Re-FREAM

Re-Thinking of Fashion in Research and Artist collaborating development for Urban Manufacturing

Working Package WP 5

Hub "Electronics and Textile"

Deliverable 5.3

Mapping "e-Textile Ecosystem and Network" Report

Grant agreement no.:	**825647**
Call identifier:	**H2020-ICT-2018-2 – ICT-32-2018 – STARTS**
Objective:	**The Arts stimulating innovation**
Start date of the project:	**01.12.2018**
Duration	**36 month**

Due date of deliverable: 31.07.2020

Actual submission date: 31.08.2020

Lead Beneficiary for this deliverable: Wear It Berlin

Contributions by: WIB

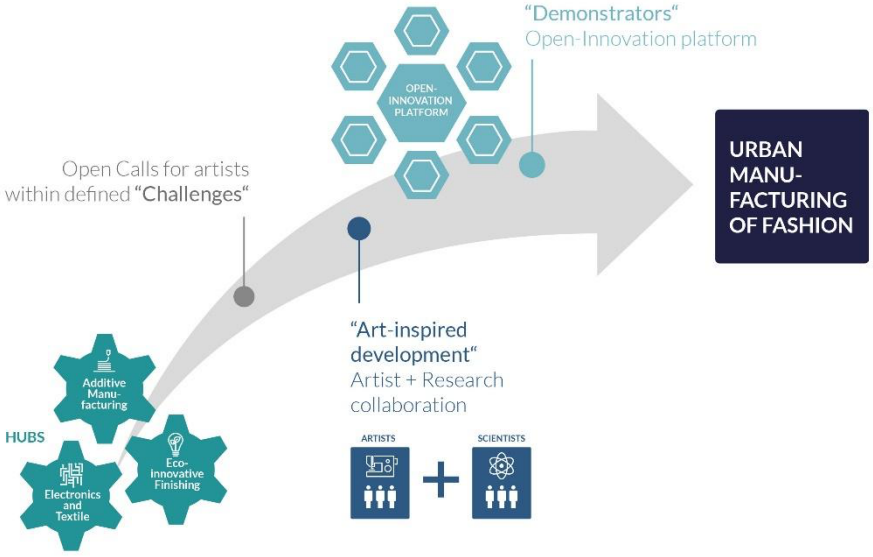
Project co-funded by the European Commission within H2020 Framework Programme		
Dissemination Level		
PU	Public	X
CO	Confidential, only for members of the consortium (including the Commission Services)	
Type		
R	Document, report (excluding the periodic and final reports)	X
DEM	Demonstrator, pilot, prototype, plan designs	
DEC	Websites, patents filing, press & media actions, videos, etc.	

Contents

1 Context Information

1.1 The Re-FREAM Project

Re-FREAM will support **art-driven innovation** in European R&I projects by inclusion of artists in research consortia via linked third-parties. The artistic community receives a strong support from art-related partners like the Art University of Linz (UFG) and the European Institute of Design (IED), creative hubs and facilitators like Wear-IT Berlin (FashionTech), AITEX, ARCA and Creative Region combined with remarkable technology from IZM Fraunhofer (E-textiles), Stratasys, Haratech (3D-printing), EMPA (3D body simulation), Care applications (Garement nebulization) and Profactor (Additive manufacturing).



Re-FREAM boosts **art-inspired urban manufacturing**, where the city becomes a new production space. Especially for **creative fashion**, urban manufacturing offers a great opportunity to create an alternative to the much criticized production in low-wage countries.

Three technologies (additive manufacturing, electronics on textiles and eco-innovative finishing of fashion) will be explored together. **In co-creation** 20 awarded Artist/ Researcher teams, digitalized manufacturing of fashion will be developed up to TRL 5 to enable small-scale production of fashion in urban environment. An **Open-Innovation Platform** will finally link the know-how and the communities of the hubs, will offer access to relevant facilities and make the Re-FREAM art-inspired urban manufacturing working model sustainable.

1.2 Description of the Work Package concerned

Work package number		5		**Start Date or Starting Event**				01.12.2018				
Work package title		Hub "Electronics and Textile"										
Participant number		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Short name of participant		CRE	PRO	AIT	WIB	CAR	IED	ARC	HAR	UFG	STR	IZM	EMP
Person-months	2	0	10	3	14.5	0	0	1	2	0	5	15	3
	Actual (m 20)												

Objectives

1. Development of urban fashion manufacturing framework in the field of "Electronics and Textile"
2. Provision of an individualised support package (training on collaboration and creative techniques, collaboration facilitating, design, technical, prototyping, validation/fab labs) to the awarded projects in the course of prototype development;
3. Printing strategy for hybrid integration of electronics in fashion
4. Optimizing conductive and dielectric inks for PolyJet printing

Tasks

Task 5.0: Coordination [WIB]
Hub coordination ensures that the activities in the hub does not run out of budget, co. research projects are in time and the expected results are achieved. This includes:
• Management of the actors in the hub: technology providers, artists, additive manufacturing facilities
• Contribution to preparation and updating of the project webpage
• Organising Meetings
• Grant management with awarded artists
Task 5.1: Mapping Electronics and Textile Ecosphere and Networks [WIB]
This tasks aims to build up a sustainable ecosystem of electronic and textiles technologies and networks for urban fashion manufacturing including:
• Desk top research on e-textile facilities for urban fashion manufacturing,
• Research on state of the art technologies
• Mapping of e-textile networks
• Providing a state of the art profiles on relevant technologies and network on WP7 platform
Task 5.2: Art&Tech Collaboration Support & Facilitation & Monitoring [WIB]
This tasks aims to coordinate and implement the art/tech transfer within the Urban Fashion manufacturing hub and the implementation of the 7 operational co.research projects , including:

• Implementation of 2 Art/ Tech transfer local events
• Recruiting of Collaboration facilitators
• Implementation of collaboration trainings for researcher and awarded artists
• Set up of CO.Research projects including co.research agreements
• Monitoring and evaluation of the Co.Research projects

Task 5.3: Optimization of Electronic Module Kit [IZM]
IZM will develop miniaturized electronic modules that can be integrated into textiles by means of ICA/ ACA, NCA bonding, embroidery or soldering. This so called Re-FREAM e-Textile kit will consist of functional modules, like microcontroller, wireless communication, sensors and actuators In workshops we will discuss with artists the needed form factor in order fulfil an easy-to use system as well as required design aspects

Task 5.4: Optimization of Textile Circuit Board Technology [IZM]
IZM will adopt the Textile Circuit Board manufacturing technology that it can be applied to low-cost equipment as plotters and thermos-transfer press. The technology will be further developed into a multilayer technology. Based on open innovation approaches IZM will document and publish the production process and suitable materials in order to enable external use of the project results

Task 5.5: Conductive and dieelectric ink optimization and printing strategies [PRO, STR]
PRO will do a market research on conductive (Cu and Ag) and insulating (TPU, acrylate systems) The different parameters related to formulation optimization (e.g. solvent and solvent monomer ratio, additives, etc.) will be studied as to how they influence the polymerization quality, speed, energy balance, printability, geometry and electrical properties of the printed pattern, etc. If necessary Taguchi Design-Experiment (DOE) will be implemented.PRO will deal with the further ink development and optimization. Physical properties of the ink as well as printability will be characterized. Tests of finally printed objects after curing in terms of desired material properties will be done.STR will validate the inks for their PolyJet printers and test for proper printing

Task 5.6: Development of methodology for sustainable creation of artworks (IZM)

Aim of this task is to identify easy to use eco-design tools (checklists, assessment tools, creative methods) applicable to art-works and develop a process for the co-creation of eco-designed artworks in an urban manufacturing environment.

- Identification of artists needs with respect to eco-design (qualitative interviews)
- Screening of the available eco-design processes and tools according to needs, usability, and adaptability to art
- eco-design process for the creation of environmental friendly artworks (methods and steps along the product development phases ideation, definition, and development)Application and test of process for challenge 6 (Task 5.2)

Deliverable							
Del. No.	**Deliverable name**	**Lead benefi-ciary**	**Type**	**Diss. level**	**Delivery date from Annex 1 (proj. month)**	**Delivered Yes/No**	**Actual / Forecast delivery date**
D5.1	Guideline for eco-design process for the creation of	IZM	R	PU	3	Yes	30.5.2019

	environmental friendly artworks						
D5.2	First version of four E- textile artworks and two eco-designed art-works	IZM	DEM	PU	18	Yes	30.05.2020
D5.3	**Mapping "e-Textile Ecosystem and Network" Report**	**WIB**	**R**	**PU**	**20**	**Yes**	**31.07.2020**
D5.4	Hub "e-Textile" Final Report	WIB	R	CO	36	No	31.11.2021
D5.5	Final version of four E- textile artworks and two eco-designed art-works	IZM	DEM	PU	36	No	31.11.2021

1.3 Purpose and Scope of Deliverable Report D5.3

Abstract from the Re-FREAM Consortium Agreement (D 5.3):

Mapping "e-Textile Ecosystem and Network" Report [20]

This deliverable will describe the concept of a sustainable ecosystem of electronic and textiles technologies and networks for urban fashion manufacturing including desktop research on e-textile facilities for urban fashion manufacturing, research on state of the art technologies, mapping of other e-textile networks and providing a state of the art profiles on relevant technologies and network on WP7 platform.

The Deliverable Report 5.3 has the purpose of showcasing the achievements within the Work Package 5 (Hub "Electronics and Textile") of the Re-FREAM Project in regards to mapping the e-textile ecosystem and network in Europe.

The report will describe the concept and importance of a sustainable ecosystem of electronic & textile technologies, and will showcase a detailed listing of networks, facilities and technologies for urban fashion manufacturing.

2 Introduction

Urban fashion manufacturing for electronics and textiles is a wide field, containing various components and different scopes. We have clustered them into the following categories:

- Universities
- Research institutions
- Sensors
- Electronics
- eTextile & Materials
- Events
- Networks & Media
- Startup Hubs

The need to create a framework for all these components is the existing gap between the different sectors mentioned above. Re-FREAM is aiming to bring these different fields into one platform and provide them a framework which could become sustainable even after the project end.

The value of a framework for urban fashion manufacturing for Electronics and Textile is brought by two sides:

- on one hand by the diversity of the fields (from universities, to hardware manufacturers or networking events)
- on the other hand, by showcasing examples of art-tech collaborations that lead to prototypes with electronics integrated into textiles

3 Summary and Outlook

3.1 Concept of a sustainable ecosystem of electronic and textiles technologies & networks for urban fashion manufacturing

As a complex network or interconnected systems, the sustainable ecosystem of electronic and textile technologies and networks for urban fashion manufacturing is bringing together the two main target groups of the Re-FREAM project:

1. Designers and artists with an inspiring idea to re-think the future of fashion, and who want to bring the idea to a prototype stage with the help of scientists
2. Companies that offer solutions, and want to get in touch with potential collaborators, clients or

Re-FREAM is acting in between tech, science and fashion – three very different fields in essence. What urban manufacturing is doing is bringing all these fields under one umbrella, in order to contribute to creating value to the future of fashion.

In order to support the development of an urban fashion manufacturing framework in the field of "Electronics and Textile", Wear It Berlin conducted an extensive research on different stakeholders in the industry. These stakeholders have been divided into different categories, and summarizes in the point *3.2 e-Textile facilities for urban fashion manufacturing & state of the art technologies* and *3.3 Mapping of other e-textile networks* below.

3.2 e-Textile facilities for urban fashion manufacturing & state of the art technologies (desktop research)

Universities

Country	University Name
DE	HTW Berlin
BE	Royal Academy of Fine Arts Antwerp
SE	Boras
FR	ESMOD
DE	Udk
DE	BERLIN WEISSENSEE SCHOOL OF ART
DE	LETTE-VEREIN BERLIN
DE	OBERSTUFENZENTRUM BEKLEIDUNG UND MODE
DE	BEST-SABEL-BILDUNGSZENTRUM GMBH
DE	AMD BERLIN
DE	FASHION DESIGN INSTITUTE
FR	ATELIER CHARDON SAVARD
DE	ABOUT:FASHION
UK	London College of Fashion
NL	Amsterdam University
IT, FR, US, UK	Istituto Marangoni
IT	IED
AT	Angewandte Wien

AT	UFG Linz

Research Institutions

Country	Research Institution
NL	Holst Center
DE	Design research lab
DE	TITV Greiz – the institute for special textiles and flexible materials
DE	Fraunhofer IZM
DE	interactive wear
DE	cfaed - center for advancing electronics dresden
DE	TUM
DE	MAD - machine learning and data anylytics
DE	DFKI
EU (research project)	Easy imp
IT	Arca textile Lab
AT	Profactor
ES	AITEX
CH	EMPA

Sensors

Country	Company Name	Keywords
DE	TDK	wearable sensor solutions
US	Bourns Sensors GmbH	position & enviromental sensors
DE	Balluff GmbH	sensor tech
BE	BCM Sensor Technologies	sensor applications
	bosch-sensortec	motion sensors
US	aernos	nano gas sensors
DE	tacterion	modular sensors

Electronics

Country	Company Name	Keywords
UK	Printed Electronics	smart sticker, to wearables, to large physical objects, we are experts in embedding electronics
UK	flexenable	organic electronics platform and high-performance OTFT materials enable low cost, glass-free flexible displays, sensors and optics
DE	Kuttig	Electronic Manufacturing Services
DE	Contag	- Starre Leiterplatten - Multilayer bis 24 Lagen - HDI, Blind- und Buried Via-Technik, Hole Plugging - Dehnbare Leiterplatten (Conformable Electronics) - Hybrid-Multilayer (z.B. Rogers + FR4) - Flexible und starr-flexible Leiterplatten - 3D-MID
UK	cpi	printable and flexible hybrid electronics
USA	adafruit	electronics and making the best designed products for makers
DE	exp-tech	Embedded Systems, SBC und Mikrocontroller,IoT Module und LoRa Gateways,Sensorik,Motoren und Motorsteuerungen
PL	jm-ems	electronics manufacturing services
DE	innovationlab	printed and organic electronics with a focus on flexible printed pressure sensors.
UK	dycotecmaterials	stretchable silver conductive and encapsulation layers for applications such as wearable electronics, e.g. clothing, RFID, heaters, electrodes and sensors
BE	agfa	printed electronics
FI	canatu	stretchable electronics and sensors
IT	wiseneuro	stretchable electronics

eTextile & Materials

Country	Company Name	Keywords
CH	schoeller-textiles	e-textiles
RO	directa	graphene nanoplatelets-based products

DE	imbut	Automated production of smart textiles, from the textile surface to the supply lines to the electrical contacting of the textiles and electronic components
DE	smart-materials	innovative business and science location for smart materials
FR	creafibres	transformation and the spinning of technical fibers, particularly stainless steel fibers
DE	amohr	conductive textiles to be used as flat conductor, sensor, heating element or electric circuit
CH	swicofil	Highly conductive yarn and fibers like SwicoSilver HiCon, plasma metal coated yarn, stainless steel yarn, carbon loaded yarn or chemo galvanically silver coated yarn.
CH	nanoleq	elastic conductors PhantomTapeTM and electrodes ElectroSkin
AUT	Haratech	Plastics Engineering and Solutions
IL	Stratasys	3D - printers
ES	Care Applications	garment processing, including garment washing, garment dyeing and in research and development of new finishes and machinery.

3.3 Mapping of other e-textile networks

Events

Country	Company Name	Keywords
DE	Fashion Week Berlin	
DE	Wear It Berlin	
DE	Neonyt	
DE	IDtechX	combines the executive conferences 3D Printing Europe, Electric Vehicles Europe, Energy Storage Innovations Europe, Graphene & 2D Materials Europe, Internet of Things Applications Europe, Printed Electronics Europe, Sensors Europe and Wearable Europe.
DE	fashiontech	tech conference for the fashion industry
AUT	ars.electronica.	Festival for art, technology and society
	electricrunway	wearable technology runway show
US	fcwsf	Fashion community week event and platform

Networks & Media

Country	Company Name	What they do
Media		
DE	textile networks	Specialist magazine for the manufacture of textile products
UK	Fashnerd	digital magazines writing about fashion technology and wearables
	fashionretail.blog	blog is about news, insights, opinion essays and interviews specializing in the Fashion Retail industry.
Networks		
DE	fashion-council-germany	Interessenvertretung für deutsche Mode
	european-fashion-council	here you can find all fashion weeks, trade sbow and so on
UK	britishfashioncouncil	ot-for-profit organisation that harnesses the collective power of the industry
DE	inam	global network of companies and research institutes in the field of Advanced Materials.
DE	texi.	part of high-class fashion and advertising events such as Project Runway or the Art and Fashion Forum for the promotion of talent.
DE	fablab	
	fashionlab-agency	Supporting the brands in expanding their sales and communication with the retailers & with production services
AUT	Creative Region Linz	

Startup Hubs

Country	Company Name	What they do
SE	futurefashion	Fashion Tech Incubator & Investment Hub for brands, research institutes, innovators and investors
ISL	360creativehub	Innovation Hub is a vertically-integrated fashion Accelerator, with a co-working space dedicated to nurturing, expanding and accelerating emerging fashion creatives
	thepowerhouse.group	THE EUROPEAN THINKTANK FOR WEARABLE TECHNOLOGIES, FASHION TECH, AND SMART TEXTILES.
DE	MotionLab	
DE	Factory, betahause	
UK	startupbootcamp	Accelerator

DK	future-of-fashion	platform created to streamline the production process in the fashion industry
UK	startyourownfashionlabel	passionate about supporting emerging fashion labels. Our aim is to provide you with high value information, resources, knowledge and connections
SE	fashiontechgroup.com	incubate and invest in digitally native vertical brands.
AE	ftlab.com	source and channel capital to incubate and expand innovative products, technologies, business models and brands.
UK	fashion-enterprise	Incubator
ES	atelierbyisem	website is in spanish and ca'n change the language hahah maybe you will understand coy they like incubators as well :D
FR	lookforwardproject	Look Forward innovation hub (incubator)
UK	weinsocialtech	accelerator programme

3.4 Providing state-of-the-art profiles on relevant technologies and networks on the Open Innovation Platform

More than just further developing an urban fashion manufacturing framework for e-textiles, WIB raised the question “How can we make it self-sustainable?”.

A first step in creating an ecosystem of electronic and textile technologies and networks for urban fashion manufacturing was creating an Open Innovation Platform, where the artistic and scientific teams can document the co-creation process between the artists and the scientists, and therefore demonstrate good practice examples to 3rd parties. The teams share their experience in the form of blog posts, which will offer readers a transparent view of co-creation.

The second step was creating a LinkedIn Group where the audience can connect and interact online. The “Re-FREAM - 3D print, wearable electronics, sustainability and fashion” Group, which counts over 200 members from artists & designers to industry experts. The group is offering different stakeholders to connect, stay updated with the latest achievements in the industry and potentially start meaningful collaborations.

As a third step, WIB added an extra feature to the Re-FREAM website – a digital map that will summarize, amongst others, all the desktop research on urban fashion manufacturing for sustainability, 3D-printing and e-textiles. The map can be accessed here: http://www.re-fream.eu/places/

The figures below show how the map could look like on the Re-FREAM website:

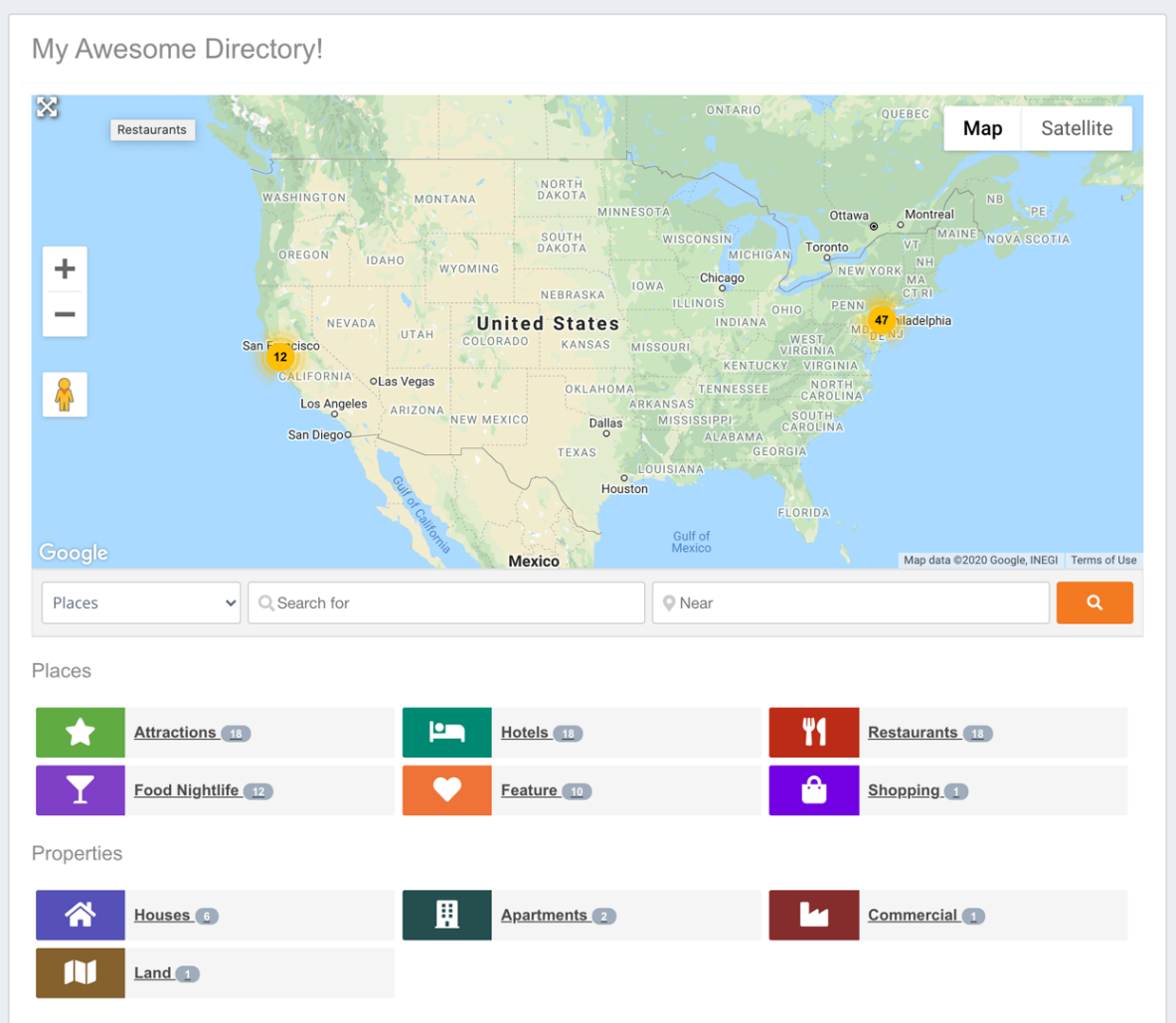


Figure 1.1 – a zoomed-out map, which shows locations, based on different categories. The categories can be adapted to the Re-FREAM requirements (eg type of stakeholder, hub etc.)

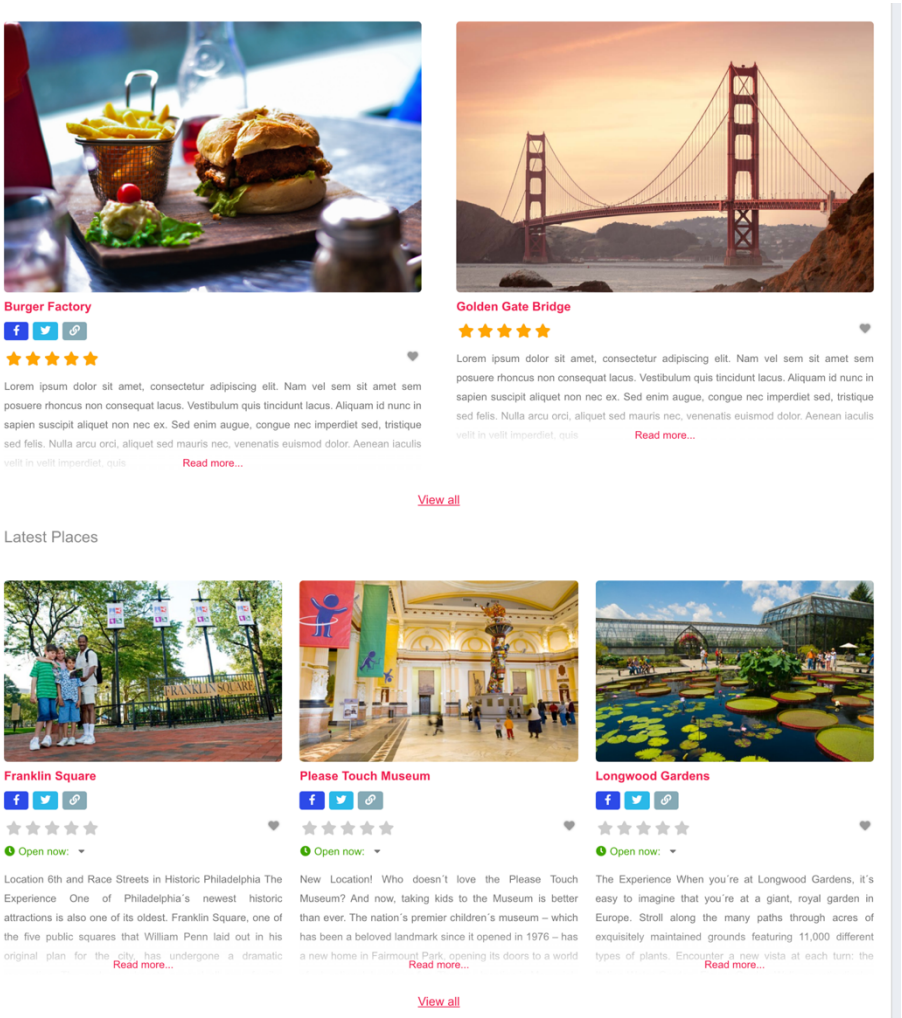


Figure 1.2 – an example of a more detailed overview in the stakeholder mapping

The feature is still „under construction“ on the Re-FREAM website, but the first steps have already been taken to make relevant stakeholders for urban fashion manufacturing available on the Open Innovation Platform, as you can see in the two figures below.

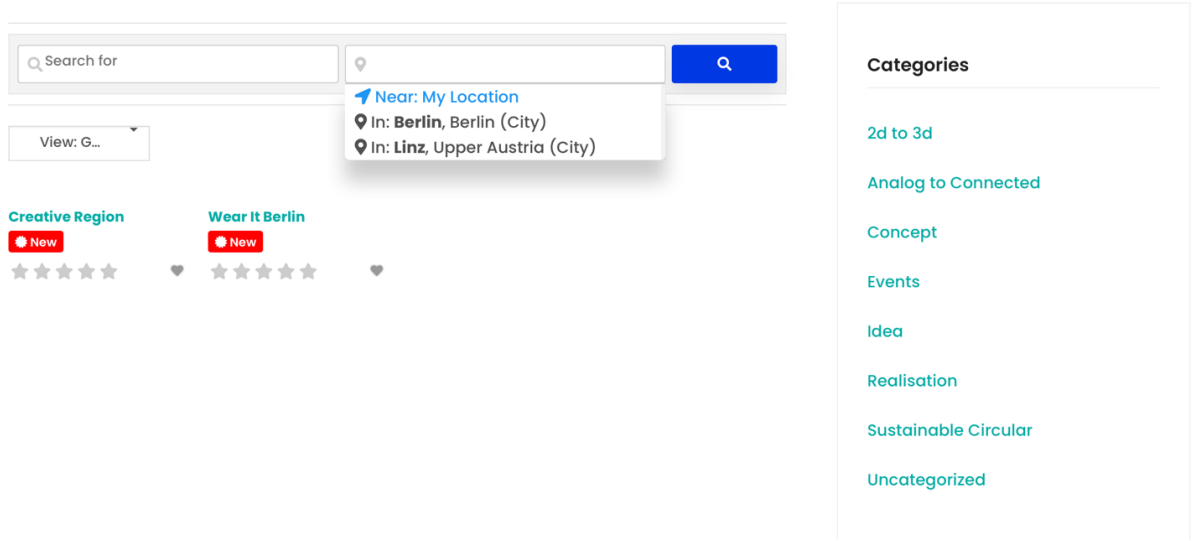


Figure 1.3 an example of the search function. Visitor will be able to search based on different categories (eg location, industry etc.)

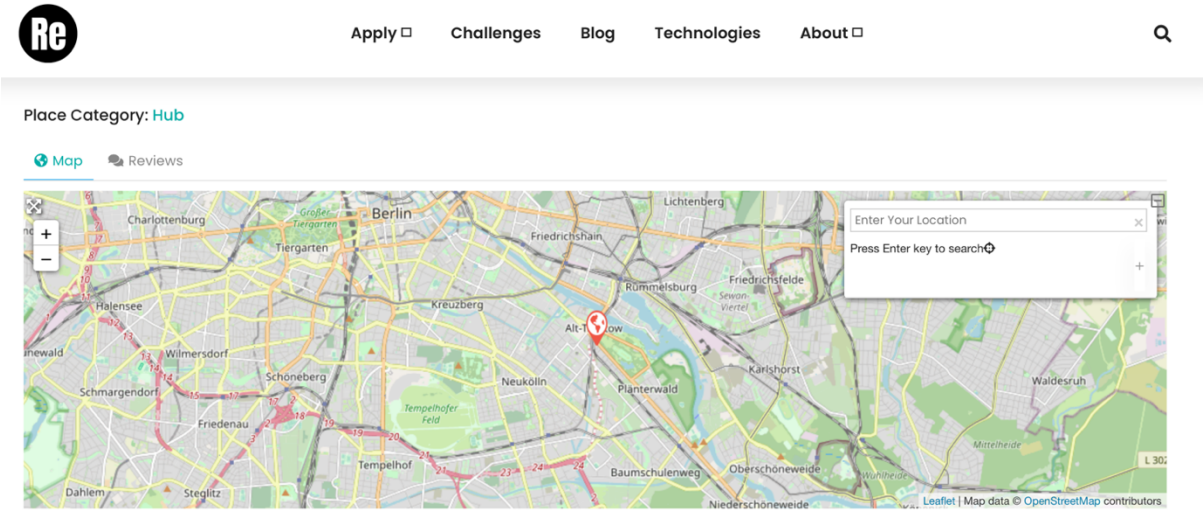


Figure 1.4 a zommed-out view of the map, for the reader to receive an overview of all stakeholders in a certain area

The tool, which is available on the Open Innovation Platform, will offer visitors the chance to quickly find solution-providers or potential partners based on certain criteria (location, industry, type of institution or company etc.). This will contribute to creating a sustainable ecosystem for urban fashion manufacturing for sustainability, 3D-printing and e-textiles.