

**Citation:** Glumac, Brano. 2021. "Luxembourg: Digital Innovation Challenges." In *The Collaborative Economy in Action: European Perspectives*, edited by Andrzej Klimczuk, Vida Česnuitytė, and Gabriela Avram, 197–205. Limerick, Ireland: University of Limerick.

## Luxembourg: Digital Innovation Challenges

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### **Abstract**

Digital innovation has become a most forwarded proposition of economic policies aiming for economic diversification and technological innovation. Moreover, it appears to be a feasible solution to the problem for Luxembourg that lacks the physical space to foster the development of an industrial sector that would require large areas. Also, diversifying from the well-established large steel industry complex is a plus. However, many obstacles can hinder the effective implementation of sharing economy principles in the digital world. This study underlines the most active industry sector, transportation, which adopts the sharing economy principles. Moreover, it provides the status of sharing economy by the figures showing participation and motivation of people living in the Grand Duchy of Luxembourg. This study also highlights its challenges and related issues in terms of citizen participation and sharing economy based on digital platforms.

**Keywords:** Digital Platform, Start-Up, Mobility, Public-Private Partnership, Luxembourg

### **Introduction**

Digital innovation supports consumers in better fulfilling their consumption needs but also enable them to produce higher value for other consumers. These new consumer co-production activities (i.e., prosumer) collectively refer to the concept of sharing economy (Dellaert 2019).

At present, in Luxembourg, the official figures are lacking to provide insight into the context and acceptance of the sharing economy. Similarly, the statistics on sharing economy's contribution to GDP and tax revenues are also missing in Luxembourg (TIR 2016). There is only one relatively reliable survey containing information about people's awareness and motivation to participate or not in the sharing economy is available. In general, the lack of data hinders the elaboration of possible policies.

However, some digital intermediation platforms have emerged and created new opportunities to provide insight into the sharing economy in Luxembourg, partly at least. This article reports on the two cases of the Grand Duchy of Luxembourg, which is characterised by a few sharing economy initiatives. The Luxembourg example may be of interest to researchers and actors studying or acting within similar economic contexts in terms of a strong push towards digital innovation and a relatively small local market. The shift towards the digital economy in Luxembourg also takes place under favourable contexts. First, Luxembourg shows remarkable economic and demographic developments. The GDP in 2019 grew 2.3% in volume, which was lower than the ten-year average (STATEC 2020). The relative growth of the population—2.3% per year between 2010 and 2017 (Decoville and Feltgen 2018)—was by far the highest in Europe at the time. This dynamism generates very high needs in terms of jobs and housing. As land is scarce, land-intensive industries would not be able to operate efficiently as the initial costs would be very high. Thus, the shift towards the digital economy and necessary digital innovation is the priority.

## Definition

In Luxembourg, the Idea Foundation has identified significant changes regarding the definition of the sharing economy (Finck and Ranchordás 2016). First, the terms “the sharing economy,” “collaborative consumption,” “the collaborative economy,” and the “peer economy” are employed interchangeably to explain mostly different phenomena. Much more important is the difficulty in capturing the sharing economy, the best illustrated by the following words: “Trying to define the sharing economy is like trying to shoot at a moving target due to its rapid development” (Finck 2016). Also, given the multitude of organizational forms and business models, the sharing economy still lacks a shared definition.

More robust is the notion behind shared economy “access over ownership,” which reflects that sharing economy practices consist in the sharing of an underutilized asset and that sharing is favoured to exclusive property. This underlines the basic principles of this new economic model, which are to optimise the rate of utilisation of underutilized assets and at the same time set incentives to extend the cycle of produced goods and contribute to a reduction of resource consumption.

Although a unified definition is still lacking, the Rifkin report (TIR 2016) at least suggested a useful classification that can be established along two dimensions. First, the ownership and control of the infrastructure, which can vary between centralized and distributed, and secondly, the polarity between capital build-up and commons accumulation. On the other hand, from the perspective of an end-user, the production and consumption levels can vary, as well as how a network effect the production units. They can be differentiated on the low and high extent of consumers’ co-production and more individual or more network units of co-production (Dellaert 2019).

The key stakeholders can be seen as taking part in the distributed and cooperative networks of connected individuals and communities, promoting co-production based on sharing, swapping, trading, or renting products and services. The motivation of stakeholders can vary in economic terms (monetary gains, cost reduction, etc.) and non-economic terms (societal, environmental, fair, and local trade, etc.). Among stakeholders in the sharing economy, a distinction must be made between professional actors and private persons operating only occasionally, followed by fixed regulation.

For example, we could differentiate these two groups by using threshold values based on income generated or the time regularity with which the service occurs. It is vital to make sure that all actors comply with their legal, tax and social obligations. This distinction should also apply to consumer rights, warranties, product quality, imposed security and sanitary norms. Besides, the relevant information about stakeholder's types should be clear and freely accessible to all prosumers.

## Key Questions

This study seeks to answer several questions regarding the sharing economy in the Luxembourg context. The following questions have been reflected:

- a) Which sector has been the most active in adapting to sharing economy principles? Moreover, what are the best examples?
- b) What are the participation and motivation levels in sharing economy for people living in Luxembourg?
- c) What are the biggest challenges in fostering innovation in digital platforms for sharing economy?

## Examples

The traffic problems are so severe in Luxembourg that the mobility issues have been in the focus of all residents, cross-border workers, but also the government. That created a unique ground for different sharing economy principles. Some of them were start-up initiatives, but a very successful program is a government-led spin-off from the Luxembourg Railway Company (CFL). Therefore, within this study, we include both examples. E-mobility needs to be paired with policies of car-sharing and carpooling and with automation technologies that will help respond, in a much more flexible way, to the travel demand. Mobility-as-a-service is a new approach where each particular travel is offered as a service on a usage basis, as opposed to a one-off selling of a vehicle that is owned. This is strongly linked to the rise of the sharing economy, where usage prevails over ownership. Enhanced multimodality, where car-sharing and carpooling are highly promoted, is central to this new seamless mobility equation. Mobility-as-a-Service is made possible by combining and managing all transport services and trips on the same digitalised platform.

Moovee is a start-up company that offers shared multi-modal mobility services for companies. The loss of time by many cross-border commuters which they spend in traffic jams and environmental concerns moved some of the Luxembourg-based companies towards shared fleet management service. Moovee provides this service via an app that allows companies and company employees to access shared cars, bikes, and scooters. Luxembourg, and especially Luxembourg City, is notorious for its road congestions. "So, why take your car to get to work if it is more convenient and faster to take another means of transportation and if you have everything you need on-site" is written on Moovee's website. The fleet also includes soft mobility transport vehicles and provides social responsibility by exposing end-users to soft and alternative mobility. This service mitigates traffic problems or parking searches. Also, Moovee supplies a range of services to companies, such as advice on composing the fleet, financing the solution, provides a booking platform, and offers operation

management services. The advantages for companies are claimed to be 30% fewer vehicles than in standing fleets, lower maintenance costs, increasing soft mobility also leads to reaching some of the sustainability goals but also social responsibility.

On the other hand, Flex is a part of a public transport company that adds car-sharing services. It operates as a platform cooperative in the mobility sector. When Luxembourg Railway Company (CFL) realised how to serve better the residents, the solution led to a digital platform cooperative. Luxembourg, and especially Luxembourg City, is notorious for its road congestions caused by daily cross-border commuters that provide 50% of the labour in the country. Flex is a spin-off of the Luxembourg Railway Company (CFL) and offers car-sharing combined with a flexible option to take the train or the bus. Flex customers have at their disposal more than eighty vehicles at thirty stations. The cars are available at their designated Flex parking spots and have to be returned to the pick-up location. They also need to be reserved in advance. Also, the price is affordable. Besides dealing directly with individuals, the CFL Mobility offers car-sharing services for potential partners such as institutions, businesses, and local authorities.

**Context**

The participation and motivation levels in sharing economy for people living in Luxembourg is lower than in most of the European countries covered in the ING survey in 2015 (Bright 2015). Specifically, Table 1 shows how much the presence of the sharing economy is relatively lower in Luxembourg in comparison to other European countries. Both in terms of the number of participants in sharing economy but also in the awareness. Regarding the motivation to participate, people in Luxembourg mentioned more the economic aspects than non-economic aspects of participating in sharing economy (Table 2).

**Table 1. Participation in the Collaborative Economy in Europe in 2015**

Country	Yes, and I have participated (%)	Yes, but I have not participated (%)
European Consumer	5	27
Austria	2	17
Germany	2	18
Czech Republic	2	20
Belgium	2	22
Luxembourg	3	21
Romania	3	23
Poland	3	25
France	4	23
United Kingdom	5	24
Netherlands	5	26
Italy	5	33
Spain	6	31

Source: Bright (2015).

**Table 2. Factors Influencing Participation in the Collaborative Economy in Europe in 2015**

Country	Motivation to Participate (%)			
	It Saves Money	An Easy Way to Save Money	It Is Good for The Environment	It Helps Build Communities
European Consumer	58	53	52	47
United Kingdom	48	43	43	35
Belgium	48	49	39	36
Romania	49	42	44	43
Czech Republic	49	44	34	29
Netherlands	49	49	33	34
Luxembourg	55	55	39	43
France	57	49	52	40
Germany	57	54	45	41
Austria	61	60	49	48
Poland	63	54	59	59
Spain	64	54	57	48
Italy	64	62	57	58

Source: Bright (2015).

In Europe, in the past years have been an astonishing increase in sharing economy platforms. Some of the most significant platforms have become global enterprises with the lead market capitalizations exceeding those with "traditional" business models. This tremendously fast growth calls into question many regulatory matters. It poses new questions for national and European level regulators (Munkøe 2017) that can affect the sharing economy companies on various regulatory aspects. Such as tax law, labour law, property law, transportation law, and regulations on tourism and other industry sectors.

At the same time, the biggest challenges in fostering innovation in digital platforms for the sharing economy have been exactly legislative. In Luxembourg as well, the government's ambiguity on the "sharing economy" is a major problem, and it is hard to make sense of the government's position on the sharing economy (Wirtz 2018). Specifically, the only official document regarding sharing economy comes from the European Commission agenda presented by the European Commission on June 2nd, 2016, and could give guidance to Luxembourg. The regulations would need to cover various aspects of the sharing economy. By enacting the appropriate legislative regulations, Luxembourg could support both consumers and businesses to engage confidently in sharing economy activities, as legal certainty is a prerequisite for sound economic development. Priority should be made explicit criteria, and thresholds should establish the distinction between professional actors and private persons operating only occasionally. Professional sharing economy activities should have to comply with comparable legal obligations that regulate market economy businesses to ensure fair competition. These concerns, for instance, business permits, safety and security standards, warranty deeds, as well as financial and social security obligations. Also,

regulation should be aimed to create formal employment for sharing economy workers—where applicable—to ensure a maximum of social security. It is vital to prevent the circumvention of labour laws and social standards (TIR 2016).

## Developments

While the sharing economy platforms are by no means as widespread in Luxembourg as in other parts of Europe, they have started to arrive in the Grand Duchy, for instance, in the form of Airbnb, and regulators may soon have to think about how to address this.

The broad development idea is to create a sharing economy web platform, a digital platform to operate sharing economy activities. This should be designed as a national one-stop-shop for all things related to the sharing economy. This web-based initiative would need to include several functions and applications (TIR 2016). First, the platform should be used to track and measure sharing economy activities to facilitate the task of collecting economic statistics and assessing taxes. Also, the platform could provide a continuously updated inventory of sharing economy activities in Luxembourg. Rifkin report (TIR 2016) wants to centralize and make the use of platform mandatory for every stakeholder (intermediation websites, owners/workers, sellers/buyers, producers/users, prosumers, etc.). It could also be supported by blockchain technology to register all transactions. Secondly, the platform should have an informative character to all stakeholders about their legal rights and obligations. Finally, by TIR (2016) opinion, the platform could serve as a collaborative innovation network (CoIN) and perform a critical educational, informational, and motivational service to help build the sharing economy by leveraging human, social, civic, and intellectual forms of capital and by securing sufficient financial capital (crowdfunding).

The one sectors seem to represent areas of particular interest for the future developments of the digital and collaborative economy, i.e., mobility. Although, "while anyone that has ever been to the "Autos-Festival" will understand that Luxembourgers may be less fast and enthusiastic about embracing car-sharing, anyone commuting to and from Luxembourg City will understand the benefits this could bring" (Finck 2016). Two streams that can largely contribute to future development is sharing mobility, and they are based on the elaborated examples.

Based on the current mobiliteit.lu platform, this unique gateway to mobility must be supported by a robust multi-modal real-time and predictive data management system able to provide users tailor-made transport solutions based on individual needs, to enable users to enjoy a seamless on-demand travel experience. The system, presented by mobiliteit.lu, will stand as a centrepiece of the Mobility Internet. Information provided will show all public transports solutions but also P+R availability for private car transport, bikes, and e-bikes availability, walking times, ride-sharing options, offer booking services and road user charging, and dynamic pricing for parking depending on peak/off-peak hours. In the long run, this could also serve as a platform where people can share their autonomous cars and thereby generate revenues. This single-entry system is a response to the multiplication of sharing platforms that are part and parcel of the new mobility solutions. It should be set up in cooperation with all private and public transport stakeholders and with neighbouring countries for a "Grande Region" approach that will eventually unify standardisation, regulations, ticketing schemes, booking, and services across the European Union.

A similar concept is emerging in the logistics field, where private vehicles and private management of logistics chains will tend to be abandoned for a multi-modal flexible travel capacity and collaborative networks. Multimodality should be extensively promoted, as initiated with the creation of the multi-modal logistics platform in Bettembourg. Again, efficiency will also be achieved through optimised use of passenger transportation means. Such a flexible solution, hosted on a transports-as-a-service single-entry platform, will be managed through collaborative networks with the prerequisite to unify regulations, standards, and services. With the increased dependency on data, Luxembourg should also provide a robust resilience monitoring program. This program will track traffic conditions, both for passengers and goods flows, the capacity of the infrastructure, and energy demands, which can be used as a database to model prediction scenarios for massive disruptions to the system brought on by catastrophic climate change events or cyber-crime and cyberterrorism.

## Issues

There are several particularly new issues in Luxembourg. Its specificity lies in the way that Luxembourg handled it in a country that can additionally harm the biggest challenge in Luxembourg of fostering an appropriate legislative framework to follow up existing and future developments in digital innovation.

Due to the heterogenic resident and workforce population, this could become a particular challenge for Luxembourg. Possible misgivings and concerns about the ubiquity of technology, data tracking and mining, big data analytics, mass surveillance and similar issues must be taken seriously to nurture the acceptance of sharing economy within the population (TIR 2016). From the view of workers, working conditions and social security are central issues, notably the status of the workers (employee or independent). The classification depends on the degree of subordination or dependency between the service provider and the intermediation platform. It is crucial in terms of social insurance coverage, working hours, workplace safety and the like. The quality of the job (formal or informal) and the income possibilities are connected issues. As sharing activities often consist of microtransactions with limited turnover, they may increase inequality as well as stimulate new economic opportunities. The outsourcing of work to an undefined public (crowdsourcing) causes competition between workers on a global level. Here, it is crucial to prevent the circumvention of social standards. Establishing a level playing field between the market and sharing economy is becoming an urgent priority. Similar regulations and legal obligations should oversee related activities to ensure fair competition.

## Other Major Players

As the sharing economy is still in its infancy phase in the Grand Duchy of Luxembourg, there is a small number of starters in the sharing economy sector. Regarding mobility, there are also electric car-sharing initiatives such as Carloh in Luxembourg City. In more general terms, no major player can be identified on the European or even Luxembourg Greater Region scale, neither starting from the University nor Unions or organizations looking.

## Future Directions of Research

Future research on digital innovation challenges in Luxembourg could be very prolific. It could capture the causal interferences of the institutional settings and the outcomes of the successful sharing platforms. The prerequisite would be an investigation of the institutional barriers, such as presented legal challenges in many forms. Therefore, insufficient legal laws, regulations, and acts should be first identified in a thorough qualitative manner. After exploring the most exciting aspects coming from the digital innovation for the sharing economy platform, the potentials for more frugal and perhaps low-tech alternatives that can meet the needs of individuals in a cross-border economy can be rewarding.

## Summary

Among all industry fields, the mobility sector measures the most active scene in digital innovation as well as adapting the concept of the sharing economy. This is a link mostly to the alarming and challenging transportation in Luxembourg, which relies on the workforce coming daily from Belgium, France, and Germany. They constitute together 50% of the workforce and create a massive, for Europeans, quarter-million daily migrations approximately.

However, regarding all industry sectors, the participation level of the people living in Luxembourg is still considered lower than in many European countries. Regarding their motivation to participate in the sharing economy, most of the people in Luxembourg named more the economic aspects than non-economic aspects.

The biggest challenge in fostering innovation in digital platforms for the sharing economy is legislative, similar to many European countries. In Luxembourg, the government's ambiguity on the "sharing economy" causes an additional problem, makes it hard to sense the government's position on the sharing economy (Wirtz 2018). This further can deliver an exact ambiguous message to potential stakeholders in sharing economy and raise other issues in the protection of workers and information safety of its citizens.

Although there are many challenges, future research on digital innovation challenges in Luxembourg could be very prolific.

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## Relevant Websites

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Flex (Car-sharing Platform from CFL): [www.flex.lu/en/front-page/](http://www.flex.lu/en/front-page/)

Foundation Idea: [www.fondation-idea.lu](http://www.fondation-idea.lu)

Luxembourg Digital Innovation Hub: [www.dih.lu](http://www.dih.lu)

MobilityLU (City department of transportation in Luxembourg City): [www.mobiliteit.lu/en/](http://www.mobiliteit.lu/en/)

Moovee (Shared Fleet Management for Companies): <https://moovee.lu/en/>