Ref. Ares(2021)4078756 - 23/06/2021

iPRODUCE

D7.1 Analysis of Market Trends and Practices in Collaborative Production Engineering and Co-creation

CBS

June 2021

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement no. 870037.

DELIVERABLE INFORMATION	
Author(s)/ Organisation(s)	Charlotte Andersen, Isabel Fróes, Efthymios Altsitsiadis (CBS)
Document type	Report
Document code	D7.1
Document name	Analysis of Market Trends and Practices in Collaborative Production Engineering and Co-creation
Status	V5.0 EU
Work Package / Task	WP7, T7.1
Delivery Date (DoA)	30 June 2021
Actual Delivery Date	23.06.2021 June 2021
Abstract	Report D7.1 Analysis of Market Trends and Practices in Collaborative Production Engineer and Co-creation is an outcome of Task 7.1, which creates an overview of existing market trends and practices dealing with collaborative production across Europe and internationally. The report provides a review of co-creation practices and case studies within current industry practices, and regarding consumer driven customisation and prosumerism. More specifically, the analysis sheds light on the history and spread of community approaches to makerspaces and fab labs; the common processes, practices and tools used in similar makerspaces contexts (hackerspaces), and their suitability along with relevant key success and failure factors. The analysis provides a set of guidelines on how to apply co-creation and open-innovation methodologies on key iPRODUCE concepts, together with an overview of how local stakeholders and communities can be involved and activated.

DELIVERABLE HISTORY			
Date	**Version**	**Author/ Contributor/ Reviewer**	**Summary of main changes**
17/05/2021	V1	CBS	
26/05/2021	V2	F6S	Internal review of deliverable
14/06/2021	V3	CBS	Implemented review
23/06/2021	V5.EU	CBS	Final Version

DISSEMINATION LEVEL		
PU	Public	x
PP	Restricted to other programme participants (including the EC services)	
RE	Restricted to a group specified by the consortium (including the EC services)	
CO	Confidential, only for the members of the consortium (including the EC)	

DISCLAIMER

iPRODUCE ● Grant Agreement: 870037 ● Innovation Action ● 2020 – 2022 | Duration: 36 months

Topic: DT-FOF-05-2019: Open Innovation for collaborative production engineering (IA)

Executive Summary

Deliverable D7.1 Analysis of Market Trends and Practices in Collaborative Production Engineer and Co-creation is an outcome of Task 7.1 of the iPRODUCE project. This task has led to the development of the present report that creates an overview of existing market trends and practices dealing with collaborative production across Europe and internationally.

The report starts with a review of best co-creation practices and case studies within industry practices, regarding consumer driven customisation and prosumerism. More specifically, the analysis carried out sheds light on the history and spread of community approaches to makerspaces and fab labs; the common processes, practices and tools used in similar makerspaces contexts (hackerspaces), and their suitability along with relevant key success and failure cases and factors that might have contributed to them. The analysis provides a set of guidelines on how to apply co-creation and open-innovation methodologies on iPRODUCE key concepts, together with an overview of how local stakeholders and communities can be involved and activated. The deliverable further offers an overview of how policies, regulatory and operational factors together with related initiatives and support actions can have major implications on initiatives of similar nature. The emergence of Blockchain and cryptocurrency are clear developments that might come to transform the market in the coming years. The work carried out in the task also provided an overview of current and upcoming technologies that might impact the consumer-driven sector, with aspects of applications facilitating 3D scanning for production being one clear example.

The report introduces the market trends and practices influencing collaborative production, covering user-driven initiatives, shedding light on the history behind the growth of fab labs, makerspaces, and hackerspaces, and how they have developed in the past few decades. This can help the reader place the various elements together and understand the context in which change is happening in the area.

It then proceeds to create a better understanding of current trends, and presents concepts related to consumer-driven practices. Prosumerism, a concept where the producer and consumer are fused into one, is found to be a dominant aspect of many of the existing services and marketplaces supporting these practices. The growth of crowdfunding initiatives and fundraising platforms shows how community-led initiatives can lead to new and impactful solutions, disrupting the marketplace and creating new business opportunities. The market trends set the premise for the guidelines (method structure) to carry out co-creation and open-innovation methods to support the iPRODUCE solutions and platform successfully.

The report also performs an assessment of policies and regulatory aspects, including aspects of tokenisation and how they can affect upcoming user-driven marketplace developments, including the current top cryptocurrencies and more recently Non-Fungible Tokens (NFT) and how they perform in distinct fields. An analytic overview of existing and upcoming technologies is then used to show how they are used and their potential for local production in the consumer-driven sector.

The report concludes by providing a set of recommendations of how the aspects presented in the report can impact the customer goods sector, digital manufacturing, and how they need to be taken into consideration when developing the iPRODUCE service platform. The collection, interpretation, and synthesis of the analysis carried out in the framework of Task7.1 and detailed in this report builds an up-to-date knowledge base of relevant frameworks and models with a strong application potential to the specificities of creative approaches to local and on-demand urban production.

Table of contents

List of Figures

List of Tables

List of abbreviations

NFT Non-Fungible Token

IP Intellectual Property

CNC Computerised numerically controlled machine

CE Circular Economy

1. Introduction

1.1. Background

The user-driven approach and the related open innovation paradigm have gained ground in recent years through the wide spread of design methods and design thinking approaches[1]. Open innovation practices[2] have also expanded and are slowly settling as a more common practice within established industries. However, these approaches are experienced as costly and time-consuming, and require an open mind set to a collaborative process (Turkama & Kivikangas, 2016).

While larger industries tend to adapt in a slower motion, start-ups and other user-driven initiatives tend to adapt faster and 'test' themselves in the market through own investment, fundraising campaigns and accelerator programmes. At the same time, makerspaces and fab labs have expanded their reach. While initially dedicated to local hobbyists and smaller groups, in recent years they have become entrepreneurial sites, becoming more relevant in markets and business development, while also keeping the edge by integrating current and upcoming technologies to address new market opportunities (Hui & Gerber, 2017). In addition, and still according to Hui and Gerber (2017), people who believe in their ability to develop, manage and perform are more likely to become entrepreneurs.

Another aspect dealing with market practices relates to those of social entrepreneurship, which has been defined as processes that catalyse social changes through a combination of resources (Montesano Montessori, 2016). Furthermore, as technologies and related solutions in various fields keep evolving, a number of aspects have a determinant impact on the markets and user-driven initiatives. From an economic perspective, the types of new models bring opportunities and challenges that lie within the uptake of Blockchain systems, cryptocurrencies and non-fungible token (NFTs).

Consequently, new business models that cover the breadth of existing and upcoming market opportunities need to accommodate a degree of flexibility, which needs to be supported by fast adapting policies and legislations.

1.2. Objectives of the deliverable 7.1

The overarching objective of this deliverable is to provide an overview of existing market trends and practices dealing with collaborative production. This deliverable is directly related to Task 7.1 of the iPRODUCE project, which investigated various elements that together account for different aspects that need to be considered in the context of the project.

The analysis looked at the spread of community approaches into makerspaces and fab labs and identified the common tools and practices that are used in similar contexts. The degree of relevance, the feasibility and fit, along with methodologies that are used in applying these approaches and concepts in different contexts were assessed. In conjunction, the analysis aimed to shed light on the stakeholders directly involved with makerspaces and fab labs and to investigate their role in the application and success of such concepts in the maker culture. Another objective of this task was to analyse relevant new technologies, trends and support actions, and to explore how policy and regulation can have a significant impact on the adoption and operationalization of these key concepts within (and hopefully beyond) the iPRODUCE context.

[1] More information about Design Thinking in deliverable *D2.4 Report-on-co-creation-and-open-innovation-methods-for-social-manufacturing*
[2] Ibid.

1.3. Structure of this report

Following this introduction section, the second section of this report presents the market trends and practices influencing collaborative production, the spread of community approaches to makerspaces and fab labs, while covering the structures, market and business models aspects involved in products emerging from user-driven initiatives, whether emerging or not from fab labs or makerspaces. These sections also covers the roles of direct and indirect stakeholders and communities in collaborative production initiatives.

The third section covers policies, regulatory aspects, support actions and related initiatives and how they impact the user-driven production sector.

The fourth section gives an overview of existing and upcoming technologies, how they are used and their potential for user-driven initiatives, including aspects of tokenisation and how they can affect upcoming user-driven marketplace developments.

The fifth and last section of the reports provides a set of recommendations of how the aspects presented in the report can impact the customer goods' sector, digital manufacturing, and how they need to be considered when developing the iPRODUCE service platform.

1.4. Methods used

The development of this deliverable is based on systematic literature reviews that were catalogued, including both a description and key relevant aspects related to the respective task objectives. Multiple sources (spanning beyond purely academic sources) were identified and used, and continually updated as to present the most recent values with the submission of the deliverable.

The work started with a thorough literature review through Google search towards academic articles looking for topics such as 'makerspaces + entrepreneurship', 'community driven markets', 'collaborative production', 'user-driven entrepreneurship'. From within the search results, 100 articles were selected as core peer-review academic resources. The research then extended to include business and related blogs and magazines as well as institutional websites discussing and presenting the selected topics. The initial research shed light on key related topics within user-driven trends and practices, which led to another search towards the topics of 'prosumerism', 'cryptocurrency', 'user-driven production + policy'; 'user-driven production + legal framework'; 'user-driven production + regulatory framework', 'manufacturing technologies', 'upcoming manufacturing technologies', 'user-driven + technologies'. Another set of resources were identified and added to the initial reviewed articles and used in the analysis, which combined builds the core references of this report (an example of query from the analysis process can be seen in *Appendix 1*.

The research covered available information (historical and market perspectives of collaborative production, co-creation practices, and case studies with a preference to industrial cases). After the collection of the preliminary and follow-up material, the deliverable evolved with an in-depth analysis, interpretation, and synthesis to create this knowledge base of relevant and applicable frameworks and models. Applicability was tested with peer reviews articles and by avoiding jargon where applicable and including practical and fitting information to facilitate the reading and use of this report. The cMDF partners also provided some of the online resources presented in the report, helping demonstrate an up-to-date industry perspective. A word query of the top 300 words within the research files are shown in figure 1.

Figure 1: Word cloud from the research files.

"Developing an entrepreneurial makerspace goes beyond inviting people with entrepreneurial goals. It involves creating opportunities offline and online to develop skills and self-efficacy in a range of entrepreneurship tasks, from manufacturing to marketing" (Hui & Gerber, 2017, p. 2028)

2. Market trends and practices dealing with collaborative production

In order to identify, present and understand the existing market trends, it is important to first present the historical spread of community approaches, makerspaces and fab lab spaces that have driven collaborative production.

Collaborative production has a dynamic nature and is primarily driven by groups of people sharing interests and expertise. These groups are commonly gathered in fab labs, maker, and hackerspaces across the world. As of 2021, there are 381 fab labs spread all over Europe, the majority of which based in Italy (87), Spain (37) and France (113)[3]. In the rest of Europe, the average is less than 10 per country. Most of the fab labs have a specific area in which they offer services. Many of them also have an educational focus and are the result of a collaboration with the local school or university.

The definition of a makerspace as *"an intersection between constructivism, constructionism, collaborative learning and problem-based learning"* (Dousay, 2017) helps understand the drive and the processes that take place in such spaces. There are many and very different makerspaces, but common to all is the possibility to produce some sort of a physical or digital product, whether it be a bookcase or an app. The fab labs and makerspaces in Europe have a wide variety of formats and sizes. However, the framework for all of them is innovation and co-creation as described in deliverable *D2.4 – Report on Co-creation and Open Innovation Methods for social manufacturing*.

Processes of creativity and innovation are key towards the *make* culture, linked to that of craftsmanship. However, "*contemporary maker culture is less focused on the acquisition of a set of specific craft skills over a long period of apprenticeship, and more concerned with a general approach in which anyone with access to the right tools and resources can create*" (Marsh et al., 2017, p. 7; Schrock, 2014) and produce whatever they can plan or design.

Shanshan (2016) describes three periods for makerspaces: the embryonic, the transition and the outbreak. The embryonic period is describe as being from the 1870s until 1970s and include the start of the Ladies Social Society in 1873 where the focus was on knitting, quilting and sewing. The transition period was characterised by having libraries creating children's focused departments with outreach programs. Most of the makerspace/ creative space history is based in museums and libraries initiatives. However, in the 1960s, the first hackerspaces formed from within the hippies' counterculture in the western world.

This continued with the launch in January 2005 of the first MAKE Magazine[4], facilitating the dissemination of the Maker Movement from the USA to the rest of the world. Furthermore, the Make:Books[5] publishing company also helped the publication of books on physical computing and related maker topics. Currently, Makerspaces have spread all over the world and still have a significant role in libraries. However, within the last 5 years it has spread from a DIY and educational purpose to become more commercial, although keeping the scope about creating collaborations and sharing knowledge (Moorefield-Lang, 2015). The outbreak period, in which we are currently, started in 2011 (Yu, 2016) with the broader widespread of makerspaces and fab labs and their establishment as desired and feasible services in society.

[3] *https://www.fablabs.io/*
[4] *https://makezine.com/*
[5] https://www.makershed.com/collections/make-books-print

Another related concept to those of makerspaces are hackerspaces, community-driven physical spaces where people can share knowledge and help each other develop different things (Smith & Light, 2017; Williams & Hall, 2015). This is very much aligned with the fact that a makerspace is defined as an open community centre where groups with shared interests, "often in computers and machining and so on can meet, socialise and collaborate" (Abdullahi & Dewa, 2020, p. 1606).

The first acknowledged hackerspace was established in 1981 in Berlin and was called the Chaos Communication Club (CCC). Later on, there were several hackerspaces formed and according to the hackerspace Wiki, as of April 2021, there are 2413 hackerspaces registered across the world[6]. In the transition period, makerspaces started blooming primarily in universities and libraries. Hackerspaces are defined as "community-operated physical places, where people can meet and work on their projects" (*HackerspaceWiki*, n.d.).

Hacker and makerspaces are interconnected and share many of the same principles and approaches to playing, working and learning (Williams & Hall, 2015). Schrock indicates that "Hacker and makerspaces arise from grassroots networks through a shared interest in maintaining a semi-permanent space for solo and collaborative work" (Schrock, 2014, p. 1). However, there are some crucial differences such as the fact that making is more concerned with the ongoing process and the satisfaction that comes from it. However, hacking can be described as strategic to bring differences together and explore specific opportunities and problems in various systems (Allen, 2017).

Another important note is that many makerspaces have a focus, such as producing crafts or a technological angle. Makerspaces focusing on multiple possibilities are not necessarily the most common, with only a few offering the wide range of production, which includes metal, wood, 3D, and electronics workshops.

Given the challenge of conceptualising the notion of 'community', there is no standard model for a community makerspace; rather, we are required to acknowledge there is a wide variety of spaces that operate according to their own sets of principles, which consequently define their own community culture. In both hacker and makerspaces, entrepreneurial and self-governing aspects are highlighted in the literature, illustrating how these communities are redefining social and economic aspects in the 21st century (Abdullahi & Dewa, 2020; Allen, 2017; Ensign & Leupold, 2018; Grimm et al., 2013; Hui & Gerber, 2017; Richterich, 2020; Rosa et al., 2017; Seo-Zindy & Heeks, 2017).

2.1. Consumer-driven customisation & prosumerism

The term *prosumers* has been earlier defined as a group of individuals who produce and consume by themselves (Qi, 2004). More recently, this definition together with others (Chandler & Chen, 2015; Cova & Cova, 2012; Darmody et al., 2017; Eckhardt et al., 2019a; Halassi et al., 2019; José Planells, 2017; Lang, Botha, et al., 2020; Lang, Dolan, et al., 2020) has been broken down into specific types of prosumers (Lang, Dolan, et al., 2020) as shown in Table 1.

These distinct categories describe the various types of prosumer sections and how they perform differently within the customer-driven customization sector (DesAutels, 2011; Fox, 2018; José Planells, 2017; Kotler, 1986; Morreale, 2014; Pitt et al., 2006; Ritzer, 2014).

[6] *https://wiki.hackerspaces.org/List_of_Hacker_Spaces*

Table 1: Prosumer Types according to Lang, Dolan et al.

DIY prosumers	Self-service prosumers	Customizing prosumers	Collaborative prosumers	Monetized prosumers	Economic prosumers
Prosumers who perform entire tasks for their own use and consumption	Prosumers who perform partial self-service tasks, often through technology	Prosumers who personalize and customize their own products and services	Prosumers who create value that is accessible to others through a non-commercial third party	Prosumers who create value that is accessible to others through a commercial third party	Prosumers who receive formal incentives from a commercial third party when creating value for others

When entering the area of prosumerism and consumer driven customization, it is important to take a step back and look at the experience economy (Pine & Gilmore, 1998). Mass production has for many years given consumers the same choices worldwide, and consumers have gone from accepting mass-productions to expecting much more with the customer journey. The experience of a purchase has become a unique part of the product leading consumers to question: Was it easy to purchase? Was the personnel nice? Did they add something extra to my package? Did it arrive fast?

The trend is that consumers want their goods to be accessible from the home via the internet and the delivery should be fast and smooth. That was what made the whole experience a crucial part of the product in the beginning of e-commerce. If the product were not bought online, it would be the service experience and the ambience that was a big part of the decision of buying.

Now these experiences are no longer unique, and consumer expect even more from their shopping (or production) experience. Fast delivery and a little extra is no longer enough; consumers now also want to have some kind of say about the design. It all starts from the experience economy, which can be traced back to Walt Disney (Pine & Gilmore, 1998).

Back in the 1970s, the traditional service industries struggled in competing for the same customers and therefore had to start differentiating themselves on the service and the experience of eating out. This experience aspect was picked up very early by various companies, such as Nike, where they started giving the consumers extra experiences and, e.g., making online communities for runners. It evolved from being ‘just shopping’ to be shoppertainment (*Shoppertainment: A Wave of Change for the Retail Industry*, n.d.).

As earlier stated:

> “But this doesn’t mean that experiences rely exclusively on entertainment; entertainment is only one aspect of an experience. Rather, companies stage an experience whenever they engage customers, connecting with them in a personal, memorable way” (Pine & Gilmore, 1998, p. 03).

Now, even more than before, due to environmental concerns, among others, the new experience economy where customization and responsibility of products and producing local in small bulks has become *the little extra*. Here, makerspaces will be able to play a large part in order to scale up locally and still deliver the best service, by making the mass production a local customer experience, while still offering competitive prices through the omission of value chain stakeholders. This process also creates an impact on waste, avoiding some products to be developed in mass scale, where some end up never being consumed.

2.1.1. Aspects impacting success and unsuccessful initiatives in consumer driven customisation

Within the consumer driven customization, it must be highlight the growth in mass-customisation, where big brands, from computers companies to sports apparel, offer opportunities of customising their products before the purchase (Freudmann, 2020). Online offers facilitated various types of mass customisation, from a computer to cars. An early example was the use of 3D interfaces to help people customise certain products. These services often used specific software plugins that enable the features required for such interactions. However, the speed of technology can sometimes jeopardise functionalities and plugins can become fast deprecated, compromising the use and creating damaging perceptions to the service or brand. Therefore, a key factor when developing platforms or online services deals with required updates and the early choice of more stable and reliable programming languages, providing more longevity to the platform and service offered.

Following the description of different types of consumers from Table1, we present in Table 2 factors that might impact success or failure of solutions in these contexts:

Table 2: Factors impacting customer-driven initiatives

	DIY prosumers	Self-service prosumers	Customizing prosumers	Collaborative prosumers	Monetized prosumers	Economic prosumers
Success	Easy access to locations & tools Great network	Good and reliable interfaces, access to production	Good and reliable interfaces	Access to large network, easy & fast exchange of information	Reliable interfaces and active network	Trust and frequently accessed platforms
Failure	Broken machines or services not working properly	Deprecated plugins; too many steps to complete task and unclear information, Etc.	Deprecated plugins; too many steps to complete task and unclear information, Etc.	Inactivity or not enough 'community' – questions or suggestions are left unanswered, etc.	Too costly Value exchange is unclear Poor interface, etc.	Lack of control over brand, platform information clashing with service offer, etc.

A key example of successful user-driven initiatives was the Covid-19 related production of PPEs, where different sets of stakeholders including makers, doctors, makerspaces, came together to fill in the gap of the supply chain due to the disruptions caused by the pandemic[7]. The open source aspect observed within the maker community is also a key factor to this success, as the cross-collaboration and sharing of ideas and tools is well appreciated, while opportunists might be pushed aside[8].

[7] *https://www.bos-cbscsr.dk/2021/01/21/innovating-under-pressure/*

[8] This comment was part of the discussion from the *iPRODUCE online event | The social manufacturing paradigm: co-creating with manufacturers, maker spaces and consumers*

Another key aspect in user-driven approaches can reflect how makers can contribute to several aspects of circular economy (CE). By having a hands-on approach to making, and the known network, makerspaces can lead CE initiatives and gain an active role in the repurposing, upscaling and recycling in the urban environment.

While big sports companies have been working with consumer driven customisation, offering customers to customise their shoes by changing designs[9], etc. other smaller companies have also followed this strategy as the success case of consumer driven customisation of *PYK Copenhagen*. This small sustainable company produces customized children's shoes where a child can design the shoe from home – so avoiding over production; most of the products are produced on demand. While the production is currently in Portugal, other opportunities of local production are opening, meaning these shoes could be produced even closer to their end-customer. Businesses as such could have a great advantage in producing locally, saving on transport and waiting time, besides ensuring the close connection to the end-user that can also facilitate take-back models for recycling and upcycling. Within the recycling and upcycling theme, big market players are playing a role, such as the ones seen in the fashion and furniture industries. H&M provides a voucher to clients who bring their used clothing (Recycling and Upcycling - H&M Group, n.d.), IKEA allows consumers to sell back their old furniture to the IKEA shops (Ikea to Buy Back Used Furniture in Recycling Push - BBC News, n.d.). These initiatives bring value to the customer and the brand, while also opening further opportunities for local production and customisation using returned products and increasing the life of the materials.

2.2. Community led approaches – Crowdfunding: a new set of stakeholders

A key set of supporting technologies for user-driven innovation deal with crowdfunding platforms (see Table 3). As makerspaces and fab labs spread across the world, developing ideas into actual products became a reality. In the 2000s, the increased development and uptake of social media services (Clay Shirky, 2008) further facilitated through the growth of community led fundraising online platforms and other market oriented solutions, allowed small producers to bring their ideas to the market (Agrawal et al., 2015; Darmody et al., 2017; Eckhardt et al., 2019b; Ordanini et al., 2011). In this scenario, customers become investors, as their financial support allows for the actual production of a product – now on demand. Through these platforms, most products just have a prototype or detailed concept developed, and through the backing of the 'crowd', these products are produced in either small or large numbers, depending on the demand.

Crowdfunding started from within the creative and art-led communities and gained ground through adjustments in the regulatory processes, which facilitated the crowdfunded investments (Agrawal et al., 2014). In this context, there are two key sets of stakeholders: funders (or backers), those who financially support the product; and creators, who initiate the project idea.

While in other market platforms, designers had to create the project before putting it for sale, with the crowdfunding opportunity, this process was reversed, and now the product was only going to be produced if there was a market interest.

[9] *https://www.nike.com/nike-by-you*
https://www.vans.com/custom-shoes.html

2.2.1. Fundraising platforms

Regarding practices impacting community led approaches, fundraising platforms stand out, as they can facilitate makers, SMEs, designers, inventors, etc. to raise funds to not only create a proof of concept, but also to widely commercialise and kick-off a whole business proposition. Crowdfunding has been described as a "collective effort by consumers who network and pool their money together, usually via the internet, in order to invest in and support efforts initiated by other people or organizations" (Ordanini et al., 2011, p. 1).

Fundraising platforms started becoming popular in the first decade of 2000, with the launch of Kickstarter in 2009. Since its launch, a number of other platforms have joined the market, offering diverse focus and opportunities for various areas.

Regarding these platforms, there are two distinguishable business model formats: the investment and the reward/donation based. While in the investment format, funders might receive monetary benefits, in the reward/donation format, funders obtain a product or support a cause (Belleflamme et al., 2015).

The interesting business aspect of these platforms deals with a proof of concept for the value proposition, through a tested market demand. By launching a campaign to produce 'an idea', it allows for designers, makers, companies to not only test the idea, but also learn, through the interaction with the backers, about possible needs and requests, that can improve the idea and consequently the product to be produced.

Table 3 provides an overview of a selection of fundraising platforms.

Table 3: Overview of fundraising platforms[10]

Market Overview	Name	Description
Most popular	Kickstarter	Founded in 2009, has raised over 4.6B in backed projects through the platform.
Best overall according to Investopedia	FundRazr	Founded in 2009 has raised over $200M – provide different fundraising models
Best for Creative Projects	Patreon	Founded in 2013, have raised over $2B to their creators.
Best for Businesses	Wefunder	They have raised over $5 billion in venture capital for their startups, have funded over 500 companies.
Best for Going to Market	Indiegogo	Founded in 2008, has raised over $1B in campaigns to over 800K ideas
Best for No Fundraising Deadline	GoFundMe	Founded in 2010 and has raised over $9B in donations
Best for Social Causes	Chuffed	Founded in 2013 in Australia, focus in helping humanitarian related causes.
Helping companies raise capital	Fundable	Founded in 2012, it has raised over $615M in funding for companies
A community-backed	Ulule	Founded in 2010 and has brought over 30K

[10] https://www.investopedia.com/best-alternatives-to-kickstarter-5081260
https://www.merchantmaverick.com/kickstarter-alternatives/
https://www.thinklions.com/blog/the-5-best-kickstarter-alternatives-for-app-startups/

Market Overview	Name	Description
incubator		projects to life
Pitch platform for investors	PitchLions	Requires a membership fee to become a member and pitch your idea.
Equity crowdfunding platform	Crowdfunder	Over $160M investment commitments

2.2.2. Market trends and practices in user-driven contexts

Regarding market trends, processes, structures practices and tools, there is a vast number of resources and a huge growth in how they appear and get popular in the market. Social media platforms support this process, being the quick and broad outlet for disseminating these services.

One of the key market trends and practices in the sector is the growth of single-entry platforms, which work as supporting digital tools, providing visibility and access to local resources where the design, development and manufacturing can be carried out. These platforms connect different sets of stakeholders, amplifying the reach of the market beyond the physical constraints where only people who would actually see or know about these spaces would have access to them.

Table 4 presents a list of existing platforms illustrating this trend and offering a vast array of services or digital tools impacting collaborative production. Among the list, there are examples of user-driven furniture customisation, which is relevant to the iPRODUCE context as it is a sector being addressed by at least two of the cMDFs, have now been picked up and integrated into a larger market offer. Some other of the listed platforms deals with electronics and other types of production, therefore relevant for all the cMDFs from the project.

Table 4: Market Trends supporting current practices: Platforms connecting ideas to production, customising mass production

Name & URL	Company Location / Area	Description
Quirky *https://quirky.com*	New York	Allows to submit an idea, patent, prototype, or actual product to the platform and if it gets chosen, the product will undergo further design, development, prototyping, testing, manufacturing, and distribution. In addition, Quirky will pay the maker every time someone buys the invention.
Sketchfab *https://sketchfab.com*	Paris	Allows anyone to publish and find 3D content online. With a community of millions of creators who have published millions of models, they are the largest platform for immersive and interactive 3D. Additionally, their store lets buyers and sellers transact 3D models with confidence using a real-time viewer and model inspector.
Participatory City *http://www.participatorycity.org* *http://www.participatorycity.org/open-*	London	Allows the residents of the London Borough of Barking and Dagenham to build networks of people in order to co-create a “practical participatory ecosystem”.

making-society		
Open Electronics *https://contest.open-electronics.org*	Italy	Supports the development, hacking and playing with electronics; sharing of open projects to create products. Their mission is to become an Open Source hacking site of reference with ideas and feedback aimed to enrich the community.
Knowle West Media Centre *https://kwmc.org.uk*	Bristol	Supports people to make positive changes in their lives and communities, using technology and the arts to come up with creative solutions to problems and explore new ways of doing things.
Goldfinger *https://www.goldfinger.design*	London	Focuses on the design and craft bespoke furniture and homeware for residential homes and many London businesses. Teaches marginalised young people the craft of woodworking as well as business and marketing skills, so they can progress into meaningful work. Offers craft courses and workshops.
Opendesk *https://www.opendesk.cc*	London	An online marketplace that hosts independently designed furniture and connects its customers to local makers around the world. Rather than mass manufacturing and shipping worldwide, they are building a distributed and ethical supply chain through a global maker network.
AtFab *http://atfab.co*	U.S.	Allows designing simple, durable, modern objects and facilitate how they are designed, manufactured, and delivered. Their furniture designs can be downloaded, locally fabricated by a global community of makers, and commissioned by private clients.
WikiHouse *https://www.wikihouse.cc*	U.K.	A digitally-manufactured building system that aims to make it simple for anyone to design, manufacture and assemble beautiful, high-performance homes that are customised to their needs.
Make Works *https://make.works/*	E.U. Part of *https://distributeddesign.eu/*	Provides access to manufacturers, makers, material suppliers and workshops, making local manufacturing openly accessible. Their platform allows designers and makers to find manufacturers, material suppliers and workshop facilities in their local areas.
Inventables *https://www.inventables.com*	Chicago	Makes products that bring out the maker inside people. Key to this is simplifying the path from idea to finished product. 3D carving is the most effective and efficient way for people to bring their ideas to life. They offer everything necessary to make 3D carving easy and inspiring: powerful machines, intuitive software, and unique, beautiful materials.
FabHub *https://www.fabhub.io*	London	A global directory of digital fabricators: makers, workshops, factories and manufacturers who offer a manufacturing service or services using digital fabrication technology. It can find a maker a digital fabricator who can make / manufacture / fabricate products that are designed for digital

		fabrication, be it CNC cutting, CNC routing, 3D printing, 3D scanning, laser cutting — any technology where you supply a digital design (normally as vector artwork or cutting sheets) that numerically controls a digital manufacturing machine.
Open Design and Hardware Group *https://design.okfn.org*	E.U.	A global network of makers, academics, designers and openness advocates who are working to build a community of practice around open design and hardware across paradigms, from product design to architecture to digital design and physical art.
Domestika.org *https://www.domestika.org/en/courses/1079-introduction-to-cnc-router-furniture-design*	Spain	Allows learning how to design and produce sustainable furniture: from a sketch to a CAD drawing and to the final piece.
LikeButter *https://likebutter.com.au/*	Australia	A design and fabrication business owned and run by industrial designer Jem Selig Freeman and sculptor Laura Woodward. Like Butter has gained a reputation for its approach to design and fabrication that is based on flexible and lateral thinking, strong aesthetics and considered detailing, in order to achieve the simplest and most effective solutions for the project at hand.
Moormann Design *https://www.moormann.de/de/*	Germany	Furniture online shop.
Panyl *https://www.panyl.com/*	US	Customises IKEA furniture.
IKEAhackers *https://www.ikeahackers.net/*	International	Hacks and transforms IKEA furniture.
Pretty Pegs *https://www.prettypegs.com/*	Sweden	Knobs and legs for IKEA (or other) furniture.
Superfront *https://superfront.com/*	International	Custom made fronts fit for IKEA furniture.
Instagram	US, Facebook owned	Some makers use only an Instagram profile as their 'shop'

2.2.3. Methodologies for the application of co-creation and open innovation in iPRODUCE in local and regional contexts

2.2.3.1. Baseline requirements

Co-creation, open innovation and design thinking, as described in deliverable *D2.4 Co-creation and Open Innovation Methods for social manufacturing*, can support some of the processes that will be executed through the iPRODUCE online platform and briefly described in Table 5.

The iPRODUCE platform offers a set of products such as matchmaking and Ricardian contracts that will facilitate the exchange among various stakeholders towards a collaborative production and opportunities for local manufacturing and exploitation of products.

However, in order to best deploy the concepts and tools that will be available from the platform, it is of extreme importance to highlight the upcoming growth of prosumerism, online services and the impact it has had in current market practices. To create a valuable marketplace for the various current and upcoming technologies and tools available, a strategy needs to be devised to explore how most efficiently to communicate the opportunities available from within the platform to the targeted stakeholders and communities.

Table 5: Co-creation and Open Innovation in iPRODUCE

Co-creation	Open innovation	Design Thinking
Project/product/service emerging from a collaborative development with a group of different stakeholders	Products and services ideas are to be co-created with groups that do not necessarily work in the company or organisation that will develop or provide them	iterative design process that includes a set of phases in developing products and services

Any platform requires a clear management strategy, defining how this management will be deployed and organised is the first aspect that needs to be clarified.

Therefore, the key aspects to bring the iPRODUCE concept forward need to focus on:

- Market competitiveness: create a detailed analysis of existing services as those presented in Table 4: Market Trends supporting current practices.
- Marketing & communication: develop a clear management and marketing strategy to run the platform in the 1st year – the learnings from the first year should inform the following campaign strategies.
- Service and site maintenance: to keep the iPRODUCE platform relevant, the website and app need to be maintained, in not only how it runs, but also concerning customer service and support.
- Scaling up (new partners, products, etc.): develop a clear blueprint with a scale up plan for the service for the launch and 2 years forward, including touchpoints, stakeholders and services.
- Quality control: define how best to secure the quality of the service and the product to be delivered through the platform. The platform needs to run an evaluation after every completed agreement.

Besides these aspects, the developments in the regulatory processes and economy (such as those of cryptocurrencies and Blockchain) that might hinder (by social acceptance, large fluctuations, and low diversity within cryptocurrency investors) or facilitate (ease of use through smart contracts, no currency exchange, etc.) the future of collaborative production need to be considered and aggregated to the services to be offered accordingly.

2.2.3.2. Methods for local initiatives

In order to develop, maintain and expand a local community of makers, SMEs, larger companies, etc., the project partners need to organise local events with distinct purposes, where they apply co-creation tools and methods, such as those listed on the *iPRODUCE website* towards new products and services that can be facilitated through the upcoming iPRODUCE platform. Within the project timeline some of these communities are being formed through collaboration among local project partners, while throughout the project tasks new partnerships and exchanges are taking place, expanding local networks and broadening the opportunities for SMEs, makers, public and private actors. These collaborations among the cMDFs and local stakeholders are focusing on the production of actual products, taking advantage of local facilities, while also opening new horizons for new product developments in the future, as the external stakeholders become aware of the possibilities in collaborative production. Some of these events can be dedicated to:

1. Co-creating objects (such as Gamer Chairs, in this case, e-players, casual gamers and game development companies should be invited).
    a. Develop concept prototypes
    b. Develop working prototypes
2. Testing new products (such as 3D printed medical appliances, invite experts, casual and resistant users to test and give feedback).
    a. Define key product value
    b. Identify existing problems
    c. Gather key points to be used to communicate the product.
3. Choosing new sets of project partners.
    a. Organise a local challenge in the form of a short task to be solved. It can be run as a hackathon or competition where the local partner gets the chance to expand its network and assess local talents that could become future collaborators.

These methods can be combined as part of the aforementioned strategies.

2.2.3.3. Methods for International initiatives

In order to develop and maintain an international community of makers, SMEs, suppliers, companies etc., the platform partners need to organise cross-country campaigns and competitions with clearly defined purposes fitting with the previously defined platform development strategies. For these international collaborations, the platform partners can also apply co-creation tools and methods as those listed on the *iPRODUCE website* and in the upcoming platform. Some of these events can be dedicated to:

1. Developing international competitions.
    a. Where the general public co-define a focus for upcoming competitions
    c. For teams to cross-pollinize ideas towards a specific problem
    d. Promote exchange of knowledge among cross-nationals
2. Testing new products (invite experts, casual and resistant users to test and give feedback).
    a. Define key product value in different markets
    b. Identify existing problems from various country perspectives
    c. Gather key points to be used to communicate the product in distinct markets.
3. Choosing a set of new project partners,
    a. Towards opening opportunities in other international markets beyond those already involved in platform.

These methods can be combined as part of the aforementioned strategies.

3. Policy, regulatory and operational factors

Regarding policy, regulatory and operational factors that can contribute to or counteract user-driven initiatives, various aspects need to be well thought out. For user-driven policies, there is a clear requirement of the involvement of different stakeholder groups (both those implementing the policies and those affected by them), groups belonging to distinct administrative sectors, combined with a closer coordination of existing policy tools.

3.1. Policy and regulatory factors

While intellectual property (IP) and patent regulations are designed to secure ideas and help the monetization gain based on them, they can also act as an impediment for innovation in related areas, primarily for user-driven initiatives, who might fall victims of large corporations, which might have the economic muscle to register, secure and monetise on novel ideas and concepts. Another aspect of IP relates to the economic aspect of registering a patent, which is currently cumbersome and expensive, and impacts how user-driven inventions are registered, unless they are attached to larger institutions or companies. The growth of Blockchain for the use of IP, such as in the case of Ricardian contracts and more recently, NFTs, might help counteract and better distribute the range of opportunities in this area.

Another aspect regarding policies deals with differences in political, social and economic scenarios among local, regional, country, European and international levels. From an international perspective, during the post-war, North America and Europe focused on public ownership, regulation and competition policy or antitrust. Despite the various international peculiarities, all of them focused on these policy instruments in different ways, however all with the goal to limit and detain the power of large corporations.

In order to support this goal but acting in a distinct way, countries have created actions to help SMEs and start-ups in the innovation field by providing financial support for these groups. In an international example, the European Commission has supported a number of user-driven projects and initiatives, providing financial support to boost and facilitate aspects related to entrepreneurship (European Commission, n.d.).

In the field of idea registering and related regulations, it is relevant to highlight that innovation and invention are related, but not identical as indicated by Audretsch:

”A patent reflects new technical knowledge, but it does not indicate whether this knowledge has a positive economic value. Only inventions that have been successfully introduced in the market can claim to be innovations as well. Whilst innovations and inventions are related, they are not identical. The distinction is that an innovation is a process that begins with an invention, proceeds with the development of the invention, and results in the introduction of a new product, process or service to the marketplace.” (Audretsch, 2004, p. 175)

Another relevant aspect dealing with innovation and regulations is the relation of a company’s size and innovation percentage. Larger companies primarily need a dedicated R&D team to have an average 3% rate in innovation, while around 50% of companies with less than 50 employees are innovative, disrupting markets and products, while not having a dedicated R&D team (Audretsch, 2004).

3.2. Operational factors

In this regard, a few aspects have been taken in consideration from larger corporations interested in working with user-driven and open innovation:

- Strategy versus operational: the core difference between strategic and operational initiatives deal with their areas of focus. While strategic initiatives focus on novel and emerging trends, technologies and paradigms towards radical market innovation, operational initiatives focus on improvement and incremental change towards higher profits and prolonging the service or product offering.
- Open versus closed model of collaboration: this model is highly dependent on the goals of the activity. In the closed model of collaboration, companies work internally and only with a specific set of partners, with which they might have non-disclosure agreements upfront, and it is seen as having less risks (Eschenbächer et al., 2010). The open model of collaboration allows companies to reach out to other groups and has different formats as seen in Table 6.

Recent research indicates that user-driven initiatives as those found in makerspaces are catalysts for innovation and collaboration, therefore there is a push for governments to support these types of initiatives towards both economic and social benefits through targeted policies (Halbinger, 2018).

Governments may find that investments in supporting user innovation via infrastructures like makerspaces may well pay off in economic benefits to society in the form of increases in the production of economically valuable innovations and a vehicle to overcome its under- diffusion (Halbinger, 2018, p. 2035)

Table 6: Guidelines for collaborations (Verganti and Pisano, 2008 in Eschenbächer et al., 2010)

Mode of Collaboration	When it is appropriate
Elite circle: One company selects the participants, defines the problem, and chooses the solution.	• You know the knowledge domain from which the best solution for your problem is likely to emerge from. • Having the best experts is important and you have the capability to pick them. • You can define the problem and evaluate the proposed solution.
Innovation mall: One company posts a problem, anyone can propose solutions, and the company chooses the solutions it likes best.	• You need ideas from many parties and the best ideas may come from unexpected sources. • The consequences of missing a better solution from an elite player are limited.

	• Participating in the network is easy. • The problem is small or, if large, can be broken in modular parts. • You can evaluate many proposed solutions cheaply.
Innovation community: Anybody can propose problems, offer solutions, and decide which solutions to use.	• You need ideas from many parties, and the best ideas may come from unexpected sources. • Because you do not know all possible user requirements, you want to share the costs and risks of innovation with outsiders. • Participation in the network is easy. • The problem is small or, if large, can be broken into modular parts. • You do not need to won intellectual property underlying the solution.
Consortium: Operates like a private club, with participants jointly selecting problem, deciding how to conduct work, and choosing solutions.	• You know the knowledge domain from which the best solutions are likely to emerge. • The problem is large and cannot be broken into modular parts. • Having the best experts is important, and you have the capability to pick them. • Contributors will not participate unless they share power • The expertise of all participants is needed. • You can share the result intellectual property with the other participants.

3.3. Related initiatives and support actions

A key support action within the regulatory framework that might influence the field of collaborative production deals with the growth of science, technology, engineering and mathematics (STEM) in basic education. As primary and secondary education offers further opportunities in STEM across countries, a growth in the understanding and knowledge acquired might speed up the sharing process required to develop knowledge for engaging in local production. Furthermore, the social media spread in sharing DIY videos of various technologies and formats, as well as other existing (and upcoming) online sources also contribute to knowledge sharing and distribution (Morreale, 2014). In the example of YouTube, which has been described as a " 'top-down' platform for the distribution of popular culture and a 'bottom-up' platform for vernacular creativity" (Rosalen, 2019, p. 6), one can learn how to draw in 3D or how to use various machines and resources, acquiring specific skills that will facilitate the process to get their hands 'dirty' in the actual production of whichever has been designed. Table 7 presents some of the related and relevant support actions and initiatives that might impact collaborative production.

Table 7: Support actions & related initiatives

Support action initiatives	Description
STEM	Country led initiatives to have STEM as part of ground education can have an impact in the growth of collaborative production in the future.
Hackathons	Research and industry led hackathons are one of the actions that contribute to spreading the value of collaborative production in wider contexts. They are also key to help navigate IP related regulations and how they will evolve to incorporate new market demands for co-designed products and solutions.
City or National led projects	As in the example of participatory city, local led actions indicate how projects can impact social and consequently economic development through creating awareness and spreading the knowledge regarding local resources. (*http://www.participatorycity.org* *http://www.participatorycity.org/open-making-society)*
International Project calls	EC calls supporting community led approaches and local manufacturing will prove effective towards new initiatives in this area. Currently, the project POP-MACHINA and REFLOW both indicate this trend.
International and National competitions	Competitions are another (open innovation) way of creating an interest and supporting community-led developments.
Training platforms	Training platforms are key to the maker community, where a range of resources, including lessons, examples and troubleshooting are provided facilitating the uptake of new technologies and supporting their following development (for a list of these resources, please see deliverable D2.4).
Blockchain, tokenisation and cryptocurrency	The creation of a decentralised market provides new ways of registering IP, value exchange and other future uses, disrupting current processes and demanding newer regulations to follow suit.

Therefore, facilitating the access to knowledge and keeping a connection with educational outlets is a way to facilitate the access to knowledge and build up opportunities for creating future customer segments for both production and distribution.

For these initiatives to gain ground, regulatory frameworks will need to be reassessed to keep up with market demands. An example of user-driven actions that have disrupted the market in recent years is the concept of Blockchain, tokenization and the opportunities that lies in using this decentralised economy.

Together with the crowdfunding initiatives, these market developments present new challenges and opportunities concerning user-driven markets and productions, such as keeping up with on-going changes in the markets, price competitiveness, cultural aspects that might impact the uptake of certain services in detriment of others, etc.

4. User-driven manufacturing technologies

There are several technologies, which are used across existing computer and mobile operating systems (IOS, Android, UNIX, Windows, etc.) and that offer the requirements to promote and develop a range of products across several machines and digital outputs.

Regarding 3D, there is a clear paradigm shift in how digital fabrication has impacted product development. Digital fabrication has gained a variety of shapes and purposes, both additive, in the case of 3D printing, and subtractive, in the case of CNC and laser cutters. These artefacts have shown a vast array of opportunities in more traditional fields and regarding user-driven customisation, with 3D printed houses (*3D Printing for Construction: The First Family to Move in a 3D Printed House*, n.d.) as one example of how these technologies can radically transform the field.

4.1. Review of user-driven manufacturing technologies

In this section, a selection of technologies in the market and in which contexts they are mostly used is presented. Many of these technologies are currently used in makerspaces and fab labs, while others still have the novelty aspect, meaning that even though they might be used, they are not necessarily widely exploited for manufacturing or production purposes, such as virtual reality (VR) presented in Table 8.

Table 8: Technologies currently used

Name	Status	Use
VR headset Oculus Quest 2	Current	Current evaluated as the best VR headset in the market, used for gaming and a few other applications
VR headset Oculus Rift S	Current	Used mostly for gaming in windows-based computers
VR headset PlayStation VR	Current	Used mostly for gaming
Fusion360	Current	Design and develop objects for either CNC or 3D printing
Microcontrollers: ESP32/ESP8266, Arduino, Raspberry Pi Arduino Nano/Uno	Current	Used for IoT / prototyping
Soldering Stations/Oscilloscopes	Current	Used for prototyping/ manufacturing/ repair Jobs
FDM 3D Printer	Current	Used for modelling
Engraving and Drilling tools	Current	Used for crafting, prototyping/ small batch productions
FDM Printers	Current	Used for prototyping
Laser Engraver/Cutter	Current	Used for prototyping and doing small batch of products

Name	Status	Use
CNC-Router	Current	Used for prototyping and small batch of products
Airtable	Current	Used for idea tracking, visualisation
Sewing machines	Current	Used for prototyping/ repair jobs/ design/ upcycling clothes
CAD/CAM/FEA software	Current	Design, simulation and manufacturing
Illustrator	Current	Used for designing illustrations and patterns that can be laser cut or engraved
CNC machining (5-axis milling/hybrid, turning, WEDM)	Current	Used for production
Laser cutting/marking (for metal and non-metal materials)	Current	Used for production
SLM 3D printers	Current	Used for production
MJF and SLA 3D printer	Current	Used for production
CMM, 3D scanner, computed tomography	Current	Used for inspection and reverse engineering
Mechanical test bench	Current	Used for testing
Vibration test chamber with temperature control	Current	Used for Testing
HPC cluster, AI, Deep Learning, VM	Current	Used for computing
Gitlab	Current	Used for co-development of tracking for source code
Electronic dev&test equipment (oscilloscopes, multimeters, spectrum analyser, NX5, emscan, oven&pick-and-place, etc…)	Current	Used for electronics prototyping, testing and pre-compliance analysis
Rhino 6 (with Grasshopper)	Current	Used for generative design
Solid Edge	Current	Used for CAD SW (additive manufacturing)
AWS	Current	Used for integration of own SW tools
3D Laser Scanner BLK360	Current	Used for Point Cloud for fabric model
Laser Cutter & 3D Drucker Ultimaker	Current	Used for prototyping

4.1.1. Cryptocurrencies

Another aspect that has disrupted the user-driven marketplace regarding legislations and operational factors that impact user-driven initiatives is the growth of cryptocurrencies (Schönhals et al., 2018). As of April 17th 2021, there were listed 5884 cryptocurrencies on the market (*https://www.coinlore.com/all_coins*). Cryptocurrency is a decentralized digital money, based on Blockchain technology, the most known currencies being Bitcoin and Ethereum.

These currencies have been accepted by some companies and, more recently, even banks. As of April 2021, Bitcoin is the most widespread cryptocurrency, with over 160 companies accepting it as a payment, such as Microsoft, Wikipedia, BMW, ATT, ETSY to name a few (*https://paybis.com/blog/companies-that-accept-bitcoin/*). While banks and states have been a bit more conservative with cryptocurrencies, a few large ones have embraced the technology, such as PayPal and Barclays.

The impact of cryptocurrencies in the user-driven and, somewhat, controlled market can be felt with the fast race which illustrates the new 'digital rush'. (Graafsma, n.d.; *The Cryptocurrency Billionaires Of 2021's Digital Gold Rush | Forbes - Forbes Africa*, n.d.).

In Table 9 we present the top five cryptocurrencies as of April 2021.

Table 9: Top 5 cryptocurrencies in the market as of April 2021[11]

Name	Description
1. Bitcoin (BTC)	Created in 2008, Bitcoin was the first ever cryptocurrency
2. Ethereum (Ether)	Created in 2015 by Vitalik Buterin, Ethereum is a Blockchain-based platform for developing decentralized apps and smart contracts
3. Ripple (XRP)	Founded in 2012 and it focus on making international transactions fast and cheap.
4. Bitcoin Cash (BCH)	Forked from Bitcoin in 2016 focusing on scalability and transaction fees
5. EOS	Founded in 2017, EOS is building a platform for developers to build decentralized applications and smart contracts.

4.1.2. Non-fungible Token (NFT)

When describing legislations and upcoming technologies in 2021, it is important to address the current growth of non-fungible token NFTs. NFTs are a "certificate of authenticity for an object, real or virtual. The unique digital file is stored on a Blockchain network, with any changes in ownership verified by a worldwide network and logged in public. That means that the chain of custody is marked in the file itself permanently, and it's practically impossible to swap in a fake." (Dean, 2021)

NFT has been picked up by artists and various other fields. It is expected that it will also be used for other types of digital products, such as designs and drawings created for digital fabrication.

In order to engage with NFTs, one needs to know what to mint and based on that decide how to trade it. Trading NFTs happens in a digital marketplace where cryptocurrencies can be traded for an NFT. The largest peer-to-peer NFT trading marketplace is Open Sea (Finzer, 2020). Other marketplaces such as Superrare (*https://www.superrare.co/*) require an approval before items are to be listed. Also, there are others that are invite only, such as Foundation (*https://foundation.app/*).

[11] https://www.coinbase.com/

4.2. Upcoming Technologies

Among applications that support the process of user-driven manufacturing are those offering 3D scans, which facilitate the process from physical to digital output to be reproduced, modified, and developed.

Regarding VR, the growth in development and acceptance of headsets is key towards a broaden use of this technology across the wider market.

Table 10 provides an overview of 3D scanning applications that might facilitate collaborative production in various forms.

Table 10: 3D scanning applications to aid manufacturing

Name	Link	Status	Purpose
Trnio	*http://www.trnio.com/*	Current	Used for scanning objects in real life and easily replicate them in 3D printers
Scann3d	*http://scann3d.smartmobilevision.com/*	Current	Used for scanning objects in real life and easily replicate them in 3D printers
RestAR	*https://www.rest-ar.com/*	Current	Scanning application used for converting video to 3D and AR visualizations:
itSeez3D	*https://itseez3d.com/*	Current	Used for scanning objects in real life and easily replicate them in 3D printers
Qlone	*https://www.qlone.pro/*	Current	Used for scanning objects in real life and easily replicate them in 3D printers
Bevel	*https://bevel3d.net/*	Current	Used for scanning objects in real life and easily replicate them in 3D printers

Table 11 provides an overview of current and upcoming technologies that aid digital fabrication and production.

Table 11: Current and upcoming technologies to aid manufacturing

Name	Status	Description
Industry 4.0 test and production equipment (robots, cobots, automates, sensors, vision systems, adaptive prehensors, RFID, Augmented and mixed reality equipment, …	Current & upcoming	Some of this 'ready to play' equipment is used to build process demonstrators or proof of concept (PoC). While these are growing in the market, they are currently not yet widespread for local production and manufacturing.
Autodesk (Fusion 360, Recap, EAGLE, Grasshopper)	Current & upcoming	Used for generative design, 3D scanning, and circuit boards – these various software keep updating and evolving together with market needs. While parametric design is widely used, generative design is slowly gaining more ground as a potential tool within manufacturing.

Name	Status	Description
Google AR core	Current & Upcoming	A set of tools for creating AR content, cross-platform. *https://arvr.google.com/arcore/*
Overly	Current & Upcoming	Easy to use application for creating AR content – AR markers and video to overlap. *https://overlyapp.com/*
Wikitude	Current & Upcoming	A set of developers' tools used for creating AR content. *https://www.wikitude.com/*
AR Media	Current & Upcoming	A set of tools for creating mixed reality content. *https://www.inglobetechnologies.com/ar-media*
ARToolkit	Current & Upcoming	A software library for creating AR content. *http://www.hitl.washington.edu/artoolkit/*
KUDAN	Current & Upcoming	Application used for creating AR content, using artificial perception technologies based on SLAM. *https://www.kudan.io/*
ARKit	Current & Upcoming	IOS based application for creating AR content. *https://developer.apple.com/augmented-reality/*
Vuforia	Current & Upcoming	Scalable enterprise AR platform used for creating AR content. *https://www.ptc.com/en/products/vuforia*
EasyAR	Current & Upcoming	Standalone SDK, used for AR allowing for designing features within Unity software. *https://www.easyar.com/*
Superviz	Current & Upcoming	Platform for immersive video conferences and presentations within 360° environments. Used for AR/VR, meetings and production. *https://www.superviz.com/*
VR Gloves	Upcoming	Haptics enhanced gloves, used for various types of VR and robotics uses. *https://haptx.com/*
8K VR HEADSET (Pimax VR)	Upcoming	Powerful eye tracking and full positioning tracking for a more realistic experience. *https://pimaxvr.com/*
VR Motion Chairs (Fazetech, VRGO)	Upcoming	Chairs that create a more immersive experience with users when paired the VR. *http://vrborg.com/review/best-vr-motion-chairs*
Omni-Directional Treadmills	Upcoming	A treadmill that can point you in any direction. *https://www.roadtovr.com/* or CyberithVirtualizer

5. Final considerations and key recommendations for iPRODUCE

When assessing user-driven trends and practices, a number of aspects are of relevance for iPRODUCE. As a start, one can discuss how the iPRODUCE platform can best support entrepreneurial actions and facilitate the growth of collaborative user-driven production.

The market research carried out for this report gives an overview of existing user-driven manufacturing and related services, providing a comprehensive picture of existing and upcoming services, and a baseline for the ambition and goals of the iPRODUCE platform.

In the following we present some considerations and key recommendations that highlight the market needs for strategic aspects, which might impact the iPRODUCE platform, such as:

- Matchmaking: platforms such as those listed under Table 4: Market Trends supporting current practices can guide the baseline of what needs to be further developed; not only the services to be provided, but also regarding identity, user interaction and experience.

- Makers have a good network among other makers as well as good knowledge of common platforms; however, there is a need to expand these networks to other stakeholders towards expanding market opportunities.

- Tokenisation and IPR: Through the market trends regarding value exchange, it has become clear that tokenisation is an opportunity and as an upcoming platform, iPRODUCE should consider ways to accommodate this type of transaction. For example, both Ethereum and EOS are equipped with smart contract capabilities. Furthermore, the recent buzz regarding NFT should not be dismissed, as an opportunity within the platform.

- Defining how the platform will be managed and maintained is key towards creating an overview and defining future strategies for marketing and communication, as well as quality control.

- Marketplace: The market research also indicated that an accessible marketplace for ‘ready to be built’ designs is also upcoming. The iPRODUCE platform should facilitate the commercialization of such designs in a productive and ‘easy to use’ manner.

- Fundraising platforms can help as open innovation platforms, where ideas can receive feedback and even a proof of concept before launching the actual production of a product.

- The iPRODUCE platform can facilitate the production from a CE perspective, offering information regarding materials passports and certificates.

- Technologies: To keep its relevance in the market, the platform (and the service providers) need to follow market trends and try (as much as possible) to offer solutions in line with the market demand.

6. References

3D printing for construction: The first family to move in a 3D printed house. (n.d.). Retrieved April 16, 2021, from https://www.sculpteo.com/blog/2018/07/19/3d-printing-for-construction-the-first-family-to-move-in-a-3d-printed-house/

Abdullahi, S., & Dewa, A. A. (2020). Makerspace as Emerging Technology and Innovation in Academic Libraries: A Call for Adoption in Abubakar Tafawa University Library Bauchi. *International Journal of Innovative Science and Research Technology*, *5*(8), 1604–1610. https://doi.org/10.38124/ijisrt20aug302

Agrawal, A., Catalini, C., & Goldfarb, A. (2014). Some simple economics of crowdfunding. In *Innovation Policy and the Economy* (Vol. 14, Issue 1). https://doi.org/10.1086/674021

Agrawal, A., Catalini, C., & Goldfarb, A. (2015). Crowdfunding: Geography, Social Networks, and the Timing of Investment Decisions. *Journal of Economics and Management Strategy*, *24*(2), 253–274. https://doi.org/10.1111/jems.12093

Allen, D. W. E. (2017). Hackerspaces as Entrepreneurial Anarchy. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.2749016

Audretsch, D. B. (2004). Sustaining innovation and growth: Public policy support for entrepreneurship. *Industry and Innovation*, *11*(3), 167–191. https://doi.org/10.1080/1366271042000265366

Belleflamme, P., Omrani, N., & Peitz, M. (2015). The economics of crowdfunding platforms. In *Information Economics and Policy* (Vol. 33, pp. 11–28). Elsevier. https://doi.org/10.1016/j.infoecopol.2015.08.003

Chandler, J., & Chen, S. (2015). Prosumer motivations in service experiences. *Journal of Service Theory and Practice*, *25*(2), 220–239. https://doi.org/10.1108/JSTP-09-2013-0195

Clay Shirky. (2008). Here comes everybody: the power of organizing without organizations. In *Choice Reviews Online* (Vol. 46, Issue 02). [[Penguin Group]]. https://doi.org/10.5860/choice.46-1205

Cova, B., & Cova, V. (2012). On the road to prosumption: Marketing discourse and the development of consumer competencies. *Consumption Markets and Culture*, *15*(2), 149–168. https://doi.org/10.1080/10253866.2012.654956

Darmody, A., Yuksel, M., & Venkatraman, M. (2017). The work of mapping and the mapping of work: prosumer roles in crowdsourced maps. *Journal of Marketing Management*, *33*(13–14), 1093–1119. https://doi.org/10.1080/0267257X.2017.1348384

Dean, S. (2021). *What are NFTs? Who is Beeple? A digital art craze explained - Los Angeles Times*. https://www.latimes.com/business/technology/story/2021-03-11/nft-explainer-crypto-trading-collectible

DesAutels, P. (2011). UGIS: Understanding the nature of user-generated information systems. *Business Horizons*, *54*(3), 185–192. https://doi.org/10.1016/j.bushor.2010.12.003

Dousay, T. (2017). Defining and Differentiating the Makerspace. *Educational Technology*, *57*(2), 69–74. https://www.jstor.org/stable/44430528?seq=1

Eckhardt, G. M., Houston, M. B., Jiang, B., Lamberton, C., Rindfleisch, A., & Zervas, G. (2019a). Marketing in the Sharing Economy. *Journal of Marketing*, *83*(5), 5–27. https://doi.org/10.1177/0022242919861929

Eckhardt, G. M., Houston, M. B., Jiang, B., Lamberton, C., Rindfleisch, A., & Zervas, G. (2019b). Marketing in the Sharing Economy. *Journal of Marketing*, *83*(5), 5–27. https://doi.org/10.1177/0022242919861929

Ensign, P. C., & Leupold, P. (2018). Grassroots opportunities for innovation, technology, and entrepreneurship: Makerspaces in non-urban communities. *PICMET 2018 - Portland*

International Conference on Management of Engineering and Technology: Managing Technological Entrepreneurship: The Engine for Economic Growth, Proceedings. https://doi.org/10.23919/PICMET.2018.8481850

Eschenbächer, J., Thoben, K.-D., & Turkuma, P. (2010). Choosing the best model of living lab collaboration for companies analysing service innovations. *Projectics / Proyéctica / Projectique*, *5*(2), 11. https://doi.org/10.3917/proj.005.0011

European Commission. (n.d.). *6.1. User-driven innovation initiatives - Internal Market, Industry, Entrepreneurship And Smes*. 2020. Retrieved February 25, 2021, from https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/policy-objectives/61-user-driven-innovation-initiatives

Finzer, D. (2020). *The Non-Fungible Token Bible: Everything you need to know about NFTs*. OpenSea.Io. https://opensea.io/blog/guides/non-fungible-tokens/

Fox, S. (2018). Domesticating artificial intelligence: Expanding human self-expression through applications of artificial intelligence in prosumption. *Journal of Consumer Culture*, *18*(1), 169–183. https://doi.org/10.1177/1469540516659126

Freudmann, A. (2020). Customers Want Customization, and Companies Are Giving It to Them - The New York Times. *New York Times*. https://www.nytimes.com/2020/03/18/business/customization-personalized-products.html

Graafsma, H. (n.d.). *New Opportunities with new Detectors*. Retrieved April 17, 2021, from https://www.forbes.com/sites/forbestechcouncil/2017/11/21/new-opportunities-with-cryptocurrency/

Grimm, R., Fox, C., Baines, S., & Albertson, K. (2013). Social innovation, an answer to contemporary societal challenges? Locating the concept in theory and practice. *Innovation: The European Journal of Social Science Research*, *26*(4), 436–455. https://doi.org/10.1080/13511610.2013.848163

HackerspaceWiki. (n.d.). Retrieved April 29, 2021, from https://wiki.hackerspaces.org/Hackerspaces

Halassi, S., Semeijn, J., & Kiratli, N. (2019). From consumer to prosumer: a supply chain revolution in 3D printing. *International Journal of Physical Distribution and Logistics Management*, *49*(2), 200–216. https://doi.org/10.1108/IJPDLM-03-2018-0139

Halbinger, M. A. (2018). The role of makerspaces in supporting consumer innovation and diffusion: An empirical analysis. In *Research Policy* (Vol. 47, Issue 10, pp. 2028–2036). https://doi.org/10.1016/j.respol.2018.07.008

Hui, J. S., & Gerber, E. M. (2017). Developing makerspaces as sites of entrepreneurship. *Proceedings of the ACM Conference on Computer Supported Cooperative Work, CSCW*, 2023–2038. https://doi.org/10.1145/2998181.2998264

José Planells, A. (2017). Video games and the crowdfunding ideology: From the gamer-buyer to the prosumer-investor. *Journal of Consumer Culture*, *17*(3), 620–628. https://doi.org/10.1177/1469540515611200

Kotler, P. (1986). The Prosumer Movement: A New Challenge for Marketers. *Advances in Consumer Research*, *13*(1), 510–513. https://www.acrwebsite.org/volumes/6542/volumes/v13/NA-13/full

Lang, B., Botha, E., Robertson, J., Kemper, J. A., Dolan, R., & Kietzmann, J. (2020). How to grow the sharing economy? Create Prosumers! *Australasian Marketing Journal*, *28*(3), 58–66. https://doi.org/10.1016/j.ausmj.2020.06.012

Lang, B., Dolan, R., Kemper, J., & Northey, G. (2020). Prosumers in times of crisis: definition, archetypes and implications. *Journal of Service Management*, *32*(2), 176–189. https://doi.org/10.1108/JOSM-05-2020-0155

Marsh, J., Kumpulainen, K., Nisha, B., Velicu, A., Blum-ross, A., Hyatt, D., Jónsdóttir, S. R., Little, S., Marusteru, G., Elísabet, M., Sandvik, K., Scott, F., Thestrup, K., Arnseth, C., Kristín, D., Jornet, A., & Hlíf, S. (2017). *Makerspaces in the Early Years: A Literature Review.* http://makeyproject.eu

Montesano Montessori, N. (2016). A theoretical and methodological approach to social entrepreneurship as world-making and emancipation: social change as a projection in space and time. *Entrepreneurship and Regional Development*, *28*(7–8), 536–562. https://doi.org/10.1080/08985626.2016.1221229

Moorefield-Lang, H. (2015). Change in the Making: Makerspaces and the Ever-Changing Landscape of Libraries. *TechTrends*, *59*(3), 107–112. https://doi.org/10.1007/s11528-015-0860-z

Morreale, J. (2014). From homemade to store bought: Annoying Orange and the professionalization of YouTube. *Journal of Consumer Culture*, *14*(1), 113–128. https://doi.org/10.1177/1469540513505608

Ordanini, A., Miceli, L., Pizzetti, M., & Parasuraman, A. (2011). Crowd-funding: Transforming customers into investors through innovative service platforms. *Journal of Service Management*, *22*(4), 443–470. https://doi.org/10.1108/09564231111155079

Pine, B. J., & Gilmore, J. H. (1998). Welcome to the experience economy. *Harvard Business Review*, *76*(4), 97–105. https://hbr.org/1998/07/welcome-to-the-experience-economy

Pitt, L. F., Watson, R. T., Berthon, P., Wynn, D., & Zinkhan, G. (2006). The penguin's window: Corporate brands from an open-source perspective. *Journal of the Academy of Marketing Science*, *34*(2), 115–127. https://doi.org/10.1177/0092070305284972

Qi, W. (2004). The third wave. In *Nonwovens Report International* (Issue FEBRUARY). Bantam. https://doi.org/10.4324/9781315107776-3

Richterich, A. (2020). When open source design is vital: critical making of DIY healthcare equipment during the COVID-19 pandemic. *Health Sociology Review*, 1–10. https://doi.org/10.1080/14461242.2020.1784772

Ritzer, G. (2014). Prosumption: Evolution, revolution, or eternal return of the same? *Journal of Consumer Culture*, *14*(1), 3–24. https://doi.org/10.1177/1469540513509641

Rosa, P., Ferretti, F., Guimarães Pereira, Â., Panella, F., & Wanner, M. (2017). *Overview of the Maker Movement in the European Union*. https://doi.org/10.2760/227356

Rosalen, R. (2019). YouTube: Online video and participatory culture. In *New Media & Society* (Vol. 21, Issue 9). Polity Press. https://doi.org/10.1177/1461444819859476

Schönhals, A., Hepp, T., & Gipp, B. (2018). Design thinking using the blockchain. *CRYBLOCK 2018 - Proceedings of the 1st Workshop on Cryptocurrencies and Blockchains for Distributed Systems, Part of MobiSys 2018*, 105–110. https://doi.org/10.1145/3211933.3211952

Schrock, A. R. (2014). "Education in Disguise": Culture of a Hacker and Maker Space Journal. *InterActions: UCLA Journal of Education and Information Studies*, *10*(1). http://escholarship.org/uc/item/Ojs1n1

Seo-Zindy, R., & Heeks, R. (2017). Researching the emergence of 3D printing, makerspaces, hackerspaces and fablabs in the global south: A scoping review and research agenda on digital innovation and fabrication networks. *Electronic Journal of Information Systems in Developing Countries*, *80*(1), 1–24. https://doi.org/10.1002/j.1681-4835.2017.tb00589.x

Shoppertainment: A Wave of Change for the Retail Industry. (n.d.). Retrieved April 26, 2021, from https://industrywired.com/shoppertainment-a-wave-of-change-for-the-retail-industry/

Smith, A., & Light, A. (2017). Cultivating sustainable developments with makerspaces. *Liinc Em Revista*, *13*(1), 162–174. http://sro.sussex.ac.uk

The Cryptocurrency Billionaires Of 2021's Digital Gold Rush | Forbes - Forbes Africa. (n.d.). Retrieved April 17, 2021, from https://www.forbesafrica.com/video/2021/04/15/the-cryptocurrency-billionaires-of-2021s-digital-gold-rush-forbes/

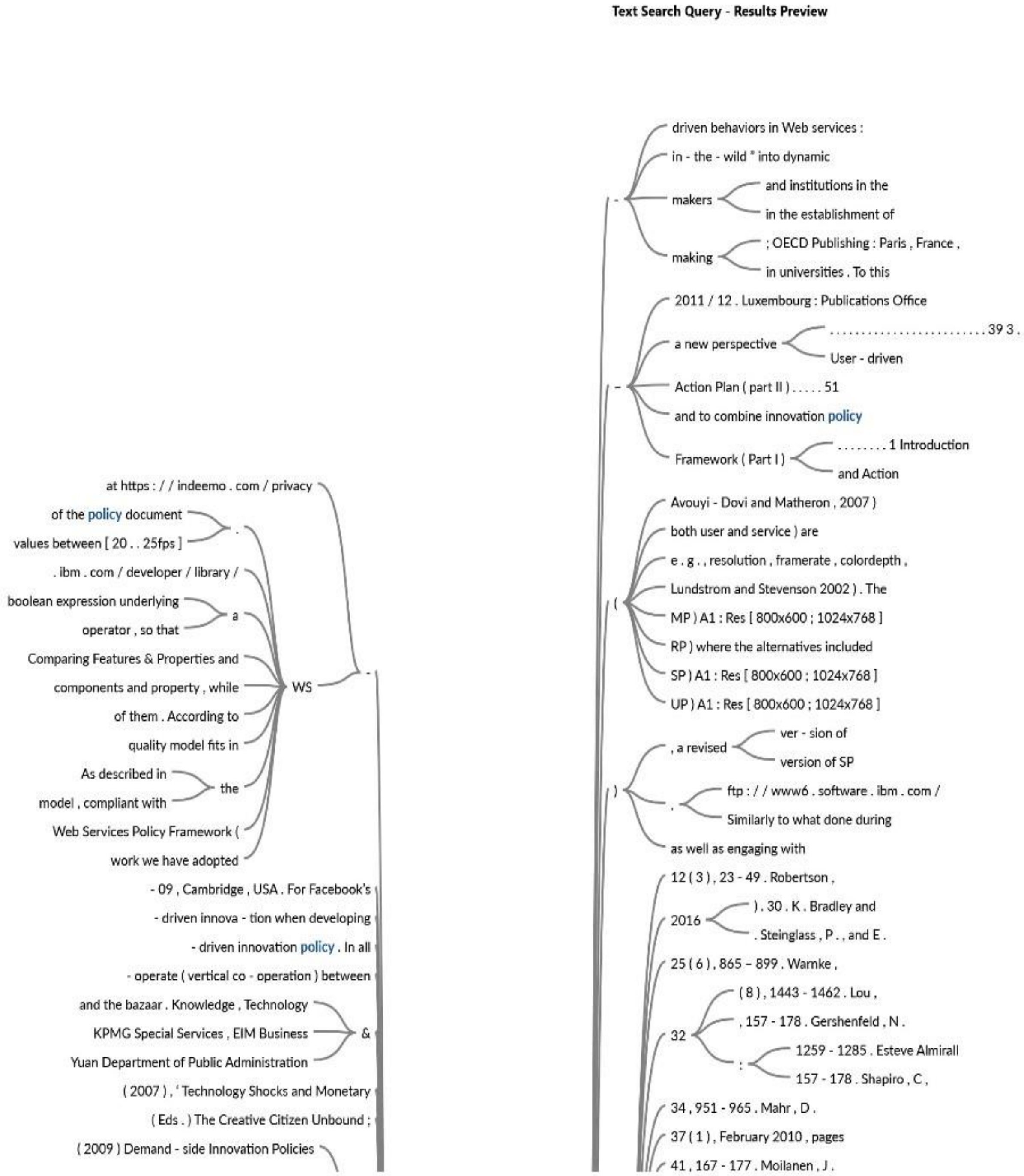
Turkama, P., & Kivikangas, M. (2016, May 23). Addressing the challenges of user-driven development and innovation. *2010 IEEE International Technology Management Conference, ICE 2010*. https://doi.org/10.1109/ICE.2010.7476986

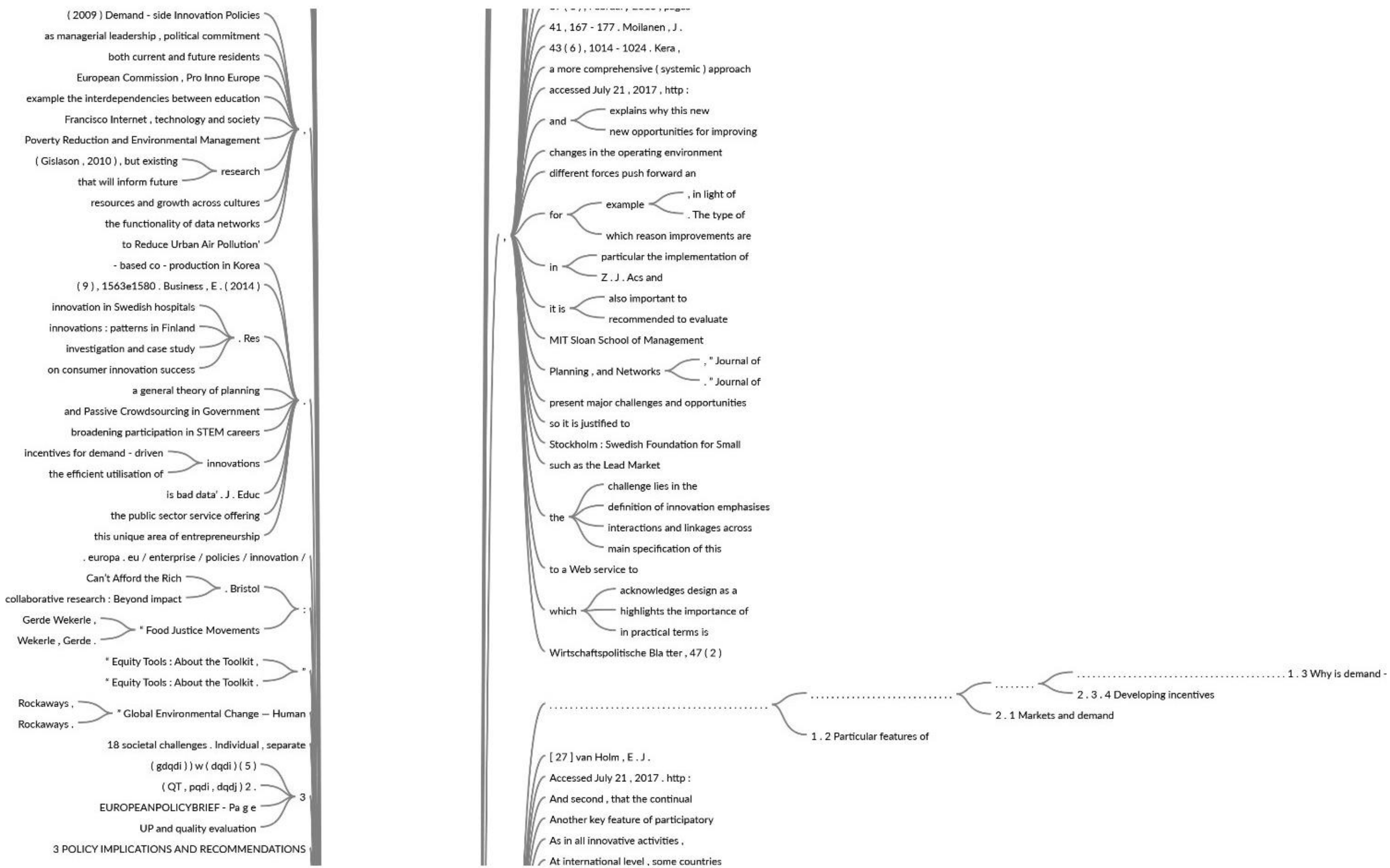
Williams, M. R., & Hall, J. C. (2015). Hackerspaces: A case study in the creation and management of a common pool resource. *Journal of Institutional Economics*, *11*(4), 769–781. https://doi.org/10.1017/S1744137415000016

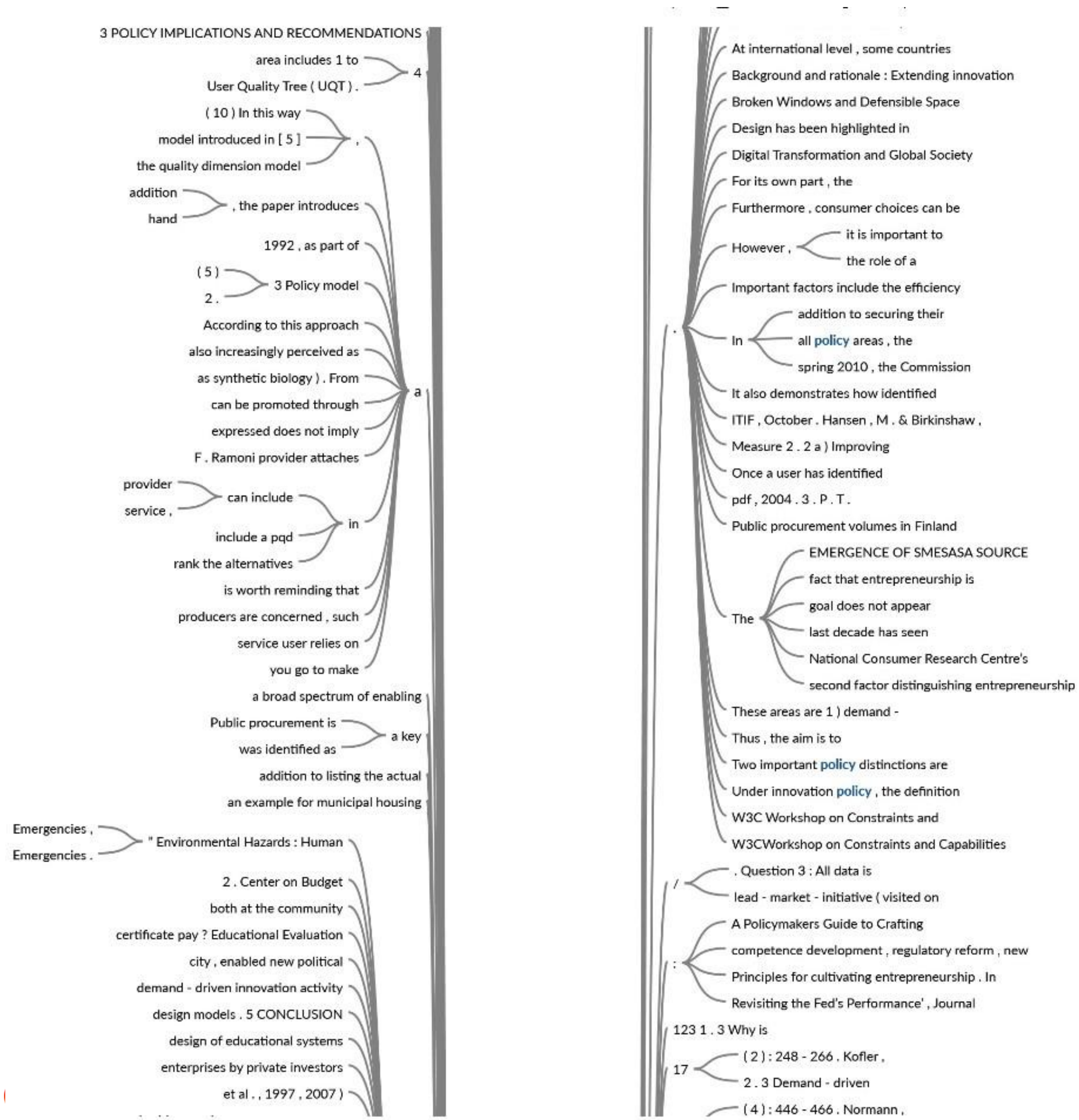
Yu, S. (2016). *Makerspaces as learning spaces: An historical overview and literature review*. https://doi.org/10.7939/R31T6Q

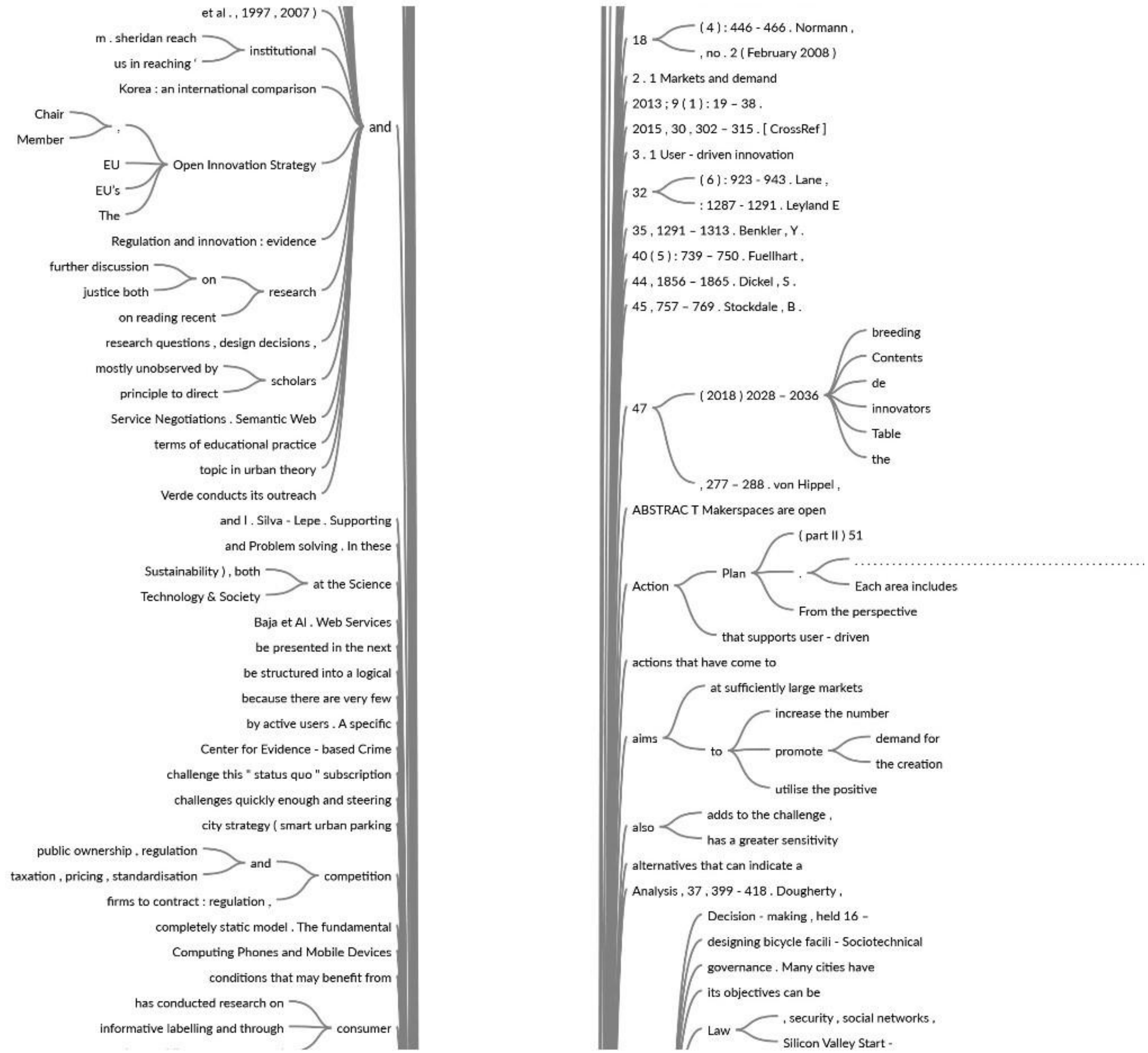
7. Appendix

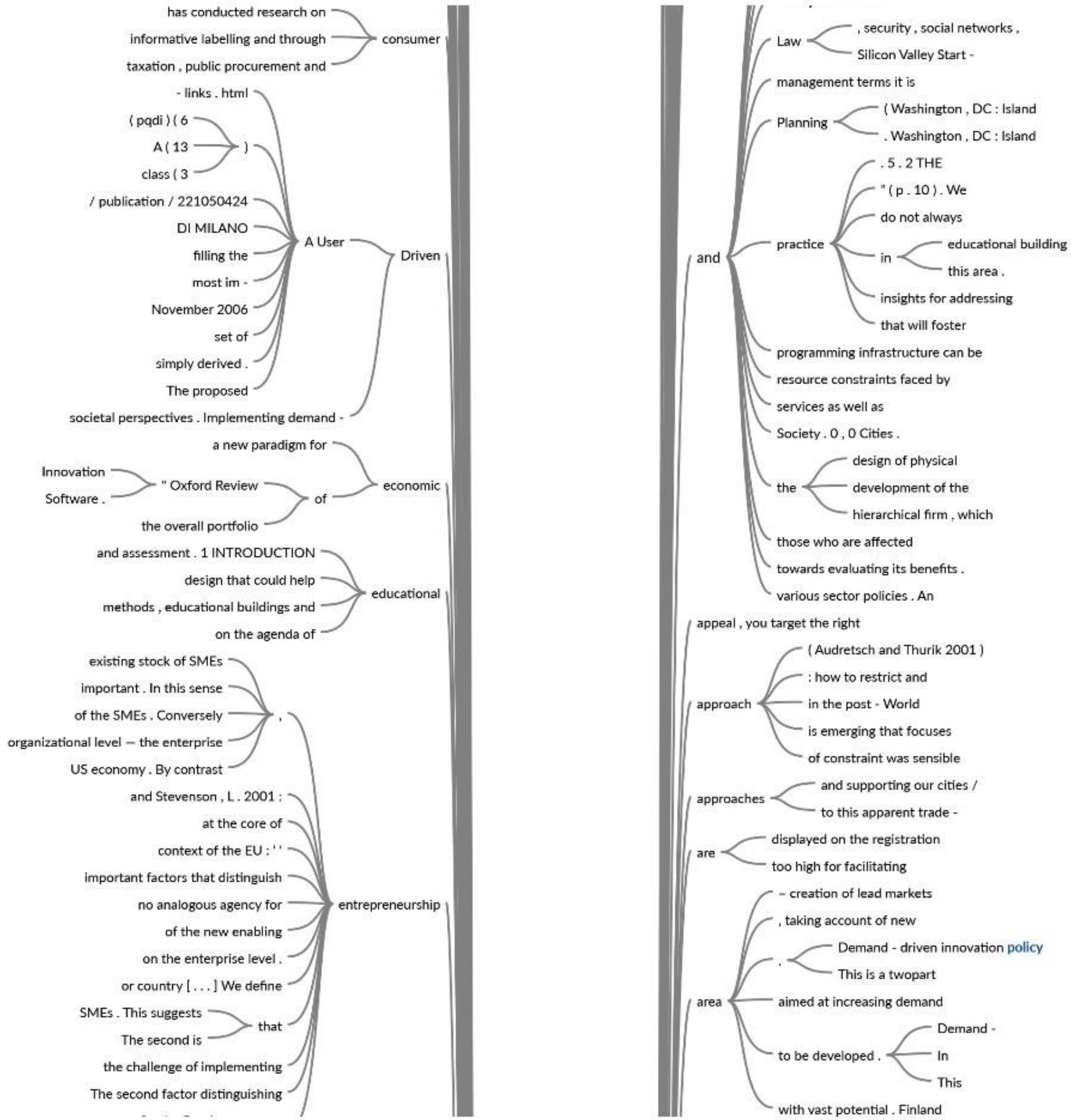
7.1. Appendix 1: Research text query example – policy

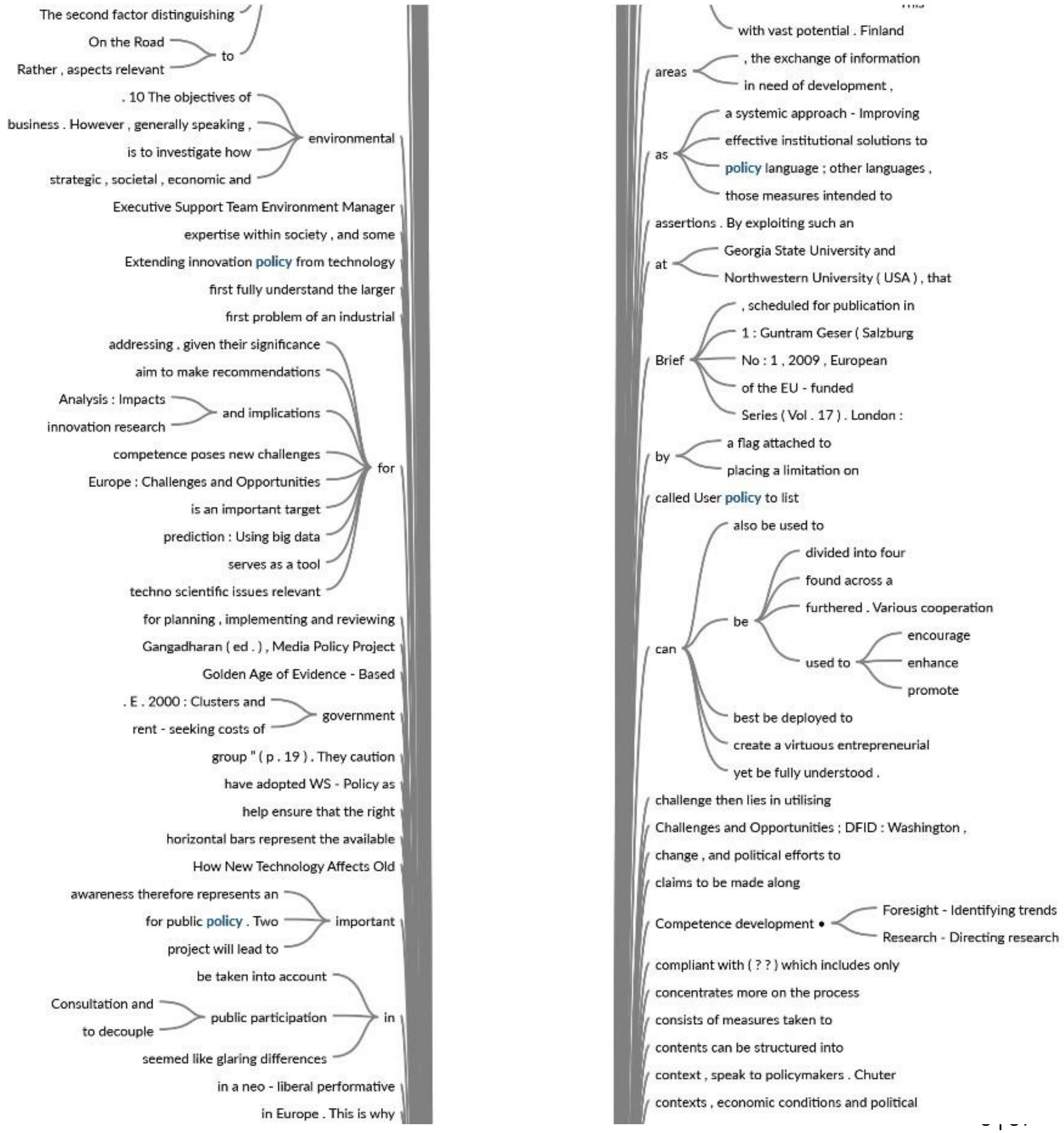


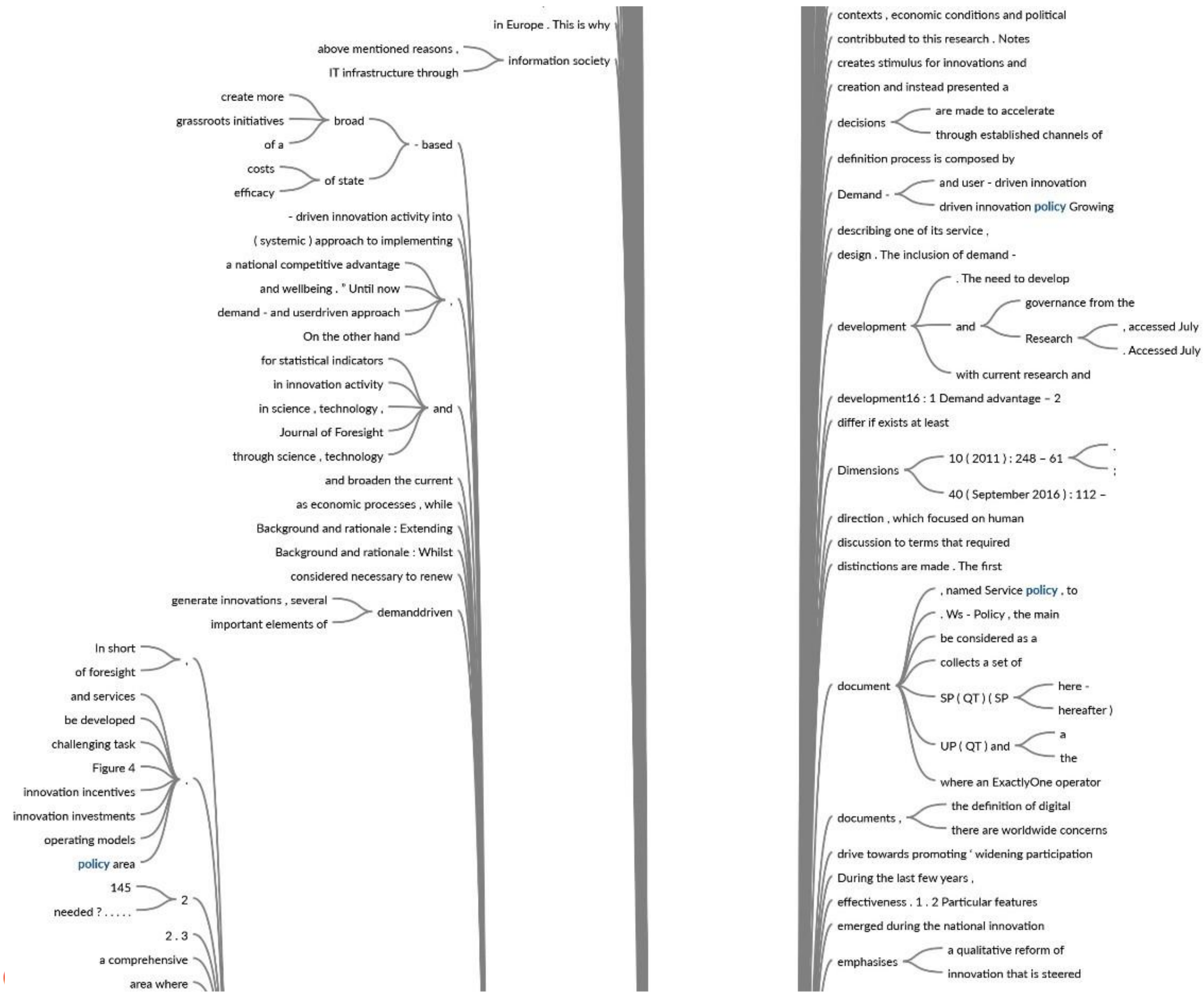

(2009) Demand - side Innovation Policies
as managerial leadership , political commitment
both current and future residents
European Commission , Pro Inno Europe
example the interdependencies between education
Francisco Internet , technology and society
Poverty Reduction and Environmental Management
(Gislason , 2010) , but existing
that will inform future
research
resources and growth across cultures
the functionality of data networks
to Reduce Urban Air Pollution'
- based co - production in Korea
(9) , 1563e1580 . Business , E . (2014)
innovation in Swedish hospitals
innovations : patterns in Finland
investigation and case study
on consumer innovation success
. Res
a general theory of planning
and Passive Crowdsourcing in Government
broadening participation in STEM careers
incentives for demand - driven
the efficient utilisation of
innovations
is bad data' . J . Educ
the public sector service offering
this unique area of entrepreneurship
. europa . eu / enterprise / policies / innovation /
Can't Afford the Rich
collaborative research : Beyond impact
. Bristol
Gerde Wekerle ,
Wekerle , Gerde .
" Food Justice Movements
" Equity Tools : About the Toolkit ,
" Equity Tools : About the Toolkit .
Rockaways ,
Rockaways .
" Global Environmental Change – Human
18 societal challenges . Individual , separate
(gdqdi)) w (dqdi) (5)
(QT , pqdi , dqdj) 2 .
EUROPEANPOLICYBRIEF - Pa g e
UP and quality evaluation
3
3 POLICY IMPLICATIONS AND RECOMMENDATIONS
41 , 167 - 177 . Moilanen , J .
43 (6) , 1014 - 1024 . Kera ,
a more comprehensive (systemic) approach
accessed July 21 , 2017 , http :
and
explains why this new
new opportunities for improving
changes in the operating environment
different forces push forward an
for
example
, in light of
. The type of
which reason improvements are
in
particular the implementation of
Z . J . Acs and
it is
also important to
recommended to evaluate
MIT Sloan School of Management
Planning , and Networks
, " Journal of
. " Journal of
present major challenges and opportunities
so it is justified to
Stockholm : Swedish Foundation for Small
such as the Lead Market
the
challenge lies in the
definition of innovation emphasises
interactions and linkages across
main specification of this
to a Web service to
which
acknowledges design as a
highlights the importance of
in practical terms is
Wirtschaftspolitische Bla tter , 47 (2)
1 . 3 Why is demand -
2 . 3 . 4 Developing incentives
2 . 1 Markets and demand
1 . 2 Particular features of
[27] van Holm , E . J .
Accessed July 21 , 2017 . http :
And second , that the continual
Another key feature of participatory
As in all innovative activities ,
At international level , some countries

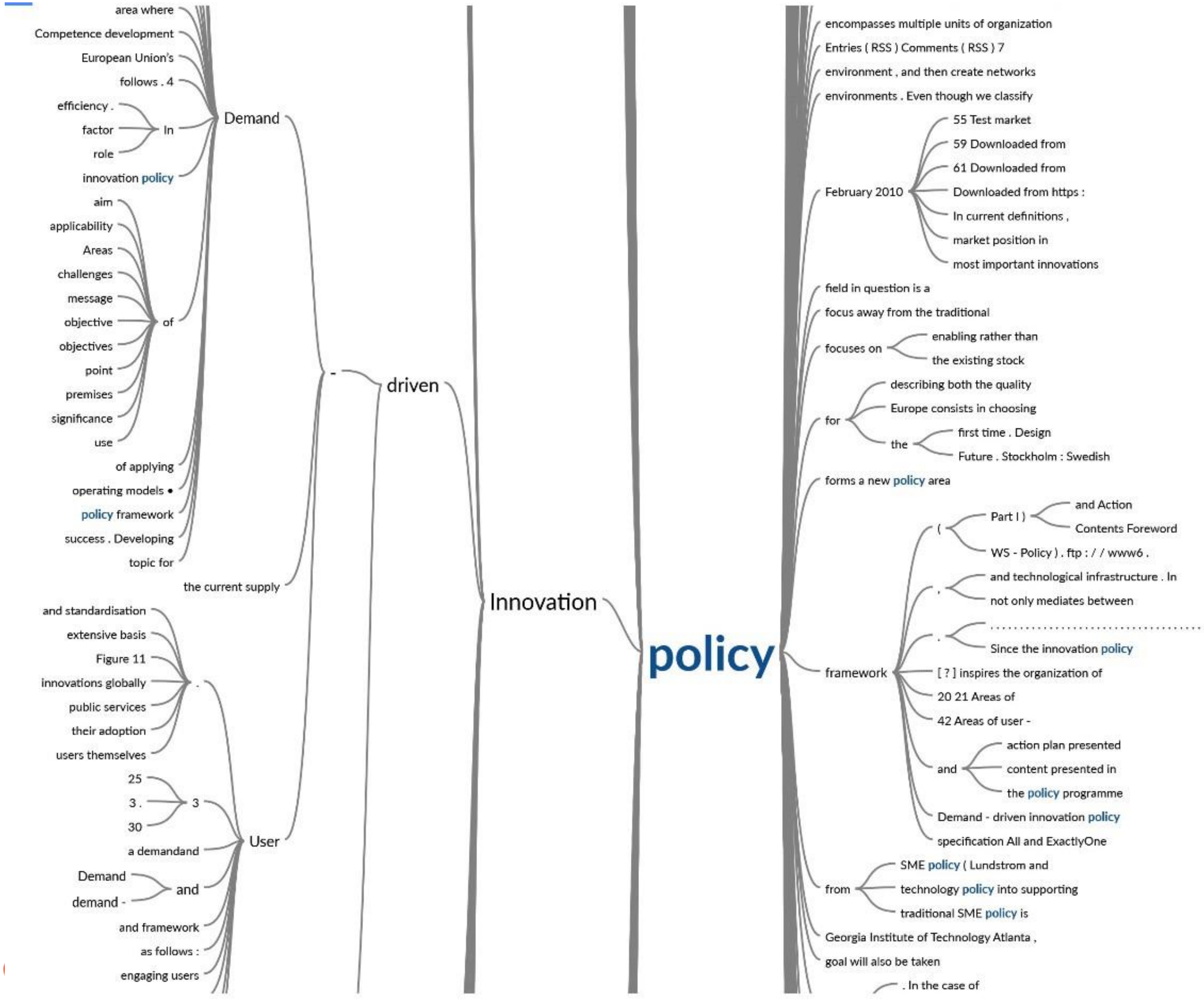

3 POLICY IMPLICATIONS AND RECOMMENDATIONS
area includes 1 to
User Quality Tree (UQT) .
4
(10) In this way
model introduced in [5]
the quality dimension model
addition
hand
, the paper introduces
1992 , as part of
(5)
2 .
3 Policy model
According to this approach
also increasingly perceived as
as synthetic biology) . From
can be promoted through
expressed does not imply
F . Ramoni provider attaches
a
provider
service ,
can include
include a pqd
rank the alternatives
in
is worth reminding that
producers are concerned , such
service user relies on
you go to make
a broad spectrum of enabling
Public procurement is
was identified as
a key
addition to listing the actual
an example for municipal housing
Emergencies ,
Emergencies .
" Environmental Hazards : Human
2 . Center on Budget
both at the community
certificate pay ? Educational Evaluation
city , enabled new political
demand - driven innovation activity
design models . 5 CONCLUSION
design of educational systems
enterprises by private investors
et al . , 1997 , 2007)
At international level , some countries
Background and rationale : Extending innovation
Broken Windows and Defensible Space
Design has been highlighted in
Digital Transformation and Global Society
For its own part , the
Furthermore , consumer choices can be
However ,
it is important to
the role of a
Important factors include the efficiency
In
addition to securing their
all policy areas , the
spring 2010 , the Commission
It also demonstrates how identified
ITIF , October . Hansen , M . & Birkinshaw ,
Measure 2 . 2 a) Improving
Once a user has identified
pdf , 2004 . 3 . P . T .
Public procurement volumes in Finland
The
EMERGENCE OF SMESASA SOURCE
fact that entrepreneurship is
goal does not appear
last decade has seen
National Consumer Research Centre's
second factor distinguishing entrepreneurship
These areas are 1) demand -
Thus , the aim is to
Two important policy distinctions are
Under innovation policy , the definition
W3C Workshop on Constraints and
W3CWorkshop on Constraints and Capabilities
. Question 3 : All data is
lead - market - initiative (visited on
A Policymakers Guide to Crafting
competence development , regulatory reform , new
Principles for cultivating entrepreneurship . In
Revisiting the Fed's Performance' , Journal
123 1 . 3 Why is
17
(2) : 248 - 266 . Kofler ,
2 . 3 Demand - driven
(4) : 446 - 466 . Normann ,

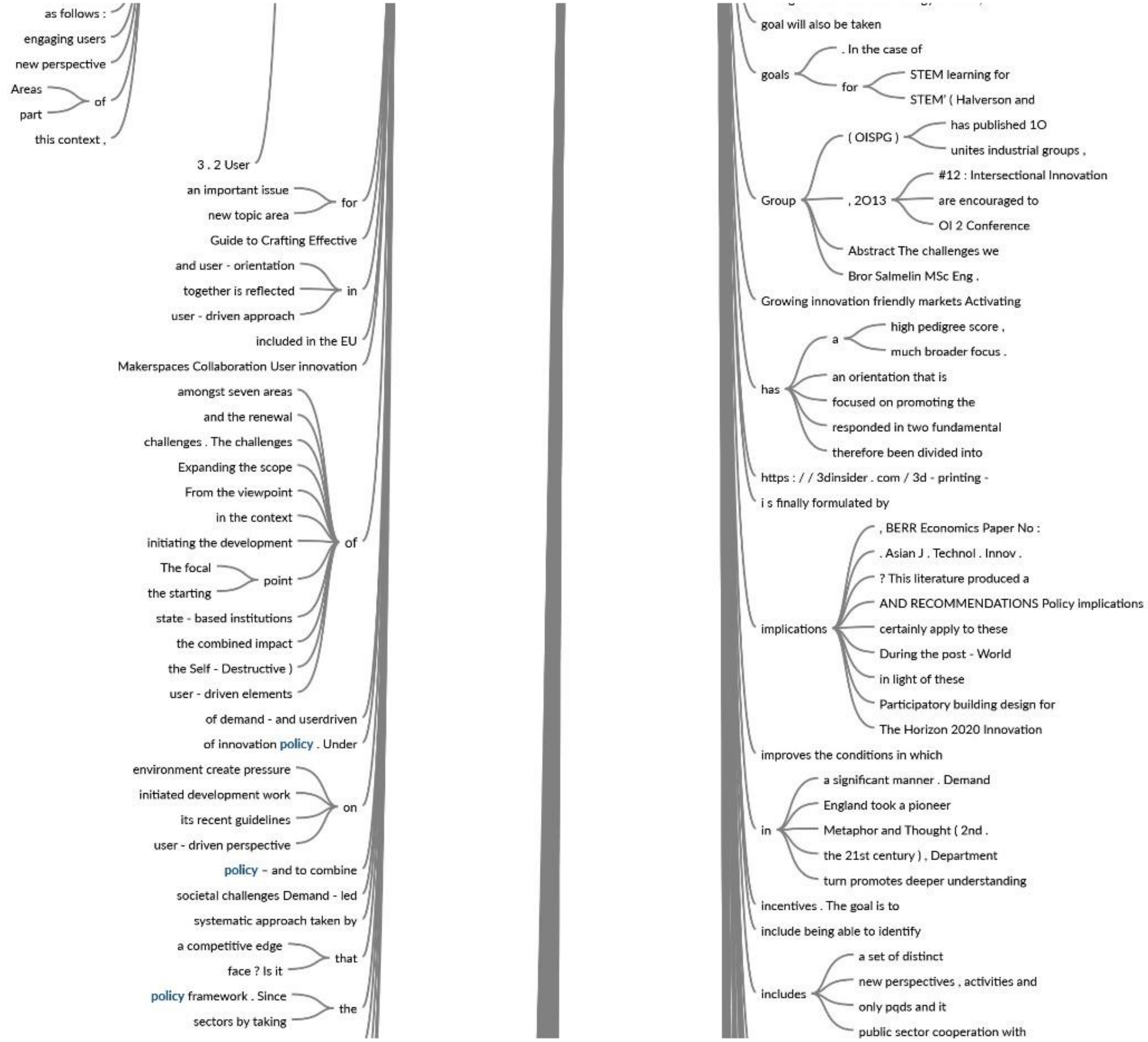

et al . , 1997 , 2007)
m . sheridan reach
us in reaching '
institutional
Korea : an international comparison
Chair
Member
EU
EU's
The
Open Innovation Strategy
and
Regulation and innovation : evidence
further discussion
justice both
on
research
on reading recent
research questions , design decisions ,
mostly unobserved by
principle to direct
scholars
Service Negotiations . Semantic Web
terms of educational practice
topic in urban theory
Verde conducts its outreach
and I . Silva - Lepe . Supporting
and Problem solving . In these
Sustainability) , both
Technology & Society
at the Science
Baja et Al . Web Services
be presented in the next
be structured into a logical
because there are very few
by active users . A specific
Center for Evidence - based Crime
challenge this " status quo " subscription
challenges quickly enough and steering
city strategy (smart urban parking
public ownership , regulation
taxation , pricing , standardisation
and
competition
firms to contract : regulation ,
completely static model . The fundamental
Computing Phones and Mobile Devices
conditions that may benefit from
has conducted research on
informative labelling and through
consumer
18
(4) : 446 - 466 . Normann ,
, no . 2 (February 2008)
2 . 1 Markets and demand
2013 ; 9 (1) : 19 – 38 .
2015 , 30 , 302 – 315 . [CrossRef]
3 . 1 User - driven innovation
32
(6) : 923 - 943 . Lane ,
: 1287 - 1291 . Leyland E
35 , 1291 – 1313 . Benkler , Y .
40 (5) : 739 – 750 . Fuellhart ,
44 , 1856 – 1865 . Dickel , S .
45 , 757 – 769 . Stockdale , B .
47
(2018) 2028 – 2036
breeding
Contents
de
innovators
Table
the
, 277 – 288 . von Hippel ,
ABSTRAC T Makerspaces are open
Action
Plan
(part II) 51
.
Each area includes
From the perspective
that supports user - driven
actions that have come to
aims
at sufficiently large markets
to
increase the number
promote
demand for
the creation
utilise the positive
also
adds to the challenge ,
has a greater sensitivity
alternatives that can indicate a
Analysis , 37 , 399 - 418 . Dougherty ,
Decision - making , held 16 –
designing bicycle facili - Sociotechnical
governance . Many cities have
its objectives can be
Law
, security , social networks ,
Silicon Valley Start -

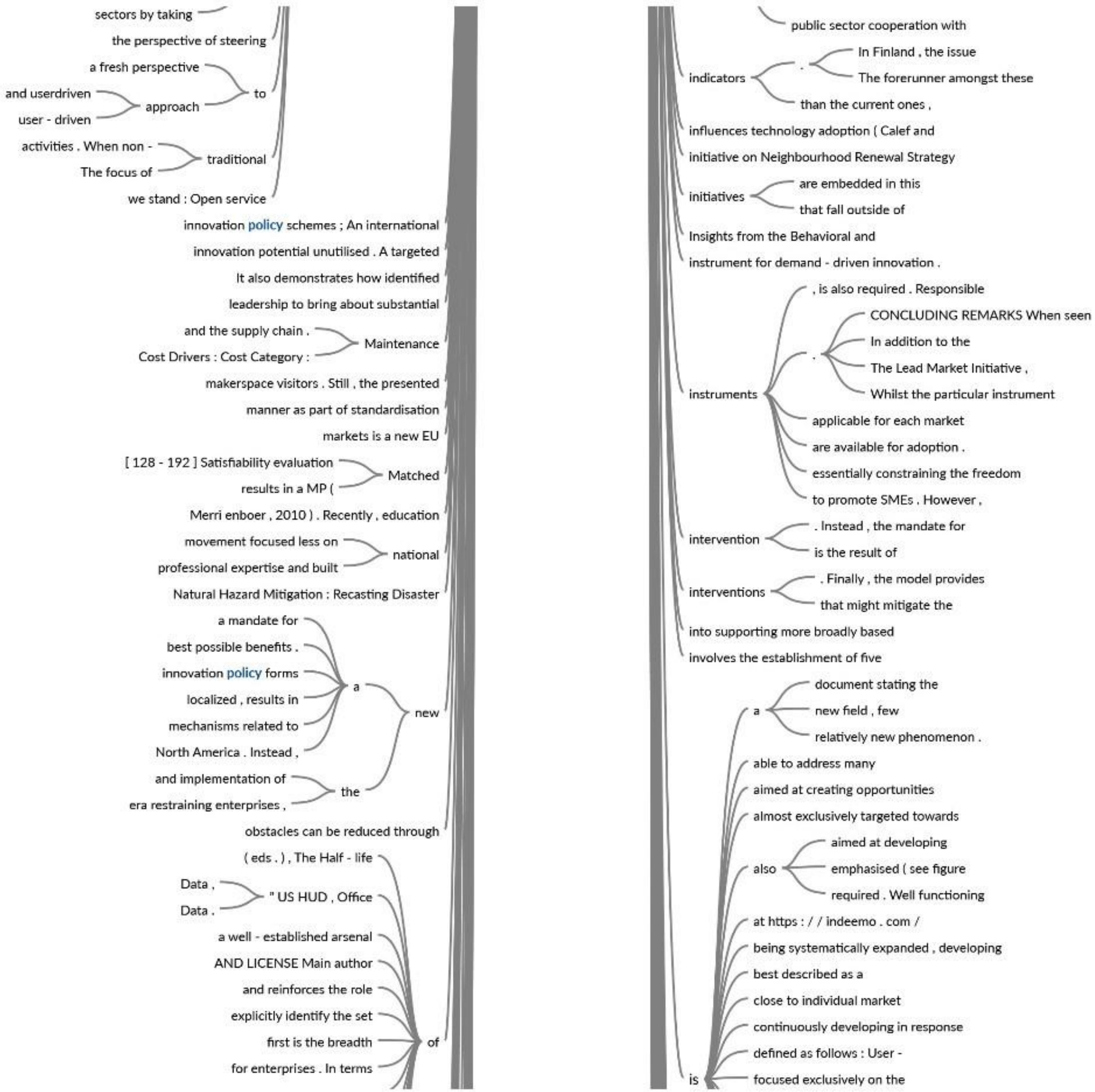

has conducted research on
informative labelling and through
taxation , public procurement and
consumer
- links . html
(pqdi) (6
A (13
class (3
)
/ publication / 221050424
DI MILANO
filling the
most im -
November 2006
set of
simply derived .
The proposed
A User
Driven
societal perspectives . Implementing demand -
a new paradigm for
Innovation
Software .
" Oxford Review
the overall portfolio
of
economic
and assessment . 1 INTRODUCTION
design that could help
methods , educational buildings and
on the agenda of
educational
existing stock of SMEs
important . In this sense
of the SMEs . Conversely
organizational level – the enterprise
US economy . By contrast
,
and Stevenson , L . 2001 :
at the core of
context of the EU : ' '
important factors that distinguish
no analogous agency for
of the new enabling
on the enterprise level .
or country [. . .] We define
SMEs . This suggests
The second is
that
the challenge of implementing
The second factor distinguishing
entrepreneurship
Law
, security , social networks ,
Silicon Valley Start -
management terms it is
Planning
(Washington , DC : Island
. Washington , DC : Island
. 5 . 2 THE
" (p . 10) . We
do not always
practice
in
educational building
this area .
insights for addressing
that will foster
and
programming infrastructure can be
resource constraints faced by
services as well as
Society . 0 , 0 Cities .
the
design of physical
development of the
hierarchical firm , which
those who are affected
towards evaluating its benefits .
various sector policies . An
appeal , you target the right
approach
(Audretsch and Thurik 2001)
: how to restrict and
in the post - World
is emerging that focuses
of constraint was sensible
approaches
and supporting our cities /
to this apparent trade -
are
displayed on the registration
too high for facilitating
area
– creation of lead markets
, taking account of new
.
Demand - driven innovation policy
This is a twopart
aimed at increasing demand
to be developed .
Demand -
In
This
with vast potential . Finland

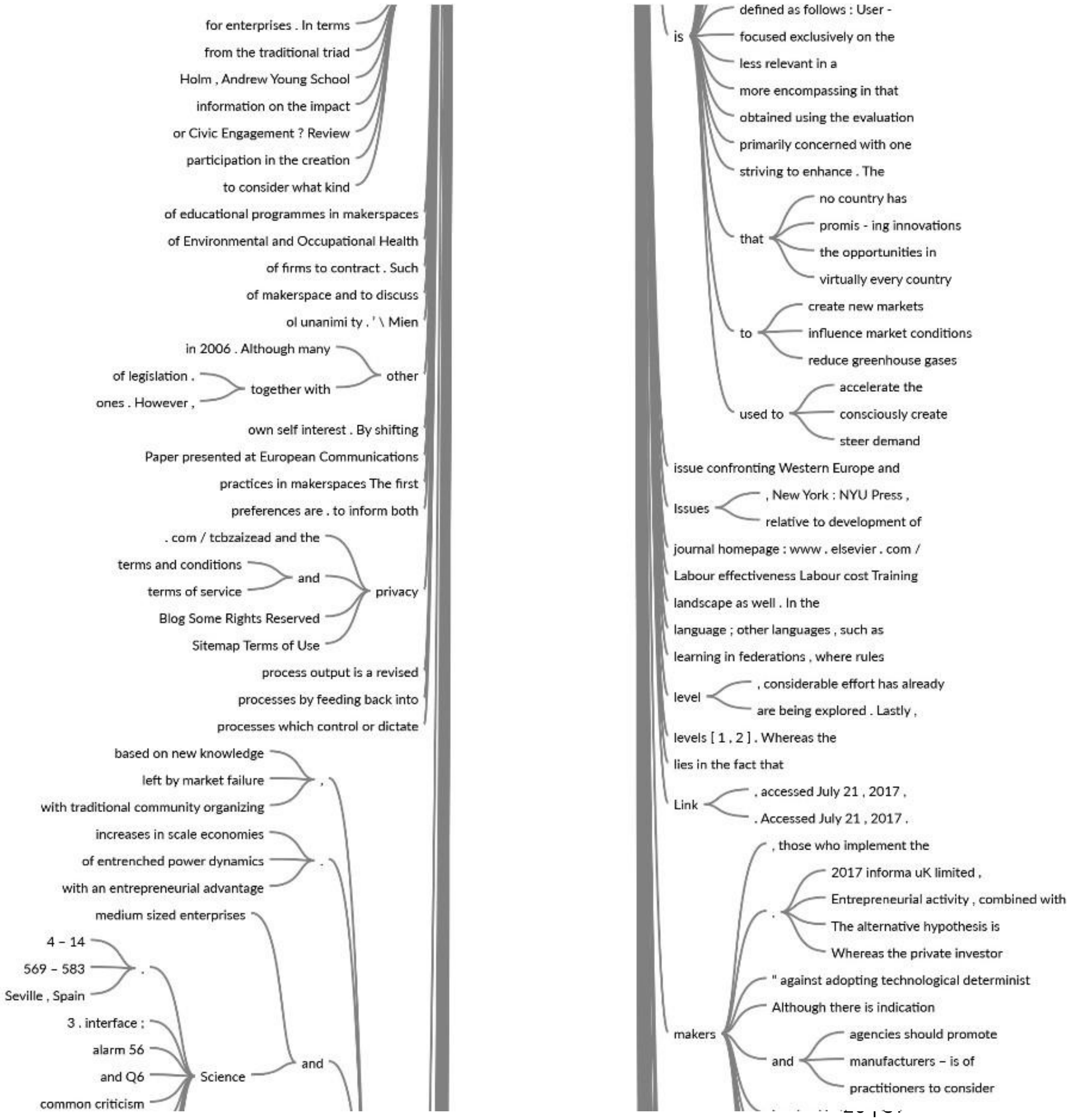

The second factor distinguishing
On the Road
Rather , aspects relevant
to
. 10 The objectives of
business . However , generally speaking ,
is to investigate how
strategic , societal , economic and
environmental
Executive Support Team Environment Manager
expertise within society , and some
Extending innovation policy from technology
first fully understand the larger
first problem of an industrial
addressing , given their significance
aim to make recommendations
Analysis : Impacts
innovation research
and implications
competence poses new challenges
Europe : Challenges and Opportunities
is an important target
prediction : Using big data
serves as a tool
techno scientific issues relevant
for
for planning , implementing and reviewing
Gangadharan (ed .) , Media Policy Project
Golden Age of Evidence - Based
. E . 2000 : Clusters and
rent - seeking costs of
government
group " (p . 19) . They caution
have adopted WS - Policy as
help ensure that the right
horizontal bars represent the available
How New Technology Affects Old
awareness therefore represents an
for public policy . Two
project will lead to
important
be taken into account
Consultation and
to decouple
public participation
seemed like glaring differences
in
in a neo - liberal performative
in Europe . This is why
with vast potential . Finland
areas
, the exchange of information
in need of development ,
as
a systemic approach - Improving
effective institutional solutions to
policy language ; other languages ,
those measures intended to
assertions . By exploiting such an
at
Georgia State University and
Northwestern University (USA) , that
Brief
, scheduled for publication in
1 : Guntram Geser (Salzburg
No : 1 , 2009 , European
of the EU - funded
Series (Vol . 17) . London :
by
a flag attached to
placing a limitation on
called User policy to list
can
also be used to
be
divided into four
found across a
furthered . Various cooperation
used to
encourage
enhance
promote
best be deployed to
create a virtuous entrepreneurial
yet be fully understood .
challenge then lies in utilising
Challenges and Opportunities ; DFID : Washington ,
change , and political efforts to
claims to be made along
Competence development •
Foresight - Identifying trends
Research - Directing research
compliant with (? ?) which includes only
concentrates more on the process
consists of measures taken to
contents can be structured into
context , speak to policymakers . Chuter
contexts , economic conditions and political

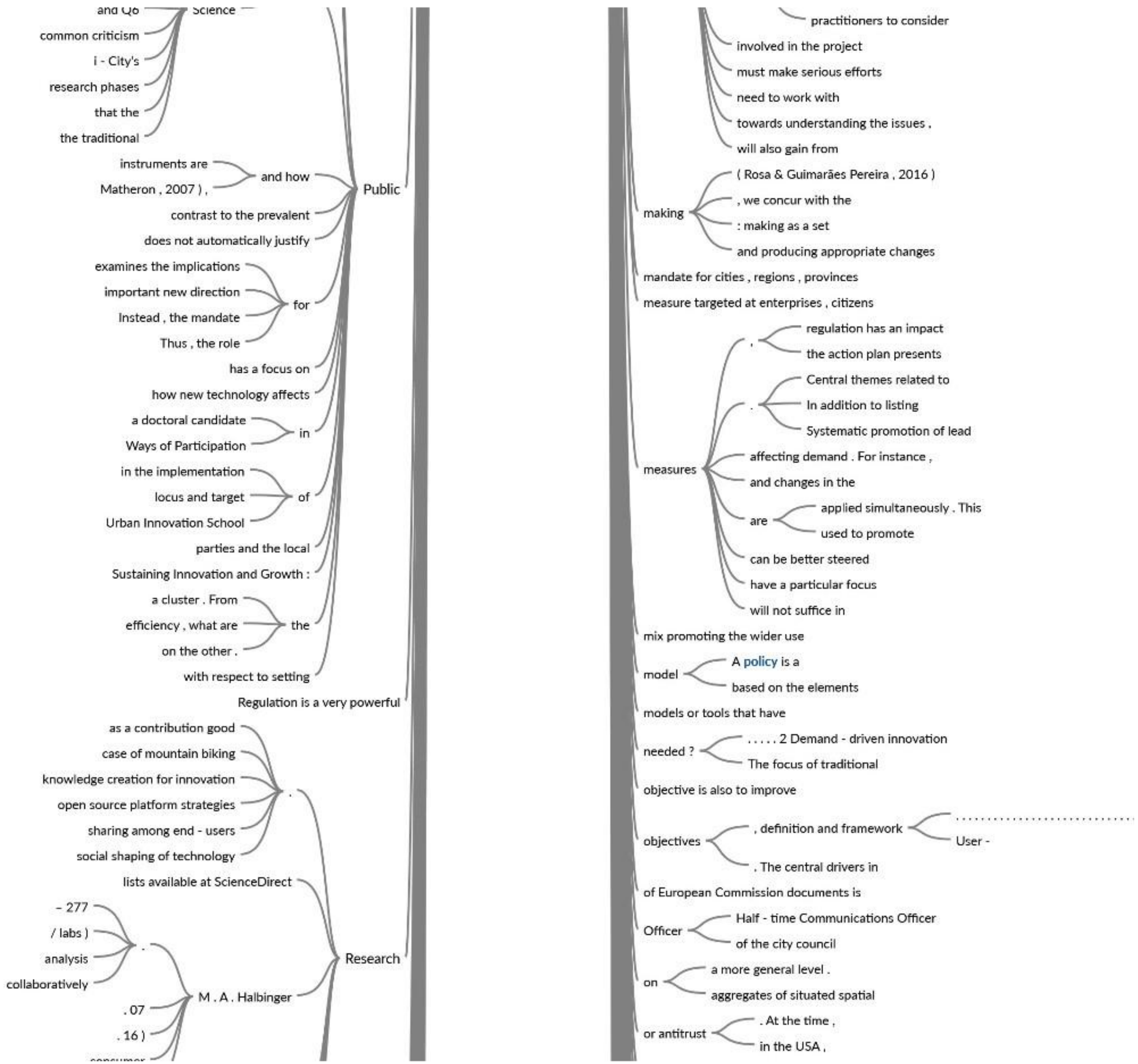

in Europe . This is why
above mentioned reasons ,
IT infrastructure through
information society
create more
grassroots initiatives
of a
broad
costs
efficacy
of state
- based
- driven innovation activity into
(systemic) approach to implementing
a national competitive advantage
and wellbeing . " Until now
demand - and userdriven approach
On the other hand
for statistical indicators
in innovation activity
in science , technology ,
Journal of Foresight
through science , technology
and
and broaden the current
as economic processes , while
Background and rationale : Extending
Background and rationale : Whilst
considered necessary to renew
generate innovations , several
important elements of
demanddriven
In short
of foresight
and services
be developed
challenging task
Figure 4
innovation incentives
innovation investments
operating models
policy area
145
needed ? . . . . .
2
2 . 3
a comprehensive
area where
contexts , economic conditions and political
contribbuted to this research . Notes
creates stimulus for innovations and
creation and instead presented a
decisions
are made to accelerate
through established channels of
definition process is composed by
Demand -
and user - driven innovation
driven innovation policy Growing
describing one of its service ,
design . The inclusion of demand -
development
. The need to develop
and
governance from the
Research
, accessed July
. Accessed July
with current research and
development16 : 1 Demand advantage – 2
differ if exists at least
Dimensions
10 (2011) : 248 – 61
40 (September 2016) : 112 –
direction , which focused on human
discussion to terms that required
distinctions are made . The first
document
, named Service policy , to
. Ws - Policy , the main
be considered as a
collects a set of
SP (QT) (SP
here -
hereafter)
UP (QT) and
a
the
where an ExactlyOne operator
documents ,
the definition of digital
there are worldwide concerns
drive towards promoting ' widening participation
During the last few years ,
effectiveness . 1 . 2 Particular features
emerged during the national innovation
emphasises
a qualitative reform of
innovation that is steered

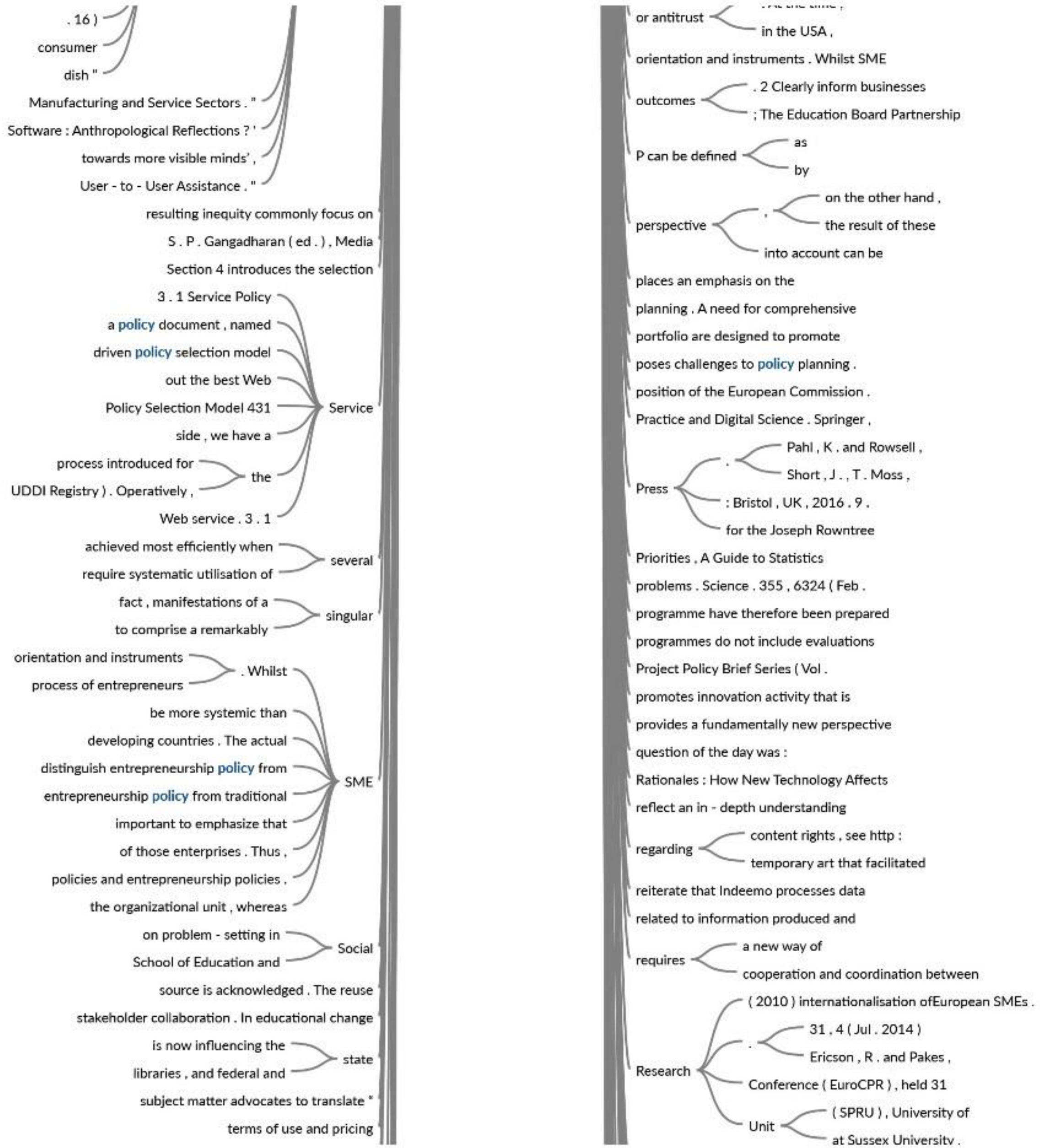

area where
Competence development
European Union's
follows . 4
efficiency .
factor
role
In
innovation policy
Demand
aim
applicability
Areas
challenges
message
objective
objectives
point
premises
significance
use
of
of applying
operating models •
policy framework
success . Developing
topic for
the current supply
-
driven
and standardisation
extensive basis
Figure 11
innovations globally
public services
their adoption
users themselves
.
25
3 .
30
3
a demandand
Demand
demand -
and
and framework
as follows :
engaging users
User
Innovation
policy
encompasses multiple units of organization
Entries (RSS) Comments (RSS) 7
environment , and then create networks
environments . Even though we classify
February 2010
55 Test market
59 Downloaded from
61 Downloaded from
Downloaded from https :
In current definitions ,
market position in
most important innovations
field in question is a
focus away from the traditional
focuses on
enabling rather than
the existing stock
for
describing both the quality
Europe consists in choosing
the
first time . Design
Future . Stockholm : Swedish
forms a new policy area
framework
(
Part I)
and Action
Contents Foreword
WS - Policy) . ftp : / / www6 .
,
and technological infrastructure . In
not only mediates between
.
Since the innovation policy
[?] inspires the organization of
20 21 Areas of
42 Areas of user -
and
action plan presented
content presented in
the policy programme
Demand - driven innovation policy
specification All and ExactlyOne
from
SME policy (Lundstrom and
technology policy into supporting
traditional SME policy is
Georgia Institute of Technology Atlanta ,
goal will also be taken
. In the case of

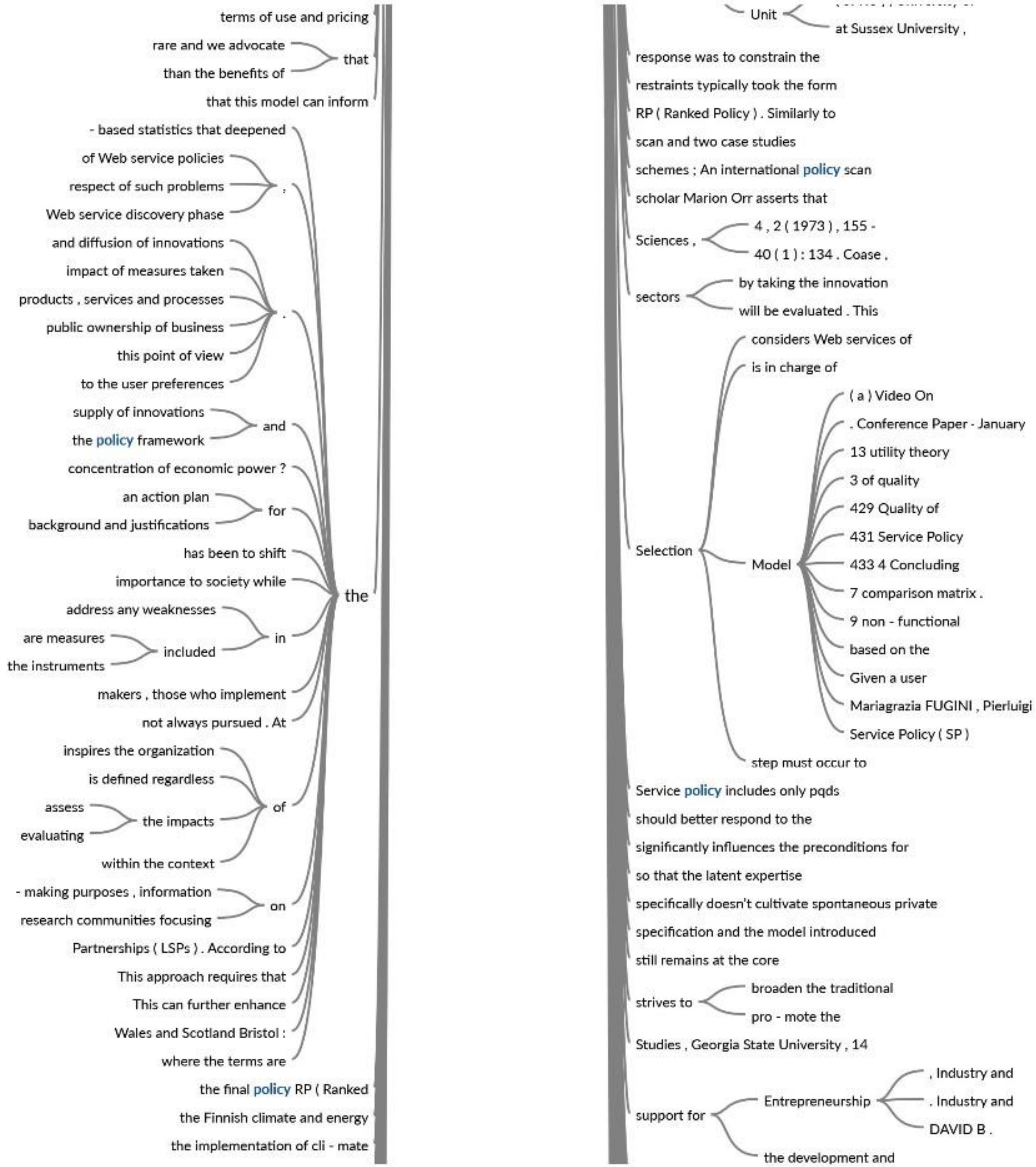

as follows :
engaging users
new perspective
Areas
part
of
this context ,
3 . 2 User
an important issue
new topic area
for
Guide to Crafting Effective
and user - orientation
together is reflected
user - driven approach
in
included in the EU
Makerspaces Collaboration User innovation
amongst seven areas
and the renewal
challenges . The challenges
Expanding the scope
From the viewpoint
in the context
initiating the development
of
The focal
the starting
point
state - based institutions
the combined impact
the Self - Destructive)
user - driven elements
of demand - and userdriven
of innovation policy . Under
environment create pressure
initiated development work
its recent guidelines
user - driven perspective
on
policy – and to combine
societal challenges Demand - led
systematic approach taken by
a competitive edge
face ? Is it
that
policy framework . Since
sectors by taking
the
goal will also be taken
goals
. In the case of
for
STEM learning for
STEM' (Halverson and
Group
(OISPG)
has published 1O
unites industrial groups ,
, 2O13
#12 : Intersectional Innovation
are encouraged to
OI 2 Conference
Abstract The challenges we
Bror Salmelin MSc Eng .
Growing innovation friendly markets Activating
has
a
high pedigree score ,
much broader focus .
an orientation that is
focused on promoting the
responded in two fundamental
therefore been divided into
https : / / 3dinsider . com / 3d - printing -
i s finally formulated by
implications
, BERR Economics Paper No :
. Asian J . Technol . Innov .
? This literature produced a
AND RECOMMENDATIONS Policy implications
certainly apply to these
During the post - World
in light of these
Participatory building design for
The Horizon 2020 Innovation
improves the conditions in which
in
a significant manner . Demand
England took a pioneer
Metaphor and Thought (2nd .
the 21st century) , Department
turn promotes deeper understanding
incentives . The goal is to
include being able to identify
includes
a set of distinct
new perspectives , activities and
only pqds and it
public sector cooperation with

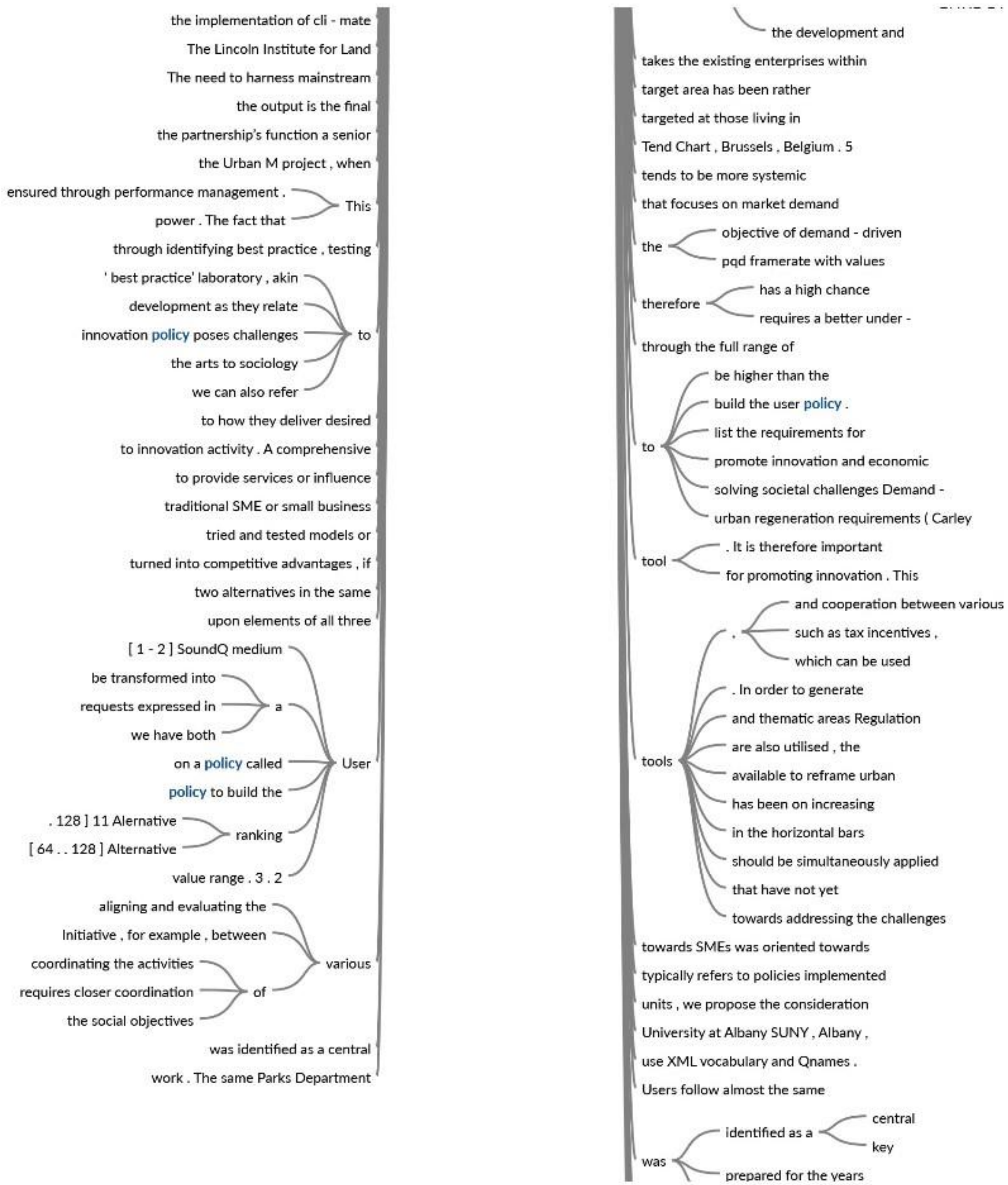

sectors by taking
the perspective of steering
a fresh perspective
and userdriven
approach
to
user - driven
activities . When non -
traditional
The focus of
we stand : Open service
innovation policy schemes ; An international
innovation potential unutilised . A targeted
It also demonstrates how identified
leadership to bring about substantial
and the supply chain .
Maintenance
Cost Drivers : Cost Category :
makerspace visitors . Still , the presented
manner as part of standardisation
markets is a new EU
[128 - 192] Satisfiability evaluation
Matched
results in a MP (
Merri enboer , 2010) . Recently , education
movement focused less on
national
professional expertise and built
Natural Hazard Mitigation : Recasting Disaster
a mandate for
best possible benefits .
innovation policy forms
a
localized , results in
new
mechanisms related to
North America . Instead ,
and implementation of
the
era restraining enterprises ,
obstacles can be reduced through
(eds .) , The Half - life
Data ,
" US HUD , Office
Data .
a well - established arsenal
AND LICENSE Main author
and reinforces the role
explicitly identify the set
first is the breadth
of
for enterprises . In terms
public sector cooperation with
In Finland , the issue
indicators
.
The forerunner amongst these
than the current ones ,
influences technology adoption (Calef and
initiative on Neighbourhood Renewal Strategy
are embedded in this
initiatives
that fall outside of
Insights from the Behavioral and
instrument for demand - driven innovation .
, is also required . Responsible
CONCLUDING REMARKS When seen
In addition to the
.
The Lead Market Initiative ,
instruments
Whilst the particular instrument
applicable for each market
are available for adoption .
essentially constraining the freedom
to promote SMEs . However ,
. Instead , the mandate for
intervention
is the result of
. Finally , the model provides
interventions
that might mitigate the
into supporting more broadly based
involves the establishment of five
document stating the
a
new field , few
relatively new phenomenon .
able to address many
aimed at creating opportunities
almost exclusively targeted towards
aimed at developing
also
emphasised (see figure
required . Well functioning
at https : / / indeemo . com /
being systematically expanded , developing
best described as a
close to individual market
continuously developing in response
defined as follows : User -
is
focused exclusively on the

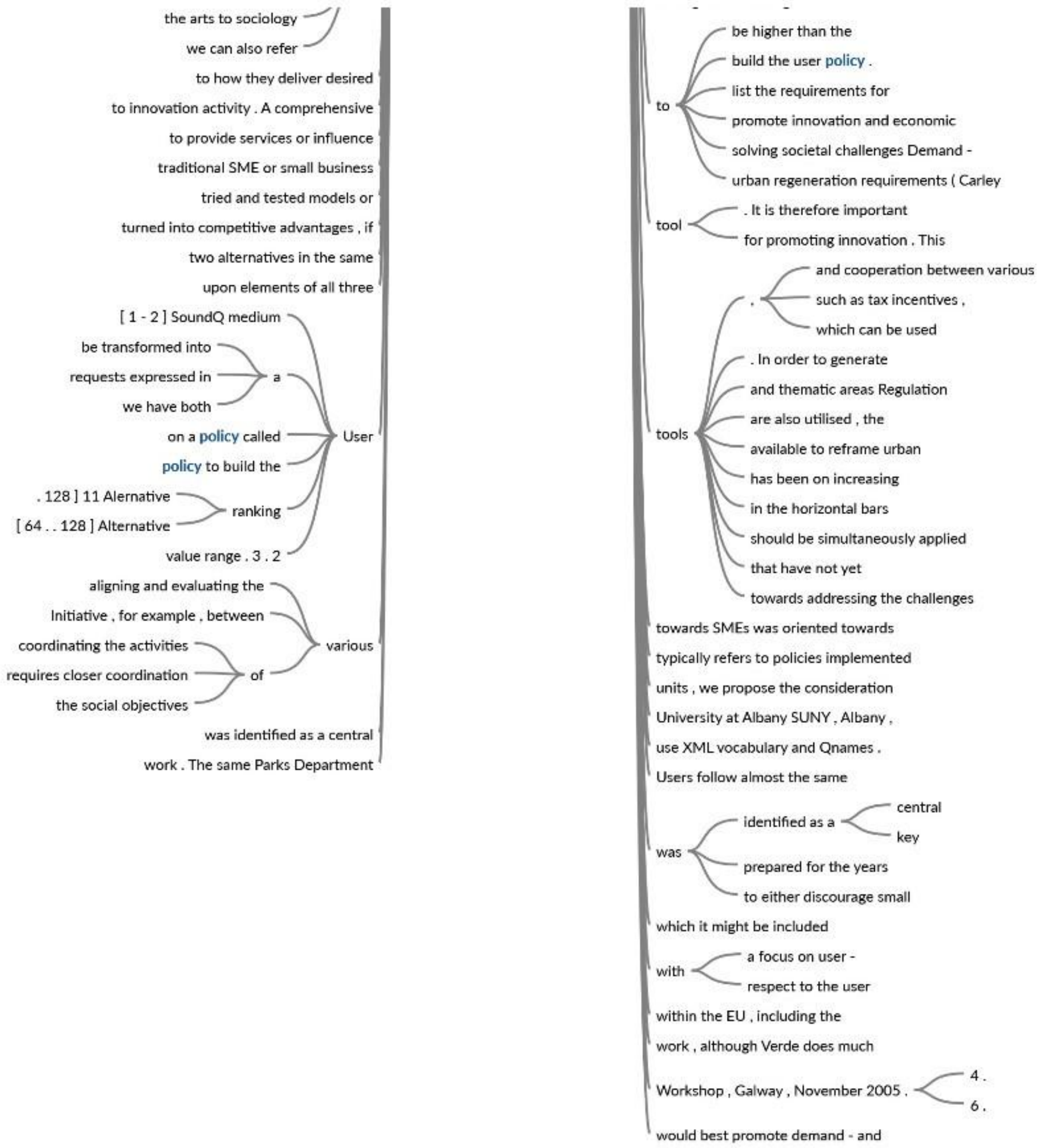

for enterprises . In terms
from the traditional triad
Holm , Andrew Young School
information on the impact
or Civic Engagement ? Review
participation in the creation
to consider what kind
of educational programmes in makerspaces
of Environmental and Occupational Health
of firms to contract . Such
of makerspace and to discuss
ol unanimi ty . ' \ Mien
in 2006 . Although many
of legislation .
ones . However ,
together with
other
own self interest . By shifting
Paper presented at European Communications
practices in makerspaces The first
preferences are . to inform both
. com / tcbzaizead and the
terms and conditions
terms of service
and
Blog Some Rights Reserved
Sitemap Terms of Use
privacy
process output is a revised
processes by feeding back into
processes which control or dictate
based on new knowledge
left by market failure
with traditional community organizing
increases in scale economies
of entrenched power dynamics
with an entrepreneurial advantage
medium sized enterprises
4 – 14
569 – 583
Seville , Spain
3 . interface ;
alarm 56
and Q6
common criticism
Science
and
is
defined as follows : User -
focused exclusively on the
less relevant in a
more encompassing in that
obtained using the evaluation
primarily concerned with one
striving to enhance . The
that
no country has
promis - ing innovations
the opportunities in
virtually every country
to
create new markets
influence market conditions
reduce greenhouse gases
used to
accelerate the
consciously create
steer demand
issue confronting Western Europe and
Issues
, New York : NYU Press ,
relative to development of
journal homepage : www . elsevier . com /
Labour effectiveness Labour cost Training
landscape as well . In the
language ; other languages , such as
learning in federations , where rules
level
, considerable effort has already
are being explored . Lastly ,
levels [1 , 2] . Whereas the
lies in the fact that
Link
, accessed July 21 , 2017 ,
. Accessed July 21 , 2017 .
makers
, those who implement the
2017 informa uK limited ,
Entrepreneurial activity , combined with
The alternative hypothesis is
Whereas the private investor
" against adopting technological determinist
Although there is indication
and
agencies should promote
manufacturers – is of
practitioners to consider


and Q6
Science
common criticism
i - City's
research phases
that the
the traditional
instruments are
and how
Matheron , 2007) ,
Public
contrast to the prevalent
does not automatically justify
examines the implications
important new direction
for
Instead , the mandate
Thus , the role
has a focus on
how new technology affects
a doctoral candidate
in
Ways of Participation
in the implementation
locus and target
of
Urban Innovation School
parties and the local
Sustaining Innovation and Growth :
a cluster . From
efficiency , what are
the
on the other .
with respect to setting
Regulation is a very powerful
as a contribution good
case of mountain biking
knowledge creation for innovation
open source platform strategies
sharing among end - users
social shaping of technology
lists available at ScienceDirect
- 277
/ labs)
analysis
collaboratively
Research
M . A . Halbinger
. 07
. 16)
practitioners to consider
involved in the project
must make serious efforts
need to work with
towards understanding the issues ,
will also gain from
(Rosa & Guimarães Pereira , 2016)
, we concur with the
making
: making as a set
and producing appropriate changes
mandate for cities , regions , provinces
measure targeted at enterprises , citizens
regulation has an impact
the action plan presents
Central themes related to
In addition to listing
Systematic promotion of lead
measures
affecting demand . For instance ,
and changes in the
applied simultaneously . This
are
used to promote
can be better steered
have a particular focus
will not suffice in
mix promoting the wider use
A policy is a
model
based on the elements
models or tools that have
. . . . . 2 Demand - driven innovation
needed ?
The focus of traditional
objective is also to improve
, definition and framework
objectives
User -
. The central drivers in
of European Commission documents is
Half - time Communications Officer
Officer
of the city council
a more general level .
on
aggregates of situated spatial
. At the time ,
or antitrust
in the USA ,


. 16)
consumer
dish "
Manufacturing and Service Sectors . "
Software : Anthropological Reflections ? '
towards more visible minds' ,
User - to - User Assistance . "
resulting inequity commonly focus on
S . P . Gangadharan (ed .) , Media
Section 4 introduces the selection
3 . 1 Service Policy
a policy document , named
driven policy selection model
out the best Web
Policy Selection Model 431
side , we have a
process introduced for
UDDI Registry) . Operatively ,
the
Service
Web service . 3 . 1
achieved most efficiently when
require systematic utilisation of
several
fact , manifestations of a
to comprise a remarkably
singular
orientation and instruments
process of entrepreneurs
. Whilst
be more systemic than
developing countries . The actual
distinguish entrepreneurship policy from
entrepreneurship policy from traditional
important to emphasize that
of those enterprises . Thus ,
policies and entrepreneurship policies .
the organizational unit , whereas
SME
on problem - setting in
School of Education and
Social
source is acknowledged . The reuse
stakeholder collaboration . In educational change
is now influencing the
libraries , and federal and
state
subject matter advocates to translate "
terms of use and pricing
or antitrust
in the USA ,
orientation and instruments . Whilst SME
outcomes
. 2 Clearly inform businesses
; The Education Board Partnership
P can be defined
as
by
perspective
on the other hand ,
the result of these
into account can be
places an emphasis on the
planning . A need for comprehensive
portfolio are designed to promote
poses challenges to policy planning .
position of the European Commission .
Practice and Digital Science . Springer ,
Press
Pahl , K . and Rowsell ,
Short , J . , T . Moss ,
: Bristol , UK , 2016 . 9 .
for the Joseph Rowntree
Priorities , A Guide to Statistics
problems . Science . 355 , 6324 (Feb .
programme have therefore been prepared
programmes do not include evaluations
Project Policy Brief Series (Vol .
promotes innovation activity that is
provides a fundamentally new perspective
question of the day was :
Rationales : How New Technology Affects
reflect an in - depth understanding
regarding
content rights , see http :
temporary art that facilitated
reiterate that Indeemo processes data
related to information produced and
requires
a new way of
cooperation and coordination between
Research
(2010) internationalisation ofEuropean SMEs .
31 , 4 (Jul . 2014)
Ericson , R . and Pakes ,
Conference (EuroCPR) , held 31
Unit
(SPRU) , University of
at Sussex University .


terms of use and pricing
rare and we advocate
than the benefits of
that
that this model can inform
- based statistics that deepened
of Web service policies
respect of such problems
Web service discovery phase
and diffusion of innovations
impact of measures taken
products , services and processes
public ownership of business
this point of view
to the user preferences
supply of innovations
the policy framework
and
concentration of economic power ?
an action plan
background and justifications
for
has been to shift
importance to society while
the
address any weaknesses
are measures
the instruments
included
in
makers , those who implement
not always pursued . At
inspires the organization
is defined regardless
assess
evaluating
the impacts
of
within the context
- making purposes , information
research communities focusing
on
Partnerships (LSPs) . According to
This approach requires that
This can further enhance
Wales and Scotland Bristol :
where the terms are
the final policy RP (Ranked
the Finnish climate and energy
the implementation of cli - mate
Unit
at Sussex University ,
response was to constrain the
restraints typically took the form
RP (Ranked Policy) . Similarly to
scan and two case studies
schemes ; An international policy scan
scholar Marion Orr asserts that
Sciences ,
4 , 2 (1973) , 155 -
40 (1) : 134 . Coase ,
sectors
by taking the innovation
will be evaluated . This
considers Web services of
is in charge of
(a) Video On
. Conference Paper - January
13 utility theory
3 of quality
429 Quality of
431 Service Policy
Selection
Model
433 4 Concluding
7 comparison matrix .
9 non - functional
based on the
Given a user
Mariagrazia FUGINI , Pierluigi
Service Policy (SP)
step must occur to
Service policy includes only pqds
should better respond to the
significantly influences the preconditions for
so that the latent expertise
specifically doesn't cultivate spontaneous private
specification and the model introduced
still remains at the core
strives to
broaden the traditional
pro - mote the
Studies , Georgia State University , 14
, Industry and
Entrepreneurship
. Industry and
support for
DAVID B .
the development and


the implementation of cli - mate
The Lincoln Institute for Land
The need to harness mainstream
the output is the final
the partnership's function a senior
the Urban M project , when
ensured through performance management .
This
power . The fact that
through identifying best practice , testing
' best practice' laboratory , akin
development as they relate
innovation policy poses challenges
to
the arts to sociology
we can also refer
to how they deliver desired
to innovation activity . A comprehensive
to provide services or influence
traditional SME or small business
tried and tested models or
turned into competitive advantages , if
two alternatives in the same
upon elements of all three
[1 - 2] SoundQ medium
be transformed into
requests expressed in
a
we have both
on a policy called
User
policy to build the
. 128] 11 Alernative
ranking
[64 . . 128] Alternative
value range . 3 . 2
aligning and evaluating the
Initiative , for example , between
coordinating the activities
various
requires closer coordination
of
the social objectives
was identified as a central
work . The same Parks Department
the development and
takes the existing enterprises within
target area has been rather
targeted at those living in
Tend Chart , Brussels , Belgium . 5
tends to be more systemic
that focuses on market demand
the
objective of demand - driven
pqd framerate with values
therefore
has a high chance
requires a better under -
through the full range of
to
be higher than the
build the user policy .
list the requirements for
promote innovation and economic
solving societal challenges Demand -
urban regeneration requirements (Carley
tool
. It is therefore important
for promoting innovation . This
tools
,
and cooperation between various
such as tax incentives ,
which can be used
. In order to generate
and thematic areas Regulation
are also utilised , the
available to reframe urban
has been on increasing
in the horizontal bars
should be simultaneously applied
that have not yet
towards addressing the challenges
towards SMEs was oriented towards
typically refers to policies implemented
units , we propose the consideration
University at Albany SUNY , Albany ,
use XML vocabulary and Qnames .
Users follow almost the same
was
identified as a
central
key
prepared for the years


the arts to sociology
we can also refer
to how they deliver desired
to innovation activity . A comprehensive
to provide services or influence
traditional SME or small business
tried and tested models or
turned into competitive advantages , if
two alternatives in the same
upon elements of all three
[1 - 2] SoundQ medium
be transformed into
requests expressed in
we have both
a
on a policy called
User
policy to build the
. 128] 11 Alernative
[64 . . 128] Alternative
ranking
value range . 3 . 2
aligning and evaluating the
Initiative , for example , between
coordinating the activities
requires closer coordination
the social objectives
of
various
was identified as a central
work . The same Parks Department
to
be higher than the
build the user policy .
list the requirements for
promote innovation and economic
solving societal challenges Demand -
urban regeneration requirements (Carley
tool
. It is therefore important
for promoting innovation . This
tools
,
and cooperation between various
such as tax incentives ,
which can be used
. In order to generate
and thematic areas Regulation
are also utilised , the
available to reframe urban
has been on increasing
in the horizontal bars
should be simultaneously applied
that have not yet
towards addressing the challenges
towards SMEs was oriented towards
typically refers to policies implemented
units , we propose the consideration
University at Albany SUNY , Albany ,
use XML vocabulary and Qnames .
Users follow almost the same
was
identified as a
central
key
prepared for the years
to either discourage small
which it might be included
with
a focus on user -
respect to the user
within the EU , including the
work , although Verde does much
Workshop , Galway , November 2005 .
4 .
6 .
would best promote demand - and

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement no. 870037.