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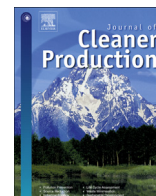
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# When bike sharing business models go bad: Incorporating responsibility into business model innovation

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## ABSTRACT

Innovations to business models are particularly promising for tackling societal challenges. However, innovation outcomes can be unpredictable. To minimise negative impacts and enhance the success of business model innovation processes, we argue that socio-ethical issues must be incorporated and managed. Research on responsible innovation, which seeks socially desirable and ethically acceptable innovations via the incorporation of socio-ethical issues, is well developed but has often used a technocentric lens. Consequently, it is unclear how socio-ethical issues interact with business model innovation. We explore how business model innovation interacts with socio-ethical issues and aim to understand the ways responsible innovation can help inform business model innovation processes and outcomes. We do this by exploring platform enabled bike sharing business models in the Netherlands. We construct a theoretical framework considering purpose, process and product dimensions of business model innovation. Our results illustrate how socio-ethical factors can play a key role in the success or failure of business model innovation. We argue that without including socio-ethical factors explicitly within analytical lenses, that key elements may be missed, resulting in an incomplete picture of key business model innovation dynamics.

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## 1. Introduction

Business model innovation (BMI) is seen as particularly promising in terms of tackling sustainability challenges, such as achieving sustainability mobility, as well as delivering business benefits (Chesbrough, 2010; Freudenreich et al., 2020; Geissdoerfer et al., 2018). The sharing economy is one example of a set of innovative business models, enabled by digital platforms, that are disrupting existing industries (Meilă, 2018; Owyang et al., 2013) and helping to tackle sustainability challenges (Belk, 2014; Curtis and Lehner, 2019). For example, car sharing platforms offer temporary access to cars, reducing consumption by increasing the use of 'idle goods' (Bondorová and Archer, 2017; Geissinger et al., 2019). Platforms also reduce costs and enable rapid scaling of innovations (Kolk and Ciulli, 2020).

However, as with other BMIs, the promise and potential of platforms, has often not matched actual outcomes and impacts (Acquier et al., 2017; Geissinger et al., 2019; Meilă, 2018). For example, the "boomerang effect" has shown that low cost access to shared vehicles (e.g. ride sharing) may increase their use at the expense of more sustainable options such as public transport, cycling or walking (Murillo et al., 2017). While the explosive growth of these types of platforms has created wider social and ethical issues such as privacy concerns, adverse impacts on public space, nuisance or tax avoidance (Frenken et al., 2020; Meilă, 2018; van Waes et al., 2020).

Platforms, as new innovative business models, show that even where sustainable advances are possible, that unexpected, unintended and negative impacts can occur. This raises the question of how best to manage BMI<sup>2</sup> in a way that delivers sustainability advances, while minimising unintended and negative impacts, as

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<sup>2</sup> We define BMI as "the conceptualisation and implementation of business models. This can comprise the development of entirely new business models, the diversification into additional business models, the acquisition of new business models, or the transformation from one business model to another" (Geissdoerfer et al., 2018).

current traditional approach to innovation or risk management appear to insufficiently take account of these effects. Answering this question involves the synthesis of business model and responsible innovation literatures. Responsible innovation (RI) responds to this challenge by seeking to ensure that innovations avoid doing harm on the one hand, and provide positive impacts on the other, by taking socio-ethical issues into account through anticipative, inclusive, reflexive and responsive approaches (Stilgoe et al., 2013; Voegtlin and Scherer, 2017; Von Schomberg, 2013). RI seeks to go beyond only *motivating* positive outcomes (intention), to also *enable* positive outcomes, by incorporating an explicitly moral perspective to traditional innovation practices (Bennink, 2020); it emerges alongside similar techniques, such as Design Thinking, but takes a more explicit moral stance (Nathan, 2017; Pavie and Carthy, 2015). By combining the definitions of RI and BMI, a responsible BMI approach can be defined as the 'conceptualisation and implementation of new business models in a transparent and interactive process by which societal actors and innovators become mutually responsive to each other, with a view to the (ethical) acceptability, sustainability and societal desirability of the innovation process and its outcomes. Socio-ethical issues include social issues: where the issue at hand is beyond the control of single individuals, and where the issue creates conflicting opinions (e.g. how best to manage privacy); and ethical issues: those that require an actor to choose between options that must be evaluated as right (ethical) or wrong (unethical) (e.g. the 'trolley problem' faced in the development of self-driving cars).

However, the issue of 'responsible' BMI is largely ignored within both the RI and BMI literature. For instance, on the one hand, while most definitions of sustainable business models explicitly or implicitly include ethical concerns (Stubbs and Cocklin, 2008), most do not include the responsibility to 'avoid harm', focusing only on the responsibility 'to do good'.<sup>3</sup> Some limited engagement with the concept of 'value destroyed' is the only exception (Bocken et al., 2013; Yang et al., 2017). On the other hand, the RI literature largely takes a technological focus, with those studies exploring non-technological aspects either omitting the business model or engaging with it superficially (Jarmai et al., 2020; Long et al., 2020a,b). These omissions are problematic, as business models influence the success and impact of technologies and how they are deployed and used (Chesbrough, 2010), meaning it is likely that the business model also influences the socio-ethical impacts of a technology. This raises the prospect of 'responsible technologies' being applied 'irresponsibly' due to the business model used.

In this research, we therefore aim to improve our understanding of the role of socio-ethical factors in BMI processes, and the influence they have on BMI outcomes. We posit, that for responsible outcomes, socio-ethical factors must also be integrated into BMI processes (Hope and Moehler, 2015), as well as technological innovation processes. We aim to explore the interplay between socio-ethical factors and BMI processes and design. We thus seek to answer the following research question: *How does BMI of platform enabled bike sharing interact with socio-ethical aspects?*

By tackling this question, we will improve our understanding of how to avoid unintended and negative outcomes, potentially improve our understanding around BMI failure, as well as critical role BMI for sustainability more broadly (Bocken et al., 2014; Chesbrough, 2010; Schaltegger et al., 2016). Established factors,

<sup>3</sup> This aligns with the field of sustainability transitions, where research tends to focus on hopeful developments, but 'unsustainable trends' and the shadow side of innovation is often understudied (Antal et al., 2020; Shove and Walker, 2007). This is problematic as scaling up sustainable innovation may solve one problem, but may create or intensify another one (Van den Bergh et al., 2015).

such as triple bottom line issues or levels of resource allocation (Geissdoerfer et al., 2018), play key roles in the success or failure of BMI. However we argue that incorporating an RI lens and the consideration of socio-ethical factors into analysis of BMI creates a more complete picture of BMI processes and impacts and introduces socio-ethical factors as an additional category for BMI failure and design-implementation gaps. In doing so, we answer calls to further explore the barriers and challenges – in this case, socio-ethical issues – facing BMI (Geissdoerfer et al., 2018). This will be of value to those innovating business models and stakeholders, including communities, users and governments.

### **Free-floating bike sharing**

To realize our research aim, we explore the emergence of a new generation of bike sharing enabled by platform business model innovation: free-floating bike sharing (FFBS). This represents an interesting case, as advocates claim FFBS as an innovative business model able to achieve sustainability mobility.<sup>4</sup> Although FFBS is a relatively new phenomenon, pioneering studies demonstrate how the emergence of this business model created wider socio-ethical issues. The business model and launching strategies are associated with causing "significant disruptions and stresses" (Ma et al., 2018; Médard de Chardon, 2019; Meilă, 2018; Spinney and Lin, 2018). Recent studies have documented a range of impacts, such as the privileging of access to these new forms of mobility for more affluent groups (Médard de Chardon, 2019), through to companies taking advantage of the friendly image of bikes for gathering of personal data for marketing purposes (Duarte, 2016). Spinney and Lin (2018) highlight how platform enabled bike sharing has given rise to new terrain of capital accumulation. While, van Waes et al. (2018a) and Petzer et al. (2020), discuss the impact of FFBS on public space leading to public nuisance. Curtis and Mont (2020) observe that the free-floating bike sharing market in China was saturated by hyper-competitive companies, which created an oversupply of (often low-quality) bikes, leading to under-utilized bikes. van Waes et al. (2020) show non-collaborative approaches of how business models are launching in cities without formal consent. Hence, such platforms (such as free-floating bike sharing) are not sustainable by default, meaning their business models require strategic and deliberate design and implementation.

To this end, this research set out to explore the incorporation of responsibility into BMI. The remainder of the paper is structured as follows. In section 2, we explore key literature, before articulating a theoretical framework. In section 3, we outline the empirical context and methods used to answer the research question. In section 4, we describe different companies and city responses. In section 5 the results of applying the framework are described. In section 6 we discuss our findings. We end with a conclusion.

## **2. Literature review**

### *2.1. Responsible innovation*

RI seeks to solve grand societal challenges while also avoiding potential unforeseen and negative consequences that can occur with innovation (Von Schomberg, 2013). Initially conceived within a science and technology domain under the term responsible research and innovation (Burget et al., 2017), RI is widely defined as: "a transparent, interactive process by which societal actor and innovators become mutually responsive to each other with a view to the (ethical) acceptability, sustainability and societal desirability

<sup>4</sup> Although the term 'free-floating bike sharing' includes the word 'sharing', in principle these systems are about rental. The service bikes sharing systems provide is to make bikes available for shared use, based on tariff and a short period of time.

of the innovation process and its marketable products (in order to allow a proper embedding of scientific and technological advances in our society)" (Von Schomberg 2013:1). More recently, RI is increasingly seen as an umbrella concept (Grunwald, 2011), with wider definitions emerging from management science highlighting three dimensions as the responsibility to 'do no harm', the responsibility to 'do good', and the responsibility of 'innovation governance regimes' to facilitate these aims (Voegtlin and Scherer, 2017). We argue that these definitions are not mutually exclusive and draw on both the science and technology studies-based definition of Von Schomberg (2013) by incorporating the frameworks developed by Stilgoe et al. (2013) and Stahl et al. (2017) while recognising the value in the umbrella definition offered by Voegtlin and Scherer (2017), which is able to incorporate the science and technologies studies perspective, as well as management-based approaches, such as BMI.

The responsibility to avoid harm has largely been pursued through forward looking frameworks, which seek to overcome the deficiencies involved in retrospective regulatory approaches (Stilgoe et al., 2013). These approaches focus on process, such as the 3Ps framework; this examines socio-ethical issues via purpose (the motivations and justifications), process (the activities involved in the innovation process), and product (or outcomes, and their societal and environmental impacts according to specific indicators) (Stahl et al., 2017). Alternatively, the AIRR framework, highlights four key dimensions, including anticipation, inclusive deliberation, reflexivity, and responsiveness (Stilgoe et al., 2013). Anticipation requires that 'what if ...' questions are asked by innovators, which helps to ensure an openness to many possible outcomes and to think systematically about possible impacts, seeking to address dilemmas of control (Genus and Stirling, 2018). Inclusive deliberation encourages a diverse set of societal stakeholders to be included in the innovation process. While reflexivity focuses on questioning and exploring the moral boundaries and roles of innovators. The fourth dimension, responsiveness, seeks that the necessary resources and capabilities are available to appropriately respond to any issues raised through the first three dimensions.

The responsibility to do good and generate positive outcomes draws on approaches such as eco-innovation, shared value creation or sustainable business models (Boons and Lüdeke-Freund, 2013; Markman et al., 2016; Porter and Kramer, 2011; Schaltegger et al., 2016), which we will explore in more detail in the following sections, and includes efforts to link more established inclusive innovation approaches, such as 'Design Thinking' (Nathan, 2017; Pavie and Carthy, 2015). While a key third responsibility highlights the importance of governance, raising questions of how best to ensure that innovation processes incorporate and adhere to the responsibility to do no harm and do good (Scherer and Voegtlin, 2020; Voegtlin and Scherer, 2017).

While research on RI in business or industry settings is growing, to date it has failed to explore innovation within business models. Instead, it largely focuses on technological innovation, for example within the health, agri-food or ICT sectors (Eastwood et al., 2019; Gremmen et al., 2019; Long et al., 2020a,b; Stahl et al., 2017), or taking conceptual or review approaches to establish the relevance of the concept for industry actors (Halme and Korpela, 2014; Nazarko, 2019). Critically, engagement with business models or related innovation process are largely missing or superficial (Hope and Moehler, 2015; Jarmai et al., 2020; Long et al., 2020a,b).

## 2.2. BMI, sustainability and responsibility

Business models are conceptual tools that show the underlying value creating logic of organisations (Osterwalder et al., 2005). They define how a business creates value, chooses customers and users,

which markets to enter, and are generally seen to include a value proposition, revenue model, key activities and key resources (Boons and Lüdeke-Freund, 2013; Chesbrough, 2010; Osterwalder et al., 2005; Osterwalder and Pigneur, 2013).

BMI is a key lever for enhancing sustainability, termed Sustainable BMI (Geissdoerfer et al., 2018). Sustainable BMI focuses on creating sustainable value, through changes to how an organisation, and its wider network, create value (Bocken et al., 2014). While we focus on the broader category of BMI, sustainable BMI research is helpful and relevant due to its focus on wider sustainable value, and explicit incorporation of societal and ethical factors (Boons and Lüdeke-Freund, 2013; Geissdoerfer et al., 2018).

In terms of normative BMI guidance, Boons and Lüdeke-Freund (2013) proposed that: (1) the value proposition integrates environmental and/or social additional to economic ones; (2) the supply chain is managed responsibly; (3) the customer interface motivates users to take responsibility; and (4) the financial model takes account of social and environmental externalities, ensuring fair distribution. While, in their review of sustainable BMI, Geissdoerfer et al. (2018) find that SBM definitions generally incorporate pro-active multi-stakeholder management, the creation of both monetary and non-monetary value for a broad range of stakeholders and incorporate a long-term perspective. The importance of stakeholder values is also well established in the SBM literature (Breuer and Lüdeke-Freund, 2016; Randles and Laasch, 2016).

Hence, clear synergies are observable between range of aspects of RI and sustainable BMI. Both use grand societal challenges as points of departure, via the aims or 'purpose' of an innovation, or the value proposition of a business model. Additionally, pro-active stakeholder management and stakeholder theories (Evans et al., 2017; Freudenreich et al., 2020) correspond well with stakeholder inclusion, and concepts of inclusive deliberation found in RI dimensions (Lubberink et al., 2017; Stilgoe et al., 2013). Indeed, one of the few contributions on responsible business models highlights the importance of stakeholder values to the business model design process (Hope and Moehler, 2015). However, such contributions are often focused on 'doing good', failing to conceptualise this deliberative inclusion process as one that also involves avoiding harm. Indeed, RI arguments that inclusive deliberation improves innovation outcomes and enhances societal embeddedness is corroborated by recent BMI research drawing on stakeholder theory (Freudenreich et al., 2020). Business modelling tools provide a rare exception, briefly highlighting the avoidance of harm, either through the concept of 'value destroyed' (Yang et al., 2017), which tries to capture negative impacts, within a value conception, or more broadly through negative externality conceptions (Bocken et al., 2013).

Yet, what a RI lens may add to the BMI literature are additional explanations for why positive 'do good' outcomes occur and/or are successfully embedded in society, or how BMI manages to avoid harm. Indeed, recent calls within the BMI literature highlight that there is a current lack of understanding why business models fail, including in terms of the design-implementation gap, both issues that can be attributed to socio-ethical factors, according to RI (Geissdoerfer et al., 2018; Stilgoe et al., 2013; Voegtlin and Scherer, 2017; Von Schomberg, 2013).

## 3. Methods

### 3.1. A framework for responsible BMI

In this section, we synthesise previous RI and BMI approaches to form a framework to explore how socio-ethical factors interact with BMI processes. A central tenet of our framework asserts that



socio-ethical factors influence BMI and that BMI and the business models impact socio-ethical factors (see Fig. 1).

We incorporate the '3Ps' approach to RI as this provides a broad and inclusive framework able to capture input, process and impact factors of BMI (Stahl et al., 2017).

*Purpose* considers input factors, highlighting the motivations for BMI, the extent of any initial awareness of socio-ethical factors, and to what extent grand societal challenges represented an input into the formation of the value proposition – a key similarity between RI and BMI (Boons and Lüdeke-Freund, 2013; Stilgoe et al., 2013; Voegtlin and Scherer, 2017). The context, motivations, values and philosophy of the organisation and its innovators are all key data, providing explanations for why certain processes were (or were not) undertaken and provides a point of departure. For instance, it is likely that the motivations and values of the entrepreneur (Bronson, 2019; Randles and Laasch, 2016) influence the innovation process, such as levels of inclusivity, and the outcomes.

*Process* focuses on how the BMI process unfolds. Here, we draw on the AIRR framework dimensions of anticipation, inclusivity, reflexivity and responsiveness (Stilgoe et al., 2013). Anticipation covers the extent to which companies consider and anticipate potential (socio-ethical) impacts of their BMI; here we seek to capture not just expected 'value' additions, to the innovators, users or stakeholders (Yang et al., 2017), but also wider socio-ethical impacts. Inclusivity considers who is deliberately included in the innovation process, and how. For example, whether stakeholders are just consulted versus being included in a co-creative approach. Stakeholder inclusion is a core component of BMI (Freudenreich et al., 2020; Stubbs and Cocklin, 2008), however, RI suggests that for successful innovation, stakeholder inclusion must include consideration of socio-ethical issues (Lubberink et al., 2017), where social and ethical aspects are explicitly considered. It should be noted that it is not the stakeholder inclusion that is seen as novel, but rather the explicit incorporation of social and ethical themes and topics in the process. Reflexivity is used to describe the extent to which companies' question or consider their role and relevant moral boundaries. Through the responsiveness dimension, we seek to capture adjustments to the business model and/or innovation process. The influence of these RI dimensions differs according to the values and motivations evident in the 'purpose' aspect (Bronson, 2019) and stage of the innovation process (Long et al., 2020a,b), for instance, responsiveness is likely to be more important towards the end of the innovation process, compared to anticipation, which may be more important towards the beginning.

Fig. 2 provides a simplified representation of the conceptual framework, while Table 2 gives an overview of the key concepts and their operationalisation.

*Product* focuses on the output of the BMI process: the new business model launched. We utilise a simplified 'value' based approach in order to judge and structure how the business model interacts with its environment. We distinguish between the Value Proposition (what value is provided and to whom), Value Creation & Delivery (how is value provided) and Value Capture (how does a company make money and captures value), while incorporating principle of responsible and sustainable business models (Bocken et al., 2014; Boons and Lüdeke-Freund, 2013; Chesbrough, 2010; Hope and Moehler, 2015; Osterwalder and Pigneur, 2013; Von Schomberg, 2013).



Fig. 1. Interaction between socio-ethical factors and business model design and operation.

### 3.2. Data collection and analysis

We explore how BMI interacts with socio-ethical factors through the context of bike sharing in three Dutch cities, illustrating different impacts and responses: Amsterdam, Rotterdam and Utrecht. This is an interesting setting as the Netherlands is a typical cycling country and the technology used (i.e. bicycle) is long-standing and widely accepted.<sup>5</sup> This allows business model effects to be isolated more easily from novel technological effects. We examine seven innovative bike sharing companies, analysing the BMI process (covering conceptualisation and implementation) and the socio-ethical impacts. We focus on 'one-way free-floating' bike sharing business models (van Waes et al., 2018a), which have been met with mixed results across cities. Given the novelty of these bike sharing systems and the propensity for start-up companies to be dynamic and subject to change, we took a case study approach (Yin, 2012).

Data was collected from 2017 to 2020 from primary and secondary sources. Semi-structured interviews were conducted in two rounds (See Table 1 for an overview. Interviews are referred to in the text as r1 through to r12). Two rounds of data collection allowed us to capture and reconstruct the unfolding of FFBS in different cities. During the first round (2017), FFBS was in the start-up phase and launched by different companies in Amsterdam, Rotterdam and later in Utrecht. Interviews were conducted with founders and/or managers of FFBS companies. Interviews were structured according to the business model dimensions (mainly focusing on Input and Product factors in Table 2). One company was not open for an interview, so insights about this company (Obike) were generated through secondary data sources.

During the second round (2020), the bike sharing sector had stabilized. Market saturation took place (i.e. some of the early companies left and new companies entered) and municipalities implemented regulations. Table 2 shows the launching date per company in each city, illustrating their operating period. Policy-makers were also interviewed during the second round to understand how municipalities dealt with the impacts of FFBS. This round of data collection was oriented at BMI and the end product (mainly focusing on Process and Product factors in Table 2).

Due to the dynamic character of the sector and the companies, the data collection approach had to be adaptive and flexible, and as such, was iterative in nature, with initial interviews informing subsequent ones (Easterby-Smith et al., 2012). Interviews took around 60 min, were conducted face-to-face or via video chat apps and recorded for transcription.

In addition to interviewing, market and regulatory dynamics were closely observed and monitored. For all cases, data was triangulated using secondary sources (newspaper articles, company websites & press releases, policy documents). Through triangulation we sought to further validate the data through cross verification of additional sources, using different instruments (secondary courses versus primary interview data). The interview and secondary data were used to reconstruct implementation strategies, explore the final business model configuration as well as give insights into the BMI process. The data allowed the impacts of the systems (positive and negative) and associated business models to be considered.

Analysis involved extracting relevant text fragments from the transcribed interviews and supporting documentary evidence that could help answer the research question. This text was then coded

<sup>5</sup> Proportion of bike use in Amsterdam, Rotterdam and Utrecht (other modes: walking car, tram, metro and bus), respectively: 25%, 19% and 29% (Kennisinstituut voor Mobiliteitsbeleid, 2019).

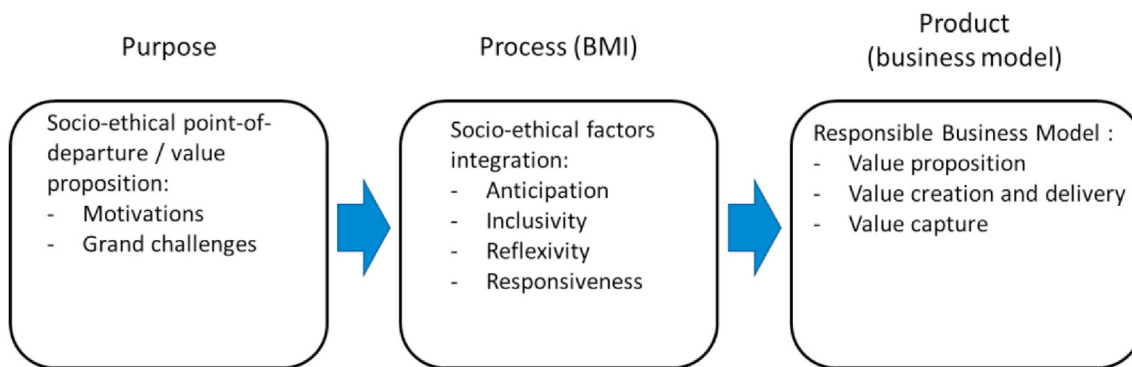


Fig. 2. Conceptual framework.

Table 1  
Overview of interviewees.

	Respondent	System	Interviewee	Date
Round 1	r1	Donkey Republic	CEO and co-founder	3-9-2017
	r2	HelloBike	Managing director	1-2-2017
	r3	FlickBike	Founder	27-9-2017
	r4	Ofo	Country manager	23-8-2017
	r5	Mobike	Advisor	15-2-2018
	r6	Donkey Republic	Local manager Amsterdam	8-2-2018
	r7	Donkey Republic	Local manager Utrecht	5-6-2019
Round 2	r8	Donkey Republic	CEO and co-founder	5-2-2020
	r9	City of Rotterdam	Project manager and advisor bike sharing	26-2-2020
	r10	City of Utrecht	Project manager bike sharing living lab	2-3-2020
	r11	Mobike	Manager Rotterdam	26-2-2020
	r12	Jump	Head of Benelux Policy	23-3-2020

into the framework shown in Fig. 2, covering purpose (inputs), process (BMI) and product (the business model). Table 2 shows how the conceptual framework was used for coding the data. Following this, we sought to identify patterns among the companies (Yin, 2012), which produced unique case specific themes and patterns. These themes and patterns could then be compared between companies (companies compared to one another).

### 3.3. Research context: business model launch and city responses

In this section we describe how FFBS was introduced and responded to in cities.

#### 3.3.1. Introduction of free-floating bike sharing companies to the Netherlands

Bike sharing is nothing new to the Netherlands; the first public bike sharing system in the world (Witte Fietsenplan) was founded in 1965 in Amsterdam. Although this model ultimately failed, a radical idea was born. Since 2004, the national railways operate a successful system (OV-fiets) focusing on the last-mile for train passengers. This dominant model faced competition from 2016, as a new generation of bike sharing business models emerged, first in Amsterdam, and later in Rotterdam and Utrecht.

These new business models aimed at facilitating one-way journeys. The value proposition seeks to allow bike pick-up and drop-off anywhere in the city, providing more freedom than other models. Apps are used to highlight the location of available bikes, with the aim that there is always one within walking distance. This model also means there is limited-to-no physical infrastructure, but that parking space within public areas is an important resource. This contrasts to other, traditional bike sharing models, such as ‘two-way station-based’, where bikes are typically hired from a train station and must be returned to that point after (for example,

the above mentioned Dutch OV-fiets), or ‘one-way station-based’ systems, with a network of physical docking stations in a city and the bike can be parked in these stations (for example, Santander Cycles in London and Vélib in Paris) (van Waes et al., 2018a).

One of the first new players was Hellobike (Amsterdam-based start-up founded in 2016) that placed 500 bikes at Zuidas business district having won a tender in 2016. From summer 2017, several other companies introduced bikes and within a few weeks 5000–7000 bikes were put on the streets of the city centre (Gemeente Amsterdam, 2017). The bikes were placed on the streets overnight, often without formal consent from the municipality. Among these companies were Flickbike (Amsterdam-based start-up, founded in 2017), Donkey Republic (founded in 2015 in Denmark) and Obike (founded in 2017 in Singapore). The latter company was also active in Rotterdam. In this period, the two largest global bike sharing companies, Ofo and Mobike (both founded in China in 2016), opened offices in the Netherlands. Ofo operated in Rotterdam and since 2017, Mobike operated in Rotterdam, Delft and The Hague. Since 2019 e-bikes are provided in Rotterdam by Jump. Jump was originally founded as Social Bicycles in 2010. In 2018 the company rebranded into Jump, and was acquired by Uber in the same year. In 2020 the company was acquired by Lime, a micro mobility company from the U.S.

#### 3.3.2. City responses

The three cities show different responses to FFBS (Table 3 provides an overview of FFBS entry and exit and municipal responses). Within a few months, the rapid growth and its impacts led to a ban on all FFBS companies in Amsterdam in October 2017 (See van Waes et al. (2018a) for a thorough description). FFBS had limited public and political support due to problems with bike parking and the management of public spaces (O’Sullivan, 2017). With no clear rules, the city initially proposed a two-year pilot with three

**Table 2**  
Operationalisation of conceptual framework.

Socio-ethical factors and definitions		Empirical evidence (i.e. examples of what to look for/indicators)
Purpose	Motivations and grand societal challenges: The extent of any initial awareness of socio-ethical factors, and extent grand societal challenges represented are an input into value proposition formation.	<ul style="list-style-type: none"> <li>- Motivations, values and philosophy of the organisation</li> <li>- Awareness of potential socio-ethical aspects related to business model.</li> <li>- Mentions of links between BMI and grand societal challenges.</li> <li>- Additional motives for operating business model (e.g. marketing, data collection, building a mobility platform, etc.)</li> </ul>
Process	Anticipation: efforts taken to consider and anticipate potential socio-ethical impacts	<ul style="list-style-type: none"> <li>- Awareness about potential unforeseen impact of business model</li> <li>- Systematic efforts to think about and avoid potential negative impacts as well as highlight new innovation opportunities and what desirable futures look like - Formal or informal use of scenario planning, foresighting techniques, horizon scanning, or similar.</li> </ul>
	Inclusivity: considers who is included in the innovation process, and how	<ul style="list-style-type: none"> <li>- Efforts to include a diverse set of societal stakeholders in the innovation process (e.g. engagement with cities, companies, users, universities)</li> <li>- Engagement efforts through consulting, collaboration or other deliberative or dialogue-based approaches, which include consideration of socio-ethical issues.</li> <li>- Efforts to manage stakeholders locally, including raising and discussing socio-ethical aspects.</li> </ul>
	Reflexivity: extent to which companies question their own role and relevant moral boundaries.	<ul style="list-style-type: none"> <li>- General reflections on industry, business models, current and future developments</li> <li>- Reflections and awareness about roles and responsibilities</li> <li>- Reflection and consideration of the internal and wider values and systemic aspects that influence socio-ethical aspects (e.g. contemporary industry practice around the collection of user data and the ethics attached to this, or reflection of societal impacts of regulation).</li> </ul>
	Responsiveness: adjustments to the business model and/or innovation process in response to issues raised relating to anticipation, inclusivity and reflexivity.	<ul style="list-style-type: none"> <li>- Alterations made to the business model in response to: negative societal impacts, changing local circumstances (e.g. changing discourse, limited public acceptance, introduction of legislation) and stakeholder (community, regulator) feedback or responses.</li> </ul>
Product	Value proposition	<ul style="list-style-type: none"> <li>- Degree to which applied value propositions incorporate grand societal challenges (e.g. linking to challenges such as health, environment, social inequality), For whom is value provided?</li> <li>- Socio-ethical impact of applied value proposition, for example, ensuring access for wide set of consumers (non-exclusion of disadvantaged groups) and consideration or recognition of impacts on local communities</li> </ul>
	Value creation & delivery	<ul style="list-style-type: none"> <li>- Activities that reflect principles of sustainability and responsibility</li> <li>- Processes to manage and maintain bike sharing systems (e.g. redistributing bikes, managing disputes or complaints)</li> <li>- Practices that reflect responsible use of public parking space</li> <li>- Lifecycle: footprint and lifetime of bikes</li> <li>- Bike's user experience</li> <li>- Quality and safety standards</li> </ul>
	Value capture	<ul style="list-style-type: none"> <li>- Handling of user data</li> <li>- Primary (e.g. bike sharing fees and subscriptions) vs secondary or additional sources of income (e.g. advertisements, data collection)</li> <li>- Growth strategy and ethos</li> </ul>

**Table 3**  
Month of entry and exit of companies in Amsterdam, Rotterdam and Utrecht and local responses.

	Amsterdam	Rotterdam	Utrecht
<b>Companies</b>			
Hellobike	Nov 2016-current	–	–
Flickbike	Jun 2017– Oct 2017	–	–
Obike	Jun 2017– Oct 2017	June 2017–June 2018	–
Donkey Republic	May 2017– Oct 2017	Aug 2017 – current	April 2019 – current
Mobike	–	Nov 2017 – current	–
Ofo	–	Nov 2017–2018	–
Jump	–	Oct 2019 – current	–
<b>Municipal response (policy)</b>	Banned FFBS within 3 months after introduction	Welcomes multiple companies and has a licensing system that sets rules	Selected a single company based on a tender procedure and set up a living lab

providers, a maximum fleet of 3000 bikes and minimum use of bikes of 4 trips per bike per day (Gemeente Amsterdam, 2017). In this institutional vacuum, companies tried to influence policy in Amsterdam, proposing alternative regulations and pilot projects. At the same time some companies relocated to other cities such as Rotterdam. Eventually the municipality decided in 2019 that FFBS would not be allowed due to limited public support,<sup>6</sup> likely

<sup>6</sup> Only Hellobike was allowed to stay as they got formal permission to operate at a business district outside the city centre.

impacted by the practices of many of the companies.

Rotterdam was more welcoming towards FFBS. Initially, in 2017, Obike, Ofo, Mobike and Donkey Republic operated in Rotterdam and the municipality was pleased with their presence (r9). During a pilot phase, the municipality consulted the companies (e.g. quarterly meetings), introducing a licensing system in 2019 which creates agreements with companies (e.g. minimum use per bike per day requirements, rules with regards to customer care, maintenance, redistribution, data sharing). This enables the municipality to intervene in case of nuisance, for example when shared bikes are lying around (NRC, 2019). In 2020, the market has changed – some

Purpose	Process	Product
Motivations & societal challenges <ul style="list-style-type: none"> <li>Solving 'last mile' issue</li> <li>Sustainable mobility</li> </ul>	Inclusivity: <ul style="list-style-type: none"> <li>(Shift to) cooperative/ co-creative approaches (e.g. agreements, living lab)</li> </ul> Responsiveness: <ul style="list-style-type: none"> <li>Recognition of problems and BM adjustment</li> </ul> Reflexivity: <ul style="list-style-type: none"> <li>Reflections about the field of bike sharing and regulations</li> </ul>	Value proposition <ul style="list-style-type: none"> <li>For users: flexibility and sustainable mobility</li> <li>For cities: sustainable mobility without additional public funding</li> </ul> Value creation and delivery <ul style="list-style-type: none"> <li>Inclusive, co-creative approaches with cities, researchers and social working places (data sharing)</li> <li>Maintenance, redistribution, reuse of bikes</li> <li>Qualitative bikes</li> </ul> Value capture <ul style="list-style-type: none"> <li>Fees and subscription</li> </ul>
Underlying motives: <ul style="list-style-type: none"> <li>Technology companies: data driven business models</li> <li>Transparency about hidden value proposition</li> </ul>	Not anticipated: <ul style="list-style-type: none"> <li>Impacts on public space not anticipated</li> </ul> Non-inclusive: <ul style="list-style-type: none"> <li>Minimal engagement/ non-cooperative</li> </ul> Unresponsive: <ul style="list-style-type: none"> <li>Failure to respond to issues (community backlash/ abuse of public spaces)</li> </ul> Reflexivity: <ul style="list-style-type: none"> <li>Limited</li> </ul>	Value creation and delivery <ul style="list-style-type: none"> <li>Uncooperative approach</li> <li>Limited maintenance and bike not attuned to local standards</li> </ul> Value capture <ul style="list-style-type: none"> <li>Platform integration</li> <li>Growth strategy: release first, ask permission later</li> </ul>

Fig. 3. Analysis of FFBS business model interaction with socio-ethical factors.

companies left, and newcomers entered the city – with Mobike, Donkey Republic and Jump as the only remaining companies.

The Amsterdam FFBS ban also prompted companies to relocate bikes to Utrecht. Like Amsterdam, Utrecht is considered a typical cycling city as a substantial proportion of urban movements is done by bike (see footnote 4). However, the municipality was cautious following Amsterdam's experience and set up a two-year living lab experiment, in collaboration with Utrecht University, to learn if and how FFBS can contribute to urban mobility. Donkey Republic is the single FFBS company in Utrecht, operating 700 bikes. The company had to agree on requirements with regards to dedicated parking zones, maintenance and service and sharing user data (r10).

#### 4. Results and analysis

In this section, we apply the framework developed in section 2.3 – a populated version can be found in Fig. 3. We highlight motivations of different companies, key BMI events, before examining the key business model elements related to noted socio-ethical impacts.

##### 4.1. Purpose

###### 4.1.1. Motivation and grand societal challenges

As per the sampling strategy, all cases shared a basic business model – FFBS – aimed at providing first/last mile transportation and contributing to sustainable mobility, highlighting that all cases had a grand societal challenge motivation (or purpose). Companies also sought to address local (Dutch) challenges, such as the abundance of bikes, abandoned 'orphan' bikes, bike parking pressure or mobility poverty.<sup>7</sup> For example Ofo, Donkey Republic, Mobike and Flickbike aimed to solve the problem of 'orphan' bikes and decrease bike parking pressure (r1, r3, r4, r5) "If something breaks, people leave their bikes and buy a new one. If people from Amsterdam no

<sup>7</sup> These are also identified by municipalities as key cycling related challenges (Gemeente Amsterdam, 2017; Gemeente Rotterdam, 2018; Gemeente Utrecht, 2015).

longer have their own bike but rather have access to a shared bike, this will lead to more space in the long term". Besides start-ups, also existing companies entered the market, complementing existing mobility services. For example, the e-bikes of Jump are accessible through the Uber app. Bike sharing is an addition to their existing – rides – service: the bikes are mainly used for short trips, during rush hour in city centres (r12).

Remarkably, some cases show additional motives that raised potential socio-ethical issues. For example, Ofo views itself as part of a wider 'internet of things' ecosystem which values data collection. The company considers itself a platform – comparable with platform-based companies Uber and Airbnb – that connects bikes and bike sharing companies rather than just owning and producing bikes: "We always say that we are a platform. Our dream is that in ten years, with one Ofo account, you can open all the bicycles on the streets, in every country." (r4). The company also highlights they differ from traditional bike sharing companies: "We never call ourselves a bike rental business. Just like Uber never called themselves a taxi business. They call themselves an internet company. The business model of an internet company is based on volumes. The bigger volumes we get, the bigger the profit we will earn in the future." (r4).

This quote highlights first, that the FFBS companies relied on high volumes for their profitability, which likely influenced their launch strategies. Second, this quote highlights the potential additional value propositions around data collection and digital payments, partly reflected by the close links between FFBS companies and large technology and e-commerce companies. The could change the aim to one of maximising interactions and use of the platform to create value, rather than providing bike sharing. Chinese e-commerce giant Alibaba invested in Ofo and since 2018 Mobike's parent company is Meituan-Dianping, China's largest provider of on-demand online services, such as food-delivery.<sup>8</sup> On a similar note, Mobike and Ofo are integrated with widely used Chinese social-media (such as WeChat – a multipurpose app by Tencent, one of the largest internet technology companies in the world), mobile payment (such as Ali-pay) and food-delivery platforms.

<sup>8</sup> After this acquisition, Mobike was renamed Meituan Bike in China.



This integration enables a large group of potential users to be reached. Data obtained through users of FBSS - using an app to locate and (un)lock a bike - could be commercially valuable (e.g. geo-based advertising), showing a potentially 'two-sided' business model, with a hidden value proposition. The nature of the model and the collection and use of this data raises questions around transparency and privacy.

Purpose can also change over time. For example, Jump was founded as Social Bicycles, a FFBS company that - like any urban transportation company - collaborated and established long term partnerships (incl. contracts and agreements) with cities to operate bike sharing systems and contribute to sustainable mobility. However, after being acquired by Uber the approach somewhat changed from this collaborative approach to an approach that did not involve close engagement with authorities (rather followed a 'launch first ask questions later' approach).

#### 4.2. Process

The elements of the BMI process were more varied, interacting with RI dimensions, which act as differentiators between the cases.

##### 4.2.1. Anticipation

The failures to anticipate problems highlight issues of anticipatory capabilities in relation to the BMI process, including implementation of the business model via the entry strategy. Some companies did not recognise the potential problems that could result from releasing FFBS into space restricted streets. While these models may be appropriate in urban locations, such as Chinese cities with a prominent last-mile problem, limited use of private bikes and availability of parking space, within Amsterdam and Rotterdam they were problematic, causing congestion in public spaces (r9) (Koops, 2017).

Examination of the entry strategies suggests some companies (e.g. Obike) expected their FFBS system of thousands of distributed bikes to manage itself, without further human support on the streets (r9). Other cases were more aware of local contexts from the start. For example, the business models of Hellobike and Donkey Republic combined 'dockless' bike sharing with designated parking zones,<sup>9</sup> avoiding the 'uncontrolled' parking issues. Companies (e.g. Donkey Republic, Mobike, Flickbike) also had street operation personnel, responsible for maintenance and redistribution of bikes. This raises the question - to be tackled next - of why these cases seemed to have enhanced adaptive capacity, and so be better able to foresee potential issues and mitigate accordingly.

*Inclusivity* acts as a differentiator among the cases. Although some companies (i.e. Obike, Flickbike, Ofo) claimed they informed the city about their operations, there was no formal engagement or consent with the authorities (r3, r4). A 'launch first, answer questions later' approach helped capture market share, but also resulted in lower inclusivity levels.

The lack of a legal base to regulate these innovative business models (r9) meant there were no formal procedures for dialogue, showing how also urban authorities (i.e. Amsterdam and Rotterdam) were unprepared and lacked anticipative capacity (due to the very quick and unannounced launch). At the same time, these urban authorities were responsible for most of the engagement efforts, aimed at stimulating dialogue with companies and working towards a collaborative and inclusive approach to BMI, through established systems. In Amsterdam and Rotterdam, companies were consulted prior to decisions about regulatory frameworks

(r9). In Utrecht, a single company was selected to participate in a living lab. This resulted in fewer issues and highlights co-learning from the Amsterdam experience regarding inclusivity and anticipation (r10) (te Brömmelstroet et al., 2020).

The recruitment of local staff - which varied among the cases - emerged as a facilitating factor for foreign companies to engage with local authorities and try to establish longer term relationships. For example, Mobike hired a local bike sharing professional with an established network as a manager, enhancing sensitivity to the local (socio-political) context (r5). In stark contrast, Ofo sent a single Chinese employee to launch across the whole Benelux region in only three months (r4).

##### 4.2.2. Reflexivity

The cases show varied reflexive capacity about roles and responsibility in the FFBS market. For example, some advocated a role for government regulation: 'A bike sharing system will only work when regulated by the municipality' (Cornelissen, 2017). In contrast, other companies did not understand measures taken. For example, Obike called Amsterdam's ban of FFBS a 'hate campaign'.

There was also recognition of the impact of irresponsible behaviour and the potential of reputational damage to FFBS in general: "Since Obike launched in the Netherlands bike sharing got a negative reputation. They had a different approach: quickly making money by putting thousands of bikes on the streets without further management or maintenance and without taking the urban environment into account" (r11).

##### 4.2.3. Responsiveness

In response to unintended negative impacts of FFBS, several firms continued the innovation process, adjusting the BM. Municipalities played an important role in stimulating this subsequent BMI as they regulated bike sharing through pilots, living labs, assessments and monitoring. Companies can be split into those that responded and adjusted to issues, such as concerns around the use of public space, and those that did not.

In relation to the uncontrolled parking of bikes, and congestion of public spaces due to FFBS, some providers (e.g. Donkey Republic, Flickbike) proposed to work with designated public or private parking areas, adjusting their business models to align to the city's specific contextual needs (r3, r6) (Voermans, 2017).

Some companies adjusted their revenue model, taking local challenges as an opportunity to attract new users. For example, bike parking pressure at train stations can be relieved through bike sharing. Mobike and Donkey Republic collect private bikes (often a second bike parked at a train station) and in return owners could receive a subscription for bike sharing (r7, r9). In Rotterdam, these bikes were donated to social community projects and low-income families.

Companies were also responsive to national and local governments' ambition for interoperable bike sharing enabled by an overarching platform allowing access to different systems. Several bike sharing companies took up this idea; Mobike: "Eventually we want you to be able to access a bike everywhere with one account, whether this is a station-based bike like OV-fiets, a free-floating bike like Mobike or a lease bike like Swapfiets" (Van Tongeren, 2018).

#### 4.3. Product

The business models that emerged from the process described, went through adjustments in some cases. In the following section, rather than providing an exhaustive description, we draw attention to the most interesting aspects of the business models in relation to socio-ethical issues.

<sup>9</sup> Bikes can only be parked and (un)locked within these 'geographically fenced' zones which are shown in the bike sharing app.

#### 4.3.1. Value proposition

The value proposition of FFBS companies is similar across all cases: providing access to a bike that one can take and drop a bike anywhere in a city (flexibility).<sup>10</sup> For cities, FFBS companies provide an attractive proposition, as they do not demand public funding in contrast to the traditional bike sharing systems with physical docking stations. However, the 'free-floating' aspect was adjusted (in line with responsiveness dimensions) in some cases in response to restrictions by authorities. Although these adjustments – from free-floating to a system with dedicated parking zones – also raised viability questions, as highlighted by oBike: "Our system works optimally when you are able to pick a bike every 200 m. Only then it's able to grow, we can see where there is a demand for bikes and where not. All the pilots in cities with only 20 bikes won't work. It is a pity that the municipality took this drastic measure. This gives bike sharing a bad name." (Voermans, 2017).

This exposes a tension between a 'responsible' value proposition – the ability to ride and park anywhere – and profitability. Additionally, value proposition aspects with questionable business ethics included: additional, hidden, value propositions around data and financing (creating two-sided business models), which drove some cities to ask for further compliance. And, excluding particular areas from bike sharing by the company. For example, the municipality of Rotterdam suffers with 'mobility poverty' in less developed areas, which could be alleviated through bike sharing (r9). There is evidence they do not provide their service in such areas, due to low demand and risk of vandalism (r11, r12) (van Veelen, 2020).

#### 4.3.2. Value creation and delivery

Value creation and delivery aspects relevant to socio-ethical issues included engaging in and maintaining partnerships, the redistribution management of bike fleets, and repositioning disorderly parked bikes in response to complaints.

Collaborative and partnering activities emerged as a critical BMI aspect, differentiating companies who were able to adapt, and those who were not, reinforcing the importance of inclusivity and its links to anticipative capacity. In response to initial problems, collaborative activities have been established – often initiated by municipalities – with both local authorities and communities, through dialogue, market consultations and 'living labs'. The agreements made between municipalities and companies to share data to learn about FFBS is one example, where the municipalities of Rotterdam and Utrecht now require companies to share data through a national dashboard, so authorities can see where bikes are parked and how long they are inactive (r9, r10).

In the early phase, some companies failed to install adequate systems, inconveniencing others. Long-parked bikes cause most nuisance. To counter this, cities have set minimum use per bike requirements. After a while, bikes need to be replaced. But this redistribution is a relatively expensive activity for companies.<sup>11</sup>

Companies engage in several activities to adequately handle complaints, for example regarding long-parked unused bikes. Most companies have personnel on the streets for handling parking<sup>12</sup> or

<sup>10</sup> This study does not primarily focus on users and their experience in using these bikes. Nevertheless, evidence from the Netherlands – where bike ownership is the norm – shows there is a demand for this form of bike sharing, but it mainly replaces walking, cycling (with a private bike) and public transport trips (Farla, 2019; Ma et al., 2020; Van Waes et al., 2018a,b).

<sup>11</sup> A bike stands still for too long signals limited demand. To prevent this, companies limit parking zones to areas with high demand for shared bikes.

<sup>12</sup> Users have a key role to play when it comes to parking. Disorderly parking is one of the main negative side effects of FFBS. Municipalities encourage companies to incentivize responsible parking behaviour, for example by giving credits that can be used for bike sharing (r9, r11). This highlights how key activities are an area of the business model that interacted with (negative) socio-ethical factors.

maintenance issues. Companies in Rotterdam are also obliged to have a telephone number through which citizens can file complaints. However, platform orientated companies (e.g. Mobike, Jump) criticize such a rule, as they prefer a cheaper digitized complaints system (for example through their own app with a chatbot) (r11, r12). *The municipality doesn't realize the costs involved of a call center. These are quite high per individual bike ride. Usually, we take care of issues through the app. A human call center leads to more communication which is not handled efficiently* (r12). This highlights that activity and resource decisions, critical for value creation and delivery, are influenced by economic concerns of the companies.

The need for maintenance is of course related to the quality of bikes, a key resource of companies. Whereas some companies provide bikes that meet local standards and practices, there were also some companies that introduced low-cost bikes not attuned to the local cycling experience. Especially, the type of bikes, of poor quality and lacked maintenance, caused controversy among municipalities and citizens.

#### 4.3.3. Value Capture

Finally, the primary stream of income comes from bike sharing fees and subscriptions.<sup>13</sup> Companies compete with different fees.<sup>14</sup> But, for companies to maintain affordable FFBS proves to be challenging when they need to comply with requirements by authorities to prevent socio-ethical impacts. Companies are generally positive about such measures, although they could lead to more expensive (and thus less attractive/accessible) bike sharing. As Mobike highlights, "Nothing is for free. All extra efforts come with costs, which needs to be charged to our users in order to keep bikes sharing financially feasible" (NRC, 2019). According to Jump, such requirements need to be balanced with price and demand: "If you set requirements that are not efficient, this will lead to increases in price, which makes the bike less accessible, leading to lower use rates and a less efficient system." (r12).

## 5. Discussion

In this research we sought to explore how BMI interacts with socio-ethical issues, including the role of socio-ethical issues in the innovation process, and the socio-ethical impacts of the BMI by presenting FFBS as an example of BMI, within a sharing economy context, we explore a case demonstrating unintended and negative consequences and the role that BMI processes played. In this section, key findings and implications for practices and future research are discussed.

### 5.1. Business model innovation interaction with socio-ethical factors

To address the research question of this paper, the results show how BMI interacts with socio-ethical factors, illustrating how these factors can play a key role in the success or failure of BMI.

Almost all companies, as well as municipalities, within the case were initially unable to anticipate impacts during initial conceptualising and implementation of the business model. We see that following initial implementation there were both intended and unintended impacts, with unintended negative impacts of a socio-ethical nature leading to initial bans. Following this, our cases split

<sup>13</sup> In section 4.1 we discussed how some companies may have hidden value proposition with an additional revenue model besides bike sharing fees.

<sup>14</sup> Tariffs varied: €0,50/30 min with Mobike or Obike; €0,20/minute for a Jump e-bike.

into those companies who were able to exercise ‘inclusivity’ and ‘responsiveness’ and adjust their business models, and those who either would or could not. This latter category of firms were inflexible in terms of ‘incorporating local needs and market conditions’ (which included limited bike storage space within the local environment and poor quality, inappropriate bike models).

We illustrate this in Fig. 4, highlighting the ‘process’ element of our framework. This shows how RI in our case is actually represented by a process of BMI implementation followed by learning and adjustment, with key RI dimensions operating at different points. BMI and socio-ethical factors interact: the implemented business model creates or aggravates socio-ethical issues, which in turn motivate additional BMI and adjustment. Anticipation, inclusivity and reflexivity have relevance in the initial stage of BMI, while the fourth dimension, responsiveness, only becomes relevant once initial impacts were observable. This is somewhat at odds with the RI literature, which idealistically sees these processes occurring in a way that inhibits and prevents unintended and negative impacts (Lubberink et al., 2017; Stahl et al., 2017; Stilgoe et al., 2013), whereas, in our cases, these dimensions operate reactively, to socio-ethical impacts.

We propose that in the absence of institutionalised RI – i.e. where RI is not a norm, nor embedded in organisational or governmental cultures, as is likely the case in many contexts – a period of business model implementation is required as a learning period. This highlights a potential key role for RI and sensitivity to socio-ethical issues during business model experimentation efforts, a burgeoning area of the literature (Bocken et al., 2019). Indeed, we observe that FFBS companies learnt from one another, alongside

public authorities, who implemented ‘learning’ spaces aimed at monitoring and generating insights about impacts (such as the Living Lab in Utrecht and the pilot in Rotterdam).

In highlighting these core results, we empirically confirm our criticism that current RI literatures focus on technological innovation misses the key influence that BMI, and the business models it leads to, can have on the (socio-ethical) impacts of technologies (Jarmai et al., 2020; Long et al., 2020a,b; Stubbs and Cocklin, 2008). In doing so, we expand the number of contexts that RI approaches may be relevant to and the value of socio-ethical perspective. This raises the question of the extent to which an RI lens is applicable to other non-technical types of innovation, such as social innovation.

We do recognise that anticipating repercussions of the implementation of innovative business models, such as FFBS (combined with the absence of established regulations), is challenging. Each city responded differently with local context specific measures (strict ban, pilot or living lab). Implementing a new business model in practice is guided by an iterative process of learning by doing and adjusting. In this sense, the processes in our case follow previously identified processes. The additional value of RI is its ability to highlight the role that socio-ethical issues specifically, play in these processes and introduces socio-ethical factors as an additional category for BMI failure and design-implementation gaps (Geissdoerfer et al., 2018), alongside existing failure reasons such as changing prevailing mind-sets, triple bottom line challenges or insufficient resource allocation (c.f. Evans et al., 2017). Hence, we acknowledge that BMI failure is not only due to socio-ethical issues, but that a RI lens highlights additional factors and presents a more holistic picture.

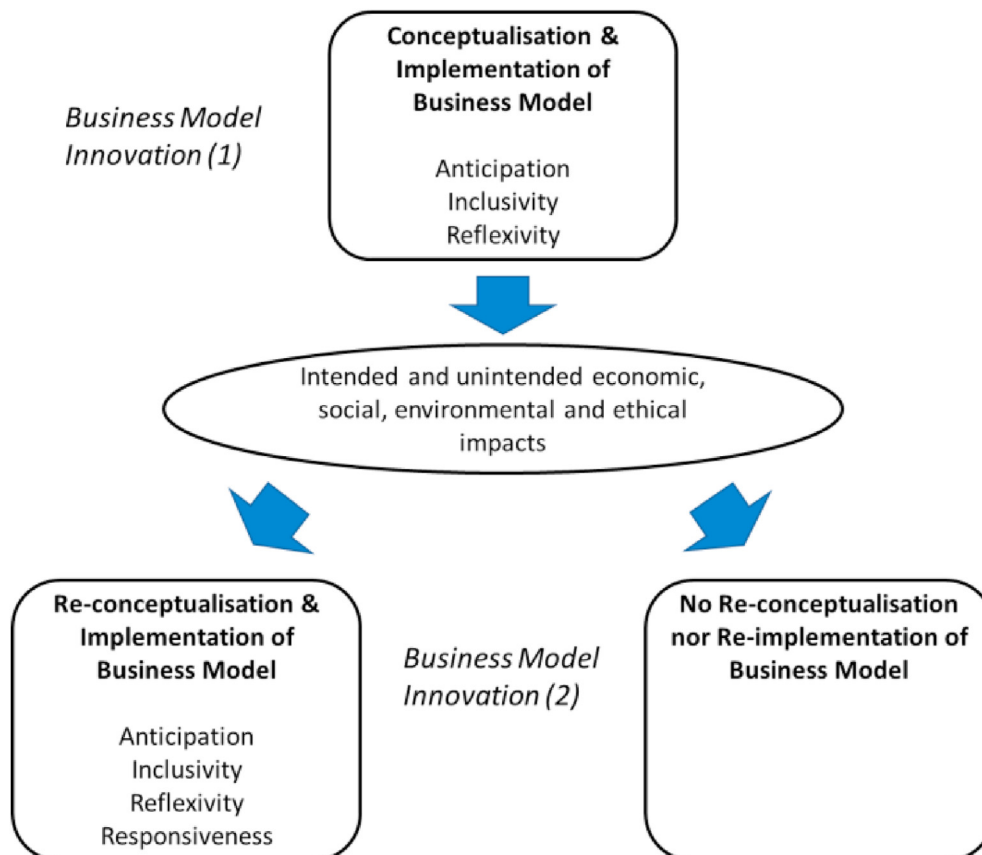


Fig. 4. How a responsible BMI processes unfolded in the case of bike sharing: interaction with socio-ethical issues.

## 5.2. Locally embedded and top-down applied platform-based business models

The second observation concerns the influence of underlying motivations behind business models on responsible innovation outcomes. Analysis of the case highlights two types of FFBS companies that deploy business models with different underlying purposes, influencing processes and strategies of responsible innovation and outcomes differently. Hence, the ability and inclination to enact responsible innovation processes and strategies is arguably influenced by, the 'purpose' dimension of our framework.

On the one hand the FFBS field contains of companies that apply a two-sided business model seeking additional sources of value creation (e.g. Obike, Ofo, Mobike, Jump). These companies associate themselves more with well-known platform-based businesses such as Airbnb and Uber rather than urban mobility providers.<sup>15</sup> They operate following a (top-down) platform logic that is reliant on acquiring large market share, leading to aggressive business model implementation strategies – 'launch first and legitimize later' – an approach often taken by platform-based businesses. The narrow profit margins of such platform-based mean high volumes (in this case bikes) are needed. Hence, rapidly reaching a large user base by putting large numbers of bikes on the streets was critical for these companies, which led to fierce competition and eventually could lead to a race-to-the-bottom. Backed by venture capital investors (with deep pockets), companies engaged in predatory pricing and shipped low-cost bikes with short life span, poor service, minimal redistribution and limited maintenance. These companies often also aim to minimise labour costs, often via minimising 'on the ground' personnel through automation and digitization raising questions over the appropriate relationship with local regulators (Cohen and Kietzmann, 2014).

Their reliance on scale and the way they were run, suggests that their primary ambition (purpose) was not to provide a sustainable solution to mobility challenges, but rather to establish and operate a platform (i.e. ecosystem or app) that creates additional economic value through data collection, advertisements and integration with other services. This would create value for the companies and its shareholders, but little for any other stakeholders – additional economic value at the expense of social value – raising business ethics issues (Freudenreich et al., 2020; Yang et al., 2017). This observation aligns with studies stressing concerns around the entry of new types of actors that are behind the surge in bike sharing and their additional interests in data gathering (Duarte, 2016; Spinney and Lin, 2018).

On the other hand, there are companies with a more local origin and community-oriented approach focused on local challenges (e.g. Donkey Republic). These provide a service that is more attuned local contexts, with a bike that matches the experience of users and with a business model less reliant on platform dynamics (gradually scaling vs rapid scaling), highlighting a more collaborative and mission-driven logic (Nixon and Schwanen, 2019). These types of firms, whose primary purpose is to provide a local sustainability solution, are likely to be more open to, and more adept at engagement with key stakeholders. Although in our case these companies were still subject to the same BMI implementation mistakes as the platform-based companies, they were able to leverage their focus on the locality and its communities to engage in inclusive deliberation, and establish which parts of the business model needed further adjustment. Hence, these companies benefited from incorporating local stakeholder perspectives and

<sup>15</sup> Whereas they can be considered more related to traditional public transport companies (a sector with its own logic, rules and practices).

needs (Bocken et al., 2013), as well as being able to adjust to these needs and produce a more locally relevant, socially desirable and ethically acceptable business model.

The RI lens enabled us to explore how additional purposes and different 'logics' (Stubbs and Cocklin, 2008) behind the BMI processes, led to different socio-ethical impacts, even while the core value propositions of all companies were the same.

The alternative purpose and underlying logic of the cases (Stubbs and Cocklin, 2008) can then be used as an explanatory factor influencing other aspects of the BMI process, including implementation, and the willingness and ability to enact subsequent BMIs. The underlying logic of the business models influences the type and nature of socio-ethical impacts, creates business ethics issues, and due to a reliance on scale and an inability to adjust, in these cases failure of the business model.

Additionally, we also see how purpose and its influence may not be static, and changes over time, as was the case with Jump, moving from a community-based model, to one more associated with the impacts and effects of the platform-based models after its acquisition by Uber. BMI literature has shown how institutional logics impact development trajectories, and our results add by highlighting a link with socio-ethical factors (Stubbs and Cocklin, 2008; Vaskelainen and Münzel, 2017).

The poor fit of the platform-based business model, in conjunction with an aggressive business implementation strategy meant that after 2 years (most of) these companies went bankrupt or left the Netherlands. Obike went bankrupt in 2018 (leaving their bikes for trash on city streets across the world, including in Amsterdam and Rotterdam).<sup>16</sup> In 2019, both Ofo and Mobike ceased all international operations and put sole focus on the Chinese market (Liao, 2019; Moore, 2020).<sup>17</sup> However, Mobike is still active in the Netherlands, but since 2020 operating independently from the Chinese mother company following a management buyout (r11). The founding purpose of these platform-based business models – to operate on a large scale in population dense areas, with limited cycling – demanded a necessary adaptation to the local context (in this case, regulated pilots in NL) which meant that their financial viability was restricted. Our cases highlight how RI principles are relevant not just in the design or conceptualisation part of a BMI process, but also during implementation.

## 5.3. Place dependency of (ir)responsible business model innovation

A third observation is that (ir)responsible BMI is context dependent. Although this study did not compare business models between different international contexts, the case of FFBS in Dutch cities should be viewed against the backdrop of the emergence of bike sharing across cities globally. While these business models do not inherently imply socio-ethical problems, this research has shown that the application to the Dutch context led to particular issues, observable through RI dimensions. FFBS was invented and applied on a large scale in China and although it also led to unintended impacts there (such as an over capacity of bikes), there have been additional issues in European cities (such as concerns about data privacy). This business model addressed a recognised urban challenge in China and was socially supported. However, as is clear, it did not mean it could be easily implemented in other urban contexts.<sup>17</sup>

<sup>16</sup> In Amsterdam, the redundant bikes that were left for trash and removed by the city were offered for sale at a local thrift store (AT5, 2018).

<sup>17</sup> This aligns with van Waes et al. (2020) that highlight that for effective business model implementation, both local institutional and physical aspects should be taken into account.



This means that the promise of easy implementation and transferability across contexts of platform-based models is potentially naive and ignores the importance of local context. Different contexts appear to lead to specific socio-ethical issues and challenges. This has important implications for wider sustainability innovations. Many sustainability challenges have a global nature yet are likely to have similar local and contextual dynamics; this is likely to be especially true where socio-ethical issues are prominent adoption and diffusion factors. Hence, this highlights the importance of perspectives such as RI that are able to both recognise and take account of socio-ethical factors, producing more socially desirable and ethically acceptable innovations.

#### 5.4. Implications for practice and future research

For FFBS companies, and managers working within other sharing economy applications our central recommendation is to apply RI principles to BMI processes. The sharing economy is characterised by high growth rates and often disruptive, technological and service innovations (Belk, 2014; Frenken et al., 2020; Owyang et al., 2013). This makes the sharing economy a prime candidate to experience socio-ethical challenges (Scholten and van der Duin, 2015); as our case shows, socio-ethical impacts are not isolated to high-tech innovations, they are also observable in disruptive non-technological innovations, highlighting the relevance of RI. Managers should ensure engagement and dialogue with stakeholders and implement internal innovation management processes that explicitly include socio-ethical issues, alongside more traditional financial and technological ones. These lessons could be particularly applicable to other innovative 'micro mobility' modes (including e-bikes and e-scooters), a rapidly growing sector with the potential of transforming urban mobility but also accompanied by irresponsible innovation dynamics, and provide an additional perspective to the burgeoning literature on bike sharing (Du and Cheng, 2018; Nikitas, 2019; Ricci, 2015; van Waes et al., 2018a). A limitation with regards to generalizability of the results is that this research focused particularly on BMI in the urban mobility domain within Dutch cities. Therefore, studying cases of (ir)responsible business model innovation in other domains within different spatial contexts may reveal different types of socio-ethical issues. Indeed, this research highlights the importance of socio-ethical factors for wider sustainable innovation diffusion and adoption. Broader research questions that require attention concern the types of innovation and contexts in which socio-ethical factors are likely to be important, as it is in these contexts that RI approaches will be most needed in order to enhance sustainable outcomes.

A key area for future research concerns the institutionalisation of responsible BMI processes, and the development of innovation governance systems (Voegtlin and Scherer, 2017). Our examples raise questions of how responsibility is and should be distributed between companies, regulators, and wider society (including users and researchers). This could include facilitating inclusive deliberation efforts and contributing towards anticipative capacity, through to the co-creation of experimental spaces aimed at learning about the innovation, as seen in Utrecht and Rotterdam. In other contexts however, institutionalisation process may rely more on firms themselves, drawing on self-regulatory types of approaches (Scherer and Voegtlin, 2020; Stilgoe et al., 2013). Linked to this is the issue of speed and scaling. The severity and urgency of sustainability challenges increasingly argues for more rapid innovation diffusions and scaling. Within this context, one can imagine supporting the rapid launching strategies seen within some of the cases. Indeed, rapid experimentation, enabling fast learning of what works and does not. However, this should be seen as distinct

from the non-inclusive launch first, ask questions later strategies, which although rapid, face additional socio-ethical challenges. Future research should explore how rapid experimentation can be connected to rapid scaling strategies that are also able to integrate RI principles, and in so doing, reap the innovation diffusion benefits. Another fertile topic for future research would be the interconnection of Design Thinking approaches for BMI and their ability to integrate RI principles. This has received some initial attention within the RI domain, and the BMI context could be an especially interesting avenue (Nathan, 2017; Pavie and Carthy, 2015).

## 6. Conclusion

In conclusion, we show that BMI processes interact with socio-ethical issues, affecting the relative success or failure of the business models that result. That BMI seems subject to the influence of socio-ethical issues, highlights a potentially new area for the application of responsible innovation, involving companies, regulators and communities. The case of FFBS shows that in the end, cities and their communities are key stakeholders in the BMI process, reiterating the importance of anticipation, inclusive deliberation and responsiveness.

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## Credit author statement

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## Declaration of competing interest

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

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