



Business Innovation Observatory



Collaborative Economy

Collaborative production and the maker economy

Case study 51

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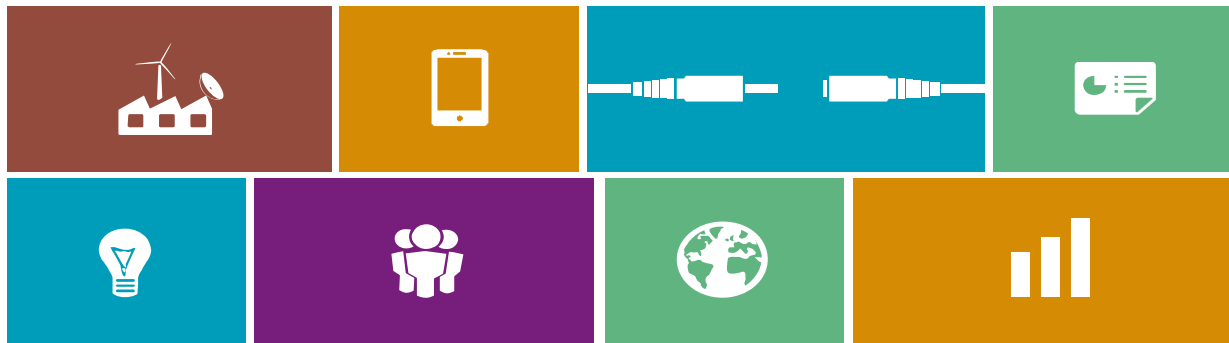
Authors: Laurent Probst, Laurent Frideres, Bertrand Pedersen, PwC Luxembourg & Sarah Lidé, PwC Sweden.

Coordination: Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs, Directorate F “Innovation and Advanced Manufacturing”, Unit F1 “Innovation policy and Investment for Growth”.

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1. Executive summary

Collaborative production entails the collaboration of groups or networks of individuals to design, produce or distribute goods, and is related to the idea that it is the community that decides what to produce. Two main characteristics mark collaborative production – it is peer-to-peer, and it is open. Collaborative production activities include collaborative design, collaborative making, and collaborative distribution. In turn, the maker economy perspective involves efforts which are initiated and driven by individuals and communities rather than by corporations.

Nesta estimates that 25% of people in the UK have used the internet to take part in collaborative activities in 2013, and PwC estimates a potential opportunity for revenue worth EUR 298 billion. The maker economy is experiencing similar momentum, with makers fuelling business and contributing approximately EUR 26 billion into the world economy annually.

Collaborative production and the maker economy puts power in the hands of individuals, which means that ideas can be faster and more easily transferred into reality and onto the market, thanks to cheap, powerful prototyping tools as well as access to maker communities. This shift also means that consumers are shifting to become co-producers and impacting existing industry practices.

The Internet and social media are enabling individuals to more easily connect and share ideas, thus fuelling the maker movement. Makers are forming their own communities, and these networks are in turn influencing more to become makers themselves. The maker economy is creating the possibilities to create new streams of income, both for individual artisan sellers as well as for local family-based makers. In turn, the rise of co-working spaces, Fab Labs, makerspaces and hackerspaces are allowing people with

common interests to come together and increasing access to manufacturing infrastructure previously confined to manufacturing companies. These types of spaces are becoming particularly popular in Europe, with there being three times more Fab Labs in Europe than in the US.

One of the common challenges faced by collaborative production startups is in the scaling up of manufacturing to a sufficiently large scale, as well as the tension between democratised manufacturing and existing tax and regulations that favour traditional import and export approaches to manufactured products. There are also quality and safety issues to consider when individuals are empowered to make a wide range of goods. Uncertainty and risks relating to flexible work contracts (often a key feature of the collaborative economy as well) is another factor to consider, alongside the need to develop a viable business model.

Accordingly, policy makers can support the uptake of collaborative production by encouraging the provision of shared physical infrastructure and maker spaces that grant entrepreneurs and makers access to manufacturing facilities and networks, as well as promote platform marketplaces to consolidate demand for the services of local makers and connecting entrepreneurs to crowdfunding platform as well. Regulation should further encourage democratised manufacturing, such as preserving and enhancing of interoperability of systems and open standards, as well as updating and clarifying tax rules impacting activities along the production and distribution chain. Policy makers can also encourage the development of an appropriate mix of government, community and industry standards to quality assure the products and services emerging from collaborative production.



2. Collaborative production and the maker economy

2.1. Trend presentation

Collaborative production is sometimes considered as one of the four main areas of activity (the other three being collaborative consumption, collaborative learning, and collaborative finance) of the collaborative economy (often used interchangeably with the sharing or peer-to-peer economy) (see

“Open innovation and open source concepts are key.”

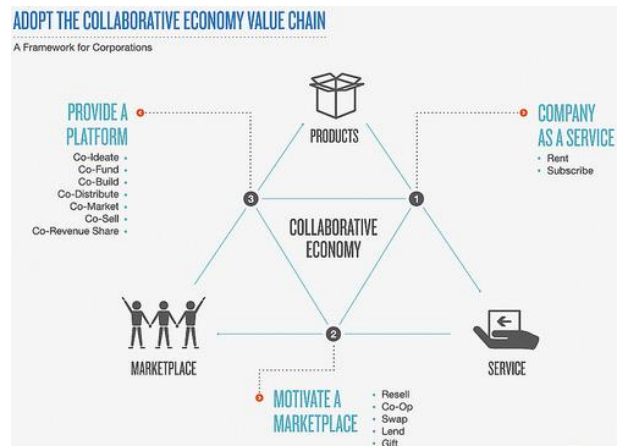
– **Phoneblok**

Figure 1 on page 3). The collaborative economy involves using internet-based technologies to connect people in order to optimise the use of resources such as good and skills. In turn, **collaborative production entails the collaboration of groups or networks of individuals to design, produce or distribute goods**¹, and is related to the idea that **it is the community that decides what to produce**². Two main characteristics mark collaborative production – it is **peer-to-peer** (i.e. peers collaborate in horizontal networks and generally are not part of the same institution or company), and it is **open** (i.e. production outputs can be modified or copied without excessive restrictions, resulting in large amounts of usable and shareable information)³.

Collaborative production has its roots in co-creation where different parties (e.g. a company and a group of customers) come together to jointly produce a mutually valued outcome⁴. The advent of the Internet has only served to increase its reach on a much wider scale, beyond the limit of standalone partnerships (often involving corporations) to leverage on networks to connect peers with common areas of interest and creative ideas with the promise of distributed production.

A number of simultaneously-occurring disruptions are facilitating the emergence of collaborative production. **Collaborative financing platforms** such as crowdfunding and social lending have not only connected ideas to money held by individuals, but have created the opportunity for a **community of funders to provide continuous feedback and input** in the development of products. **3D printing** is democratising manufacturing and production, while the **rise of co-working spaces, makerspaces and hackerspaces** are allowing people with common interests to come together and share resources and knowledge in order to create and build things, while having access to the physical infrastructure needed to complete projects.

Figure 1: The collaborative economy value chain



Source: Altimeter Group⁵

Collaborative production platforms are allowing for extremely localised and personalised products and services that meet real-time demand, while resulting in innovations that would have otherwise been very costly for traditional companies. It also leverages on the desire of customers to develop new products and services as partners rather than just consumers.

Collaborative production manifests itself in co-ideating, co-funding, co-building, co-distributing, co-marketing and co-selling efforts.⁶ Collaborative production can take place company-to-company, company-to-customers, or simply among individuals⁷. In turn, the **maker economy** perspective involves **efforts which are initiated and driven by individuals and communities rather than by corporations**. It “puts power in the hands of the people to fund, design, prototype, produce, manufacture, distribute, market and sell their own goods.”⁸

Collaborative production activities include:

- Collaborative design – Peers collaborating to design a product or service.
- Collaborative making – Peers collaborating outside of formal organising structures or institutions in order to develop and create projects and products.
- Collaborative distribution – Peers organising and fulfilling the distribution of goods to other peers.⁹

New business models are emerging with collaborative production as a key component. Disruptive companies in this market are showcased below.



2.2. Overview of the companies

Table 1: Overview of the company cases referred to in this case study

Company	Location	Business innovation	Signals of success
Phonebloks	Netherlands	Phonebloks is an independent organisation helping the consumer electronics manufacturing industry steer development and production that produces less electronic waste than their products do today by promoting modularity, open innovation, open source and the circular economy.	<ul style="list-style-type: none"> - Phoneblok manages a community of 25,000 members. - Its partners, among others, include Google and Sennheiser.
Nimber	Norway	Nimber is a peer-to-peer delivery platform that taps into the idling capacity of people travelling somewhere, over either short or long distances, leveraging internet technologies to connect them directly to people with something needing delivery.	<ul style="list-style-type: none"> - Nimber facilitates approximately 25,000 deliveries each year, and has 30,000 signups in Norway alone. - It has recently successfully launched in the UK.
OpenDesk	UK	OpenDesk has a global network of makers and a collection of furniture by a range of international designers. Because that furniture is designed for digital fabrication, it can be downloaded as a digital file and made locally and on demand.	<ul style="list-style-type: none"> - OpenDesk generates revenues of approximately EUR 70,000 each month. - It has local maker partners in US, UK, France, Spain and Italy, and receives orders worldwide.
Hackster	US/France	Hackster is a hardware creation community where hardware hackers and makers share their projects. It provides hardware engineers with a toolbox they need to successfully take a product from concept to production.	<ul style="list-style-type: none"> - Hackster has close to 20,000 users in its community, and aims to increase this to 50,000 by the end of 2015. - It has recently launched a service offering targeted as businesses, called "Hackster for Business". - It estimates to generate revenues of close to EUR 900,000 by the end of 2015. - It currently has 45 platform providers as partners, including Microsoft.

Problem 1 – Mobile phones are creating one of the fastest growing electronic waste streams, creating various ethical and environmental problems present in the consumer electronic market as a whole.

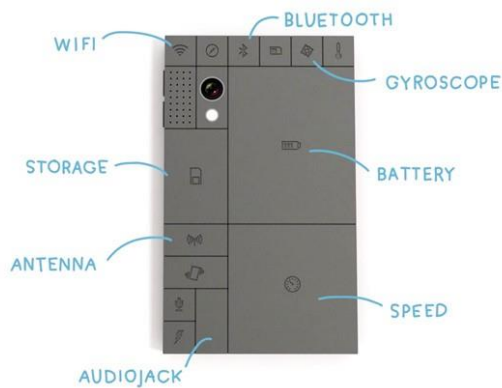
Innovative solution 1 – Phonebloks is an independent organisation helping the consumer electronics manufacturing industry steer development and production that produces less electronic waste than their products do today.

As a first step, it is aiding existing industry to steer away from manufacturing products that are sold and repaired or replaced as whole-widgets, and towards products that are modular. It also promotes approaches relating to open innovation, open source and the circular economy. Phonebloks operates on a voluntary basis by a small team and depends on donations and partnerships and steers clear of venture capital in order to maintain its independence.

As part of a social media campaign in 2013, over 979,253 supporters indicated their support for Phonebloks on social media, with a total reach of over 380,000,000 people. Later that year, Phonebloks announced a partnership with Motorola in 2013, and released Project Ara, an initiative that aims to develop an open hardware platform for creating highly modular smartphones. Project Ara is now owned by Google and Phonebloks continues to provide support.



Phonebloks is steering existing industry towards modularity.



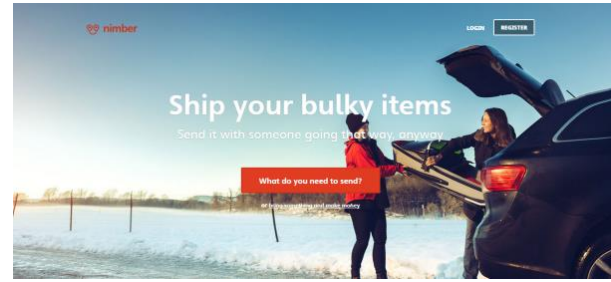
Source: Phonebloks¹⁰

Problem 2 – There exists idling capacity for those travelling from one place to another that remains untapped, especially for logistics purpose.

Innovative solution 2 – Nimber is a peer-to-peer delivery platform that taps into the idling capacity of people travelling somewhere, over either short or long distances, leveraging internet technologies to connect them directly to people who need to have something delivered. The platform features a location-based algorithm that matches delivery jobs with people who are heading that way, while the marketplace pricing system offers a fair deal to both parties. Persons offering delivery services are fully vetted and background checked, which serves to build trust among those who choose to use the service.

Nimber has three main use cases: for consumer-to-consumer delivery, sole traders or SMEs with no logistics solutions, and last mile delivery solutions for existing delivery companies. Nimber has currently 30,000 users in the Norway, and has recently launched in the UK as well.

Nimber is the “AirBnB of delivery”



Source: Nimber¹¹

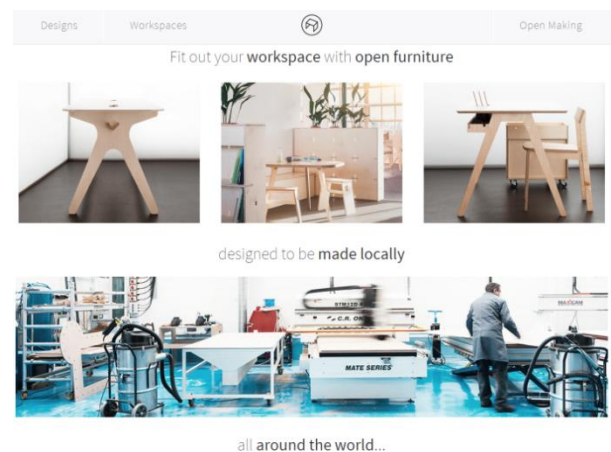
Problem 3 – Furniture production and distribution involves time-consuming and expensive shipping, costly showrooms and storage facilities.

Innovative solution 3 – OpenDesk has a global network of makers and a collection of furniture by a range of international designers. Because that furniture is designed for digital fabrication, it can be downloaded as a digital file and made locally and on demand.

Designers get a global distribution channel; makers get profitable jobs and new customers; customers get designer products without the designer price tag, a more social, eco-friendly alternative to mass-production and an affordable way to buy custom made products.

OpenDesk distinguishes itself from its competitors by hosting the designs as well as managing local manufacturing. It also has a niche in that it makes all of its products from wood and its designs are available in .dwg and .dxf formats, machine readable models which allow for easy local manufacturing via robotic CNC machines.

OpenDesk is a free, open source line of furniture that one can make or order unassembled from a maker with a CNC machine.



Source: OpenDesk



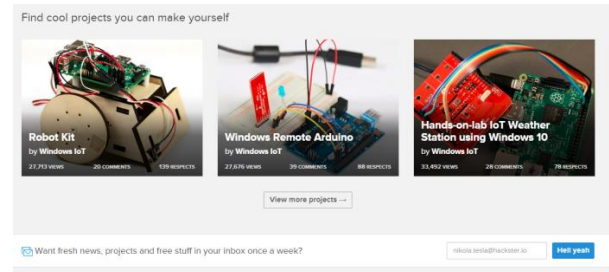
Problem 4 – Individuals are increasingly wanting to build and make their own hardware, but do not have the knowhow or resources to proceed.

Innovative solution 4 – Ben Larralde, one of the co-founders of Hackster, first set out to launch a crowdfunding platform for makers specialising in hardware. He then realised that making hardware is more than just about funding, but that makers needed help to actually build and produce their designs.

And so Hackster was born – a hardware creation community where hardware hackers and makers share their projects. It provides hardware engineers with a toolbox they need to successfully take a product from concept to production of prototypes. In turn, platform providers partner with Hackster to be featured in its community and have the opportunity to leverage on user-generated content while increasing their exposure among users.

In short, Hackster provides makers with the knowledge they need to build something; makers get their work and expertise validated by their peers; sponsoring platform providers get marketed as well as access to new ideas.

Hackster is a place where hardware hackers and makers share their projects and bring their products to life.



Source: Hackster

3. Impact of collaborative production and the maker economy

3.1. The market potential of the trend

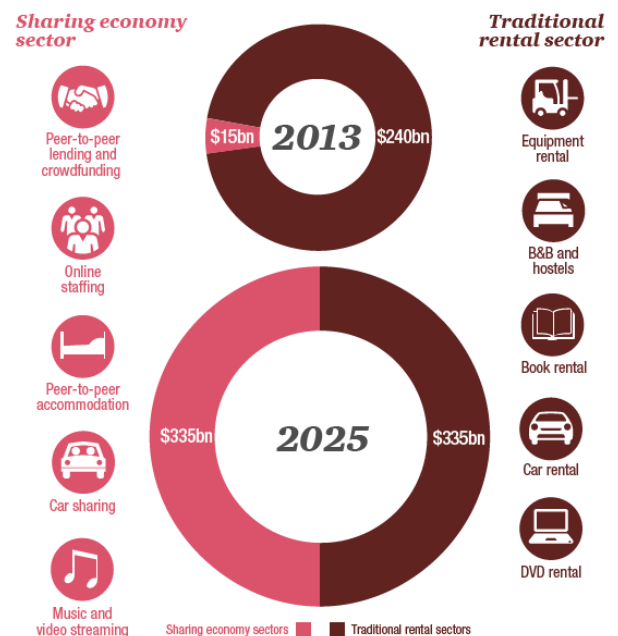
Nesta estimates that 25% of people in the UK have used the internet to take part in collaborative activities in 2013.¹² In turn, PwC estimates that by 2025, five sharing economy sectors could generate more than 50% of overall sales in all ten rental sectors, up from 5% today, and indicating a potential revenue opportunity worth EUR 298 billion (see Figure 2 on page 6).

The maker economy is experiencing similar momentum. **Makers** fuel business and **contribute approximately EUR 26 billion into the world economy** annually.¹³ The overall market for 3D printing products and various maker services reached EUR 1.95 billion in 2012, and is expected to hit EUR 5.34 billion by 2017 and EUR 7.48 billion by 2020.¹⁴

The UK government in turn estimates that the **population of manufacturing firms with zero employees** (i.e. consisting of just the owners) has **increased by almost 40%** over the past three years¹⁵. Atmel, a major backer of the Maker movement, further believes that there are approximately **135 million U.S. adults who are makers**¹⁶.

Figure 2: The rise of the sharing economy

Sharing economy sector and traditional rental sector projected revenue growth



Source: PwC



TechShop, a maker co-working space, has experienced 798% revenue growth in the last 3 years¹⁷. In 2012, DARPA — the research arm of the Department of Defense in the US — announced a ten-million-dollar grant (EUR 9 million equivalent) to promote the maker movement among high-school students. DARPA also gave three and a half million dollars to TechShop to establish new makerspaces that could help the agency with its “innovation agenda”¹⁸. In China, authorities in Shanghai have announced plans to launch a hundred makerspaces, while the Communist Youth League has been active in recruiting visitors to Maker Carnivals in China.¹⁹

3.2. The creation of new markets and jobs

The Internet and social media are enabling individuals to more easily connect and share ideas, thus fuelling the maker movement. **Makers are forming their own communities, and these networks are in turn influencing more to become makers themselves.** Maker Faire, a maker event that is held in a number of cities around the world each year, features a wide variety of themes, from food to jewellery to technology, and attracted more than 530,000 participants in 2013²⁰.

4. Drivers and obstacles

4.1. Quicker time to market and consumers become producers

Collaborative production and the maker economy puts power in the hands of individuals, which means that **ideas can be faster and more easily transferred into reality and onto the market.** Cheap, powerful prototyping tools as well as access to maker communities such as Hackster mean that makers can rapidly test the product-market fit to their ideas and understand whether the product has a real business opportunity or if it needs further iterations. In consequence, decentralising the production results in changes in consumer culture and behaviour, and in the future can make open-source, sustainable products the new normal habit.

Collaborative production can also cause radical changes in the production process – **marketing jumps at the beginning of production chain (instead of at the end)** – involving users who are both co-producers and future consumers²².

This shift in roles of consumers to become co-producers also means that **consumer demands for more sustainable approaches to manufacturing are impacting existing**

The maker economy is creating the possibilities to create new streams of income, both for individual artisan sellers as well as for local family-based makers. Etsy, the Internet-based global handicraft marketplace, has more than one million artisan sellers who sell handmade products on the site, with the site itself generating close to EUR 900,000 in revenues in 2012. **74% consider their Etsy shops as businesses** and 18% sell goods on Etsy full time. 91% aspire to grow their sales in the future. **Etsy sellers are 88% women, 97% run their businesses from home**²¹. OpenDesk collaborates with local makers, often comprising of either an individual or a family-run business with a separate core business, to manufacture customised OpenDesk products close to and on demand from the customer. In addition, collaborative production may well provide **new sources of value creation and value capture.** For instance, individual makers or small startups who do not have the resources for a full-scale logistical solution may choose to leverage a service like Nimber that taps on unused delivery capacity at affordable price levels, and truck drivers who own their own vehicles can optimise existing delivery routes by taking on deliveries on route, thus earning more per mile travelled.

industry practices, as captured by Phoneblok’s influence and push towards modularity resulting in projects such as Project Ara.

4.2. Collaboration spaces and technologies democratising manufacturing are driving collaborative production

As a report²³ for Social Innovation Europe (an initiative funded by the European Commission) notes, makers and manufacturing are using social innovation concepts and open source principles to transform traditional industrial manufacturing approaches. The advent of collaborative production and the maker economy has been driven, among other factors, by **lowered barriers to communication and the rise of web 2.0 platforms** which are enabling individuals and organisations to connect rapidly and easily. **Collaborative fundraising platforms** have created the opportunity for a community of funders to provide continuous feedback and input in the development of products. In addition, the **falling cost of technology and its corresponding rise in usability** are contributing to the



accelerating spread and uptake of such technologies by individuals and businesses. The cost of the tools such as 3D printers, CNC Mills and products like Arduino and Raspberry PI mother boards have come down and are in reach of normal consumers.²⁴ These tools are democratising manufacturing and production, enabling inventors to realise proof of concept and reduce prototyping development costs significantly. In turn, the **rise of coworking spaces, Fab Labs, makerspaces and hackerspaces** are allowing people with common interests to come together and increasing access to manufacturing infrastructure previously confined to manufacturing companies. For instance, TechShop, a chain of maker workspaces in the US, offers access to state-of-the-art prototyping tools at an affordable EUR 90 a month.²⁵ These types of spaces are becoming particularly popular in Europe – **there are about three times more Fab Labs in Europe than in the US.**²⁶

4.3. Making stops short of manufacturing due to scalability and regulatory issues

One of the common challenges faced by collaborative production startups is in the **scaling up of manufacturing to a sufficiently large scale.**

“Finding the right partner to manufacture your product, and to manufacture it right at the right price is, in our view, one of the main challenges.”
- Hackster

Hackster sees that as a challenge for many makers in its community – while Hackster provides support in helping its users develop a marketable prototype, the makers often find it difficult to take the

next step in manufacturing the hardware product on a larger scale. OpenDesk is seeking to establish partnerships with local manufacturing firms, but finds it difficult to get these firms engaged since many of the others OpenDesk receives are one-off, while the manufacturing firms are looking for a constant flow of projects as opposed to peaks and troughs.

Because collaborative production firms such as OpenDesk deal with a three-sided market – designers, makers, and end

“The biggest challenge is developing demand and supply in sync” - OpenDesk

customers – creating sufficient scale becomes important in order to offer something of value especially to designers and local

makers. OpenDesk has chosen, at this phase, to originate a lot of furniture designs themselves in order to create a marketplace of customers and local makers, but in the future OpenDesk envisions that their own designs will comprise a small proportion compared to externally generated designs.

Another challenge faced by maker firms is that their disruptive manufacturing process of originating designs in one place and manufacturing in another is **coming against existing tax and regulations that favour traditional import and export approaches to manufactured**

products. For instance, OpenDesk is facing issues relating to value-added tax (VAT) given the fact that it is a UK-based company but has products manufactured in local markets outside of the UK.

4.4. Quality and safety when production is democratised

With collaborative production and the maker economy, individuals are empowered to make a wide range of goods. The collaborative economy is “innovative and democratic by nature”, providing consumers with the opportunity to act as producers. This leads to questions around **product integrity and purpose** – how to regulate activities to ensure the quality and safety of products and services, and prevent the production of dangerous or illegal goods such as guns²⁷.

Nimber has not had such issues thus far (no items have been stolen in the history of the company), but just in case, each delivery is insured up to a value of EUR 700.²⁸

At OpenDesk, any maker can register themselves on the site. Because these makers tend to be professional and have revenue streams from other core business, OpenDesk has found that there have generally been no real issues relating to quality. The main challenges have instead related to expectations (pipeline of projects) and pricing. Similarly, from the customer perspective, they have had little problem with quality. Most issues were related to communication of specifications, expectations regarding pricing of a highly customised product. For some companies the trade-off between privacy and the convenience of better services (e.g. UnderTheDoormat) is also something to consider.

4.5. Implications of flexible work contracts

Changes in the nature of work as we know it, with the disappearance of certain jobs in favour of digital labour is an ongoing phenomenon. Collaborative production firms share similar risks as those encountered by companies in the collaborative economy when it comes to the corresponding rise in flexible work contracts – **potential risks of job destruction, spreading in-work poverty, making the risk of doing business fall on individuals, and other social costs** (unemployment insurance, health, pension)²⁹.

Furthermore, if these platforms set quality standards for service providers (designer, maker, etc), with such standards deemed necessary in order to build the trust needed to connect strangers, would that then give rise to service providers being construed as employees instead of as independent contractors?

Building confidence and trust is therefore necessary to compensate the disruptive speed of changes caused by the trend.



4.6. Financing and developing a viable business model

Given that loans and other investment mechanisms are designed for traditional businesses, commercial collaborative production startups, need to further validate their business model in order to attract the appropriate level of venture capital financing, particularly in Europe. Some believe that the big challenge relates to valuation, where US companies are seen to get a much better valuation than European ones. It is therefore difficult to get critical mass in Europe, where it is relatively easy to become a national leader, but it is harder to become a leader also in other European countries. Consequently, American collaborative economy companies have a clear advantage over European ones because they have the scale and they get easier higher valuation.

They are however looking to alternative forms of financing. OpenDesk's primary source of financing was from the government – it received EUR 350,000 of seed funding for development of the system, and sees crowdfunding as a secondary source of equity – crowdfunding. Similarly, Nimber is looking at a mixture of venture capital and crowdfunded investment to fund its expansion.

At the same time companies with a social mission such as Phonebloks have received a lot of international attention and donation offers from, for example, the US. However, company was not able to accept these donations because they were not tax deductible (given that Phonebloks was based in Europe).

“US is investing into the future, not in yesterday's models.” – Nimber

5. Policy recommendations

The collaborative economy is the people's economy; it currently covers around 28% of the world population. Collaborative production and the maker economy could serve to boost employment and inspire competitive growth in Europe, particularly in the global high tech ecosystem.³⁰ The increase in demand for smaller scale manufacturing prompting a return of some manufacturing businesses to the region, and individual consumers and makers could more easily upscale their ideas into innovative products. For this to happen, supporting physical infrastructure and marketplace platforms are key, in addition to regulation that supports the scaling up of democratised manufacturing, encourages quality assurance, and clarifies the framework for flexible work contracts.

designers, makers, traditional manufacturers, local government and civil society.³²

Encouraging shared spaces can also promote sustainability and reduce waste. Researchers have found that the best strategy for sustainable prototyping is to share tools: have the fewest number of machines running the most jobs each.³³ Here, makerspaces which facilitate sharing of manufacturing infrastructure like 3D printers can provide both economic and environmental advantage to their customers.

In addition, shared maker spaces can provide capacity building for makers and entrepreneurs to acquire the financial and business management skills they need to access global markets, and become an offline complement to online community support.

5.1. Support provision of shared physical infrastructure and maker spaces

The provision of **shared physical infrastructures** such as maker labs and Fab Labs should be supported. These physical infrastructures around which communities can experiment and grow are important to ensure it is not just big companies with resources who can utilise ideas from open innovation.³¹

Supporting local maker spaces and any learning initiative is key to creating strong local communities and arming current and future workforce with modern tools. –

Hackster

These spaces can empower local innovators to collaborate with traditional manufacturers while leveraging on a global network of knowledge, and can be even more effective if integrated as part of a smart specialisation strategy that facilitates interaction and cross-sectoral pollination between

5.2. Promote platform marketplaces

As recommended by the Social Innovation Europe report³⁴, **platform marketplaces which connect companies and customers and promote open source collaboration should be promoted.** These platforms are especially important considering the needs of local small manufacturing firms in having a steady pipeline of projects – platform marketplaces could assist in **consolidating demand for the services of local makers** and create the critical mass needed to fuel the growth and connectivity of local makers into collaborative production networks. They could thus serve as a catalyst in expanding the stakeholder base (demand and supply side) in sync, a key criteria for community-based collaborative production companies to succeed.



Platform marketplaces can progress one step further in not just connecting designers to makers, but connecting them to

“Europe is leading the way in crowdfunding. It should accelerate funding in new areas.” – Nimber

prospective investors as well. Considering how collaborative financing acts as one of the key drivers of collaborative production, **crowdfunding platforms and**

networks could be incorporated in the marketplace ecosystem, which would also provide a natural feedback mechanism from the crowd (many of whom are prospective customers) to the designers and makers for companies and communities such as OpenDesk and Hackster.

Such European-based collaborative financing platforms may also further support organisations like Phonebloks who wish to remain independence while being highly engaged with consumers to drive the sustainability agenda.

5.3. Regulation to enhance the democratisation and scaling up of making

The preservation and enhancement of interoperability of systems and open standards (for example, open API standards for tooling machines and equipment such as CNC machines, and new distributed and decentralised warranty structures) should be maintained to keep the barriers to entry low for makers and entrepreneurs.³⁵

In addition, regulation and tax rules, such as VAT, should be updated and clarified along the production and distribution chain to facilitate the local manufacturing of designs sourced from another territory via organisations like OpenDesk. This may not be as big an issue within the EU where, with EU as a single market, the free movement of goods and services applies. However, it becomes more complex when services (e.g. furniture design) are rendered within EU for a party outside EU, and gets manufactured into a good (e.g. customised furniture) in the non-EU local market.

5.4. Clear regulatory frameworks for flexible labour contracts

National regulators should provide clarity relating to the flexible labour contracts employed by many companies operating within the collaborative economy, not least to lower the uncertainty relating to potential legal exposure and liabilities in the future. Guidelines on what constitutes de-facto employment versus the use of independent contractors should be defined clearly and in conjunction with collaborative economy stakeholders to increase understanding and implications on the future of employment and labour in the context of the collaborative economy.

Furthermore, special provisions could be foreseen to favour the use of flexible workforce in start-ups. Adequate support and environments, e.g. in the form of co-working modern technology centres could also speed up their growth,

5.5. Assure quality of products and services through government, community and industry standards

Given the open nature of collaborative production solutions, self-regulation might act as a viable alternative to existing approaches relating to oversight and regulation, for instance through the use of peer review tools which can encourage trust and self-regulation within communities.³⁶ However, as Nesta points out, self-regulation is largely helpful for activities where peer review is well suited, but cannot supersede government regulation. As such, a combination of the two may be the best approach, with self-regulation providing a flexible and fast way of responding to emerging challenges with new types of service offerings. Government policy in turn needs to be regularly evaluated to identify any new public risks that may not be covered by existing policies and regulations, and updated accordingly.

The above approach can be further complemented by encouraging industry partners to set an industry-led certificate of trust that could address specific industry risks relating to product and service quality and integrity. The establishment of standards is therefore crucial to make parties safe and secure during any economic transaction within the collaborative economy.



6. Appendix

6.1. Interviews

Company	Interviewee	Position
Hackster	Ben Larralde	Founder
Hackster	Adam Benzion	Co-founder
Nimber	Ari Kestin	CEO
OpenDesk	Tim Carrigan	CEO and co-founder
Phonebloks	Tomas Halberstad	Communications

6.2. Websites

Company	Web address
Hackster	www.hackster.io
Nimber	www.nimber.com
OpenDesk	www.opendesk.cc
Phonebloks	phonebloks.com

6.3. References

- ¹ Nesta. 2014. Making Sense of the UK Collaborative Economy. [ONLINE] Available at: http://www.nesta.org.uk/sites/default/files/making_sense_of_the_uk_collaborative_economy_14.pdf. [Accessed 30 April 15].
- ² Dan Robles. 2011. Collaborative Production, Consumption, or Destruction?. [ONLINE] Available at: <http://www.relationship-economy.com/2011/01/collaborative-production-consumption-or-destruction/>. [Accessed 30 April 15].
- ³ Antonin Léonard. 2012. From consumption to production, here comes the collaborative economy. [ONLINE] Available at: <http://magazine.ouishare.net/2012/07/from-consumption-to-production-the-collaborative-economy/>. [Accessed 30 April 15].
- ⁴ Prahalad, C.K.; Ramaswamy, V., 2004. Co-Creation Experiences: The Next Practice in Value Creation. *Journal of Interactive Marketing*, Volume 18, Number 3.
- ⁵ Altimeter Group. 2013. The Collaborative Economy. [ONLINE] Available at: <http://www.slideshare.net/Altimeter/the-collaborative-economy>. [Accessed 30 April 15].
- ⁶ Altimeter Group. 2013. The Collaborative Economy. [ONLINE] Available at: <http://www.slideshare.net/Altimeter/the-collaborative-economy>. [Accessed 30 April 15].
- ⁷ Indy Johar, Fiorenza Lipparini, Filippo Addarii. 2015. Making Good our Future. [ONLINE] Available at: <https://webgate.ec.europa.eu/socialinnovationeurope/sites/default/files/sites/default/files/SIE%20-%20Making%20Good%20our%20Future%20-%20May%202015.pdf>. [Accessed 19 May 15].
- ⁸ Jeremiah Owyang. 2014. Maker Movement and 3D Printing: Industry Stats. [ONLINE] Available at: <http://www.web-strategist.com/blog/2014/02/13/maker-movement-and-3d-printing-industry-stats/>. [Accessed 25 May 15].
- ⁹ Nesta. 2014. Making Sense of the UK Collaborative Economy. [ONLINE] Available at: http://www.nesta.org.uk/sites/default/files/making_sense_of_the_uk_collaborative_economy_14.pdf. [Accessed 30 April 15].
- ¹⁰ Phonebloks, 2015, <https://phonebloks.com/en> [Accessed 30 April 15].



- ¹¹ Nimber, 2015, <https://www.nimber.com/> [Accessed 30 April 15].
- ¹² Nesta. 2014. Making Sense of the UK Collaborative Economy. [ONLINE] Available at: http://www.nesta.org.uk/sites/default/files/making_sense_of_the_uk_collaborative_economy_14.pdf. [Accessed 30 April 15].
- ¹³ USA Today. 2013. Martha Stewart: Meet USA's new entrepreneurs. [ONLINE] Available at: <http://www.usatoday.com/story/money/business/2013/10/14/martha-stewart-column-meet-the-makers/2980701/>. [Accessed 25 May 15].
- ¹⁴ Tim Bjarin. 2014. Why the Maker Movement Is Important to America's Future. [ONLINE] Available at: <http://time.com/104210/maker-faire-maker-movement/>. [Accessed 25 May 15].
- ¹⁵ Pascal Fernandez. 2015. Europe Makes Way for the Makers. [ONLINE] Available at: <http://blogging.avnet.com/weblog/avnetvoices/2015/02/24/europe-makes-way-for-the-makers/>. [Accessed 23 June 15].
- ¹⁶ Tim Bjarin. 2014. Why the Maker Movement Is Important to America's Future. [ONLINE] Available at: <http://time.com/104210/maker-faire-maker-movement/>. [Accessed 25 May 15].
- ¹⁷ Adrienne Jeffries. 2013. At Maker Faire New York, the DIY movement pushes into the mainstream. [ONLINE] Available at: <http://www.theverge.com/2013/9/23/4760212/maker-faire-new-york-diy-movement-pushes-into-the-mainstream>. [Accessed 25 May 15].
- ¹⁸ Evgeny Morozov. 2014. Making It. [ONLINE] Available at: <http://www.newyorker.com/magazine/2014/01/13/making-it-2>. [Accessed 25 May 15].
- ¹⁹ Evgeny Morozov. 2014. Making It. [ONLINE] Available at: <http://www.newyorker.com/magazine/2014/01/13/making-it-2>. [Accessed 25 May 15].
- ²⁰ Joan Voight. 2014. Which Big Brands Are Courting the Maker Movement, and Why. [ONLINE] Available at: <http://www.adweek.com/news/advertising-branding/which-big-brands-are-courting-maker-movement-and-why-156315?page=2>. [Accessed 25 May 15].
- ²¹ Etsy. 2013. Redefining Entrepreneurship: Etsy Sellers' Economic Impact. [ONLINE] Available at: https://blog.etsy.com/news/files/2013/11/Etsy_Redefining-Entrepreneurship_November-2013.pdf. [Accessed 25 May 15].
- ²² Indy Johar, Fiorenza Lipparini, Filippo Addarii. 2015. Making Good our Future. [ONLINE] Available at: <https://webgate.ec.europa.eu/socialinnovationeurope/sites/default/files/sites/default/files/SIE%20-%20Making%20Good%20our%20Future%20-%20May%202015.pdf>. [Accessed 19 May 15].
- ²³ Indy Johar, Fiorenza Lipparini, Filippo Addarii. 2015. Making Good our Future. [ONLINE] Available at: <https://webgate.ec.europa.eu/socialinnovationeurope/sites/default/files/sites/default/files/SIE%20-%20Making%20Good%20our%20Future%20-%20May%202015.pdf>. [Accessed 19 May 15].
- ²⁴ Tim Bjarin. 2014. Why the Maker Movement Is Important to America's Future. [ONLINE] Available at: <http://time.com/104210/maker-faire-maker-movement/>. [Accessed 25 May 15].
- ²⁵ Indy Johar, Fiorenza Lipparini, Filippo Addarii. 2015. Making Good our Future. [ONLINE] Available at: <https://webgate.ec.europa.eu/socialinnovationeurope/sites/default/files/sites/default/files/SIE%20-%20Making%20Good%20our%20Future%20-%20May%202015.pdf>. [Accessed 19 May 15].
- ²⁶ Fab Foundation. 2015. Fab Labs. [ONLINE] Available at: <http://www.fabfoundation.org/fab-labs/>. [Accessed 23 June 15].
- ²⁷ Nesta. 2014. Making Sense of the UK Collaborative Economy. [ONLINE] Available at: http://www.nesta.org.uk/sites/default/files/making_sense_of_the_uk_collaborative_economy_14.pdf. [Accessed 30 April 15].
- ²⁸ The Telegraph. 2015. Nimber, the 'Airbnb for sending stuff' arrives in the UK. [ONLINE] Available at: <http://www.telegraph.co.uk/finance/businessclub/technology/11599367/Nimber-the-Airbnb-for-sending-stuff-arrives-in-the-UK.html>. [Accessed 18 June 15].
- ²⁹ Indy Johar, Fiorenza Lipparini, Filippo Addarii. 2015. Making Good our Future. [ONLINE] Available at: <https://webgate.ec.europa.eu/socialinnovationeurope/sites/default/files/sites/default/files/SIE%20-%20Making%20Good%20our%20Future%20-%20May%202015.pdf>. [Accessed 19 May 15].
- ³⁰ Pascal Fernandez. 2015. Europe Makes Way for the Makers. [ONLINE] Available at: <http://blogging.avnet.com/weblog/avnetvoices/2015/02/24/europe-makes-way-for-the-makers/>. [Accessed 23 June 15].



- ³¹ Indy Johar, Fiorenza Lipparini, Filippo Addarii. 2015. Making Good our Future. [ONLINE] Available at: <https://webgate.ec.europa.eu/socialinnovationeurope/sites/default/files/sites/default/files/SIE%20-%20Making%20Good%20our%20Future%20-%20May%202015.pdf>. [Accessed 19 May 15].
- ³² Indy Johar, Fiorenza Lipparini, Filippo Addarii. 2015. Making Good our Future. [ONLINE] Available at: <https://webgate.ec.europa.eu/socialinnovationeurope/sites/default/files/sites/default/files/SIE%20-%20Making%20Good%20our%20Future%20-%20May%202015.pdf>. [Accessed 19 May 15].
- ³³ Jeremy Faludi. 2013. Is 3D printing an environmental win?. [ONLINE] Available at: <http://www.greenbiz.com/blog/2013/07/19/3d-printing-environmental-win>. [Accessed 20 June 15].
- ³⁴ Indy Johar, Fiorenza Lipparini, Filippo Addarii. 2015. Making Good our Future. [ONLINE] Available at: <https://webgate.ec.europa.eu/socialinnovationeurope/sites/default/files/sites/default/files/SIE%20-%20Making%20Good%20our%20Future%20-%20May%202015.pdf>. [Accessed 19 May 15].
- ³⁵ Indy Johar, Fiorenza Lipparini, Filippo Addarii. 2015. Making Good our Future. [ONLINE] Available at: <https://webgate.ec.europa.eu/socialinnovationeurope/sites/default/files/sites/default/files/SIE%20-%20Making%20Good%20our%20Future%20-%20May%202015.pdf>. [Accessed 19 May 15].
- ³⁶ Nesta. 2014. Making Sense of the UK Collaborative Economy. [ONLINE] Available at: http://www.nesta.org.uk/sites/default/files/making_sense_of_the_uk_collaborative_economy_14.pdf. [Accessed 30 April 15].