf Handy (2012), <sup>9</sup> Gaters (2003), <sup>16</sup> Strömberg e (2016), <sup>22</sup> Parkin et al. <sup>32</sup> Menghini et al. (2017), <sup>40</sup> Popovi	<pre>/as pr /as pr m but m but field a /aleben / (200 0), <sup>33</sup>s 0), <sup>33</sup>s</pre>	posed to be a driver (barrier) in the bicycle-leasing program literature; able was proposed to be a driver (barrier) for e-bikes in the e-bike literat in the general cycling literature. Studies on the bicycle-leasing program and Leahy (2011), <sup>3</sup> Clark et al. (2014), <sup>4</sup> Avineri and Steven (2011), <sup>5</sup> C2N and Appleton (2007), <sup>10</sup> Heinen et al. (2011), <sup>11</sup> Sahlqvist and Heesch ( 2016), <sup>17</sup> De Geus et al. (2008), <sup>18</sup> Heinen et al. (2010), <sup>19</sup> Simons et al. (8), <sup>25</sup> Sener et al. (2009), <sup>26</sup> Dill and Voros (2007), <sup>27</sup> Heesch et al. (20 titnson and Bhat (2005), <sup>34</sup> Winters et al. (2017), studies on e-bikes: <sup>35</sup> Joj al. (2014), <sup>41</sup> Astegiano et al. (2015), <sup>42</sup> Lee et al. (2015), <sup>43</sup> Langford (2	$\Lambda^{C} = Variable was pr irre; X = No variables on in: VA (2013). Studies on VA (2013). 12Fernández-H (2014), 20Winters et (2014), 20Winters et (2015), 38Titze et al. (20 mison and Rose (2015), 013), 44Rose (2012),$	copos were n cycl leredi eredi al. (2 007), <sup>36</sup> I 3), <sup>36</sup> Di	It to be a driver (barrier) in the bicycle-leasing program and in the general proposed in both literature streams; $\chi^{\rm C}$ = Variable was not proposed in the mg in general: <sup>6</sup> Akar and Clifton (2009), <sup>7</sup> Bopp et al. (2012), <sup>8</sup> Enond and et al. (2014), <sup>113</sup> Titze et al. (2008), <sup>14</sup> Xing et al. (2010), <sup>15</sup> Bamberg et al. (15), <sup>21</sup> Eriksson and Forward (2011), <sup>22</sup> Dill and Gliebe (2008), <sup>23</sup> Muñoz <sup>99</sup> Winters et al. (2011), <sup>33</sup> Mortens et al. (2017), <sup>38</sup> Jones et al. (2016), <sup>39</sup> Plazier and Rose (2012)

are more difficult to observe or describe. To date, there is no research on the role of observability for the adoption of the companybicycle leasing program. The present study considers observability as another potential adoption driver.

Other studies mentioned potential facets of the five characteristics described above (either referring to alternative theories or without reference to Rogers' DOI Theory) in the context of the literature on the adoption of bicycles. Previous studies have considered the adoption of bicycle sharing programs (e.g., Bachand-Marleau et al., 2012; Hazen et al., 2015; Munkácsy, 2017; Parkes et al., 2013) and factors influencing the adoption of e-bikes (e.g., Astegiano et al., 2015; Dill and Rose, 2012; Fyhri and Fearnley, 2015; Johnson and Rose, 2015; Jones et al., 2016; Langford, 2013; Lee et al., 2015; Ling et al., 2017; MacArthur et al., 2014; Plazier et al., 2017; Popovich et al., 2014; Rose, 2012; Seebauer, 2015; Wolf and Seebauer, 2014). To the knowledge of the authors of the present study, however, there are no studies that have appeared in the area of the company-bicycle leasing program that referred to all of the five characteristics of the DOI Theory.

Table 1 provides an overview of the literature and highlights those studies that particularly considered bicycle-leasing programs (see Notes in Table 1). As the present study investigates the drivers and barriers of the adoption of company-leasing bicycles at the organizational and the employee levels, Table 1 refers to both levels. At the organizational level, the study investigates the drivers (barriers) that promote (or delay and hinder) the adoption of the bicycle-leasing program. At the individual level, the study investigates the drivers and barriers that make employees lease and use (or delay and not lease and not use) bicycles via the program. Since e-bikes are often leased via the program, Table 1 also summarizes the drivers and barriers that have been identified for the adoption of e-bikes.

As Table 1 shows, the organizational level of adoption has largely been neglected in the previous studies, with one notable exception (C2WA, 2011), which is a self-report. Also, the previous studies remain partially silent on what factors hinder the adoption of leasing bicycles (see right column in Table 1). For example, little is known about the role of low (or high) trialability and low (or high) observability within the context of adopting the bicycle-leasing programs at the individual level. The present study aims to partially fill this void and aims to explore the adoption drivers and barriers of the German bicycle-leasing program at both the organizational level and the individual level. In what follows, the methodological procedure of the study is described.

#### 3. Methods

#### 3.1. Case study approach

Case study methodology was used to get insights into the adoption drivers and barriers of the German company-bicycle leasing program. It is used to obtain an in-depth understanding of phenomena or processes in real-world experiences and where it is believed that contextual conditions are highly pertinent (Yin, 2018). This is the case in the present study. A case study methodology is appropriate when the investigators have minimal or no control over the behavior of the research participants, and when the study focuses on contemporary events (Yin, 2018). This is also the case in the present study. Thus, the single case study approach was deemed appropriate to provide answers to the research questions.

Due to the exploratory nature of the research questions, a qualitative case study design was chosen for the study. Qualitative case studies emphasize lived experiences and interrelations between actors in relation to a phenomenon (Yin, 2018), whereas quantitative case studies focus on the identification of trends in attitudes and opinions of a population, as well as testing relationships between variables (Creswell and Creswell, 2017). Since the present study sought to explore decisions that result from lived experiences as well as decisions from multiple stakeholders, a qualitative approach was deemed to serve the purpose of the study.

The exploratory case study approach is particularly helpful when a research topic is relatively new, or when the topic suffers from a shortage of information and literature (Yin, 2018), which is the case in this study, as there is no scientific literature on the German company-bicycle leasing program. Multiple sources of evidence were used in this case study to increase the quality, accuracy, and confidence in the study's findings. The combination of document analysis and interview analysis (using both company representatives and employees as informants) in a single case study helps increase the understanding of stakeholders' diverse lived experiences. It allows to gain deep insights, taking into account differing perspectives and behaviors through triangulation; this should increase the credibility of the research findings (Yin, 2018).

#### 3.2. Document analysis

The accessible information on the German company-bicycle leasing program was subjected to a document analysis (Silverman, 2001). Via a document analysis, data are extracted to increase one's understanding as well as to explore meanings and purposes. The data are often used as background material in qualitative research designs (Corbin and Strauss, 2008; Rapley, 2007). The analysis provides a better understanding of the development of the company-bicycle leasing program (against the background of policy making), how the program works, and what arguments are used to promote adoption and reduce barriers to adoption.

The first step of the analysis was to identify relevant documents. They were identified via searching the homepages of the most important stakeholders of the program (governmental organizations, providers, and associations). Also, online press releases that focused on the program were searched. Additional material was collected using electronic search engines (Google and Google Scholar, OPAC, and ScienceDirect). The following search terms were used: "bicylce" (or "bike") was connected with (AND) "company" (or "firm", "employer", "leasing", "tax", "fiscal"). The hits were saved, screened, and selected for an in-depth investigation (according to their relevance). The documents were then reviewed for citations and additional references. The following thirteen documents provided the data for the document analysis: press release of the German Cyclists Association (ADFC, 2017), report of a

Civil Servants Association (BSW, 2017), paper on orders of the highest tax authorities of the federal states (BMF, 2012), minutes of plenary proceedings of the Federal Council of Germany (Bundesrat, 2012), questions and answers provided by the German Federal Government (Deutscher Bundestag, 2013), press release of the German Press Agency (DPA, 2017), two press releases of the market leader in the company-bicycle leasing market (JobRad, 2017, 2018), and five articles (ACE, 2016; Firlus, 2018; Sürig, 2012; Wehl, 2016; Wesp, 2015). These documents were read and examined to identify key themes (thematic analysis) related to the adoption drivers and barriers of the company-bicycle leasing program at both the employer and employee level.

#### 3.3. Informants during interviews

Beside the document analysis, personal interviews were conducted to enrich the understanding as well as triangulate the results of the document analysis. The present study combined the purposeful sampling technique with convenience sampling to take into account the peculiarities of the setting that was considered in the study (Koerber and McMichael, 2008; Patton, 2014). At the organizational level, the authors collaborated with the market leader in the company-leasing bicycle sector to receive information about companies that have already adopted the program, taking into account companies from different industries, of different organizational size, and with different past cycling-to-work cultures (in particular as regards their past means to promote cycling).

After the different companies were identified, the authors of the study contacted their representatives (who were key decisionmakers in regard to the bicycle-leasing program), made appointments for interviews with them, and interviewed the informants until saturation was reached. The informants included 13 men and 9 women from 21 companies. In the case of one company (no. 17; see Table 2), two interviews were conducted, one with a member of the work council and one with the head of the human resources department. Both were responsible for the adoption of the bicycle-leasing program in their company. The interviews with the 22 firm representatives lasted between 18 and 44 min and were conducted at the informants' place of work.

At the individual level, company-bicycle users were selected based on the principle of purposeful random sampling (Patton, 2014). The population of the employees who participated in the company-bicycle leasing program was identified with the help of the leasing agency (who has all the information because they make and store the leasing contracts) and the companies that took part in the interviews (as described above). Both gave their informed consent and the research was conducted in agreement with customer data management regulations and market research standards. Informants were then contacted and, if they agreed to participate in the study, interviewed. More informants were contacted until saturation was reached. The informants included 17 men and 5 women between the ages of 31 and 61 years. The interviews with the employees lasted between 12 and 33 min and took place at informants' preferred location, that is, either at their homes or at their workplace.

Tables 2 and 3 give an overview of the companies and employees who took part in the study. All interviews were held between November 2016 and March 2017. An interview guide with a set of 14 semi-structured questions for firm representatives and 16 semi-structured questions for company-bicycle users was developed (Appendix). The interview questions were open-ended and interviewers were able to prompt respondents for more information about specific issues that were mentioned. Semi-structured interviews were conducted to keep the interviews focused and facilitate cross-case analysis (Carson et al., 2001) but also to provide data collection flexibility to allow the researchers room to explore new and relevant issues that emerged during the interview (Pope and Mays, 2006). The interview guide was designed to capture the context, content, and process regarding the adoption of company-bicycles and focused on the drivers and barriers. Semi-structured interviews with 20–30 informants as for the present study allowed rich and in-depth data collection according to (Bowen, 2008) and (Morse, 2000).

With the concurrent data collection and data analysis approach, data saturation (the point in data collection and analysis where no new ideas emerge; Guest et al., 2006) was subsequently checked and achieved during content analysis after 22 informants from companies and 22 informants in their role as employees had been interviewed.

All informants gave their informed consent for participation in the study. With their permission, audio recordings were made of all interviews, which were then transcribed and paraphrased before the abstracted text was reduced to categories. Then, relevant parts of the interviews were translated from German into English. A native speaker checked the content of the translation (back-and-forth method). For confidentiality reasons, employees were given fictitious names.

#### 3.4. Data analysis of the interviews

The study used content analysis procedures (Mayring, 2000) to inductively code information provided in the interviews; the information coding process is crucial to the analysis (Hsieh and Shannon, 2005; Mayring, 2014). The inductive procedure was considered to be appropriate as there are no existing conceptualizations of the facets of the perceived innovation characteristics beside Rogers' (2003) general conceptualization into the following five components: relative advantage, compatibility, complexity, trialability, and observability. The QCAmap software (Mayring and Fenzl, 2013), which aims to standardize rule-guided qualitative categorization, was used to support the coding and the analysis.

The analysis began by extracting, sighting, and carefully reading the text. In the second step, the transcribed material was organized into meaningful coding units using an inductive open coding approach. Codes emerged as the reading of the text progressed. The aim of categorizing inductively is to classify data as belonging to a particular group (Elo and Kyngäs, 2008), here to driver and barrier facets within the five perceived innovation characteristics that may determine the adoption of the company-bicycle leasing program. The coded content units consist of 25 subcategories (six main categories) at the organizational level and 21 subcategories (seven main categories) at the individual level. To obtain a further categorization and abstraction into a conceptual model (Elo and Kyngäs, 2008), the subcategories (they are later called "facets", see results) were grouped into the five perceived innovation

		תור החוולשווה חומו		TIGITIC MOTIVIC	TOT OT PATTERATION	·(T-A-T)				
Company number	Industry	Informant's department	Gender <sup>1</sup>	Number of employees	Number of leased bicycles during the time of the interview	Date of adoption of the program (DD.MM.YYYY)	(Main) motives for adoption of the program <sup>2</sup>	Companies' past measures to promote cycling <sup>3</sup>	Development of bicycle facilities due to the adoption of the program <sup>4</sup>	Additional subsidization by the company
1	Media	Human resources	н	70	3	31.03.2016	nc, es, hp, pp	br, df, sh	No	No
2	Consulting	Managing director	М	70	10	17.02.2014	<b>hp</b> , eb	sh	Planned: sh	No
З	Media	Human resources	F	230	10	07.06.2016	hp, ec, es	br, cre, sh	No	No
4	Stationary	Human resources	F	340	83	01.03.2016	pp, se	bf, br	Installed: br Demand: sh	Yes: greater than
										60 days cycling per year: €35 per month
5	IT consulting and	Travel	М	380	35	22.04.2016	es, nc	br lbs, sh	No	No
	services	management								
9	Electrical	Human resources	Μ	400	26	21.08.2016	<b>es</b> , hp, nc, se	br	No	No
I	engineering	;	1		;			:	:	:
7	Insurance	Human resources	F	450	27	28.06.2016	eb, hp	Nothing	No	No
8	Bio-/nanotechnology	Human resources	Μ	450	40	02.07.2015	es, eb, hp	chf, lo, sh	Planned: cre	No
6	Social service	Human resources	н	480	4	04.05.2016	tw, hp	br	Planned: lbs	No
10	Sports and outdoor	CSR management	F	500	41	24.07.2015	se, hp	bdt, bf, br, btm, bw,	No	No
	equipment							chf, cre, lbs, lo, rew, sh		
11	Media	Human resources	н	600	32	01.06.2016	eb, es, se	br, chf, sh	No	No
12	Pharmaceutical/	Human resources	Μ	750	131	01.05.2013	se, es, eb, hp,	br, sh	Installed: br Planned:	Yes: €4.30 per month
	Cosmetics						nc, pp		cre	
13	Software	Work council	Μ	800	59	01.08.2016	<b>pp</b> , hp	br	Installed: chf, cre, df,	Yes: €18 per month
14	Building materials	Human resources	Ŀ	000	21	01 04 2015	ha ah	hr ch	IDS, SII No	NO
- L	Mechanical	Human resources	. 2	000	738	01.06.2013	пр, со <b>hn</b> ah	bdt hr chf lo ch	Installed: hr df Demand:	Vec: costs for insurance
01	engineering		H	202	0	01070010	<b></b>	Vut, VI, VIII, IV, 3II	cre	(before 01.01.2017)
16	Medical/	Human resources	н	1100	98	13.05.2016	pp, se	bf, br, chf, cre, sh	Planned: lo	No
	pharmaceutical									
17	Paper industry	Work council/	M/M	2400	605	16.03.2015	<b>hp</b> , nc	br, chf, sh	No	Yes: €10 per month
		human resources								
18	Metal industry	Human resources	Μ	2700	832	14.03.2016	hp, es	br, chf, sh	Installed: br	No
19	Food and beverage	Human resources	M	4800	437	11.05.2016	<b>eb</b> , ec, hp, nc, np. se	br	No	No
20	Software	Sustainability	М	19,000	451	08.04.2015	hp, nc, se	br lbs, sh	Installed: br	No
		management								
21	Transportation and	Mobility	Μ	197,000	0	01.09.2016	eb, hp, se	No information due	No information due to	No
	logistics	management						to different locations	different locations	
Notes. $^{1}M =$	Male. F = Female. <sup>2</sup> Th	e main motive is sh	own in ho	ld· eh = emnl	- de anding eh -	- amployer hrandir		- ad thomations	hoolth momotion as -	anihon – na store

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Table 2

problems for cars need to be solved, se = sustainability and environmental reasons, tw = means of transportation to work. <sup>3</sup> bdt = bicycle days and tours for employees, bf = provision of a bicycle fleet, br = provision of bicycle racks, btm = provision of a bicycle tube machine, <math>bw = bicycle workshops for employees, chf = provision of changing facilities, cre = provision of charging facilities for e-bikes,df = provision of drying facilities, lbs = provision of lockable bicycle storage, lo = provision of lockers, rew = installment of a reward for bicycle-commuting employees, sh = provision of showers. <sup>4</sup>Demand = Demand for new or additional bicycle facilities due to the adoption of the program. Planned installation of new or additional bicycle facilities due to the adoption of the program.

Installed = Newly or additionally installed bicycle facilities due to the adoption of the program. See  $^3$  for abbreviations.

bicycle adopters	Company characteristics <sup>1</sup>	Gender <sup>2</sup>	Age (in years)	Position	Time since adoption (in	Number of bicycles and type of bicycles	Home-work distance (in	Substitution or complementary bicycle <sup>3</sup>	Change in mobility patterns according to
					months)	adopted	km)		informants*
Andreas	IT service provider; 30	М	31	Software engineer	2	1 urban bike	17	Rw/oN	No change
ī	employees	;	:		1				
Florian	Engineering; 50 employees	Z :	39	Software engineer	5	1 mountain bike	12	Aw/oN	No change
Stefan	Consulting; 70 employees (company 2)	M	<del>1</del> 0	Managing director	IA	I racing bike	10	KW/0N	Ke+
Erika	Stationary; 340 employees	н	48	Human resources officer	6	1 e-bike	ε	Rw/oN	Lo, PS+, Re+, SC, Sh+
	(company 4)								
Maria	Stationary; 340 employees	ц	61	Purchasing officer	10	1 e-bike	19	RwN	No change
Karsten	Stationary: 340 employees	W	60	Manufacturing planning	6	2 e-bikes	3.5	AwN	Lo. Re+. SC. SWo
	(company 4)	1	2	officer	N		2		
Christian	Non-profit organization; 530	М	51	Purchasing officer	5	1 fat bike	20	Aw/oN	No change
	employees								
Erich	Packaging industry; 540	W	31	Project manager	30	1 e-bike	25	AwN	Lo, Re+
Nitle	employees Dharmacautical (commetication: 750	М	UIN	Toohniool oneinoor work	U	1 o hilo	Not voloment	ANI	
SILVI	employees (company 12)	IMI		council member	ŋ	T C-DIVC	(field work)	NTANY	LU, FOT, NCT, OU
Peter	Software: 800 employees	М	48	Consultant, work council	ŝ	1 e-bike	8	AwN	PS+, Re+
	(company 13)			member					×
Franz	Software; 800 employees	М	39	Head of software	3	1 mountain bike	4.5	AwN	Re+, SC, SWo
	(company 13)			development department					
Ingo	Mechanical engineering; 900	Μ	61	Head of industrial	12	1 e-bike	1.5	AwN	Lo
	employees (company 15)	F	c L	engineering department	Ţ	1	L	IN-7	M. 4
глиа	isteriatical engineering; 900 employees (company 15)	4	70	nullait resources officer	t		0.7	KW/ UN	
Gerhard	Automotive supplier: 1000	М	53	Machine operator	9	2 e-bikes	13	AwN	Lo, Re+
	employees								×
Tom	Medical/Pharmaceutical; 1100	М	53	In-house consultant	18	2 e-bikes	6	AwN	Lo, PS+, Re+, SC, Wo+
	employees (company 16)								
Birte	Health and social services; 1600	F	38	Secretary	7	1 e-bike	25	RwN	No change
	employees								
Uwe	Paper industry; 2400 employees (company 17)	M	58	Work council member (full-time)	19	2 e-bikes	ñ	AwN	Lo, PS+, Re+, SC, Sh+, Wo+
Inorid	Paner industry: 2400 employees	ц	55	Himan resources	18	1 e-hike	10	AwN	IO DS+ Re+ SC Sh+
nugur	(company 17)	4	8	assistant	2		01		SWo
Martin	Health and social services;	М	46	IT coordinator	3	1 mountain bike	9	AwN	No change
	10,000 employees								
Paul	Transportation and logistics;	Μ	48	Purchasing officer	0.07	1 trekking bike	70	Aw/oN	No information (time
	197,000 employees (company								since adoption was too short)
0440	Transmostation and logistics	М	61	Controllor	ç		0	NN	
OII0	1174000 employees (company	M	43	Controller	N	алге-рике	Ø	AWIN	то, го +, ке +
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Company- bicycle adopters	Company characteristics <sup>1</sup>	Gender <sup>2</sup>	Age (in years)	Position	Time since adoption (in months)	Number of bicycles and type of bicycles adopted	Home-work distance (in km)	Substitution or complementary bicycle <sup>3</sup>	Change in mobility patterns according to informants <sup>4</sup>
Dieter	Food retail; 233,000 employees	М	42	Food service manager	0.03	1 e-bike	20	Aw/oN	No information (time since adoption was too short)

Rw/oN = Replacement of an old bicycle and no need for a new bicycle ("without need"), Aw/N = Additional bicycle and no need for a new bicycle ("with need"), Aw/N = Additional bicycle and no need for a new bicycle ("with need"), Aw/N = Additional bicycle and no need for a new bicycle ("with need"), Aw/N = Additional bicycle and no need for a new bicycle ("with need"), Aw/N = Additional bicycle and no need for a new bicycle ("without need"). NR = Not revealed. <sup>4</sup>Perceived change in mobility patterns after the adoption according to the informants: Lo = Longer cycling trips (distance and/or duration), PS + = More cycling trips for personal and social activities (e.g., visiting friends or family members, seeing the doctor), Re + = More cycling trips for recreation, SC = substitution of car trips, Sh + = More cycling trips for shopping activities, SW0 = Start to cycle to work, W0 + = More cycling to work.Notes. <sup>1</sup>See Table 2 for information about the companies. <sup>2</sup>M = Male, F = Female. <sup>3</sup>Need-based motivation for adoption: RwN = Replacement of an old bicycle and need for a new bicycle ("with need").

characteristics, where possible, and complemented by additional inductively coded main categories; they are called "adoption determinants", see results). All subcategories and main categories emerged from the data and were defined by the authors.

Two coders performed the coding; inter-rater reliability was excellent with Cohen's  $\kappa = 0.84$ . After completing the coding and grouping, the two coders engaged in an iterative process to further elucidate the meaning of the identified subcategories and the relationships between them. The final interpretation of the findings, as presented in this manuscript, emerged through active discussion among the co-authors.

# 4. Results

In both the documents and interviews, a number of different facets of the drivers and barriers were mentioned at the organizational and individual level. The inductive coding initially explored the meaning of the facets, followed by the relation to the five perceived innovation characteristics. In the document analysis, the following adoption drivers (or barriers) were coded: employee health, employee satisfaction, employee commitment, employer branding, environmental benefit, no extra costs, reduction of parking problems, decrease in traffic safety, time investment, complex tax laws, dealing with differences in employees' eligibility, and unforeseen financial burden (organizational level); as well as healthand environmental benefits; mobility, monetary savings, possibility to lease more than one bicycle, and loss of social security contributions (individual level).

In what follows, the results that emerged from the interviews are provided. They provide rich insights into the adoption drivers and barriers. The results from interviews with the company representatives are presented first. Then, insights into the perspective of the employees are provided. Links between document and interview data coding are outlined.

#### 4.1. Drivers and barriers at the organizational level

Tables 4–7 provide an overview of the different facets that were identified in the data, and their relation to the adoption determinants. Eight different facets of relative advantage drivers were mentioned in the interviews; three additional facets were identified as barriers and may thus be considered as a relative *dis*advantage (Table 4). The eight driving facets are the following:

#### Table 4

Adoption drivers and barriers of company-leased bicycles in relation to relative advantage at the organizational level.

Facet (characteristic)	Example statement
Relative advantage	
Employee health	"We believe that exercise is good for our people." (Company 17) "Health aspects were the main motive for the
	implementation () that actually appeared to be true (). Last year, we did a study on absenteeism and saw that the so-
	called JobRad users have about a third fewer days off than the rest of the staff." (Company 15)
Employee satisfaction	"We are a very employee-friendly company and try to have as many benefits as possible for the employees () just as another measure to make our people happy." (Company 5)
Employee commitment	"For us, this also means an instrument for employee commitment." (Company 3) "We have a strong orientation toward
	increasing the commitment of our employees in our corporate culture (). And that's how I would see it." (Company 19)
Employer branding	"The second motive was () employer branding, to make companies () attractive as an employer brand and also to show
	applicants () doing something for its employees." (Company 15) "When it comes to recruiting specialized staff () you put
	all the aspects on the table. () one or two colleagues () explicitly asked for it [the bicycle-leasing program] when they were hired." (Company 19)
Mobility	"The main motive is actually that many of our employees visit families in the urban or working area (). Thus, they are
-	traveling a lot. And then we thought about it, you could do that just in the urban area, it's also wonderful with the bike and it
	offers many advantages. Therefore, the company had already partially focused on the bike idea through the type of work of
	our employees () many actually use it for their trips during working hours." (Company 9)
Environmental benefit	"We have been EMAS-certified since 2008, and with EMAS you have to analyze your environmental aspects and that's where
	it turned out () that transportation, business travels, and commuting account for almost half of our carbon footprint."
	(Company 10) "At that time, I think it [the bicycle-leasing program] was very much a matter of pure sustainability. () hey,
	that's a great topic to save carbon dioxide." (Company 20)
No extra costs	"() if there are no costs involved, then you can do it." (Company 1) "Of course, we took care that there are no extra costs."
	(Company 5) "() and there are no costs involved, that's the advantage." (Company 12)
Reduction of parking problems	"It started with the fact that we had a relocation (). We had about 900 parking spaces in the old building and in the new
	one, only 360 parking spaces. Now, we have rented a large outdoor parking lot with about 500 parking spaces. And this
	parking lot is only available for five years and then it is over, i.e. within five years, we have to get the staff into developing
	alternatives to the car." (Company 13)
Relative disadvantage	
Lack of proof of evidence	"This is a kind of small experimental object, you know. We'll do it and then we'll have a look, how it is accepted and what
	effects we get." (Company 7) "We said in terms of money, it should be plus minus zero in hope of achieving positive effects
	() and let's see what kind of effects we get." (Company 17)
Decrease in traffic safety	"Some managers from the management board said then, oh, that's too dangerous now. After all, the risk of accidents
	increases when we have e-bikes when they rush through the traffic at 25 or 30 km per hour." (Company 13) "() and road
	safety. That was briefly discussed in advance, riding a bike in traffic () we thought about that." (Company 8)
Time investment	"() whenever there is something special, when an employee has a claim we have to care about, that costs time of course."
	(Company 17) "I have to follow up with my human resources director if we advertise again. Because there is some work to be
	done for it." (Company 14)

Adoi	otion	drivers	and	barriers	of o	compa	nv-leas	ed bic	vcles	in	relation	to	com	oatibilit	v at	the	ors	anizational	level.
							,		.,						,		~~~		

Facet (characteristic)	Example statement
<i>High compatibility</i> High fit with existing values	"We live and breathe sports ()." (Company 10) "We want to continue to promote our three main areas of activities, quality leadership, top employer, and pioneer in environmental protection. And, of course, it [the
High fit with past measures to promote cycling	bicycle-leasing program] fits very well with this concept and with achieving these goals." (Company 21) "Regarding the topic of bicycle commuting, I think there is nothing that we have not already implemented. Yes, we have showers, we have changing rooms, we have illuminated, centrally located and easily accessible bicycle parking spaces protected from rain and with lockers, we have free charging stations for e-bike batteries () we have a bicycle workshop, we have a bicycle tube machine." (Company 10) "We are also ADFC certified, for the second time now (). And therefore, we must have a special number of bicycle racks on site. So, we are already
High fit with daily work routine	supporting and promoting the cyclists and that was, of course, another opportunity." (Company 11) "It's just a sideline. That has to run next to all the other work. In the beginning, it took a bit longer, but meanwhile, we got 30 bicycles, so it's a routine now." (Company 14) "This is an established process. We tried to put an FAQ document on the server to answer most questions. There are references to the bike dealers and there are references to JobRad where you can also inquire. So, from now on, our effort actually approaches zero." (Company 13)
Low compatibility	
Low fit with daily work routine	"() it really adds up. We, in the human resources department, have to deal with it () we do not hire people to do it (). We therefore really try to keep the workload low." (Company 17). "Right now, we have more than 600 bikes in total and you can't just handle them additionally () you need to install new processes." (Company 17)

#### Table 6

Adoption barriers of company-leased bicycles in relation to complexity at the organizational level.

Facet (characteristic)	Example statement
Complex tax laws	"We then regulated the taxation with the tax office, but that was not so easy." (Company 4) "Yes, the residual value problem is there. To say that the bike has a higher value afterwards than it actually costs. The residual value paid by the people is ten percent. But actually, the bike has at least a value of 30. And then the question, what does it mean? Is this just a hidden installment purchase? And if it was a hidden installment purchase, the deduction from the gross salary is not possible. And that's the difficulty. Then the whole thing is taxable and therefore not profitable anymore regarding the tax advantages. So, this tax problem remains." (Company 19)
Difficulties in handling unforeseen changes in work contracts	"() and also, wage garnishment against employees was a specific topic () or continuation of payment for employees who are absent. These were the only topics that gave us quite a headache and where we had to look for solutions." (Company 15) "What gave us quite a headache was what we should do when an employee leaves the company before the leasing contract ends, for whatever reason () how do we deal with it." (Company 11)
Difficulties in handling of bicycle thefts	"At the beginning, we also felt quite uncertain about the topic of thefts. Because if there are a lot of them, our insurance premium would probably go up." (Company 15) "And, of course, there is much work to do if there is a theft." (Company 16)
Dealing with differences in employees' eligibility	"The biggest problem is actually that we have no opening clause in our labor agreement and only the employees who have an above the general pay scale allowance or are non-tariff employees who can apply deferred compensation benefit from the social insurance. That's the biggest hurdle." (Company 14) "The biggest problem we've stumbled upon is that we have employees on fixed-term contracts. How to communicate the offer, that they have no right to order a bike." (Company 11)
Investment in complex bicycle infrastructure needed	"When we moved into the new building, there were priorities, of course, and the bicycle storage room was not one of the top priorities. It was just a big empty room and there was slight anger. Meanwhile, the whole thing is developing. We now have four bike racks and a drying area for clothing and so on. But that was important, otherwise the staff is quite dissatisfied." (Company 13) "We wanted to make it perfect () and immediately bought a charging tower to charge the batteries with such a chip card (). This thing was a bad investment from the beginning, it never really worked. In the meantime, we do not have it any more, we charge the batteries quite normally at the socket. () it cost us only time, money, and nerves at the end (). Since only one type of rechargeable battery fits, if somebody has a different brand, then it does not work." (Company 10)
Difficulties in estimating future workload of staff	"Stumbling blocks were, let me say, from the point of view of our human resources department, oh, how much work it [the bicycle-leasing program] is (). But looking back, we see that it was not so bad. But there were reservations." (Company 17) "We cannot yet assess how the process execution will be managed after three years and what to expect then. The model has been introduced for 18 months." (Company 20)

employee health; employee satisfaction; employee commitment; employer branding; mobility (meaning that employees become more mobile); environmental benefit (meaning that the environmental dimension of sustainability is promoted); no extra costs; and reduction of parking problems. These findings coincide with the seven drivers at organizational level investigated in the previous document analysis. Only the facet mobility was not mentioned in the documents. The barriers are the following: lack of proof of

Adoption drivers of company-leased bicycles in relation to trialability, observability, and stakeholder involvement at the organizational level.

Characteristic	Facet	Example statement
Trialability	Possibility to have a test run	"We started about two and a half years ago with the prototype and it has proven successful. And then we called for proposals." (Company 21) "They decided to test it with two employees first, to be able to estimate a bit how much work it would actually mean and how exactly it would work." (Florian)
Observability	Companies as role models	Seekers: "In the end, we have heard of human resources managers from other companies who also have JobRad (). We tried to talk to other companies who already implemented it, () how does it work? () what JobRad or any other representative tells, is it consistent with your experience as company? () and then () we decided that we () want to start." (Company 17) Givers: "() and we went public, there were many reports in the local press. And a lot of companies asked us about it [bicycle-leasing program], there were a lot of calls from other companies. And meanwhile, we have noticed that many other companies in the region also offer the concept." (Company 15)
Involvement of key stakeholders	Strong support by decision- makers	"The human resources manager and also a member of the management board are enthusiastic cyclists. And that's how they stumbled on the topic and got some information about it." (Company 18) "I thought about who I can win over for it [company bicycle-leasing program]. () I thought about it, where do I find fellow combatants for the cause. And there was one colleague in the human resources department who loves cycling. And it was an important point when I won him over for the topic. You have to work strategically." (Company 12) "Our boss is very environmentally-friendly and for such things, it's easy to win him over." (Company 4) "We discussed this with our managing director () and he is a passionate cyclist himself and he said right away, ves. we do it." (Company 3)
	Strong support by work council	"The basic idea, the intention and the persistent demand for it actually came from the work council, which in hindsight was also really positive, because in the end the employee representatives were the ones who pushed this forward (). All the consulting service in advance or the conclusion of contracts was done by the work council." (Company 17) "We agreed upon our own bike policy with our social partners and the work council." (Company 20)

evidence; decrease in traffic safety; and time investment. Only the facet lack of proof of evidence was not mentioned in the documents. One sample statement from the documents is the following: "Security concerns regarding company bicycles are voiced. In fact, the higher speeds of e-bikes or unfavorable weather can lead to accidents." (ACE, 2016)

With regard to compatibility, the inductive coding revealed high compatibility facets with values, past activities in the area of the promotion of cycling, and past work routines. Table 5 shows the following four facets: high fit with existing values, high fit with past measures to promote cycling, and high fit with daily work routine (three drivers) and low fit with daily work routine (one barrier). Sample statements that were mentioned in the interviews are presented in Table 5. With regard to companies' measures to encourage cycling to work, some of the informants stated that their company had already promoted cycling to work before the leasing program started. Other companies already had facilities such as showers, bicycle racks, and lockers that could be used by bicycle commuters. Two companies have received the "bicycle-friendly employer" certificate from the ADFC (i.e., the German Cyclists Association), signaling above-average commitment to, and offers for, cyclists. However, the low fit with daily work routine means that participation in the program leads to additional work that needs to be newly structured and organized. Some informants complained about this, but none of the companies has created a dedicated job for the bicycle-leasing program, an indicator that the participation may have increased the workload on the current staff.

Table 6 summarizes the coding results with regard to complexity. The adoption determinant includes barriers only. The following facets were coded: complex tax laws, difficulties in handling unforeseen changes in work contracts, difficulties in handling bicycle thefts, dealing with differences in employees' eligibility, investment in complex bicycle infrastructure needed, and difficulties in estimating future staff workload. In particular, German tax laws were perceived to be complex, which was also emphasized as an important potential barrier in various sources of the document analysis: "The actual fiscal risk of contract design is overlooked by many employers. This may turn the company bicycle into a tax trap (...). The risk of additional tax charge exists for the entire lease period." (Wehl, 2016) Furthermore, special cases relating to company bicycles can hinder or at least delay the implementation of the program. For example, companies worry about bicycle accidents, thefts, and employees with wage garnishment, sick leave, and termination of employment before the leasing runs out. Companies with labor agreements often have to negotiate with the trade unions in order to reach a consent for the employees to lease a company bicycle. Developing additional complex bicycle infrastructure (e.g., installing showers where there is no easy access to water) can be a hindering factor for adopting the bicycle-leasing program. The interviews showed that the investment in cycling facilities lag behind the demands of commuters in some companies (Table 2). Special cases and potential expenditures such as investment in bicycle infrastructure coincide with unforeseen financial burden for companies, a barrier detected in the document analysis. "For companies, costs are incurred for administration and employee remuneration." (Firlus, 2018) Also, statements of firm representatives indicated that some company representatives find it difficult to validly forecast the workload that is associated with the implementation of the program because of the complexity of the topic and to handle differences in employee's eligibility to lease a company bicycle (the latter is in line with findings from the document analysis). The document analysis revealed the following statement: "Since 2012, bicycles have been equated with company cars in the private sector - not so in public service. The labor agreement with employees in the public service does not yet provide this possibility (...).

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Facet (characteristic)	Example statement
Relative advantage	
Health	"I thought an e-bike was the best alternative, the healthiest alternative () for me." (Birte) "() I want
Mobility	to leave the car at home to do something for my health." (Uwe) "I cycle for leisure but not regularly (). But now with the new trekking bike () I am riding to the city or go shopping (). I just leave the car at home." (Paul) "So, I have 25 km to work () that was previously not doable with the old bike () I do that from time to time to go to work by bike () that has already changed. Well, let's say, any visits you normally did by car, 10 km away, I do it all with my e-bike now, of course." (Erich) "We live in a hilly area and do not cycle so much in the mountains. And with the e-bike, it's no problem at all now. Since then, you ride on routes that you would not otherwise. You ride more often () longer distances () just hop on your bicycle in the evening and go
Monetary savings	shopping." (Ingrid) "I am in tax class five, which saves me 28%, that is quite a bit. Well, others do not save that much, but with tax class five, it's a lot. And then the bike costs you less than if you buy it directly. And as you pay it in 36 monthly leasing installments, then you don't even feel that you pay so much for the bike."
Purchase for a family member or friend	"There is the opportunity to get one for the spouse, which means for the two of us. I have leased two pedelecs, two e-bikes (). That was a very important argument for me, yes." (Tom) "I ordered one for my wife, an e-bike, and you know, now I can ride with her at eye level (). Because I have a normal bike and I leased an e-bike for my wife and through this, it is easier now to ride together." (Nils)
Relative disadvantage No availability of the desired bicycle in participating bicycle shops	"For me, I do not consider it [to lease a company bicycle] (). We have found a small dealer in Austria () who has a bike () that weighs only 15 kilos, not 25. But unfortunately, it's in Austria and they are probably not part of the JobRad dealers ()." (Otto) "I would have liked to have a different bike than the one I got, but unfortunately () not every bike shop participates." (Martin)

The necessary change of law, however, takes time." (BSW, 2017)

Table 7 summarizes the results with regard to trialability and observability, which include one facet each. Involvement of key stakeholders (referring to both decision-makers and work council) is another adoption determinant. The possibility to have a test run was a driver (and relates substantively to the complexity adoption determinants, as shown in the statements in Table 6). Also, during the innovation-decision process, companies seek to gather information from best- and worst-practice examples in order to reduce uncertainty. In particular, company representatives find it helpful to talk to other company representatives who have already set up the company-bicycle leasing program.

According to Rogers (2003), attitudes of organizational decision-makers are likely to mediate the relationships between the five perceived innovation characteristics and the adoption decision. The statements made by the informants reveal that it was important to win one or several key persons with decision-making authority for the program. The management board and the department of human resources seem to be of particular importance. The work council can play an important role in the program in various ways too. Since its goal is to represent employees' interests, they devote their time to discuss the pros and cons of the program. Some informants emphasized that, in their company, the work council is responsible for all the communication, advertising, and consulting with respect to the program.

To conclude, the results on the drivers and barriers at the organizational level indicated 15 facets that drive adoption and 10 facets that can delay or hinder adoption. In what follows, the study presents the results of the coding at the individual level.

# 4.2. Drivers and barriers at the employee level

Tables 8–11 provide an overview of the different facets that were identified in the data, and their relation to the adoption determinants. There were four different facets of relative advantage drivers that were mentioned in the interviews; one facet was identified as a barrier (Table 8). The drivers are the following: health; mobility; monetary savings; and purchase for a family member or friend. They are congruent with results of the document analysis (e.g., monetary savings indicated by Jobrad (2017): "Your newly won freedom on two wheels has not only environmental and health benefits, but also financial benefits: the company bicycle is taxed

### Table 9

Adoption drivers	of company-leased	bicvcles in relation t	o compatibility at th	ne individual level.
	F F F F F F F F F F F F F F F F F F F		· · · · · · · · · · · · · · · · · · ·	

Facet	Example statement
High fit with past cycling behavior	"I have always ridden a bicycle. I () bought it through JobRad." (Birte) "I have already been cycling with an e-bike for the last four years, to get to work and for private trips." (Maria) "I used to go to work from time to time with my normal bike in the past." (Tom)
High fit with bicycle-related needs	"I knew already that I wanted to buy a bike." (Franz) "I would have bought a new one anyway, because the range of the old one was not enough anymore ()." (Ingo) "I wanted to buy such a bike anyway and that's why it came at the right time." (Peter)

Adoption drivers and barriers of company-leased bicycles in relation to complexity at the individual level.

Facet (characteristic)	Example statement
High complexity Difficulties in the understanding of the program	"Then I asked a bit about the conditions, additional costs and such things or what it means for my
zancanco a un anomanang or an program	wage or the topic of insurance, I have asked such things in the in-house payroll office. I didn't fully understand the whole program." (Karsten) "We had to spend some time to understand this concept." (Gerhard)
Complexity of commuting to work by bicycle because of a lack of infrastructure	"() Our cycling infrastructure () I am skeptical toward this, because riding such an expensive bike, I do not want to leave it outside while working eight hours, even if you store it safely. And there isn't any possibility to take a shower before or after work. And charging stations, as you might know them from other companies, do not exist here." (Dieter) "() inside the building, we definitely need adjustments to meet the needs of the cyclist's logistics chain, starting when a cyclist enters the building and ending up in a completely different place in the building, but not with his cycling clothes, but with his business clothes (). And that's a challenge that's not that easy." (Peter)
Poor information provision about the program	"There wasn't really much I got from my company, and yeah, I would have liked a bit more information." (Erich) "There's an intranet site just on the homepage, and it said that there's JobRad right now and so on, but great advertising is not going on now." (Martin) "We are a subsidiary () that has not been passed on to us, not from the human resources department, pure word-of-mouth ()." (Paul)
Poor support by the employer	"My order was rejected in the first instance, without comment, without reason, point () I guess probably 50% have received a rejection () and then, of course, I immediately called Leaserad () and they did not know the reason for it (). The reason was probably the same as with me, the personnel number. We have two personnel numbers () and I checked it. I have also indicated the wrong personnel number () The company's support wasn't very good." (Paul)
Low complexity	
Good handling of the program to increase employee understanding	"That was all very clearly formulated and also the whole process was very simple () that went through the human resources department () and went off without problems." (Birte) "With the webpage of JobRad () it wasn't a problem at all. Everything was well explained, that was all very clear." (Andreas) "You just have to use the calculator, look if it's worth it and then you look for a bike and that's it () I did not find it difficult." (Martin)
Provision of good bicycle commuting infrastructure	"I got access to the showers, it was offered to me to use it after cycling (). And we also have a bicycle cage, a lockable one, and there are individual boxes, bike boxes. I have one now. You can rent them and there is only space for one bike." (Birte) "There was a quite good upgrade of bike racks, such bike racks, where you can chain your bike to it, because of the insurance. So, this installation was a good improvement." (Karsten)
Good information provision about the program	"() and I went on this platform and had a look at a nearby bicycle dealer and then selected one and with this activity, let me say, my interest was aroused () and there was a cost calculator on the platform, what do I have to pay for the bike for a certain price? This made sense to me, what do I have to pay for the bike? (). I prefer to pay 57 euros per month compared to 2,400 euros in cash (). It became very interesting for me and I said, yes, I think about it." (Paul) "Communication measures of various kinds () in company meetings () e-mail, Yammer () e- bike providers have been invited (). There is also a notice board in our house with contact persons who can be contacted at any time." (Peter) "So, the first time I heard about it was on an
Good support by the employer	information day. Bicycle dealers came to our company and then someone from JobRad came and showed how the concept worked." (Erika) "Since introducing JobRad, the company has organized several things (). So, a lot of different actions (). And all that was positive." (Ingo) "We have a department in the company that takes care of it, of occupational safety and also of JobRad. And I inquired there about the program, about technical questions, like what's the best engine, the best brand. The advice was quite helpful." (Tom)

according to the 1% rule"). If the desired bicycle is not available in the participating bicycle shops, adoption is hindered (barrier). Environmental benefit as a driver and loss of social security contributions as a barrier (as found in the document analysis) were not mentioned by the informants. In the data, some interactions between these determinants and the activities that were implemented by the companies were identified. Table 8 describes these interactions by presenting sample statements from employers when they referred to the drivers and barriers at the individual level.

Thirteen employees stated that there was a change in their mobility behavior after they had adopted a company-leasing bicycle (Table 3). The interviews with these informants indicate that the number of trips and/or the distance of the trips increased after the adoption of the progam. Some informants used their bicycle for new and different travel purposes. Some informants substituted car trips, especially when adopting an e-bike. These findings complement the findings reported in Table 8.

Five companies offered their employees additional financial support (Table 2). They either provided a monetary contribution to the installment or paid the insurance. The subsidization increases the attractiveness of the financial incentive of participation, as stated by the following company representatives: "What we do - and this is also a financial benefit to the employee - is that we pay the theft insurance for the employee, so it's the cost of this theft insurance." (Company 13) Another company connects the financial incentive to performances in cycling to work: "If an employee commutes to work at least 60 working days a year, then he or she gets a

Adoption drivers of company-leased bicycles in relation to trialability, observability, and stakeholder involvement at the individual level.

Characteristic	Facet	Example statement
Trialability	Possibility to have a test ride	"I went to my bike dealer (). I just wanted to look what he got there. I was not sure if I would take an e-bike () and there, I have to admit, there was an e-bike in such nice colors that convinced me (). Then I tried it out, up the mountain (), so I took it." (Erika) "I took an e-bike, because I tested an e-bike a few months ago. And then I knew, I want to get an e-bike and the leasing program was the opportunity." (Peter)
Observability	Colleagues as role models	"I've seen it with colleagues of mine who told me about it, the program () and then, I also exchanged for the purchase of e-bikes and checked their bikes, got advice on the engine and all that." (Gerhard) "() so many bikes around, so many people who ride a bike to work, especially last summer." (Ingrid)
Involvement of key stakeholders	Colleague influencers	"() advertising () generally nothing at all from my employer. That's pure word-of- mouth (). We are a subsidiary () that has not been passed on to us, not from the human resources department, pure word-of-mouth () I am also quite communicative. I said, guys, if you order, then please () and that got around quickly." (Paul) "That was announced once and got around by word-of-mouth." (Ingrid)
	Support via collaboration of involved companies	"We even had JobRad days in Frankfurt, many people got there. There were people from the local environmental office in Frankfurt. There were representatives from JobRad who presented the financing. There were bike dealers who showed their bikes, e-bikes and stuff. That was in September, a lot of promotion was going on there." (Otto)

subsidy of EUR 35 per month (...) believe me, people find it out through word-of-mouth. There is a real competition among the employees about who cycles more (...) who has signed up for the subsidization; and that is controlled by the employees themselves (...). At the end of the year, you have to enter the number of your trips and this is posted on the intranet, who has the most trips and who has the most kilometers (...) and the winner can cycle for free for a year." (Company 4)

The company representatives also realized that employees appreciate the fact that they can get more than only one bicycle: "About 40 people at our location have three or four bikes. So, we are fully aware of the fact that cycling is also a partnership activity." (Company 17) "Most of them really fully utilized the option to lease three bikes, for their families, or if they were single, they leased for their brother or neighbor or someone else." (Company 18)

One hindering program participation factor is the occasional limited availability of desired bicycles. Bicycles can only be ordered from dealers that have a cooperation agreement with the employer's leasing provider. If some employees cannot get the desired bicycles, they do not participate in the program, according to some informants.

Compatibility perceptions (Table 9) relate to two facets: high fit with past cycling behavior and high fit with bicycle-related needs. Values as facet of compatibility according to Rogers (2003) were not mentioned by individuals. None of the informants mentioned the lack of compatibility as a barrier. Table 9 summarizes the findings and provides some sample statements.

Complexity perceptions at the individual level refer to difficulties in the understanding of the program, complexity of commuting to work by bicycle because of a lack of infrastructure (including fear of theft of the bicycle), poor information provision about the program, and poor support by the employer (four facets that delay or hinder adoption; Table 10). However, other statements revealed how the reduction of complexity can drive adoption: opposites were coded as drivers. For example, installing lockable bike boxes onsite can provide theft protection. After they had adopted the program, ten companies felt pressure to develop new or additional bicycle facilities for their employees (Table 2). Thus, a change in infrastructure may be necessary to leverage the program.

Interestingly, adding the company representatives' perspective to these findings, the provision of little information is sometimes intended by the company, as revealed in the following statement of a representative: "We were careful with regards to advertising for the offer and waited to see how everything developed." (Company 3) This indicates that some companies were hesitant to promote the concept because the consequences could not be fully evaluated (see Table 4 in relation to relative disadvantages from the employers' perspective). However, others mentioned the following: "Of course, it [the bicycle-leasing program] goes over the work council, we hear a lot about that. And they talked about it in the last staff meeting, it's great." (Company 19) If communication is facilitated during events such as staff meetings, the concept is typically promoted well. Thus, there is some variance with regard to the efforts that companies put into communication with employees and promotion of the concept.

Table 11 summarizes the results with regard to trialability and observability, which include one facet each. Involvement of key stakeholders (referring to both colleagues and collaborating companies) is another adoption determinant.

Several representatives from companies also highlighted the relevance of trials. One example is the following: "The start was in the context of a big health day (...) a regional bicycle dealer was also on board (...) and test rides could be carried out. Leaserad sent an employee who helped us with the marketing and informed the staff (...). We thought (...) that we could get ten bicycles to our staff in the first year, but that accelerated very quickly in the following weeks after the health day. In the first year, we already had about 90 leasing bicycles." (Company 15)

Some representatives from companies also reported that visibility of company-leasing bicycles at the workplace attracts the attention of employees and can hence promote the program. The following statements highlight the observability as an adoption determinant at the individual level: "And when you ask how we communicate this today, we do not really need to communicate it. The people who do it, who participate, make other people envious with their bike and that's actually the main source of information that goes on today. What a great bike, it feels good. What do I have to do to get one?" (Company 19) Furthermore, role models were

identified to be relevant: "Then the role model effect of the management and executives (...) is really important. (...) all four members of the management really constantly cycle to work. (...) that has an incredible signaling effect and also the middle management, many of them joined (...) of course that's another motivating factor." (Company 10) "He [a company bicycle user] certainly weighed over 100 kilos and he lost quite a bit. And then, that was the idea, how to win those colleagues where you do not really expect it. And I said to him, write a short report, a short interview in our company magazine. (...). That worked really well, to win such people over as an ambassador." (Company 12) Also, the relevance of colleagues as influencers has been mentioned: "(...) they talked about it, where did you buy your bike, that's great, and so on." (Company 4) Thus, there are some important interactions between the perception of the company representatives and the (potential) adopters at the employee level.

The involvement of, and collaboration between, stakeholders is highly relevant, according to some company representatives: "Once a year, we organize a health marketplace, where all internal and external health service providers present themselves. And I regularly have colleagues from JobRad here and also from a bike shop, who provide test bikes, so that the topic is in the mind of our employees. And in the spring we organize it again." (Company 12)

This leads us to another adoption determinant, namely seasonal effects: adoption was reported to be more likely in spring (towards summer time) than in autumn (towards winter time). This is reflected in the following statements: "25 km (...). I do it [cycling to work] when it's warmer." (Birte) "Yes, I used it [company bicycle] already (...) when it was reasonably warmer." (Andreas) "Well, I'll buy a second JobRad soon, in the spring." (Ingo) This is supported by a statement from a company representative: "Some people said, ok, it's autumn now, we don't do it now. We will do it next spring." (Company 14) Seasonality is thus considered an adoption determinant at the individual level (with spring [towards summer time] as driving facet and autumn [towards winter time] as hindering facet).

To conclude on the drivers and barriers at the individual level, the results indicated 15 facets that drive adoption and six facets that delayed or hindered adoption. Fig. 1 provides an overview of the findings.



Fig. 1. Overview of the adoption determinants and facets that drive or hinder adoption of the German company-bicycle leasing program at the organizational and individual level.

# 5. Discussion

The purpose of the study was to explore the drivers and barriers of the adoption of the German bicycle-leasing program from the perspective of German employers and employees. The results of the case study showed that there are different facets that drive and that can delay or hinder adoption. These facets can be related to the following determinants at both the organizational and the individual level: relative advantage, compatibility, complexity, trialability, observability, and involvement of key stakeholders. At the individual level, seasonal effects were explored further with spring (towards summer time) as a driver and autumn (towards winter time) as barrier. According to interviews with informants, the adoption of the program led to changes in how companies promoted cycling within their company and in the mobility behaviors of employees (in both commuting to work and private life).

The study contributes to the scientific literature in four ways. First, the study is the first one to systematically explore the facets that drive, delay, or hinder the adoption of bicycle-leasing programs at the organizational level (employers). Second, the study complements previous studies that were conducted in the area of employee adoption of bicycle-leasing programs that have taken a quantitative approach in the sense that it proposes several facets that have been neglected so far. Third, the study contributes to the DOI Theory when applied to the adoption of means of active transportation in the sense that additional adoption determinants are proposed. Lastly, the study provides first insights into the German company-bicycle leasing program and its potential effects, a relevant topic in a country that is historically connected with the car industry and that has frequently violated pro-environmental standards in the past, such as urban air pollution standards - violations that might be reduced in magnitude and frequency via cycling. In what follows next, these contributions are described in more detail.

First, previous studies have remained largely silent about what factors influence the adoption of bicycle-leasing programs at the organizational level. A study conducted by the C2WA (2011) found that companies adopt the program for three reasons: employee health, employee engagement, and lower carbon footprint. However, the methodology of the study remains unclear und no other factors were mentioned, which is surprising given that both actual and anticipated costs were found to inhibit the adoption of innovations (e.g., Damanpour and Schneider, 2009, 2006; Frambach and Schillewaert, 2002). The results of the present study supported the existence of the three facets of relative advantage that were addressed in the study by the C2WA (2011), but in addition to previous research found that costs as well as other employee-related attributes (satisfaction, mobility) and company-related attributes (branding, reduction of parking problems) matter. Furthermore, compatibility, complexity, trialability, observability, and involvement of key stakeholders were identified as additional determinants of the adoption - factors that the study conducted by the C2WA (2011) neglected. In particular, actual and anticipated additional workload was a topic that was often addressed in the interviews and that is reflected in various relative (dis)advantage and (high or low) complexity facets.

Second, the study complements previous studies in the area of employee adoption of bicycle-leasing programs that have taken a quantitative approach in the sense that it proposes several facets that have not been considered to date. C2WA's (2011) survey of employees in the United Kingdom found that health benefits (including increased fitness, weight loss, and improved mental health, well-being, and happiness) as well as financial savings and emission reduction made employees participate in the program. The results of the present study revealed deeper insights into the perceived characteristics that likely influence the adoption of the German company-bicycle leasing program than both C2WA (2011) and the study conducted by Caulfield and Leahy (2011), which conceptualized health, cost saving, time saving, convenience, flexibility, safety, and emission reduction motives (these factors mostly relate to relative advantage). It is not surprising that the C2WA (which has a genuine interest in promoting the program) did not take into account any barriers in their survey. The present study partially fills this void that is also prevalent in other studies (C2WA, 2013; Caulfield and Leahy, 2011) and considers barriers in addition to drivers. The results also complement the financial and cost-benefit analysis conducted by Clarke et al. (2014), who did not consider the effects of multiple bicycle purchases or employer branding as an economic benefit, for example.

Third, the study contributes to DOI Theory when applied to the adoption of active transportation means. In particular, Nehme et al.'s (2016) study is limited to compatibility as one of the five perceived innovation characteristics only. They conceptualized compatibility as a variable that includes the enjoyment of riding a bicycle, the physical fitness of people, safety along commuting routes, and what type of person someone is ("I am not the kind of person that rides a bike for transportation" was the item for the latter facet). In the present case study, two components were identified: high fit with past cycling behavior and high fit with bicycle-related needs. Although enjoyment might be relevant, it provides some benefit to individuals and can likely be classified as a relative advantage facet. (The higher enjoyment of riding the car instead of riding the bicycle is a relative disadvantage.) The same argument can be made for traffic safety. Physical fitness was treated as a desirable outcome that is beneficial to individuals in the present study when they ride their bicycle.

Besides compatibility, the five factors of relative advantage, complexity, trialability, observability, and involvement of key stakeholders were identified in the present study at both levels. Thus, while it appears that Rogers' (2003) DOI Theory might be useful for studying the adoption of the company-bicycle leasing program, the study proposes to add the involvement of key stakeholders to Rogers' (2003) characteristics. Although it does not relate to the innovation itself, but to the companies behind the innovation, the results on this particular dimension provide suggestive evidence that adoption might be more likely if the various stakeholders work together to set up and run the company-bicycle leasing program. As this category was coded for both the organizational level and the individual level, the variable might be of relevance at both levels. The importance of winning key stakeholders is supported by the literature, as effective advocacy is a crucial part of efforts to increase active transportation to work (Richards et al., 2010).

Also, the results of the present study suggest that the promotion of a driving facet of an adoption determinant may not be the same as the prevention of a hindering facet of an adoption determinant. For example, cost aspects were mentioned as a driver at the organizational level, while time aspects were seen as barriers. Ontologically, the innovation adoption literature has discussed about

whether adoption and rejection determinants are conceptually different or not (e.g., Nabih et al., 1997). The results support Gatignon and Robertson's (1989) perspective that the determinants can be conceptually different both with regard to their substantive meaning and with regard to their potential influence on adoption decisions.

Lastly, the study provides first insights into the company-bicycle leasing program as it is set up in Germany. The results indicate that adopting a company-leasing bicycle might lead to a change in the mobility behaviors in the sense of a more active and sustainable transport lifestyle (i.e., an increase in the number of cycling trips and their distance, the usage of bicycles for new and different travel purposes, and the substitution of car trips). This is in accordance with findings from the e-bike literature (e.g., Fyhri and Fearnley, 2015, for increased number of trips and their distance; Johnson and Rose, 2015; Popovich et al., 2014, for the substitution of car trips) and studies on bicycle-leasing programs (e.g., Caulfield and Leahy, 2011; Clarke et al., 2014, for increased cycling levels). At the moment, active transportation is a relevant topic in Germany, because cities have frequently violated proenvironmental standards in the past, such as air pollution levels (which, for some indicators, are even allowed to be higher in the EU compared to the WHO's recommendation; Eddy, 2018; EU, 2008; WHO, 2006) and there is political and legal pressure to counteract this trend. Aspects that are peculiar to Germany relate to German tax laws, the strong influence of the work council (if present), compatibility concerns because of the prominence and emotional connection of German residents to their cars, and the strong influence of car industry lobbyists, among others. The authors of the present study are not aware of any studies that have assessed whether, and when, the concept of the company-bicycle leasing program is adopted by German employers or employees, and whether the adoption leads individuals to change their mobility patterns. The present study partially fills this void in research by interviewing 44 German stakeholders in this area and analyzing thirteen relevant documents.

#### 6. Managerial and policy implications

The study provides several managerial and policy implications. First, the study informs companies and policy makers about drivers and barriers at both the organizational and the individual level so that they can act in more sustainable ways (e.g., reduce emissions from commuting employees) and develop target-group specific programs. The most positive environmental effects should occur when commuters switch from the use of cars to the use of active transportation (e.g., walking, biking) (C2WA, 2011; Clarke et al., 2014). Leasing companies as well as policy makers can develop target-group specific programs and target particularly those companies that may be interested in the promotion of sustainability in their company (because of an environmental strategy or high emissions, for example); target those companies that may be interested in employer branding (because of challenges in recruiting personnel, for example); or target those companies that may be interested in increasing the health status of their employees (because of high rates of absenteeism and presenteeism, for example). Also, within companies that are already participating in the program, target-group specific programs can be realized by incentivizing employees who are mostly driven by financial savings via campaigns that highlight or extend financial benefits (e.g., savings when a bicycle is leased [vs. purchased outside the program] can be calculated online, additional savings when another bicycle for a family member or friend is purchased are outlined, savings of expenditure on gas when the car is left at home can be calculated online); convincing employees who mention concerns about the high complexity of the program via campaigns that increase ease of use of the program (e.g., informing via the intranet, providing personal support, installing bicycle-friendly infrastructure); promoting the concept by allowing collaborations between stakeholders depending on the needs of the employees (e.g., including bicycle shops that offer many e-bikes if this is desired, including specialty bike shops if this is desired, allowing leasing companies to explain the program during important meetings with staff).

Second, the list of facets that drive, delay, or hinder adoption should help companies identify relevant drivers and barriers, and promote drivers and reduce barriers accordingly. It is important that the companies take into account all characteristics that were identified when they promote the concept, and their various facets: relative advantage, compatibility, complexity, trialability, observability, and involvement of key stakeholders. Although the present research did not have the purpose to indicate which factors are more important and which are less important for the adoption of a leasing bicycle, greatest facet variance was found for relative advantage and complexity. In particular, benefit-and-cost trade-offs (savings seemed to be most important here) determine the perceived value of the concept. Difficulties in usability may make employees either postpone or hinder the adoption of the concept. Low complexity drives adoption. In accordance with the positive relationship between trip-end facilities and bicycle commuting found in the literature (Buehler, 2012; Heinen et al., 2010), the present study's results indicate the importance of investment in bicycle facilities by companies, particularly in regard to providing safe parking and charging facilities for e-bikes. The need for such investment is also created due to the high proportion of e-bikes in the leasing market. Overall, the means identified in the present study that reduce complexity might be important to increase the adoption rate inside companies. Then, more German employees attracted to the program may increase their health and may promote the environment by commuting to work by bicycle. The company may benefit from the campaign too, because health is related to higher productivity (e.g., Collins et al., 2005; Zhang et al., 2011). Other benefits may add to this (see above).

Third, the peculiarities of the German program are the specification of the leasing contracts and the German tax law. Here, a clear communication and explanation of the leasing concept and a simple outline of the tax law can be recommended. Leasing providers should explain the legal regulations in detail to companies and provide assistance with emerging questions and problems. The reduction of uncertainty to lower the perceived complexity was the adoption determinant that provided the richest information in the interviews on facets, beside relative advantage and compatibility. Thus, German leasing companies may particularly take into account these three aspects when they want to promote the concept to potential customers. German employees may be better able to estimate the tax savings when they adopt the concept.

Fourth, one important policy implication of the results of the present study is that fiscal incentives, such as Germany's company-

bicycle leasing program, might be effective in increasing cycling levels. The monetary savings appeared to be a crucial driver for employees' participation in the program. This is an important message to policy-makers in countries with ongoing discussions on monetary incentives for cycling and especially for subsidizing the purchases of e-bikes on a national level. Austria, for example, is one of the few countries with a national subsidy program for e-bikes purchased by companies, local authorities as well as non-profit and religious organizations, besides numerous local incentive programs (BMNT, 2018). It is among the countries with the highest purchases of e-bikes per capita in Europe (Haubold, 2016).

In Germany, bicycle associations have so far unsuccessfully demanded a national purchase premium for e-bikes, and the recommendation by the German Federal Council to consider the introduction of purchase premiums not only for e-cars, but also for ebikes, has not been considered in the white paper on the creation of a national regulation to promote electric mobility (Bundesrat, 2016). This seems surprising, as in 2015, the German government has introduced generous financial incentives to encourage individuals to purchase e-cars (EUR 4000 for buying a new e-car and EUR 3000 for a hybrid car). Yet the aim of the Transport Ministry to reach an adoption of one million cars onto Germany's streets by 2020 seems almost impossible to reach with less than 100,000 electric cars sold by January 2018 (Deutscher Bundestag, 2018). At the same time, e-bikes were widely adopted despite the absence of public subsidies. In 2017, approximately 3.5 million e-bikes are in use in Germany with a market share of 19% of all bicycles (ZIV, 2018).

To conclude, one may assume that fiscal incentives, when complemented by companies' investments in bicycle infrastructure (e.g., secure bicycle parking spaces and charging stations for e-bike batteries), increase adoption rates of company-leasing bicycles. Subsidies and monetary incentives provided by the companies provide further financial benefits. The collaboration with the companies' work council and other stakeholders may be one strategy to increase the adoption rates further.

#### 7. Limitations and outlook

This research is not free of limitations. First, the study used purposive sampling for the recruitment of interviewees and has a selection bias toward company-bicycle program adopters. This procedure was chosen because of the complexity of the particular program. Companies or employees who have not experienced the complexity may not be able to provide as many details on the facets as found in the study. Future studies might use a comparative design and compare the perspective of adopters and non-adopters (potentially referring to different stages of the adoption process) on adoption determinants and facets. Compatibility, for example, was not mentioned as barrier of company-leased bicycle adoption in the study, whereas for non-adopters who are used to commute by car, a lack of compatibility with past commuting behavior could emerge as a hindering factor. Future studies may also consider the different stages of the adoption process beginning with awareness of the program to the full use of the program when studying differences between companies or employees.

Second, since the main goal of the study was to explore adoption determinants (and not to generalize the findings), the samples that were considered in the study are not representative. Thus, the results of this research do not reflect the views of all program participants. Also, no generalization can be made about the importance of the different determinants and facets. Future studies might aim to find out which one of the determinants or facets predicts adoption (or rejection) of the program best, both at the organizational and the individual level. The diffusion of the program might also be a dependent variable of interest to both researchers and practitioners.

Future studies can build upon the study's contextualization and may refer to the DOI Theory to study the adoption of the company-bicycle leasing program. Survey and observational research should be employed to find out about success factors (and barriers), how adoption or diffusion develops over time, as well as what the effects of the participation in the program on transportation choices are, potentially depending on different policy implementation or adherence. Such work would provide novel insights into the behavioral effects of the adoption of the company-bicycle leasing program.

Third, the leasing company that collaborated with the authors of the present study to get insights into companies' perspectives is the market leader in the company-bicycle leasing market. It is desirable that future studies consider competitors too, because there might be inherent differences in management processes, such as customer support, marketing, and provision of additional services (e.g., organization of a health fair). The present case study does not reflect the variance in these features between different leasing companies. Still, the procedure followed in the present study serves its purpose because many of the contextual settings that determine perceptions and potential outcomes can be assumed not to vary among different companies, and the importance of health and active transportation as a general concept).

#### 8. Conclusion

The present case study provides insights into adoption drivers and barriers of the German company-bicycle leasing program by exploring categories at both the organizational level and the individual level. It showed that there are various determinants at both the organizational and the individual level: relative advantage, compatibility, complexity, trialability, observability, and involvement of key stakeholders, as well as their counterparts (barriers and drivers, respectively). At the individual level, seasonal effects were explored further with spring (towards summer time) as a driver and autumn (towards winter time) as barrier. According to interviews with informants, the adoption of the program led to changes in how companies promoted cycling within their company and to changes in the mobility behaviors of their employees (when commuting to work and/or in their private life). As positive health and environmental effects stemming from such programs likely depend on policy implementation, future research is needed to assess the

interrelationship between different policy instruments and actual behavioral variables that indicate transportation choices further, be it related to non-electronic bicycles or e-bikes.

# **Conflict of interest**

The authors declare no conflicts of interest.

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# Appendix A. Semi-structured interview guides

# Interviews with employer representatives

- 1. In which department do you work and what position do you hold there?
- 2. Why did you become the contact person for company-leasing bicycles in your company?
- 3. Since when do you offer company-leasing bicycles to your employees and how many bicycles have been leased until today?
- 4. Can you please explain the decision-making process for the adoption of company-leasing bicycles in your company? How did the topic come up, which company departments were involved in the decision-making process and how long did this process take?
- 5. For what reasons do you offer your employees company-leasing bicycles? What were the main motives for the adoption of the program?
- 6. Did you hope for certain effects on your employees and your company through the adoption of company-leasing bicycles? Can you see any positive effects today?
- 7. Did management see potential problems and difficulties regarding the adoption of company-leasing bicycles in your company during the decision-process?
- 8. Has the adoption of company-leasing bicycles caused any problems, difficulties or other negative effects for, or on, your company?
- 9. Is the bicycle-leasing program integrated into any existing business strategies of your company, such as sustainability management, health management or mobility management?
- 10. How did you promote the bicycle-leasing program to your employees during the launch period and how do you promote the program today?
- 11. Do you communicate the program to the outside world as well (for example, via your webpage, press releases or mention in job interviews)?
- 12. Is there an active exchange or communication process with employees who adopted a company-leasing bicycle?
- 13. Does your company offer cycling facilities, such as showers, bicycle racks or charging stations for e-bike batteries for bicycle commuters? Has there been any special investment in cycling facilities triggered by the adoption of company-leasing bicycles?
- 14. Have there been any other changes in your company triggered by the adoption of company-leasing bicycles, for example in the personnel or organizational area, or in daily working processes of certain departments?

# Interviews with employees

- 1. In which department do you work and what position do you hold there?
- 2. For how long have you had a company-leasing bicycle?
- 3. Why and how did you become aware of the bicycle-leasing program?
- 4. How did you find out about how the bicycle-leasing program works?
- 5. Did you exchange opinions with colleagues about the program before you signed the contract? If so, what were the topics?
- 6. Have you had any direct contact or communication with the leasing provider? If so, what were the topics?
- 7. In the decision-making process, did you see any possible problems or difficulties that might be associated with the purchase of a company-leasing bicycle?
- 8. For what reasons did you decide to lease a company bicycle?
- 9. Did you own a bicycle before you leased a company bicycle? How many bicycles do you have besides the company-leasing bicycle?
- 10. Did you want to buy a new bicycle anyway, independently of the bicycle-leasing program?
- 11. How often have you cycled both for private trips and to get to work, before you leased a company bicycle?
- 12. Has your mobility behavior changed both for private trips and to get to work since you have leased a company bicycle?
- 13. Does your company advertise the bicycle-leasing program to employees? If so, to what extent?
- 14. Does your company offer cycling facilities, such as showers, bicycle racks or charging stations for e-bike batteries for bicycle commuters? Are you aware of any special investment in cycling facilities since the bicycle-leasing program was adopted in your company?
- 15. Are you aware of any other changes in your company since the bicycle-leasing program was adopted in your company? If so, to

what extent precisely?

16. How far do you live from your place of work?

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