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Exploring social, economic and environmental consequences of collaborative production: The case of bike repair maker spaces in three European countries

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Abstract: Cities have emerged as leading forces in transforming societies towards sustainable development. Numerous repairs, do-it-yourself (DIY) and maker communities across European countries are established to: improve resource efficiency by extending the lifespan products through repair and part recovery from urban material streams; create new sources of income for local communities by sharing resources and skills; and enhance social cohesion by enabling new kinds of social interactions. The aim of this research study is to examine the contribution of such initiatives to the environment, economy, and society. The study focuses on cases of maker spaces in Sweden, Switzerland, and Spain engaged in bicycle repairs as study objects. The study addresses the following research question: What are the main social, economic and environmental impacts of collaborative production organizations? Overall sustainability effects of collaborative production activities depend upon the design, operational activities, and institutional contexts. Thus, this study analyses these cases of maker spaces from socio-economic, environmental and institutional entrepreneurship perspectives. Qualitative data is gathered through interviews with the organizers of maker spaces to formulate a systemic understanding of key activities (repair, resource recovery etc.) and exchanges (spare parts, skills, tools, financial etc.) carried out at the maker spaces in the context of the circular economy. A user survey focusing on the benefits of the maker spaces to the users is carried. The study contributes to identifying critical system dynamics associated with collaborative production in the circular economy context and highlighting main areas of further research assisting a better understanding of the systemic impacts of collaborative production.

Introduction

Cities have emerged as leading forces in transforming societies towards sustainable resource management through collaborative production and consumption. Indeed, cities across Europe have been supporting circular economy and collaborative production and consumption initiatives, such as, repair cafes, do-it-yourself (DIY) places and maker spaces.

These activities are recognised as solutions to closing and slowing the material loops in an urban context by extending product lifetimes through repair, upgrade, reuse and recovery of resources from urban waste. Product sharing, mending and repairing initiatives are often taken as environmentally sustainable due to their potential to avoid new purchases of products and spare-parts. Further, these initiatives are closely associated with their positive social and economic benefits for the local communities by enhancing repair skills and sufficiency, and social cohesion. In addition, these activities have potential to create new complex socio-economic interactions by stimulating behavioural changes in individual time-use and consumption disrupting the sustainability status-quo. Indeed, individual time-use, socio-economic conditions and resource consumption are closely linked to carbon footprints (Wiedenhofer, Smetschka, Akenji, Jalas, & Haberl, 2018a). Therefore, exploiting these consumption-behaviour relationships offer an untapped policy option.

Nonetheless, the overall sustainability impacts of collaborative production activities depend upon the design, operational activities, and institutional contexts (Winslow & Mont, 2019). Therefore, from a sustainability point of view, socio-economic, environmental and

institutional entrepreneurial perspectives are needed to evaluate these initiatives. However, theoretical frameworks to evaluate the sustainability potential of these initiatives in context to closing the material urban cycles and stimulating behavioural changes among users are unavailable.

Taking the cases of bike repair maker spaces in four European countries, this study addresses this gap in research by exploring the direct and indirect social, economic and environmental implications of collaborative production activities. The main objectives of the study are to examine the contribution of collaborative production activities at these maker spaces to slowing and closing the urban material cycles, and broader sustainability implications of user behaviour stimulated by such maker spaces. A framework to evaluate the sustainability potential of maker spaces is proposed.

Theoretical background

Collaborative production: Production, consumption and presumption

In contemporary economies, we understand that production always follows consumption and vice-verse. However, this was not the case. At the very outset of the Industrial Revolution, western societies were defined predominantly by production (Ritzer & Jurgenson, 2010). However, it was only in the latter half of the 20th century that consumption gained vital importance, especially as compared to production, due to increases in the objects of consumption (e.g. consumer products), the subjects of consumption (i.e. consumers) and consumption processes (such as marketing, advertising and branding). Toffler (1980) called this 'the second wave' of marketisation (Ritzer & Jurgenson, 2010). Production and consumption were two separate functions dividing two entities what we know as the producers and consumers (Ritzer & Jurgenson, 2010).

The term prosumer was coined by Toffler (1980) meaning the one who consumes and produces a product. He argued that modern-day internet-era presumption, what he called 'the third wave', was indeed predominant in pre-industrial societies (the 'first wave'). In contrast, collaborative production as a part of this 'third wave' is defined by Oxford dictionary as "*the production and sharing of information or physical assets based on social collaboration and knowledge sharing within horizonal peer-to-peer networks open to all members of a community, facilitated by the use of the internet and social media (as in the case of Wikipedia).*" Proponents of collaborative production claim that it brings economic empowerment for individuals, improves social cohesion, and minimizes environmental impacts by decreasing demand for new products (Botsman & Rogers, 2011). The marketed interests in do-it-itself culture and sharing of skills, tools and spaces have been supported by several cities across Europe and beyond as means to drive sustainable consumption among urban population.

Circular economy and sustainable consumption through DIY "Bike Repair" movements

DIY bike repair studios or 'bike kitchens' or maker spaces are mainly organized by grassroot initiatives, in many cases, supported by government and non-government organizations (Bradley, 2018; Lehner, 2019) due to their potential contribution to sustainability. Bradley (2018) explores the phenomenon of 'Bike Kitchens', DIY non-profit bicycle repair studios, around technology in relation to degrowth. Some of the anticipated positive benefits of DIY bike repair studios include: recovery of valuable spare parts from the waste streams, sharing of tools, reduced consumption of virgin part materials, and benefits of product life extension through repair. Based on Illich's (1985) notion of tools for conviviality, Bradley (2018) proposes that bike kitchens, by providing practical knowledge for repair to the citizens enhances autonomy and creativity among them by liberating them from commercial relations and enabling formation of non-capitalist relations. Bike Kitchen are considered as an example of democratisation of technology in practice that enables easy access to low-cost technology, tools and know-how to anyone (Bradley, 2018). Lehner (2019) argues that bike kitchens could reduce consumption among the bike kitchen community through their time expenditure in the repair activities.

However, systematic sustainability analysis of such DIY initiatives including broader sustainability implications including the unintended consequences is still lacking. Based on empirical evidences, this study provides a theoretical framework to evaluate sustainability implications of DIY repair movements.

Methods

Semi-structured interviews with key personals associated with bike repair studios were conducted in order to have an overview of the key activities, value proposition, and societal benefits, and success factors and barriers to their operations. In total, seven semi-structured interviews were conducted (see Table 1). The semi-structured interviews followed the following questions:

1. What are the main motivations behind establishing the bike studios or maker spaces?
2. What are the main social, economic and environmental benefits of the bike studio for the users?

Country	Organisation(s)	Total interviewees
Sweden	- Bike Kitchen, Malmö - Bagarmossens Cykelköket, Stockholm	3
Switzerland	- Point Vélo, Laussanne	2
Spain	- Biciclot, Barcelona - Biciosxs, Barcelona	2

Table 1. Information on the interviewees used in the study

All of the interviews were recorded with the consent of the interviewees and transcribed. The interviewees were selected from different countries representing different types of bike studio in order to get a broad perspective on their activities.

In order to collect empirical information relevant to the socio-economics impacts of bike kitchens on the users, an online survey of the users of the Bike Kitchen in Malmö was conducted. The survey was utilized to gather information on the key activities performed by the individual users and their motivations to take part in the repair activities, perceived social, economic and environmental benefits, and average time spent at the Bike Kitchen. In total, 46 individual responses were collected.

Results and Discussion

Motivations

The organizational characteristics (e.g. financial, operational, etc.) of the bike repair studios or bike kitchens included in this study significantly vary. However, the common motivation behind establishing these was the lack of DIY spaces recognized by bicycle enthusiasts who share a common interest of cycling and repairing bikes themselves. For instance, Biciclot in Barcelona was started in 1987 by a small community of urban bicycle enthusiasts, which now has taken a shape of well-established institution that closely cooperates with the City Council of Barcelona on various urban mobility projects. Similarly, the Cykelköket, Malmö and Bagarmossens Cykelköket were also started by group of individuals who jointly created DIY bike repair space.

An increased trend of bicycling in the recent years has also contributed to the demand of such places. For example, the Point Vélo, Laussanne was established in cooperation of EPFL – École polytechnique fédérale de Lausanne after recognizing the need for a DIY space in the university campus as a result of increased number of students bicycling.

These spaces are financially supported by a variety of means such as by the city governments or non- governmental organizations or self-financed. The bike kitchens are supported by volunteers who share their time and skills for free or part-time workers. For example, Point Vélo, Laussanne employs students during 1-hour lunch break because many students come to repair bikes during lunch breaks. Malmö Municipality supports the salary of 2 full-time personnel employed at Cykelköket, Malmö.

Bagarmossens Cykelköket is fully supported by volunteers working few hours a week in the evening, and funds the rented space by membership fees. Point Vélo, Laussanne has contract with the EPFL – École polytechnique fédérale de Lausanne who offers the students free use of tools and small repairs works.

Social, economic and environmental impacts of the bike repair studios

Interviews with the key organizers/volunteers at the bike repair studios revealed that a variety of activities are performed by these studios. These include recovery of bike parts from discarded bikes, sharing of tools and skills for bike repair, providing special courses on bike repairing, organizing special events, providing bikes on rent, donation of recovered bikes to under-privileged sections of society.

These studios also provide spaces to people for cultural exchange. According to Interviewee 1, *"Each time we open, 8-9 languages being spoken at the same time. It is very diverse in a way, people coming in from all around the city."*

"we still have lots of spare part that people could get for free to fix their bike." (Interviewee 1)

Effect on individual time-use

Studies have found a close relationship of individual time-use and consumption, with carbon footprints (Jalas & Juntunen, 2015; Torriti, 2017; Wiedenhofer, Smetschka, Akenji, Jalas, & Haberl, 2018b). Out of 46 responses in the survey, 30 respondents appear to spend more than 3 three hours each time they visit the Cykelköket, Malmö. The survey found out that the main motivations behind visiting the Cykelköket, Malmö are to carry out bike repair works and attend special events. Out of the total respondents, 36 visited the Cykelköket, Malmö more than 10 times in the past one year. Thus, the users spend a significant amount of time at this bike studio that could be replacing some of the usual individual consumption activities.

However, the overall environmental impacts of this alternative time-use may vary depending upon the type of institutional settings of the maker spaces. For instance, municipality-run Cykelköket, Malmö which is a non-profit organization provides spare-parts and skills exchange for free without any mandatory membership fees. Due to its organization, Cykelköket, Malmö is not allowed to sell recovered bikes without official auctions. From an economic perspective, the users positively benefit from free repairs and recovery of spare-parts; however, Cykelköket, Malmö struggles to secure funds to run the space as there is no viable financial mechanism.

"One challenge we have been having is stemming from the financial part, changing to be more a volunteer-based organisation." (Interviewee 1)

Whereas, the Point Vélo, Laussanne which is is only partly supported by EPFL – École polytechnique fédérale de Lausanne, offers only free use of tools by users but subsidized prices for repair operations and replacement of spare parts. The Point Vélo also supplies bikes on rent. Because of a viable economic model, the Point Vélo been a success from an economic perspective for both the users as well as the organizers. In contrast, Biciclot, Barcelona which is a totally volunteer-run organization has been successfully in operation for the past more than 25 years due to its social cause. Thus, institutional settings do affect the overall impacts generated by these maker spaces.

This study has conducted survey of users of only one type of organization. In-depth studies of the users of different types of maker spaces, therefore, could be conducted in order to investigate the types of activities that were replaced and their environmental, economic or social impacts. In order to positively influence the sustainability profile of maker spaces various institutional constellations could be examined to support sustainable development through grassroot innovations.

A framework to evaluate overall sustainability potential of collaborative production

Based on this study, a framework to evaluate social, economic and environmental consequences of collaborative production activities is proposed. Various steps of this framework are as follows:

1. Conceptualize the major activities at the maker spaces in context to the socio-economic and environmental interactions
2. Evaluate the social, economic and environmental impacts
3. Set goals and agendas for the maker spaces in sustainability context
4. Identify management strategies to meet the goals of the maker spaces

The first step involves conceptualizing the socio-economic and environmental exchanges taking place at the maker spaces. In the studied cases, for example, this involves the direct (positive as well as negative) impacts are repair with less or no cost, part recovery from urban waste streams, socializing and skills exchange, and changed/alternative consumption patterns due to the time spent by users etc. This step also includes exploring the rebound effects, if any, induced by maker spaces due to such as economic savings from cheaper/free repair spent on other consumption activities. Methods such as participant observation, user surveys and semi-structured interviews with organizers and users could be employed to explore these exchanges. In this study, these interactions were explored through semi-structured interviews and a user survey.

Evaluating the social, economic and environmental impacts of maker spaces requires quantifying the interactions explored during the first step. Methods such as material flow analysis could be employed to trace to the materials saved from a life cycle perspective.

In order to analyze the influence of institutional context on sustainability profile of maker spaces, various system goals and agendas could be set. In order to achieve these systems goals Different scenarios could be explored under diverse business model settings and institutional constellations for the maker spaces. Based on this analysis, various management strategies for the design, value proposition, operational practices and institutional contexts of maker spaces could be devised and implemented to maximize their sustainability potential.

Conclusions

The study concludes that the maker spaces for bicycle repair do contribute to improve resource efficiency by extending the lifespan products through repair and part recovery from urban material streams. Evidences show that these maker spaces enhance social cohesion by enabling new kinds of social interactions. through sharing of resources and skills. The activities at these maker spaces do influence individual time-use, and therefore, could have significant positive impacts on consumption (and carbon footprints). However, the type of institutional settings of the maker spaces may influence the social, economic and environmental impacts emanating from these maker spaces, especially, the ones concerning the individual time-use of the users. Thus, in-depth studies of the users of different types of maker spaces is needed in order to devise institutional constellations to positively influence to the sustainability profile of these maker spaces. The study proposed a framework to evaluate overall sustainability potential of maker spaces.

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