Scientific papers and presentations at academic or scientific events

Version 1.0

Deliverable 8.3

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Project website:	www.simplicity-project.eu

Authors:

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Document versions:

Version	Date	Changes	Author/s
V0.1	04.09.2019	Overview scientific events, papers and presentations	Bernhard Schrempf
V0.2	23.09.2019	Overview update and summary	Bernhard Schrempf

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1. Purpose of the document

The purpose of this document is to describe the realisation of the deliverable 8.3 (D8.3). This deliverable deals with scientific papers and presentations at academic or scientific events. It provides an overview of conferences and scientific events that have been visited and presentation that were made. The document is a living document that is updated continuously by all project partners. It is expected that most of the scientific dissemination activities will be based on results of the conceptualisation, design and evaluation of the pilot demonstrations.

2. Executive summary

This deliverable includes an overview of the scientific events that have been visited and that are planned to be visited in the forthcoming project year.

In addition, all scientific papers and the corresponding presentations are listed and put together in this deliverable.

The two main conferences that are addressed in the first year of the project is the ISPIM conference, the conference of the international society for professional innovation management, and the NBW conference, the conference on new business models. The aim of participating in these conferences is to discuss and validated the research in progress on the involvement of the users in the conceptualization of a digital intervention platform and to discuss potential new business models in a smart city context dealing with a digital intervention platform.

Additional dissemination activities (events, publications, etc.) in the non-scientific area are listed in Del. 1.1 the interim report and Del. 8.1 the communication and dissemination plan.

3. Administrative Information

Basic information on the SimpliCITY project and the present deliverable:

Project title	SimpliCITY - Marketplace for user-centered sustainability services
Project coordinator	Salzburg Research Forschungsgesellschaft mbH (SRFG), Salzburg, Austria; project manager: Petra Stabauer BSc MSc
Project partners	Polycular OG, Hallein, Austria Stadt Salzburg (City of Salzburg), Austria Salzburger Institut für Raumordnung und Wohnen – SIR (Salzburg Institute for Regional Planning & Housing), Salzburg, Austria Uppsala Kommun (City of Uppsala), Sweden University of Uppsala, Sweden
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4. ISPIM conference Florence

4.1 Research paper

Behavioral intervention design for scaling innovative services promoting smart sustainability

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Abstract: This research addresses the question of how to overcome the innovation chasm in the field of new smart city services, which enable living a sustainable lifestyle. The gap between smart city visionaries (early adopters) and pragmatist users (early majority) is a particular challenge in the innovation scaling phase here, because also the free use of sustainability services is very often associated with the change of behavioral routines (e.g. bike-use instead of car-use). To meet the challenge of scaling innovative smart city services, we suggest investigating the suitability of behavioral economic concepts of incentives, nudges, gamified challenges and rewards. Further, we aim to explore the preferences for specific target-group-oriented incentive approaches in the field of bicycle mobility. Based on the first results (literature review, survey) we will propose a specific intervention design for nudging sustainability services that will be then tested and evaluated in two European smart cities (JPI-Urban Europe: www.simplicity-project.eu).

Keywords: Innovation diffusion theory, innovation nudge, behavioral economic concepts, digital services for a sustainable city lifestyle

1 Problem

In order to manage the increasing number of citizens, governments around the world have already launched multiple smart city (SC) initiatives focusing on the development of new IoT

(Internet of Things) applications, wireless networks or web- and mobile-based applications. These technologies enable citizens to live a more sustainable life, which aims at producing less carbon emission, using more energy efficient services and supporting local consumption and a more inclusive lifestyle (Harter et al, 2010; Cohen, 2017). Smart city services include analogue and digital offers and cover a wide variety of application areas such as mobility, energy, social services, governability/ public services or waste management. However, until now these innovative IT solutions and services have become only successful with smart city visionaries and lead-users and are failing to reach the early majority of not so technology savvy or less enthusiastic citizens. The problem is that many of SC services which are regarded as "hybrid services", serving both individual customer needs and common goods, are not linked to initiatives focusing on raising people's awareness, or promoting and rewarding the necessary individual behavioral change (Kazhamiakin et al., 2016). In other words, the “tragedy of the commons” applies, because citizens act in their own interest and not by considering the overall goal and needs of “their city” for a more sustainable lifestyle.

The research contribution addresses the question of how to overcome the innovation chasm in the field of new smart city services, which promote and enable living a sustainable lifestyle. The gap between smart city visionaries (early adopters) and pragmatist users (early majority) is a particular challenge in the innovation scaling phase here, because also the free use of sustainability services is very often associated with the change of behavioral routines. For example, the use of a digital Smart Mobility Routing app that suggests taking the bicycle instead of using the car for the benefit of a CO_2-limited city only works well if the user is fully motivated to change their mobility behavior. To meet the challenge of scaling innovative smart city services, we suggest investigating the suitability of behavioral economic concepts of incentives, nudges and rewards etc. Further, we aim to explore the core motives and preferences for specific target-group-oriented incentive approaches in the field of bicycle mobility. Based on the first results (literature review, survey) we will propose a specific intervention design for nudging sustainability services that will be then tested and evaluated in two European smart cities (JPI-Urban Europe: www.simplicity-project.eu).

2 Current understanding

The problems mentioned above require innovative solutions, otherwise public smart city managers miss the mark. User-centric design and behavioral economics insights are seen as powerful solution to overcome the lack of users and close the gap between early adopters and the early majority. Insights especially from nudging, as one strand in behavioral economics (Thaler & Sunstein, 2009), have established itself across various sectors in governance and policy instrumentation. However, there is only limited systematic analysis of how to use nudging in the field of smart urban sustainability (Esmark, 2017). While there are already many guidelines for implementing nudges in offline environments (e.g. placing healthy food at eye level in supermarkets), digital nudging has only recently become the focus of interest for digital user interface designers (Schneider et al., 2018). Scientific results and evaluated success stories are still limited. Methods from behavioral economics (e.g. monetary-/ non-monetary incentives, nudges, reward mechanisms, challenges) have already been tested in the field of health-related issues (Vallgårda, 2012; Marteau, 2011), but findings regarding sustainability related objectives are still limited.

As is known from the growing bulk of literature in behavioral economics and social psychology, motivational incentives play an important role in influencing people's decision-making and thus their behavior. According to Lu et al. (2018: 3438) and based on the Oxford Standard dictionary, an incentive is *a thing that motivates or encourages someone to do something* and can be divided either in monetary or non-monetary incentives. Monetary or financial incentives are payments made to encourage desired change, however there are different types of rewards besides direct payments. Financial incentives, same as non-financial incentives can either be positive (rewards) or negative (penalties) (Hall, 2009). In the scientific literature monetary incentives are especially present in the fields of health and employee motivation, but some best practice examples (such as the initiative "Kilometric cycling allowance" in France, 2017, http://www.eltis.org/discover/case-studies/cycling-kilometric-allowance-france) show that monetary incentives are a suitable method for motivating people to change their mobility behavior and decision-making for another mean of transport for commuting.

Non-monetary incentives, on the other hand, do not involve any direct payment and can either be tangible or intangible. In the context of incentivisation towards a certain behavior, non-monetary incentives are often found in reward systems, such as in the non-profit initiative "goodbag" (https://www.goodbag.io/). This approach aims to engage people in environmental protection by using different incentives such as vouchers or rebates for local shops if they use a reusable shopping bag equipped with an NFC chip instead of a plastic one. Another way of motivating people in a non-monetary way are regulations, which are, according to Ly & Soman (2013: 6) defined as *restrictions, bans, compliance rules, and similar forms of regulation impose behavioural limitations that individuals or corporations are expected to comply with*, or information which ensures that people make better informed decisions. Information and education programmes are often used, for example, in personal health and savings programmes to improve learning and individual knowledge.

In recent years, there is a growing interest in the concept of nudging, that is based on insights from behavioural economics, which describes how behavioural changes are triggered by gentle incentives. Nudges are used to influence people's behaviour without resorting to other methods such as commandments or prohibitions or economic incentive systems (Ly & Soman, 2013). Basically, the concept describes how people can be steered in particular directions such as avoiding unhealthy food, without taking them the possibility to go their own way. In other terms, nudges influence behaviour by changing the way decisions are made, instead of imposing restrictions or economic incentives. Various authors, such as Sunstein, 2014; Thorun et al., 2016; Mont et al., 2014, provide an overview about the most effective types of nudging, whereas the University College London developed a comprehensive *taxonomy on behaviour change techniques (BCT*) that has been hierarchically clustered and defined (Michie et al, 2013).

As different nudges are required for different targets and within different contexts, a structured process as proposed by Ly et al. is required. Therefore, it is essential to design an effective nudging strategy in the first place. An analysis of the context and the task is required to identify how people make decisions or what are the usual behavioural habits in typical circumstances. Then the key heuristics and influences that may affect the decision outcome need to be identified (Ly et al., 2013).

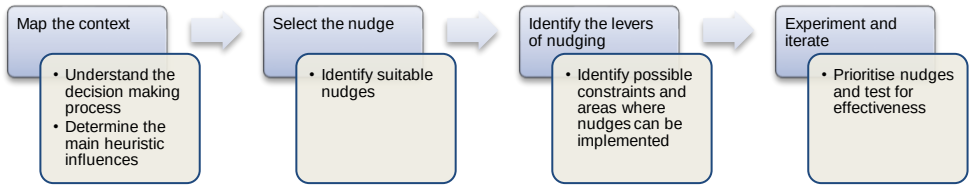

Figure 1: Nudging process (Source: Ly et al, 2013)

3 Research questions

Since there is only limited knowledge on how to design intervention campaigns in the field of smart city initiative relying on insights from behavioral economics (nudging and incentivisation) and about choosing suitable nudging or incentivisation tools for specific target groups, the research focusses on the following questions:

- What are the success factors and enablers of digital behavior-based interventions for smart city services?
- Which methods and tools are appropriate to incentivize people and are appropriate to change people's behavior by the use of ICT?
- Under which conditions is it necessary to address specific target groups in cities (young, elderly, women, men, etc.) with different methods and incentive (gamified) approaches?

4 Research design

The research questions will be tackled within a major research project funded from the Joint Programming Initiative Urban Europe – Making cities work, which focusses on digital services and incentive design for smart sustainable communities and incentive design for smart sustainable communities SimpliCITY" (2018-2020, www.simplicity-project.eu). Firstly, this project explores the methods and tools for behavioral design and incentivisation methods as well as best practices cases for (incentivizing) smart city bike services. Secondly, it identifies user preferences for different intervention instruments and based on that, thirdly, develops an intervention design to be tested and evaluated in two pilot demonstrations in two European cities, Uppsala (SWE) and Salzburg (AUT). The used behavioral intervention actions are terminated and scientifically evaluated as to the nudging effects. Altogether, the project delivers the instruments to raise the awareness and promote changes towards a sustainable city lifestyle by testing and evaluating these methods and tools.

5 Findings

The main output of the research will be an empirically sound base on insights from behavioral economics, focusing on methods and tools on how to incentivize people in order to use the

new smart city services for the common good of our cities. The preliminary results show which methods and tools are suitable for specific target groups and thematic areas and can be recommended to smart city managers for scaling.

Based on the results of the literature research, 15 international good practice cases and expert interviews in our thematic areas (bicycle mobility, local consumption and production as well as social integration), the first essential conclusions can be drawn:

- The overall effectiveness of an intervention for Smart City services increases if, for example, game or social norm actions are combined with upstream information actions.
- Additionally, the use of different forms of applications (like navigation apps in the mobility area) plays an important role in this process.

Further preliminary findings are based on a survey, conducted at a local bike event in Salzburg, AT (Radfrühling, May 2019). By means of this survey, 125 people reported on their mobility behavior and their everyday mobility. Specifically, they were asked about what would motivate them to bike more or to use selected bike services, offered by the city, more often. The questions were split up in mobility behavior in everyday life and in leisure time. For the evaluation of the data, special attention was paid on characteristics within different age groups.

First findings show that physical changes of the environment motivate people most to bike more often (58,06%), followed by the availability of information (38,71%). Incentives such as vouchers are the third-best way people feel motivated to bike more (30,65%). Playful elements are rated the lowest, as people tend to have a more pragmatically approach for their daily distances (Challenges, 20,97%; Gamification, 15,32%). Whereas, first results show that, even though the infrastructure is still the most influencing factor, people are more interested in playful elements within their leisure time. In this case 23,39% of the interviewed people would be motivated to bike more when challenges are offered and 21,77% would bike more when offering gamification interventions.

When focusing on the actual target group of the study, people who do not yet cycle on a regular basis, no significant differences of the individual preference toward a specific type of motivation can be identified. However, people who do not, or not on a regular basis bike, are slightly more motivated by incentives such as vouchers or discounts for biking more often, than already cycling citizens (this group summarizes people who stated that they use their bike on a daily basis, several times a week or at least once a week). Non-cycling citizens would also be motivated to bike more often by being provided more information on bike services or biking infrastructure.

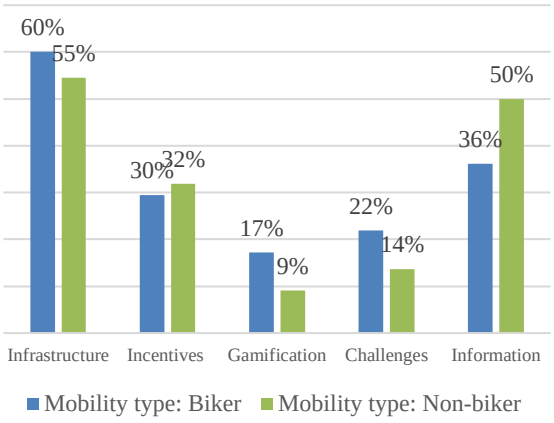

Figure 2: Incentive preference by mobility behaviour – Daily biking

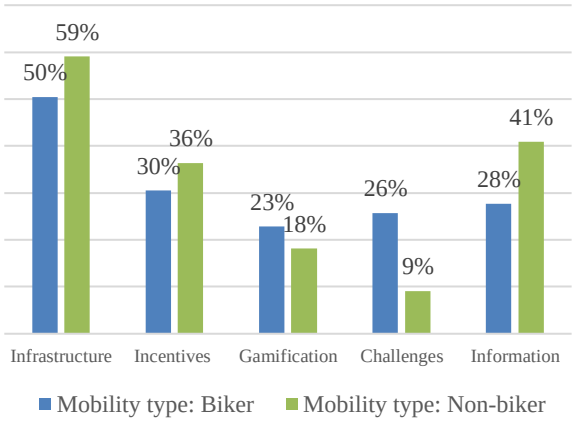

Figure3: Incentives preference by mobility behaviour (biking vs. non-biking citizens) - Leisure time

In addition, the results show that playful elements such as games or challenges tend to motivate younger target groups between 19 and 40 years of age. Figures 4 and 5 show how many people in the specific target groups would be motivated to drive more given specific methods and tools. No significant difference between everyday life and leisure time mobility has been observed.

In order to obtain a broader and more representative sample, this survey continues and is also aimed at non-cyclists, as 53% of those surveyed who do not cycle or only rarely cycle indicated that they could imagine using their bicycle daily when cycling becomes more attractive for them.

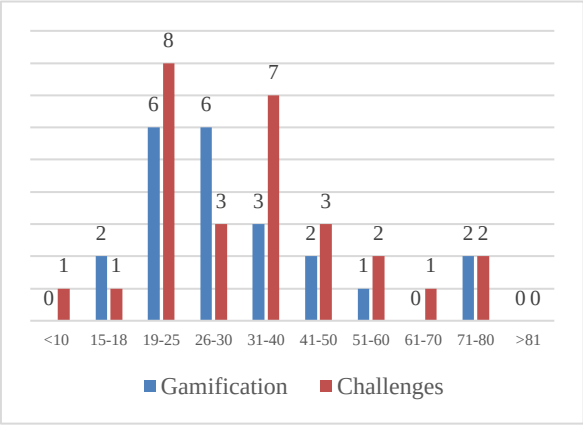

Figure 4: Playful elements - Everyday Life - Age groups

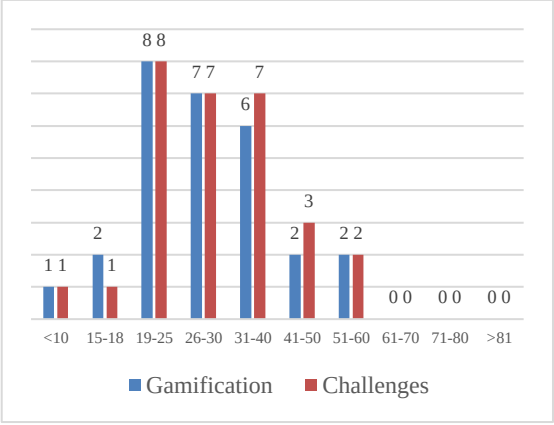

Figure 5: Playful elements – Leisure time - Age groups

6 Contributions

Much research has already been done in the field of incentivisation and nudging dealing with health-related issues (see Esmark, 2017; Thaler & Sunstein, 2009) whereas research on the potential of nudging for sustainable services/ lifestyle is limited, even though it is expected to have a positive influence (Lehner, 2016). A few examples in the field of influencing energy consumption by nudging initiatives already provide orientation, whereas the knowledge about long-term behavioral change towards a more sustainable lifestyle through digital tools and

methods for incentivizing people is still limited. This research aims not only at discussing the relevance of theoretical behavioral economics insights for innovation management research, but also at delivering practical findings (pilot demonstration of scientific framework). We will use our experience and methods to tackle the challenge of innovation scaling and designing effective intervention campaigns to achieve better decisions and more commitment by smart citizens and reaching common sustainability goals.

7 Practical implications

The expected results of the research will on the one hand provide a sound basis for smart city managers, often acting as public innovation managers. Innovation researchers will be able to connect insights from behavioral economics in overcoming the chasm in the innovation cycle. Target group specific knowledge about incentivisation methods and tools will support innovation and smart city managers by designing interventions to overcome the intention-action gap in the early phase of public service innovations.

8 Research issues to be discussed (Feedback questions)

1) On the research approach (experiences of similar research)?
2) How can other innovation research and managers (e.g. smart city management) as well as service providers benefit more from insights from behavioral economics and nudging in their daily work?
3) Are any other researchers interested in cooperation about empirical research on how to assess influence of methods and digital tools from behavioral economics for sustainable development? Are any cities interested in joining the pilot demonstrations?
4) What influence do cultural differences within Europe have on the effectiveness of nudging? Are studies available that deal with this topic?

9 References (selected)

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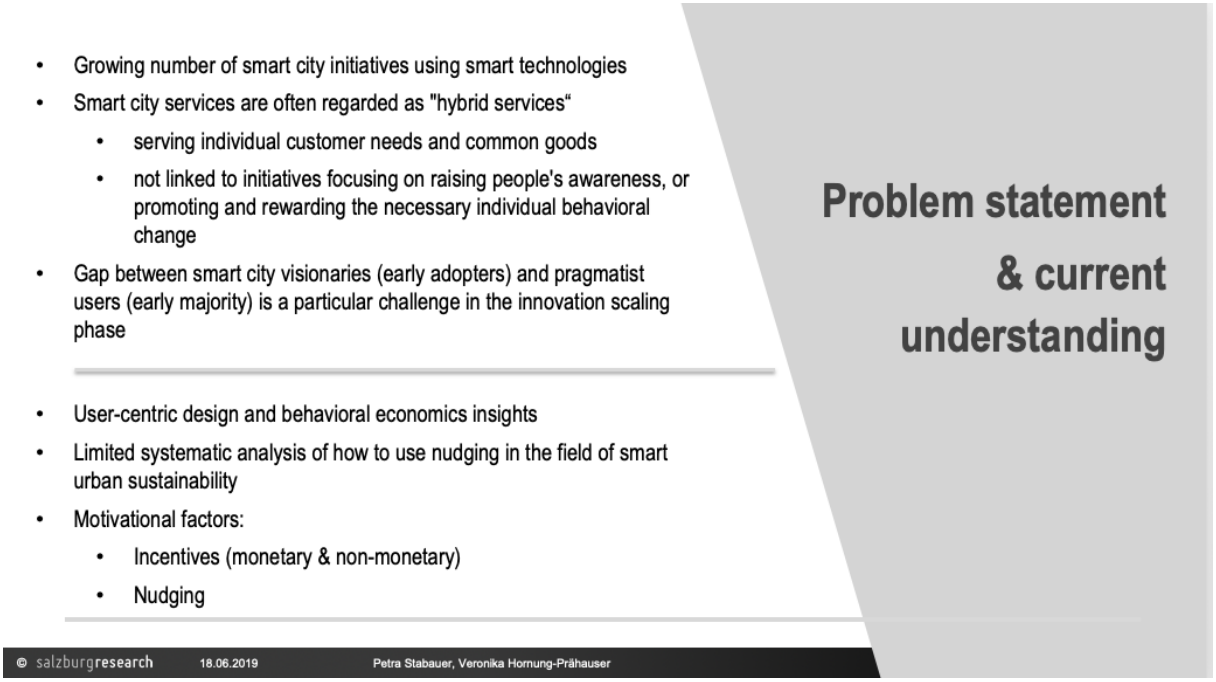
4.2 Paper presentation

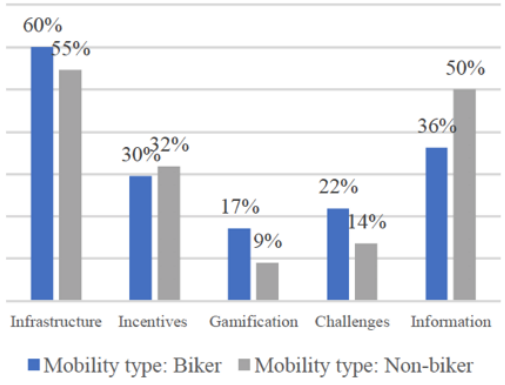


- JPI Urban Europe project SimpliCITY (AT, SWE)
- Identification of methods and tools for behavioral design and incentivisation methods; best practices cases studies
- Identification of user preferences for different intervention instruments
- Test and evaluate intervention design in two pilot demonstrations in two European cities

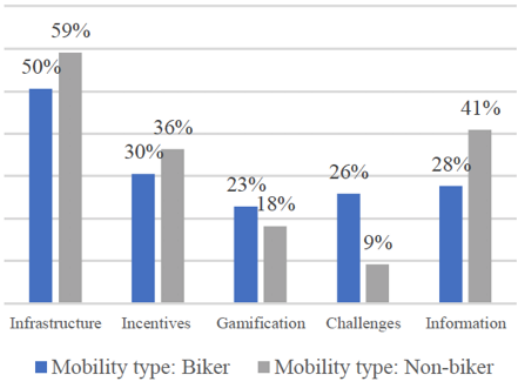
Research design & research questions

- What are the success factors and enablers of digital behavior-based interventions for smart city services?
- Which methods and tools are appropriate to incentivize people and are appropriate to change people's behavior by the use of ICT?
- Under which conditions is it necessary to address specific target groups in cities with different methods and incentive approaches?

Preliminary results



Incentive preference by mobility behavior – Daily biking



Incentives preference by mobility behavior - Leisure time

- On the research approach
- Benefit for innovation research, smart city managers and service providers from insights from behavioral economics and nudging?
- Influences of cultural differences within Europe on the effectiveness of nudging?
- Interest for cooperation about empirical research on how to assess influence of methods and digital tools from behavioral economics for sustainable development?
- Interest of cities to join SimpliCITY network (pilot demonstration/ follower city)

Feedback

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Thank you!

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5. New Business Model Conference Berlin

5.1 Submission paper

Integration of behavioral economic approaches into new business models for smart city services

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Abstract

There are many challenges that cities face nowadays like urban growth, environmental pollution or social issues. Cities answer with the use of information and communication technology (ICT) and aim to become smart cities. Besides the advantages of ICT and sensor applications, some challenges (e.g. how to deal with big amounts of data) arise. Cities need to find concepts to cope with this data, transform them to value and also scale smart services beyond a typically publicly funded project. This work helps to overcome the still lacking research concerning business models in the context of smart cities by providing a comprehensive literature review on the characteristics of business modelling for smart city services and the relevance of appropriate incentivisation and nudging approaches. This research therefore combines the concept of (smart city) business models with concepts of behavioural economics. While incentivisation and nudging campaigns have been used to change behaviour with respect to certain products, attitudes and routines, they failed to guarantee a long-term behaviour change of citizens. For this, an integrative approach is needed, namely one where incentivisation is part of long-term behaviour changes within a smart city business model. More research is necessary to evaluate and understand those long-term behaviour changes and to integrate such tools within business models.

Keywords

Business model innovation, BM key-components and architecture, smart city services, methods of behavioral economics, incentivisation and nudging

1. The challenge of scaling smart city services with new business models

European cities face a multitude of challenges like urban growth, local pollution or stringent policy targets. To overcome these challenges and strive for economic prosperity, environmental

sustainability and social inclusion, city officials use information and communication technology (ICT) as a promising solution (Timeus et al., 2017). As stated by specialists within this area, there are several benefits of the application of ICT, especially when combining ICT and sensors, commonly referred as Internet of Things (IoT). Through collecting data, more information can help to achieve sustainability goals, in e.g. a reduction of water or energy consumption and from that CO_2 emission savings or the improvement of the utilisation of existing infrastructure. In general, ICT and IoT applications have the power to support sustainable development (Bifulco et al., 2015).

However, the implementation of sensors and the use of ICT per se do not make a city intelligent and sustainable. There are also obstacles to becoming a sustainable Smart City that need to be overcome. They range from resistance to change, multiple or contradictory goals to a lack of cross-sectoral cooperation (Chourabi et al., 2012).

Furthermore, cities are challenged to create value out of the (big) data collected be newly available technologies and sensors. As stated by Bettencourt (2014: 13), “despite its general appeal, the fundamental opportunities and challenges of using big data in cities have, in my opinion, not been sufficiently formalized.” The tendency of ever more data aggravates the situation. Cities need to find concepts to cope with this data and transform them to value. This became a challenge for companies for quite some time, but is now also in the centre for cities’ representatives. There is need to scale smart services beyond the end of a typically publicly funded "SmartCityProject". This would be particularly useful in the phases of innovation processes where the gap between early adopters and the early majority for services to promote intelligent sustainable urban living needs to be bridged. Research on business model itself and business model innovation (BMI) is well advanced (Foss and Saebi, 2017), but still lacks fundamental research in the context of smart cities.

The paper is structured as follows: chapter 2 introduces the research questions, chapter 3 and 4 provide the results of the literature review and chapter 5 summarizes the preliminary conclusions and further research outlook.

Research objectives and methodology

Timeus et al. (2017) characterise a smart city business model as “the logic of how a city can create and deliver value through the development of smart services that are economically and socially viable, while reducing the city’s overall environmental footprint”. Our research tackles therefore the following research questions:

- What characterises the design of such a smart city business model in general and for its newly developed services in particular? What are key-elements of a business model that practically closes the gap between early adopters and the early majority for services which promote intelligent sustainable urban living?

- How can theoretical approaches and methods known from behavioural economics benefit the design and architecture of such a smart city business model? What can we learn from the domain of behavioural economics for business model design of smart city services?

- Which role could incentivisation and nudging strategies play when developing a new successful smart city business model? How do nudging methods interact with other major components in business model innovation?

The objective of this contribution is to provide a comprehensive literature review on the characteristics of business modelling for smart city services and the relevance of appropriate incentivisation and nudging approaches known from the scientific field of behavioural economics. This literature review will cover important concepts and theoretical approaches known in the scientific community of smart cities, business models, behavioural economics, and ICT. In addition, different combinations of insights from behavioural economics, smart city research and business model concepts were evaluated. Best practice case studies were screened (according to Yin, 2014) in order to identify success factors of incentivisation and nudging principles in smart city service projects. We will find and discuss relevant nudging strategies and incentivisation methods in cities.

Based on the characterised "extendibility" of business models to other types of organizations by Massa and Tucci (2013), the present study contributes to the literature of BMI for smart cities. Business models in the context of smart cities often deal with the *tragedy of the common* as well as with different characteristics of the model of earnings and the understanding of the customer. To overcome this challenge, the paper proposes to combine the concept of (smart city) business models with concepts of behavioral economics in order to "nudge" citizens towards a sustainable lifestyle (Sunstein and Thaler, 2008). Tools from behavioral economics (e.g. nudging, incentives) are per se not new, also within the area of sustainability, although research lacks the combination of behavioral economics and the concept of business models. The innovation to a sustainable smart city business model can help to tackle the above-described challenges.

Characteristics of new business model architectures and key-components for smart city services

In the following, we will outline some of the characteristics when suddenly adopting the business model approach for smart city concepts, the relationship between the city and the customer (in this case the citizen) becomes the centre of interest. Usually the use of public services is subject to the *tragedy of the commons,* meaning an inefficient use of these services. The integration of social and environmental aspects in business models falls thereby short, asking for an extended approach coping with this problem. While incentivisation and nudging campaigns have been used to change behaviour with respect to certain products, attitudes and routines, they failed to guarantee a long-term behaviour change of citizens. For this, an integrative approach is needed, namely one where incentivisation is part of long-term behaviour changes within a smart city business model.

Timeus et al. (2017: 17) propose the following specific smart city business model: "The City Model Canvas also borrows from the BMC for mission-driven organisations and from the 'triple layered' BMC. The first of these is an adaptation of the traditional BMC that is more suitable for organisations whose primary aim is not to maximise profit, but to achieve a particular mission (Osterwalder & Pigneur, 2010; Blank, 2016). This Business Model Canvas for Mission-driven Organisations re-labels some of the key elements in such a way that its logic reflects that of a mission-driven organisation (such as a government or non-profit organisation)".

Further, the authors state that "the second adaptation of the BMC, the triple-layered business model canvas (Joyce & Paquin, 2016), is a three-layered canvas according to which a firm articulates not only how it creates economic value, but also how it creates environmental and social value. The CMC integrates this concept and refers to it as the 'triple bottom line'" (Timeus et al., 2017: 17). The proposed CMC for smart cities is therefore an adaptation of these three templates but "re-arranged to represent the role and the goals of a city municipality. Whereas the original and the mission driven BMCs consist of nine elements, the CMC, is made up of fourteen building blocks. The 'additional' four elements represent the aforementioned triple bottom line" (Timeus et al., 2017: 17). Incentivisation methods can best be implemented in the *Deployment* or *Value proposition element.*

Figure 1 shows the Smart City Model Canvas.

1. Mission achievement: What is the ultimate goal that the city seeks to achieve?

<table>
<tr><td rowspan="2">6. Key partnerships
Who can help the city deliver the proposed value to the beneficiaries? Who can access key resources that the city council does not have?</td><td>7. Key activities
What must the city council do to create and deliver the proposed value?</td><td rowspan="2">2. Value proposition
What specific problems does the proposed service solve or alleviate?</td><td>4. Buy-in & support
Whose buy-in is needed in order to deploy the service (legal, policy, procurement, etc.)?</td><td rowspan="2">3. Beneficiaries
Who will directly benefit from the proposed services?</td></tr>
<tr><td>8. Key infrastructure & key resources
What key resources does the city council have to create and deliver the value?</td><td>5. Deployment
How will the city solve the problems of the Value proposition specifically?</td></tr>
<tr><td colspan="3">9. Budget costs
What costs will the creation and delivery of the proposed services entail?</td><td colspan="2">10. Revenue streams
What sources of revenue for the city do the proposed services provide? What other sources of revenue does the city have?</td></tr>
<tr><td colspan="3">11. Environmental cost
What negative environmental impacts can the proposed services cause?</td><td colspan="2">12. Environmental benefits
What environmental benefits will the proposed services deliver?</td></tr>
<tr><td colspan="3">13. Social costs
What are some of the potential social risks that the proposed service entails? Who is most vulnerable as a result?</td><td colspan="2">14. Social benefits
What social benefits will the proposed services bring about? For whom will these benefits materialise?</td></tr>
</table>

Figure 1: Smart City Model Canvas; Source: Timeus et al., 2017

With the help of an adapted business model canvas (City Model Canvas (CMC)), the novel business model is structured and graphically depicted. The business model canvas presented by Timeus et al. (2017) is used to analyse the business models of smart cities and is therefore of great value as a starting point our research. Compared to the traditional business model canvas by Ostervalder, additional elements added, e.g. environmental costs, environmental benefits or social impacts.

4. Methods and tools for behavioural change

"All nudges are incentives, but not all incentives are nudges." (Schweyer, 2017: 6)

According to Lu et al. (2018) and based on the Oxford standard dictionary, an incentive is "a thing that motivates or encourages someone to do something".

4.1 Economic Incentives

Economic incentives play an important role within behavioural economics, because they are used as an effective tool to change behaviour (McKenzie-Mohr and Schultz, 2015). Incentives work particularly well, when individual people evaluate their costs and benefits of their actions on a regular basis. They are mainly taxes, fines, subsidies or grants, whereby a distinction between negative and positive influences is made (Ly and Soman, 2013). Negative incentives put the focus on the failure of an individual to adopt a desired behaviour. They discipline the individual by withdrawing the reward, believing that this will encourage the adoption of the desired behaviour (Jochelson, 2007).

Positive influences (e.g. subsidies and grants) should provoke positive behaviour (Ly and Soman, 2013) and reward individuals directly for a desired behaviour or outcome (Jochelson, 2007). Another often seen classification of incentives is between monetary and non-monetary incentives (see below). While the first group is described extensively in literature, less is known about the effects or drawbacks of non-monetary incentives.

Besides the change of behaviour induced by incentives, they also can bring various side effects. Firstly, issues about the durability should be mentioned. As stated by McKenzie-Mohr and Schultz (2015: 41), "repetitive behaviours that are changed through incentives typically revert back once the incentive is removed".

There is also an over justification effect observed, meaning that the behaviour falls below its initial level once the incentive is removed. Secondly, the specificity of the change is a further limitation. Behaviours that are changed through incentives typically do not spill over into other domains (Schultz, 2010). An example therefor is the offering of an incentive for the purchase of energy-efficient lightbulbs. The effect of this changing behaviour will generally not spill over into other energy-efficiency behaviours, like e.g. turning of the computer when leaving the office. However, there are documented examples of rebound effects. This means that a person who buys and installs a more energy-efficient appliance uses it more often, because of its higher efficiency. Due to these side effects, incentives should be used sparingly and they typically work best when costs are identified as barrier to the action (McKenzie-Mohr and Schultz, 2015).

4.1.1 Monetary incentives

Monetary or financial incentives are payments made to encourage desired change, however there are different types of rewards besides direct payments. They can be in cash (e.g. bonuses or discounts) or in kind (e.g. goods or services). Same as described above, financial incentives can be positive (rewards) or negative (penalties) (Hall, 2009). In scientific literature, monetary incentives are particularly represented within three fields: health, experiments and employee motivation. For the last, Buchan et al. (2000) shows a range of potential monetary incentives (see Table 1). To our knowledge, there is no general classification of monetary incentives.

According to Hall (2009: 12), there exist certain conditions under which financial incentives can be effective in promoting behaviour:

- Cost as a barrier to the use of a service (e.g. charges for immunisations or well child visits);
- Desired behaviour change is simple and one-time rather than complex and ongoing;
- Financial incentive reinforces other strategies for change;
- Incentive is not delivered in a negative or demeaning way.

4.1.2 Non-monetary incentives

4.1.2.1 Regulation

Regulation is a concept that is hard to define and means different things to different people and organisations. The term is used for a variety of discursive, theoretical, and analytical purposes (Levi-Faur, 2010). According to Ly and Soman (2013: 6), “restrictions, bans, compliance rules, and similar forms of regulation impose behavioural limitations that individuals or corporations are expected to comply with”. Regulations are therefore helpful in situations, where the consequences of non-observance are negative or result in damage and impose a risk to society or environment. They are also useful when it comes to third party impacts, which are absorbed by the persons around a company and not by the persons of a company themselves.

4.1.2.2 Information and Awareness

Information ensures that people make better decisions, so-called informed decisions. Information and education programs are often used in e.g. personal healthcare and saving programs, where learning and individual knowledge needs to be enhanced (Ly and Soman, 2013). Public information campaigns are one tool to shape public attitudes, values and behaviour, and to reach some desirable outcome. Examples for such campaigns target to appeal the “right” behaviour, like eating nutritious food, avoid illegal drugs, recycle trash, and so on (Schans and Optekamp, 2016).

4.2 Nudging

In recent years, there is a growing interest in the concept of nudging. The concept is discussed in various areas in the scientific and the practitioner’s landscape (private and public

institutions). The term itself can be traced back to Richard Thaler and Cass R. Sunstein and the underlying concept describes how people can be steered in particular directions such as reducing energy consumption or paying the electricity bill on time, without taking them the possibility to go their own way (Sunstein, 2014). One reason for the increased use of nudges is that the generally cost little by simultaneously having a high impact on economic and other goals such as public health or energy consumption.

Based on insights from behavioural economics, which describes how behavioural changes are triggered by gentle incentives, nudges are used to influence people's behaviour without resorting to other methods such as commandments or prohibitions or economic incentive systems (Ly and Soman, 2013).

Nudging is defined as

"any aspect of the choice architecture that alters people's behaviour in a predictable way without forbidding any options or significantly changing their economic consequences. To count as a mere nudge, the intervention must be easy and cheap to avoid. Nudges are not mandates. Putting fruit at eye level [to attract attention and hence increase likelihood of getting chosen] counts as a nudge. Banning junk food does not." (Thaler & Sunstein, p.6)

Instead of imposing restrictions or economic incentives, nudges influence behaviour by changing the way decisions are made. While a significant change in economic outcomes or incentives is not considered a nudge, a nudge can be used to highlight an economic incentive.

Nudges are a relatively new tool, but they become part of the policy makers' toolbox, as they have been shown to have a significant impact on peoples' behaviour. In some cases, nudges are easier to implement than regulation or economic incentives. The goal of many nudges is to make peoples life simpler, safer or easier (Sunstein, 2014). For example, in order to reduce pollution and fuel consumption, policy may consider solutions that will drive up gasoline prices. However, drivers are against such price changes and it would be difficult for politicians to adopt such a policy without being criticised by their voters. The use of a nudge can be easier to implement and still lead to significant results. While nudges are effective at changing behaviour, their effectiveness depends strongly on the context. Therefore, it is important to choose an evidence-based approach to the design of nudges. Government agencies should have access to a database or create a database documenting different nudging strategy and the conditions under which these strategies worked or did not work (Ly & Soman, 2013). Furthermore, nudging tools should be seen as a complement to traditional policy instruments and not so much as a substitute for regulations and laws or economic tools (Lehner et al, 2015).

It should be emphasized in particular that nudges are not mandatory and can (at least theoretically) be avoided ("opting out"). The primary goal in the field of nudging is to actively shape the decision-making environment. Even though, some nudges can be seen like a soft way of paternalism, because they steer people in a specific direction, nudges are designed to preserve full freedom of choice (Sunstein, 2014), the individual's freedom of choice remains formally unaffected (Kreuzberger, 2017). In most cases, the decision-making context is

redesigned in such a way that the desired behaviour is also the most pleasant and simplest for decision-makers (Traxler & Hurrelmann, 2016). One well-known example of nudging is its use to improve eating habits, where in supermarkets or canteens healthy dishes with fruit and vegetables are placed within easy reach, while unhealthier dishes are located further up or in the back and can therefore only be reached with greater effort (Meske, 2017).

Two important aspects that need to be built into the basic practice for nudging are transparency and effectiveness. It is essential that the relevant action (nudge) should not be hidden, e.g. an employer adopts a program that automatically enrols people in a pension program (Sunstein, 2014).

The extent of behavioural change achieved through nudging, and whether a behavioural change is long-term or temporary, depends heavily on how nudging is defined and how it is applied (Samson, 2016).

Within the paper „Nudging – a very short guide" the 10 most effective methods/ tools of nudging are listed by Sunstein.

Table 1: Overview – The 10 most effective methods and tools for nudging (based on Sunstein, 2014; Thorun et al., 2016)

Nudge	Examples	Short description
Default rules	Automatic enrolment in programs	Default rules are some of the most effective nudges. Areas of application are usually fields like health, savings or education. Unless active choosing, which is also a type of nudging, is involved, some default rules are essentially inevitable. It might be an argument, that It makes sense to let people to make an active decision, instead of relying on default rules. In certain contexts, it is ineffective and burdensome as well as time-consuming to require people to choose.
Simplification	Simplification of the application mode for funding	Complexity is a serious problem, because it causes confusion, it increases expenses, and it discourages peoples from participating. Programs or initiatives should always be easy navigable and intuitive. Especially for forms and regulation, simplification should have a high priority. The effects of simplification are often underestimated.
Use of social norms	Emphasising what most people do, e.g. most people plan to vote; nine out of ten hotel guests reuse their towels	A very effective form of nudging. It is about informing people that most others are engaged in a certain behaviour. Such information is most powerful when it is as local and as specific as possible. The use of social norms can reduce criminal behaviour or behaviour that is harmful to others. This form of nudges is also suitable for undesired behaviour. In this case it is about highlighting not what most people actually do, but what most people think people should do ("90% of the people in Ireland believe that people should go to vote").

Increase in ease and convenience	Making low-cost options or health food visible by placing it at eye-level	People tend to make the easy choice. If people should be engaged to a certain behaviour it is essential to reduce potential barriers and make it “easy” and “fast”. Resistance to change is often a product of perceived difficulty or ambiguity. An add-on is to make the choice also fun.
Disclosure	Disclosure of external costs, e.g. the total environmental costs of alternative mobility options; communication of the total cost of a credit card	This type of nudging is particularly effective in the area of interested consumers who make informed decisions. The basic requirement for this is to make information understandable and easily accessible.
Warnings, graphic or otherwise	Warnings or graphics e.g. on cigarette box	When dealing with serious risks, warnings and graphic, either private or public, are a suitable nudge. In order to get people’s attention, large fonts, bold letters and bright colours are effective. But attention is a scarce resource, and warnings are attentive to that fact. Attention has to be paid, because people tend to respond to warnings counteracting them toward unrealistic optimism. People might respond to warnings by discounting them. In this case, it is recommended to experiment with more positive messages (e.g. rewards for the preferred behaviour (even non-monetary like congratulations in apps).
Pre-Commitment strategies	By which people commit to a certain course of action, e.g. www.stickk.com (stickk, is an app/ platform that promises people to support in achieving life, business, health, and career goals. Created by behavioural economists at Yale University, the free goal-setting platform influences behaviour change through loss aversion and accountability.)	Many people have specific goals, like stop drinking/ smoking, exercise more, but their behaviour falls short of those goals. But if people precommit to engage in a certain issue, they are more likely to reach their goals.
Reminders	Reminders per email or text message	People tend to miss deadlines, pay bills or take medication. This is often due to procrastination, forgetfulness or lack of time. Small memories can stimulate action. A very similar approach is "prompted choice". People do not have to choose, but are asked whether they want to choose (e.g. clean energy/new energy provider, privacy settings on the PC or whether they want to become an organ donor).
Electing implementation intentions	„Do you plan to renovate your house?” “Do you plan to vote?”	People are more likely to engage in an activity if someone elicits their implementation intentions. A simple question about future conduct is able to have significant consequences. Further, it might effective to emphasize people’s identity.
Informing people of the nature and	Feedback about energy consumption	Companies, public and private institutions have a large amount of personal information and data at their disposal and can therefore draw conclusions about past

consequences of their own past		decisions. Disclosing these past decisions can help people learn from them and improve current decisions and make them in the best possible way.

Preliminary findings and expected results

There are several types and forms of nudging and incentivisation methods, which are suitable for the sustainability context. Much research has already been done in the field of incentivisation and nudging dealing with health-related issues (see Thaler & Sunstein, 2009) whereas research on the potential of nudging for sustainable services/ lifestyle is limited, even though it is expected to have a positive influence and huge impact can be achieved. E.g. in Alcott (2010), a large-scale electricity conservation program is evaluated, where the home owners receive information about their used energy as well as a social comparison module to compare the energy demand with geographical neighbours in houses of similar size. This method is sufficient to decrease the energy demand and therefore helps to reduce CO2 emissions.

In the transport sector, Kormos et al. (2015) investigate the use of descriptive social norm information on self-reported reduction of private vehicle use. Results indicated that messages highlighting more prevalent descriptive social norms increased sustainable transportation behaviour (relative to private vehicle use) for commuting, but not non-commuting, purposes.

There are some more examples within the sustainability area, however relatively less is said about the combination of such methods and smart city actions and the possibility to change the behaviour of citizens. However, such incentivisation and nudging methods can build the base for doing so. We therefore expect to prove this relationship by testing the methods of incentivisation and nudging in practice. As a result, the feasibility of long-term behaviour change should be evaluated.

Conclusion and implications

The described approaches have not yet been tested in practice and only a limited number of nudging and incentivisation tools have been evaluated. Therefore, additional research within this field is both from a theoretical and empirical viewpoint desired. However, it needs an innovative, inter- and multidisciplinary approach like the presented one to guarantee solid business models in the long run. With the help of such business models, city managers are able to change the behaviour of their citizens towards the achievement of the SDGs.

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