



D1.6 FINAL FINANCIAL AND TECHNICAL REPORT

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Executive summary

Deliverable D1.6, Final Financial and Technical Report, presents information and findings on the second half of the DiDIY Project, i.e., M16-M30 (April 2016-June 2017). It was planned as a mirror of the Periodic Report on the second and final reporting period, by inheriting from that Report the basic structure and contents. This deliverable maintains the structure of the approved D1.4, Interim Financial and Technical Report, by focusing on technical and organizational contents, and leaving the financial information to other reporting means.

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Introduction

Purpose, structure, and state

Deliverable D1.6, Final Financial and Technical Report, presents information and findings on the second half of the DiDIY Project, i.e., M16-M30 (April 2016-June 2017). It was planned as a mirror of the Periodic Report on the second and final reporting period, by inheriting from that Report the basic structure and contents. This deliverable maintains the structure of the approved D1.4, Interim Financial and Technical Report, by focusing on technical and organizational contents, and leaving the financial information to other reporting means.

Accordingly it is organised in three main sections:

- A. a publishable summary;
- B. an extended description of the work done and the main outcomes;
- C. the final plan for exploitation and dissemination of result.

Terms and acronyms

EC	European Commission
GA	Grant Agreement
CA	Consortium Agreement
SB	Steering Board
PC	Project Coordinator
PO	Project Officer
WP	Work Package
TT	Transversal Task
WPL	Work Package Leader
MO	Management Office
LAB	Legal Advisory Board
ABACUS	AB.ACUS SRL – Member
FKI	STICHTING FREE KNOWLEDGE INSTITUTE – Member
AC	AMERIKANIKO KOLLEGIO ANATOLIA – Member
POLIMI	POLITECNICO DI MILANO – Member
MMU	THE MANCHESTER METROPOLITAN UNIVERSITY – Member
UOW	THE UNIVERSITY OF WESTMINSTER LBG – Member
LIUC	UNIVERSITA' CARLO CATTANEO LIUC – Coordinator
DIY	Do It Yourself
DiDIY	Digital Do It Yourself
ABC	Atoms-Bits Convergence
IP	Intellectual Property
KF	Knowledge Framework



A. Summary for publication

A1. Summary of the context and overall objectives of the Project

Do-It-Yourself (DIY) is a long-standing phenomenon, characterized by individual activity to create, repair, and modify objects. It typically occurs outside of companies and without the support of paid professionals. People engage in DIY sometimes with economic justifications, but also driven by personal satisfaction, interest in extreme customization, or social reputation. In a context of industrialisation, that separated producers and users, DIY is a means for individuals to recover their autonomy by the productive and creative use of their skills and time.

Information processing technology is widespread today, embedded in computers, smartphones, 3D printers, home automation systems, etc, changing the role of DIY and the way DIYers operate. To designate this emerging socio-technological phenomenon of DIY enabled and reshaped by digital tools we coined the term “Digital Do-It-Yourself” (DiDIY).

The most important features of DiDIY are:

- DiDIY is both an activity and a mindset, hence with both object-related and subject-related components;
- the distinction between users and producers of artefacts is becoming fuzzy and new opportunities and threats emerge;
- DiDIY-related technologies and social practices amplify the creativity and skills of individuals who now can afford to develop digitally self-made objects;
- what an individual produces could be the outcome of contributions from a community of developers sharing their ideas in a spirit of open knowledge.

DiDIY is a human-centric phenomenon, evolving thanks to the widespread availability of affordable technological tools and the growing number of DiDIYers operating in communities, which further lowers the barriers to new entries and thus makes DiDIY increasingly attractive.

In this dynamic context the Project aimed at developing a body of knowledge to better understand the social impact of DiDIY, to produce and disseminate information, models and guidelines to support education and policy making on DiDIY. The idea is that DiDIY has the power to improve our society, but to this goal it would benefit from the input of a cultural strategy rather than being driven solely by the market and technology.

The subject is acknowledged to be multidimensional, and as such studied, by analysing how DiDIY is reshaping organization and work, and education and research, and by exploring how it is impacting on creative society and legal systems, and is changing creative design and ethics. The development of a systemic interpretation and relevant guidelines for policy makers was the challenge for the multidisciplinary research team.

A2. Work performed from the beginning of the project to the end of the period covered by the report and main results achieved so far

The Project has produced several valuable results including:



- a Knowledge Framework on DiDIY, that harmonises languages, basic concepts, and research methodologies and proposes a structured interpretation of the phenomenon and a rich set of research questions, aimed at guiding future analyses;
- the analysis on how DiDIY is reshaping organization and work, and education and research, developed through a multidisciplinary perspective, from a review of the relevant literature to interviews with several stakeholders;
- the exploration of some of the many dimensions of the phenomenon, including the impact of DiDIY on creative society, on laws, rights and responsibilities, on ethics, developed in particular through case studies and video interviews with leading persons on the culture and ethos of DiDIY;
- a Simulation Framework on DiDIY, aimed at providing a dynamic characterisation of DiDIY-related phenomena, to be exploited also to investigate what-if questions on several aspects of the complex phenomenon;
- a toolkit to support the organisation and management of co-design processes, including techniques and tools to unlock people’s creativity and help them to work collaboratively;
- a collection of policy patterns synthesising the guidelines obtained from the research.

A rich documentation has been published, including a brochure, some fact sheets, a vocabulary of DiDIY, a Creative Society Digital DIY Manifesto, a free online course of introduction to DiDIY.

A3. Progress beyond the state of the art and expected potential impact (including the socio-economic impact and the wider societal implications of the project so far)

The phenomenon of DIY has been relatively neglected in social studies to date, despite its emergence as a significant practice and movement over several decades, and its potential for driving improvements for individuals, schools, companies, organisations, and society as a whole. Digital tools have allowed a new emphasis of collaboration and open sharing within (Di)DIY, but before this Project this was rarely studied in a systematic way.

The Knowledge Framework highlights the human-centric nature of DiDIY and systematically analyses and interprets it by taking into account the main dimensions of involvement in DiDIY, the components of such involvement, the necessary conditions of what DiDIY is and the multiple interpretations of what DiDIY may be, analysed using the four core perspectives of the Project: DiDIY in organisation and work, in education and research, in creative society, and in laws, rights and responsibilities.

The Project integrated contributions from a range of academic disciplines and showed that:

- (in organisation and work) digital technologies are transforming the concept of DIY by exploiting knowledge sharing within communities into new configurations of Digital Do-It-Together in which functional roles blur – this research could identify ways to achieve better individual and organizational performances by studying the features leveraging on, or conflicting toward, DiDIY within several different organizational domains;
- (in education and research) DiDIY is largely a bottom up phenomenon, related to the flow of skills and knowledge between stakeholders, the steps of learning processes and the outcomes, and the technology involved in learning processes – this research could indicate



ways of improving the uptake of teaching/research tools as well as raise citizens' expectations about the potential of DiDIY by mapping what is going on in different countries in different environment;

- (in creative society) DiDIY influences, alters, or empowers the dynamics of makers' relationship to digital technologies, and it enables DiDIY communities to meet the challenge of local, social, and environmental problems in a new way – this research could help guide communities towards the creative resources they need for tackling problems, with a consequent impact upon policy making regarding support for DiDIY initiatives;
- (in laws, rights and responsibilities) current legal systems are challenged by and provide challenges to the emerging culture of DiDIY, as in the case of the “right to repair” which is needed in order to make production less environmentally damaging – this research could influence the formulation of future policy and legal measures by developing a clear overview of the main challenges and policy recommendations that fit with the new paradigm.

The research has shown that DiDIY-related phenomena can be effectively modelled and simulated, capturing the activity of making so to explore “what if” scenarios on the impact of DiDIY, in order to better understand the effect of: different licensing laws/systems on its growth; sharing and communication structures concerning how makers interact and organise themselves; how the development of makerspaces/Fab Labs could facilitate the development of DiDIY. This understanding improved the Knowledge Framework, the Simulation Framework, and the policy recommendations.

B. Explanation of the work carried out and overview of the progress

B1. Objectives

The Project has been designed in reference to the following objectives, stated in section 2.1.1, “Objectives”, of the Grant Agreement, Part B:

- (i) *to establish a conceptual framework that will enable the analysis, exploration and understanding of the impact of DIY in a human-centric digital age;*
- (ii) *to produce well-founded transferable information, models and guidelines to support both education and policy making on DiDIY as it is forming, intended as an ongoing phenomenon that, while surely enabled by technology, should be driven and shaped by social and cultural strategies, not technology.*

The organisation of the Project in Work Packages has been shaped accordingly, with an explicit symmetric structure (see the diagram below) developed in terms of:

- a *backgrounder* activity, aimed at establishing the enabling conceptual framework (WP2) mentioned in objective (i) and at guaranteeing an appropriate management of the Project (WP1);
- on this ground, an *analysis* (WP3 and WP4) and *exploration* (WP5 and WP6) activity, also mentioned in objective (i);
- as a result, a *synthesis* activity, aimed at producing information, models, and guidelines (WP7) mentioned in objective (ii), and at disseminating them (WP8).

In order to emphasise the importance of a collaborative work in the analysis and exploration activities, two Transversal Tasks (TT1 and TT2) have been also introduced.



The specific work carried out by each WP and TT and the main results obtained to achieve the two general objectives are presented in the section B1.2 below.



Grounding on the work done in the first part of the Project and thanks to the findings of the research activities performed by all partners in all WPs and TTs:

- relating to objective (i), in the context of WP2 the Knowledge Framework was further revised, and in particular answers or comments were introduced to the several research questions it includes. The KF has been complemented by a Simulation Framework, that provides a dynamic characterisation of DiDIY and can be exploited also to investigate what-if questions DiDIY-related phenomena;
- relating to objective (ii), the analysis and exploration activities were performed as planned. Together with the rich knowledge base on DiDIY constituted by the deliverables of WPs 3, 4, 5, and 6 and TTs 1 and 2, they allowed the research team to produce, in the context of WP7, a set of strategic and operative recommendations, also in the form of policy patterns, offered to decision makers and policy makers interested in better adopting DiDIY to improve some aspects of our society.

B2. Explanation of the work carried per WP / TT

B2.1 Work Package 1: Project Management

WP1 began on January 2015 (M1 of the Project) and has been active until June 2017 (M30). WP1 Leader is the Project Coordinator, Luca Mari, LIUC. All partners contributed to the activities of the WP.

B2.1.1 Highlights

WP1 aimed at managing the Project and thus in particular at guaranteeing a smooth and efficient collaborative work of all partners.

36 deliverables were expected to be submitted in the second half of the Project, and all of them have been released in due time (*see the section B2.1.10, “Deliverables and deliverable submission process”, below*).

2 internal milestones were set at M24 and M30, and both were met according to the decision of the Steering Board (*see the section B2.1.8, “Milestones”, below*).

3 meetings of both the Steering Board and the Technical Board of the Project were set, each 6 months, and all of them were regularly and fruitfully held (*see the section B2.1.6, “Project meetings”, below*). All decisions taken by the SB have been recorded in the related Project meeting minutes (*see the section B2.1.7, “SB decisions”, below*).

All partners contributed to achieve the expected Project results, with the contribution of a number of researchers (*see the section B2.1.11, “Active researchers”, below*).

The contacts among the partners and of the Project Coordinator with the Project Officer have been systematic and positive.

B2.1.2 Roles and responsibilities

The roles and responsibilities that were introduced in D1.3, section 2.2, “Responsibilities”, have been maintained.



The Project Coordinator guaranteed a smooth and efficient collaboration among all partners and kept systematic contacts with the Project Officer.

The Steering Board met face-to-face three times, each 6 months, and all these meetings have been regular and fruitful. Several online meetings were held by the SB; the mailing list sb@didiy.eu has been maintained and regularly exploited by all members of the SB.

The Technical Board met face-to-face three times, in conjunction with the meetings of the SB, and all these meetings have been regular and fruitful. All discussions made by the TB have been recorded in the related Project meeting minutes. The mailing list tb@didiy.eu has been maintained and regularly exploited by all members of the TB. In order to stimulate a wider and more intense participation, both at the TB meetings and in the mailing list all researchers involved in the Project activities have been invited.

WP Leaders have systematically been in contact with the PC; each WPL reported the state of the WP-related activities in each of SB meetings.

B2.1.3 WP progress

According to D1.3, section 3.5, “Work Package progress”, each WPL has been in charge of assuring the work in the WP to be carried out according to schedule and the expected deliverables to be produced. Each WPL has been responsible for the technical and scientific aspects as well as for the day-to-day management of specific work related to the WP. Each WPL coordinated the implementation of WP activities as defined in the work plan. Within her/his respective WP and for the duration of the WP, each WPL had the responsibility to achieve all planned deliverables.

No specific issues were identified regarding WP progress.

B2.1.4 Documentation management

According to D1.3, section 3.6, “Documentation management”, the documentation management procedure defined standard rules and procedures related to documentation production, being applicable:

- by all partners,
- for all deliverables to European Commission.

The procedure is described in D1.1, sections 3, “Documentation management”, 4, “Archiving and storing”, and 5, “Internal Collaboration Tools”.

In D8.1, “Project website”, a list of internal collaboration tools is presented and justified. After the third SB meeting and for the whole second half of the Project other online tools, e.g., Skype for online meetings and Google Docs / Sheets / Presentations, have been also adopted to make the internal communication and the online collaborative development of documents more effective and efficient.

All public deliverables have been published in the Project website, section “Results” (www.didiy.eu/project/results).

No specific issues were identified regarding documentation management.



B2.1.5 Risk management

A detailed analysis of the risks that may potentially affect the smooth Project course is in GA – Annex I Part A, section 1.3.5 WT5, “Critical Implementation risks and mitigation actions”, and then in D1.3, section 4, “Risk management”.

The complete list of identified risks, together with the description of the proposed risk-mitigation measures and the analysis of the related situation, is in D1.7, section 6, “Risk management”.

B2.1.6 Project meetings

According to Decision 3, made at the kick-off meeting, along the Project time span the SB and the TB met together face-to-face at intervals of six months to review the work performed in the meantime (in the GA, section 2.3.2, “Management structures and procedures”, the minimum period of meeting was set to ten months). The schedule of the meetings, reviews, and milestones was then as follows:

Year	2015												2016												2017					
Month	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6
Month#	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	first reporting period												second reporting period																	
	kickoff																													final conference
TB meetings	1					2							3						4						5					6
SB meetings	1					2							3						4						5					6
EC reviews																	1													2
Milestones						1									2														3	

The list of the SB/TB meetings held in the second half of the Project is as follows:

Meeting	Month	Venue	Date
4 th SB/TB meeting	M19	FKI, MediaTIC, Barcelona, Spain	4 – 5 Jul 2016
5 th SB/TB meeting	M25	University of Westminster (UoW), 309 Regents Street, London, UK	24 – 25 Jan 2017
6 th SB/TB meeting	M30	Politecnico di Milano, Via Candiani, 72, Milano, Italy	21 Jun 2017

The PC, following the procedures stated in the CA [6.3.2, Preparation and organisation of meetings], sent a written agenda before each meeting to each member.

According to the GA, section 2.3.2, “Management structures and procedures”, “additional meetings [of the SB] can be arranged if necessary as well as contacts through electronic media (i.e., video or phone conferencing or email)”. The list of the SB online meetings in the second half of the Project is as follows:

Meeting	Date
4 th meeting	13 Apr 2016
5 th meeting	27 Apr 2016



6 th meeting	9 May 2016
7 th meeting	23 May 2016
8 th meeting	20 Jul 2016
9 th meeting	19 Sep 2016
10 th meeting	7 Nov 2016
11 th meeting	20 Dec 2016
12 th meeting	2 Mar 2017
13 th meeting	8 May 2017
14 th meeting	22 May 2017
15 th meeting	6 Jun 2017
16 th meeting	14 Jun 2017

B2.1.7 SB decisions

All decisions taken by the SB in the second half of the Project were recorded in the related Project meeting minutes and are listed in D1.7, section 2.2, “SB decisions”.

B2.1.8 Milestones

The following decisions of the SB meetings are related to the achievement of the relevant Milestones:

- Decision 34. Milestone MS3 has been achieved.
- Decision 38. Milestone MS4 has been achieved.

D1.7, section 2.3, “Critical Path Analysis”, lists the achieved milestones.

B2.1.9 Time span of Project Tasks

One further change was introduced in the time structure of a Tasks of the Project, as recorded in the Gantt chart, with respect to the version included in the GA, in order to improve the schedule of the Task in the specific conditions of WP development in relation to the acquired information and the developed knowledge. This change was proposed by the relevant WP Leader, approved by the SB, and documented in the minutes of a SB meeting. The related decision is:

- Decision 21. T2.5 will start at M21.

According to these changes, the definitive Gantt chart of the Project is in D1.7, section 2.3.1, “Gantt chart”.

B2.1.10 Deliverables and deliverable submission process

All deliverables were developed according to the agreed quality indicators, as specified in D1.1, section 3.2.4, “Document review and delivery”. The PC evaluated the final draft of each deliverable according to the following quality indicators:

- the deliverable is in accordance with the objectives stated in the GA – Project description;
- the deliverable offers appropriate documentation on the work done in the corresponding WP;
- the deliverable is compliant with the templates and editing guidelines as outlined within D1.1, “Project management plan”;



- the deliverable is clear and well readable;
- the deliverable is complete;
- the deliverable is useful for the target reader/audience;
- version history is clear and well documented.

All deliverables expected in the second half of the Project were submitted by the PC to the EC within the due date, with one exception: D8.9, due by 30 June 2016, was submitted on 1 July 2016, due to a documented wrong behaviour of the Participant Portal, that on 30 June 2016 prevented the uploading.

D1.7, section 3.2, “Submitted deliverables”, lists the submitted deliverables.

B2.1.11 Active researchers

The number of active researchers in the second half of the Project, split by partner and by gender, is as follows.

number	Female	Male	Total
LIUC	7	10	17
UoW	1	1	2
ABACUS	6	3	9
MMU	1	2	3
FKI	2	2	4
AC	0	2	2
POLIMI	14	4	18

B2.2 Work Package 2: Creating and maintaining a shared knowledge framework on DiDIY

WP2 began on January 2015 (M1 of the Project) and has been active until June 2017 (M30) in 10 of the second half of the Project. WP2 Leader is Luca Mari, LIUC. All partners contributed to the activities of the WP.

B2.2.1 Main activities and outcomes

The main goal of WP2 has been to develop a Knowledge Framework on DiDIY that can provide a common conceptual and lexical ground to the activities performed in the Project by integrating the different competencies of the interdisciplinary Project team, in particular by harmonizing languages, approaches and research methodologies. This was already stated in the Interim Report and did not change in the second half of the Project.

The final outcomes of WP2 are included in deliverable D2.5, “Knowledge framework, finalized version”, which maintains and refines the structure for the presentation of DiDIY developed in the previous versions, interpreted metaphorically as a building under construction, made of:

- pillars, i.e., the necessary conditions specifying what DiDIY is and without which the whole building would collapse and disappear;



- load-bearing walls, i.e., the interpretations of what DiDIY may be, common to multiple aspects of the phenomenon and admitting a range of options: the building has load-bearing walls that carry the weight of the building and are common to all storeys;
- storeys and internal walls, i.e., the aspects of the way DiDIY that can affect the society and the related interpretations, admitting a range of options: each WP of the Project corresponds to a storey, that includes some internal walls, i.e., specific interpretations of what DiDIY may be.

For each load-bearing wall and internal wall some research questions were identified and formulated, and each of them has been at least preliminary answered or commented.

B2.2.2 Lessons learned and relevance of the research

Everything that was stated on this matter in the Interim Report was confirmed in the second half of the Project. The research highlighted the complexity of the phenomenon under analysis, also due to its multidimensionality and instability, and therefore contributed to justify the importance of developing a Knowledge Framework on DiDIY, that also includes a Vocabulary of DiDIY.

It is supposed that after the formal end of the Project the Knowledge Framework will maintain its role of conceptual and structural reference for those who will keep on working, as both researchers and policy makers, on DiDIY. In particular the wide and diverse set of perspectives provided by the discussion on the many research questions, that constitute the core of the Knowledge Framework, is structured so as to offer the starting point for future research.

B2.3 Work Package 3: Analysing how DiDIY is reshaping organization and work

WP3 began on April 2015 (M4 of the Project) and has been active until April 2017 (M28). WP3 Leader is Aurelio Ravarini, LIUC. All partners contributed to the activities of the WP.

B2.3.1 Main activities and outcomes

WP3 initial objective was to develop a comprehensive review of the state of the art of research on topics related to the impact of digital technology on work and organization. The literature review was set up as a multidisciplinary task and led to the definition of a “Research model”, described in D3.1, released on January 2016.

We then explored the application of the research model into several organizational settings, among which we identified a specific set of 5 settings, or Research Topics, that were the subject of an in-depth parallel studies of the impact of DiDIY: workmen in manufacturing firms, managers (and specifically CDOs and CIOs), marketing networkers, shoppers (customer of retail companies), healthcare clinical professionals. We reported these studies in D3.6.

B2.3.2 Lessons learned and relevance of the research

The activities carried out within WP3 allowed to achieve two main results, as reported in D3.6.

We identified a representation of the roles of technology within organizations that opposes the traditional impacts of technology (automation, virtualisation, and self-service) to DiDIY, seen as a way to empower individuals by enhancing their capabilities with autonomous management of information leveraging on Atom-Bits Convergence (ABC).



The study on the identified Research Topics led to the emergence of a framework describing characteristics of individuals (workers) and of organizational environment (workplaces), which can be used both to analyse the readiness of organizational settings to exploit the DiDIY phenomenon and to identify guidelines of development of human resources and organizational practices. We reported these results in D3.5.

In synthesis WP3 led to find that DiDIY means (also) applying a “maker attitude” in existing, formalized organizations. Digital technologies can be used also to enable creativity in workers and not only to improve productivity in the machines. Decision makers inside companies and policy makers should overcome the Tayloristic view of the management and provide rewards and incentives to proactive, cross-disciplinary, tech-enabled practices. We formalized this guidelines in a number of policy patterns in D7.4.

B2.4 Work Package 4: Analysing how DiDIY is reshaping education and research

WP4 began on April 2015 (M4 of the Project) and has been active until December 2016 (M24). WP4 Leader is Enrico D’Amico, ABACUS. All partners contributed to the activities of the WP.

B2.4.1 Main activities and outcomes

The first main objective of WP4 was to define the research framework and the methodology to investigate the DiDIY phenomenon in the field of education and research. This framework was defined at the beginning of the project (M9) and is described in the first three deliverables of the WP, namely D4.1, Research space and agents, D4.2, Integration of background knowledge, and D4.3, Methodological plan. D4.3 defined the specific explorative tools to gather and analyse qualitative and quantitative data relevant to determine the transformative effects of DiDIY in European education and research.

The overall result of these three documents is a map of relevant stakeholders together with a selection of suitable tools to carry on a deeper and wider investigation on the phenomenon. Indeed, it is well known that DiDIY is becoming more and more widespread in formal and informal educational and research environments, supporting strong modifications in teaching and research methodologies taking place at different levels and in different setting (also, outside classroom). From M10, data collected during the field work confirmed this initial hypothesis. To better understand the current status of the phenomenon, field work was carried out following two converging routes:

- contacting and interviewing the identified relevant stakeholders at national and international level by means of ad-hoc in-person or remote interviews, as well as organizing joint workshop to meet and engage with active DiDIYers;
- implementing a bottom up approach intercepting spontaneous activities growing up in different countries and educational and research environments.

The fieldwork led to D4.4, Results derived from data collection and analysis, and D4.5, Strategic plan. The two deliverables are strongly interrelated, being the first one an exhaustive analysis of the data collected by interviews to stakeholders and investigation of spontaneous activities, and the second one an overview of the main potential lines of interventions and future developments to support issuing of guidelines in the area. The findings of D4.5 constituted the basis for further elaboration in WP7 to deliver suitable policy patterns in the area.



B2.4.2 Lessons learned and relevance of the research

The WP4 activities aimed at describing the current use of DiDIY in education and research. The identification of methodological tools and potential investigation routes has set the research framework that enabled the Project to get a comprehensive view of the phenomenon, at the national and international levels.

Indeed, education, mainly in informal environments, is a bottom up phenomenon, still very difficult to assess and classify. Our investigation aimed both at identifying best practices and at assessing the expectations of the citizens (students and families, as well as teachers and informal educators). Our current investigation work, based on the two lines above mentioned, lead us to two main results, of a strong potential impact on societal issues:

- investigating the link between DiDIY and education, it clearly emerged the different paces between technology evolution and the current formal educational structure, whereby the first unveils new teaching opportunities almost daily while the second lags behind, slowly absorbing novelty. Innovating education is not possible without innovating teaching schemes. Awareness and participation of teachers is mandatory to share best practices and starting a virtuous cycle;
- a cultural shift is needed to recognize DiDIY and new technologies as an opportunity to improve the (digital) culture of the society. Work needs to be done locally to make school deans aware of the need for school teachers and educators. Strengthen the connection of schools with the local resources, allowing students to engage in goal-oriented activities leveraging on new digital technologies to tackle real-life problems, is a key issue.

B2.5 Work Package 5: Exploring the impact of DiDIY on creative society

WP5 began on March 2016 (M15 of the Project) and has been active until February 2017 (M26). WP5 Leader is David Gauntlett, UOW. All partners contributed to the activities of the WP.

B2.5.1 Main activities and outcomes

Since March 2016, WP5 has undertaken a series of in-depth research activities, developed research data and completed the analysis for deliverables: D5.1, D5.2, D5.3, and D5.4, published between December 2016 and February 2017. These activities included:

- 14 one-to-one video interviews with the leaders of DiDIY related organisations, such as creative enterprises, makerspaces and entrepreneurs. These interviews provide a unique insight into current DiDIY related initiatives;
- 9 active workshops with makers, carried out in DiDIY locations associated with local making communities, such as hackspaces, makerspaces and collective work studios. The 95 makers who took part in this ‘Makerlab’ series of workshops were guided through a series of creative exercises, using LEGO and simple craft materials to make models and describe their practice;
- 6 workshops in public libraries in which 41 members of the public were able to try out DiDIY creative technologies and take part in team design challenges;
- the creation of 6 on-line videos, totaling around 45 minutes, that outline the research findings regarding the social impact of DiDIY on creative society;



- the collaborative creation of a DiDIY manifesto detailing guidelines for a DiDIY creative society to flourish.

B2.5.2 Lessons learned and relevance of the research

WP5 has been focused on the role of DiDIY in fostering a creative society and the social impact of DiDIY. Our findings are presented through the themes of Creativity, Sharing, Community, Entrepreneurship, Well-Being and Environment as these were the key themes to emerge. Findings include what follows.

- **Creativity:** Creativity and empowerment were among the strongest concepts to emerge from our research with DiDIY case studies. They were a central concern for our interviewees who often saw DiDIY creativity as a route to empowerment with technology, and as providing creative agency in other areas of life, online and offline. Our research shows how the internet and online communities play a central role in promoting knowledge, projects and skills, boosting creativity and creating a dynamic in which sharing and creativity reinforce each other.
- **Sharing:** Good creative platforms, online or offline, provide the collaborative support and help that people need to progress in knowledge and ability with the technologies, and in confidence and skills and to stay engaged. We found that many new types of engagement with making are taking place in this way, enabled by creative platforms, for example, in a diverse range of makerspaces and collaborative work spaces, providing opportunities for individuals and communities.
- **Community:** DiDIY is a community-based phenomenon. Geographical communities and communities of interest, both online and offline, are key to how DiDIY is experienced by makers. Communities provide a sense of identity, often sharing the same values and passions, and thriving through active support, feedback and knowledge exchange. Our research gives in-depth examples of community initiatives and shows how DiDIY is a strongly emerging phenomenon with increasing relevance to wider society. For example, we present results from workshops with makers in libraries where we found strong interest in makerspaces being hosted in civic settings, such as schools and libraries. At the same time projects and platforms making use of DiDIY technologies, are creating new possibilities for citizen engagement, through online and networked information systems and platforms such as the Smart Citizen project. These kinds of initiatives have opened up new opportunities to engage with technology-based citizen projects on a personal and collective level.
- **Entrepreneurship:** Within DiDIY we found a strong ethos of creative problem solving, and a spirit of collaboration, cross-fertilisation, and knowledge exchange, that enables makers to progress their DiDIY skills within making communities, online and offline, tackling more ambitious projects. This ethos is a good fit with entrepreneurship and the research reports on a number of DiDIY related start-up companies and incubation schemes.
- **Well-Being:** Makers told us that learning new skills improved their confidence, enabled self-expression and helped make them feel more socially connected, for example, building teamwork and friendships through their making activities. Many makers told us they got a deep sense of satisfaction and enjoyment from making.



- Environment: A culture of making leads individuals to reflect more carefully on their environmental impact, and encourages them to develop innovative and more sustainable solutions to everyday problems. DiDIY technologies such as 3D printing enable the creation of bespoke items and spare parts. Making projects, such as Fixperts, make use of these capabilities to encourage a culture of repair and fixing.

B2.6 Work Package 6: Exploring the impact of DiDIY on laws, rights and responsibilities

WP6 began on February 2015 (M2 of the Project) and has been active until February 2017 (M26). WP6 Leader is Wouter Tebbens, FKI. All partners contributed to the activities of the WP.

B2.6.1 Main activities and outcomes

The main goals of WP6 have been:

- to investigate the ethical implications of DiDIY on rights and responsibilities;
- to investigate the creative design implications of DiDIY on rights and responsibilities;
- to assure the dissemination of the Project results under free licenses and open standard formats, and its raw data as Open Data;
- to investigate and provide a permanent reference about the main legal issues associated with the social diffusion of DiDIY.

WP6 has worked to identify the legal challenges and put them in context, drawing lessons from the history of the Internet and global transitions taking place, also through a co-design workshop, resulting in a list of main topics to be studied for WP6 (www.didiy.eu/didiy-rights-and-obligations-legal): liability; ownership of DiDIY resources; exclusive rights (IPR); licensing and exemptions; 3D printing of exclusively protected products; IoT and privacy & anonymity; pathogens and 3D printed guns; ethics; blockchain technologies for distributed applications; DIY drones.

An overview of open hardware licenses and of online platforms for sharing 3D designs was made. Several potential cases for potential further study have been registered at the DiDIY web repository.

A draft policy on the sharing of Project results was produced, which was approved by the SB and presented as preliminary versions of deliverables D6.4, Legal aspects of dissemination of project results, and D6.5, Use of open standards and collaboration tools. These policies were implemented in the disclaimer page (www.didiy.eu/disclaimer) of the Project website.

An list of bibliography on ethics-related perspectives was published (www.didiy.eu/ethics-literature).

All outcomes have been published on the Project website and have been checked with the Legal Advisory Board (LAB), activated in March 2016 and constituted of very reputed legal scholars and lawyers active in various fields directly related to Digital DIY: Malcolm Bain, Primavera de Filippi, Angela Daly, Carlo Piana, Melanie DuLong de Rosnay, Andrew Katz. Apart from their reputation and willingness to participate, we are also very happy with the gender parity of this Board, three men and three women.

A particularly noteworthy effort for WP6 was made in March 2016 when the Project co-organised the Commons Collaborative Economies conference (procomuns.net) together with the Barcelona City Hall and various EU projects (P2Pvalue, D-Cent, DiDIY) and local civil society groups. Around four hundred people participated in the 3 day encounter, including several European



Commission representatives. The Project coordinated and actively participated in 4 sessions that are directly related to DiDIY, IoT, industrial commons, legal and policy questions related to DiDIY, open source circular economy.

In August 2016 the team produced its deliverable report on rights and obligations (D6.1) taking into account many of the lessons learnt so far. However a process of Request for Comments was opened in September, after the submission of the deliverable to the EC. Members of the Legal Advisory Board have been extensively commenting and suggesting improvements. Also did the international Open Source Hardware community, in particular through the Open Source Hardware Association (OSHW), where key people from the maker movement get together to share legal, economic and other experiences. The quality of the feedback received urged the team to produce a new version of the deliverable and submit that to the Project Officer.

It was seen that the sharing of knowledge under free and open licenses has led to a growing number of successful projects. Here it was not just the legal aspects, of licensing, governance and other that are considered relevant. In particular it is perceived there is a lack of understanding of how such projects develop into a sustainable business model, when the project is replicable and knowledge is shared freely. It was then decided to bring in the Open Business Model framework that the FKI has been developing based on various previous research projects. Within this framework projects are analysed along four main pillars: 1) modes of production, 2) revenue models, 3) licensing models and 4) governance model. The summarised rationale for a successful project typically goes like this: the collaborative peer production of (part of) products and services of that project brings costs down, allowing a range of revenue models to reach economic viability (including the sale of the physical hardware, donations, value added services, etc). However, for motivating people to contribute as peer producers, voluntarily, the licensing and governance models should be aligned and sufficiently open and collaborative. In Deliverable D6.3. this framework is further developed and applied in the study of 14 cases of Digital DIY and hardware technologies. The framework has been of practical use in various co-creation settings, such as the following: project participants of La Comunicadora used it to analyse cases and help define their own; a social innovation and circular economy programme by the Autonomous University of Barcelona used it in their Digital4Circular programme in a co-creation workshop; during the Final Conference of the Digital DIY project in Milan in its workshop on Co-creation, Open Business Models and Collaborative Workers three groups have mapped out a few cases to get familiar with the key concepts.

During the Project WP6 has been of service to other WPs to review produced deliverables and suggest improvements of the application of the Licensing Policy.

B2.6.2 Lessons learned and relevance of the research

From the initial research activities in WP6 a long list of topics emerged, where the old legal system seems to be challenged by and provide challenges to the emerging culture of DiDIY. The main topics are listed at www.didiy.eu/didiy-rights-and-obligations-legal.

One conclusion is that (most of) the current legal system has been designed for business logic and practices that developed during the first and second industrial revolutions, needing big, centralised manufacturing infrastructures for mass production. However the currently emerging new culture and practices, as pointed out by the Project, have a very different logic that fits in many cases only partially with the old legal structures. As the economic and social production system is in serious transition, we should ask ourselves whether these legal systems need and can be brought in balance



with current needs or that certain well defined moratoria might be more suitable to let the new culture prosper instead of stifling it in its infancy, and once matured come up with more suitable legal changes. Consider for example the “right to repair”, which is socially much needed in order to bring the economy in line with a more sustainable way of production. Here we might need to go beyond the current limitations of IP laws in order to foster a thriving repair economy.

B2.7 Work Package 7: Integrative modelling, guidelines and tools for the transferability of results

WP7 began on September 2015 (M9 of the Project) and has been active until June 2017 (M30). WP7 Leader is Bruce Edmonds, MMU. All partners contributed to the activities of the WP.

B2.7.1 Main activities and outcomes

The following steps have been done in WP7:

- researched the relevant issues and facts about DiDIY in conversation with the other Project partners;
- designed, implemented and tested a flexible modelling framework, which will allow these issues to be explored in a variety of models in response to feedback from domain experts;
- created an illustrative model to show what this could do – “a model of making”;
- presented this model at the third Project meeting to gain feedback and suggestions as to what future models/versions should concentrate upon and what these models may miss out;
- collected and analysed the comments and now developing a plan for the next stages of model development.

This resulted in some positive suggestions for scenarios to be explored using simulations within the Project (how the structure of communication changes things, the impact of makerspaces, and the impact of licensing options and IP laws) and some basic extensions to the simulation framework (multi-dimensional motivations, skills, and communication of plans). The main results achieved include:

- a computer-programming library to facilitate the development these models, released to the public on December 2015 (cfpm.org/discussionpapers/154/factbase-a-netlogo-extension). In order to make the, relatively complex, simulation framework easier whilst still retaining a relative level of code transparency we developed an extension to the NetLogo language which will provide some features similar to those in declarative programming languages or SQL queries. This was programmed in Java and made public on the NetLogo extensions website so it will also be useful to others. Although this extension does a complex computational job, what it is doing is transparent because a high-level analogy is sufficient to understand its operation. The prototype simulation model uses this extension in the core of its agents memory and learning abilities;
- a second computer-programming library is being developed to support discrete event simulations in NetLogo. This facilitates simulations where there are timed processes and events, where the timing is critical to the results. When this has been tested this will be released to the public under a free license;



- a prototype Integrative Model, “A model of making”, was released to the public (www.openabm.org/model/4871). The purpose of this model is to provide the simulation infrastructure needed in order to model the activity of making, i.e., individuals using resources they can find in their environment plus other things that other individuals might sell or give them, to design, construct and deconstruct items, some of which will be of direct use to themselves, some of which they might sell or give to others and some of which might be used as a tool to help in these activities. It explicitly represents plans and complex objects as separate entities in the model, embedding the Atoms–Bits distinction highlighted within the Project. This allows plans to be shared between agents, which give the steps of how to make objects of use, either on a commercial or a free basis. The framework is intended as a basis upon which many, more specific, models could be constructed, allowing the exploration of a variety of “what if” or counterfactual possibilities and thus give a concrete but dynamic and complex instantiation of the issues and situations discussed within the Project.

In a third stage a specific model to investigate the possible effects of introducing DiDIY approaches into a machine workshop was developed. This extends the prototype model and implements a world with a number of workers machines, resources and manufacturing goals. The compares the case of a traditional workshop where the workflow is centrally planned from one where each worker can decide what to do and where. Preliminary results show a mixed impact of allowing more autonomy to workers, for example with larger numbers of workers in a workshop there is more total waiting time in the traditional model of working than in the distributed approach but is the same for smaller number of workers. This model will continue to be explored and developed after the formal end of the Project.

A second version of the prototype is being developed to investigate how different ways of communicating can impact upon DiDIY efficiency and creativity. This allows us to explore the trade-offs and differences between different cases, for example between on-line and off-line interaction, how the structure of a web-platform may enhance or frustrate development, or the impact of forcing most communication through a central hub (such as in a traditional classroom set-up).

In a second strand of work, an initiative was started to develop what we call “policy patterns”. This takes the idea of ‘solution patterns’ which originated in the work of the architect Christopher Alexander. This idea was refined in the area of computer science, where we took our starting point from. The idea is that each pattern is a possible solution to a particular problem or issue, written within a standard template. We applied this approach to that of solutions or recommendations in the area of policies and decisions relating to makerspaces and makers. The template was refined for our particular task during an internal Project workshop in Manchester, held in September 2016. This format was then used to write and refine possible solutions that are suggested by the research in the various strands of Project. A wiki format was set up and customised to facilitate this process (see didiy.eu/patterns). The idea is that other people in the maker movement can add to, refine, critique and improve these patterns so that it becomes a truly community resource.

B2.7.2 Lessons learned and relevance of the research

Although NetLogo is a well-developed language, it lacks some facilities that would make programming cognitive agents easier. We have programmed and publicly released a Netlogo



Extension to make this much easier, allowing the flexible storage and querying of predicates. This extension will be useful far beyond the Project, bringing cognitive modelling and social simulation closer. In particular, the European Social Simulation Association SIG on cognitive modelling has been involved in beta testing it. The second extension to support time-critical or event-driven simulations (developed for the model of a machine workshop) will also be of general use.

The prototype model is, of itself, a considerable advancement on the current state of the art. Although related complex market models, ecological models and distributed AI models have existed before, this is – to our knowledge – the first ever social simulation model of making. This makes explicit the DiDIY parallel processes of “Atoms” and “Bits” and allows their relationship to be explicitly explored. It allows different scenarios to be explored and thus enable a better understanding of their consequences. Each of these scenarios, in its own right, could have a significant impact upon our understanding of these and their potential impact upon society. The two scenarios developed (the one of a machine workshop and the one exploring different patterns of communication) turned out to be more tricky than anticipated, and will continue to be developed after the formal end of the project. In particular, what is necessary to add into the model in terms of cognitive and social skills in order to support informal and distributed cooperation is considerable. We anticipate some very interesting insights to come of these.

The simulations demonstrate the holistic nature of DiDIY phenomena – they show that if you remove any of its key components (e.g., individual knowledge, sharing, cooperation, etc) the phenomenon disappears. This reinforces the multi-level and multi-aspect nature of DiDIY: this reflects the difficulty of introducing DiDIY approaches within existing institutions, where existing systems, which presume a centralised way of working, frustrate its introduction.

In terms of the policy patterns, those that have sufficiently matured and developed by the Project members have become the core of the recommendations in three of the WP7 deliverables: D7.2, D7.3 and D7.4. It took a while before the format and the idea was understood and internalised by the Project members, since this is a new approach for this kind of development. Some of the patterns on the online Project wiki have remained a skeleton of an idea, so these have not been included in the deliverables. However these might prompt others to develop them. Whether these patterns take off and become a resource that the wider community develops is yet to be seen.

B2.8 Work Package 8: Dissemination, future roadmap and sustainability

WP8 began on January 2015 (M1 of the Project) and has been active until June 2017 (M30). WP8 Leader is Marco Fioretti, FKI. All partners contributed to the activities of the WP.

B2.8.1 Main activities and outcomes

The two main, interrelated goals of WP8 were initially defined as:

- coordinating and performing the dissemination and communication activities throughout the whole duration of the Project, in order to make its results known and to establish contact with DiDIY stakeholders who may exchange related information with Project members, or perform some activities with them;
- working to guarantee the long term sustainability of the Project research results and proposals that aim to support the diffusion of DiDIY in European society.



In practice, in the second half of the Project, the detailed roadmap and directives for WP8 have been:

- the corresponding parts of the original Project proposal by the DiDIY Consortium;
- D8.2, Dissemination and communication plan, March 2015 (www.didiy.eu/public/deliverables/didiy-d8.2.pdf);
- D8.7, Interim dissemination report, March 2016 (www.didiy.eu/public/deliverables/didiy-d8.7.pdf);
- the first version of DiDIY Sustainability Plan, released in September 2016

Since April 2016, the activity of WP8 has produced three main results, of which two are specific deliverables of the Project: D8.11, DiDIY Risks, synergies and education, released in December 2016, and D8.14, DiDIY Guidance e-manual, released in June 2017.

The research performed for D8.11 has identified several scenarios, in nine areas from public safety to education, social divides and economic growth, in which DiDIY will very likely play an important role in the medium and long term future of European society. D8.11 explains what may be, depending on how it is practised and accepted by the general population on one hand, and regulated and supported by policy makers on the other, the main positive or negative consequences of DiDIY in each of those scenarios.

The analysis of the above scenarios has shown that DiDIY will present significant opportunities, risks and challenges (again: depending on how it is practised and regulated, or not) for six basic aspects of today's society: unnecessary complexity, existing business and innovation models, separation between (mass) producers and consumers, rigidity and scope of laws and regulations, ethics values and safety, personal responsibility.

The final result of D8.11 has been the definition of some conditions that should be realized, in order to maximise the positive outcomes of a mass adoption of DiDIY by society, while minimising the associated risks. The first of these conditions is the realisation of certain synergies, among different classes of DiDIY stakeholders. The second is the active promotion of what is defined in D8.11 as "basic DiDIY knowledge", as well as of concrete access to DiDIY, among the general population.

Another major activity for WP8 has been the preparation of the Guidance e-manual, D8.14, described in Task 8.8 "*Final Conference and Decision Maker Dialogue Meeting (M30)*" of the Grant Agreement. That Task includes a decision maker dialogue meeting at the end of the project, during which, among other things: "*a guidance e-manual gathering the 4 fact sheets and other core results from the main deliverables of the Project will be presented to the policy makers community that has the responsibility to regulate DiDIY, in order to maximize its more lasting, sustainable and socially relevant outcomes*". Starting from that assignment, the e-manual has been written with two main assumptions and constraints. First of all, it should be immediately accessible from, and usable by, at least, policy- and decision-makers, as well as educators. Ideally, it should be accessible by the general public. Therefore, the e-manual should use the simplest possible language, and be published online also in PDF and ePUB formats, for easier reading and dissemination. Secondly, unlike almost all other deliverables of the Project, not only did the e-manual not need be original material, but it must be "only" a synthesis, reorganized/rearranged by topic or target audience(s), of the main issues and proposals already published in the deliverables listed in the "Main Deliverables Used" list below. This has led to the preparation of an e-manual structured to answer the questions: "What is this" (introduction to the phenomenon, the Project, and the manual itself); "Who should read it"



(relevance of DiDIY for decision/policy makers, educators, etc); “What to know” (DiDIY definition and main facts; explanation of the main kinds of long-term positive and negative impacts); “What to do” (practical guidelines and proposals, divided by main topic, and target audiences). In practice, the e-manual synthesises and connects to each other, adding simple, real-world explanations taken from the Project blog, the main outcomes of the other deliverables mentioned below, even though many other results of the Project have influenced its content, and final structure.

The third main results of WP8 activity have been the many actual activities of dissemination, communication, evangelisation, etc, aimed at guaranteeing the maximum reuse and long term sustainability of the results of the Projects. Especially in the second half of the Project, these activities have mainly consisted of:

- studying, and trying to contact directly, in order to work together toward the Project goals, as many organizations and communities of stakeholders as possible, including but not limited to EU institutions and academia to Fab Labs, teachers associations, trade unions, and NGOs;
- collecting materials for “products”, from courseware to policy guidelines, that would be used outside, if not after, the Project itself.

Coherently with the Project subject, as much dissemination and communication as possible have been done in “Do-It-Yourself style”, that is with the resources available among Project members and the communication department of all partners.

The dissemination channels that would be used for this purpose, and their corresponding targets, were defined in D8.7. The ways in which they have been used, and the results obtained in each channel are described in detail in D8.13, the final communication and dissemination report (www.didiy.eu/public/deliverables/didiy-d8.13.pdf), released in June 2017.

For this reason, in this deliverable we only report the most important points and conclusions, of only the *most* important dissemination channel and topics. Much more complete information is in D8.13.

Some of the activities mentioned in D8.7, namely the creation of a Virtual Network of Interest (VNI), a Massive Open Online Course or official videos or infographics, have not been executed. The reasons are a combination of lack of resources on the DiDIY side, due to higher priorities, combined with growing evidence, along the Project, that there was no real demand or interest for those services, especially a VNI.

The final version of the DiDIY fact sheets, D8.12, has been delivered as planned in June 2017, and also presented at the DiDIY Final Conference (www.didiy.eu/conference). Besides a general introduction to DiDIY, the final fact sheets summarize the results of the whole project, in its four main areas: Education and Research, Organization and Work, Creativity, Rights and Responsibilities. All fact sheets, which are online at www.didiy.eu/project/fact-sheets, share a common final section, which puts special emphasis on how to reuse all the results of the DiDIY Project, and on how to contact the Consortium Partners, in order to do more work in the same field.

Throughout their activities, the DiDIY team members have produced a total of 27 articles, scientific papers and other works, on all areas and impacts of DiDIY. The team members have also produced 27 original short videos on the same topics, and provided links to third party videos of DiDIY-related topics. The original videos are all available on the DiDIY Vimeo channel (vimeo.com/didiy), and both them and the 3rd party ones are listed in the DiDIY website video gallery (www.didiy.eu/video).



In the second half of the project, participation to, or organization of public events took place at a lower rate than in the first 15 months of activity, and was more focused on specific groups, or organizations, of less classes of DiDIY stakeholders. In spite of this, since April 2016 the Project members have organized, or taken part into, over 70 events all across Europe, reaching an estimated more than six thousands people, in very different audiences classes. The most relevant of those events, especially from the point of view of long term roadmap and sustainability, include: two full days in Barcelona (DiDIY Community day in July 2016 and DiDIY hackathon in July 2017), a meeting with a few MEPs and JRC researchers in Bruxelles (November 2016), and of course the DiDIY Final Conference, held on June 22nd, 2017 in Milan. Detailed descriptions of all these events and their outcomes, as well as more data about all the other events, are available in D8.13.

B2.8.2 Lessons learned and relevance of the research

Since 2015, as described in the report D8.4 “DiDIY Support and Awareness in Europe” we learned that DiDIY as seen and studied in this Project is a very wide and important phenomenon, but also one that, in many cases, is very little studied and acknowledged today. We had also found that the objectives and approach of the project were much closer to other EU projects and researches in the social innovation field than to those specifically devoted to digital technologies.

In the second part of the Project, the main consequence of these findings was the decision to spend more time than before in disseminating the results of the projects among communities and organizations working on “non-digital-centric” topics like: open business models, collaborative/circular economy, resilience, transition towns and, more in general, digital social innovation.

Another important lesson learned, discussed in much more detail in Chapter 3 of D8.13, is that “what worked to maximize dissemination was the combination of having as much good website content as possible first, and then regularly, and systematically exploiting it everywhere else”.

B2.9 Transversal Task 1: DiDIY and creative design

As a Transversal Task, TT1 is constantly active. TT1 Leader is Marita Canina, POLIMI.

B2.9.1 Main activities and outcomes

The main task for TT1 was setting up of two series of co-design workshops held at the beginning of the second half of the Project. To this purpose we first identified crucial factors to be investigated as potential features of the current DiDIY phenomenon. The main result is the need for a wider exploration of DiDIY as a phenomenon of social innovation fostering empowerment and the development of key competences. In particular we focused on the development of the so-called “21st century skills”, which include creativity and critical thinking, collaboration and effective communication. This analysis resulted to be a fundamental basis not only for the development of TT1 activities but also a significant contribution to the structure and development of the Project main themes and the Knowledge Framework in particular.

In order to collect material for the co-design workshops, we developed a collection of primary data plan for a clearer understanding of if and how such competences emerge in the DiDIY practice. This includes direct observation and research activities in the places where such practice is carried out, in particular makerspaces. We identified and gathered existing tools from different design



approaches and toolkits, with particular attention given to creativity processes and creativity elicitation tools. Specific tools were created by following co-design principles and by adapting some already existing from co-design approaches gathered in order to trigger and understand the dynamics, which are often tacit and latent, underpinning the enactment of such skills in DiDIY. The data collected fed our interpretation of the dynamics fostering the development of the key competences and have been represented through an ad hoc model. The overall findings from TT1 fed the other WPs.

TT1 contributed to:

- WP2 by participating to the discussion around the development of the foundational interpretation of DiDIY and the Knowledge Framework, and in particular by reporting reflections on definitions and descriptions of DIY, studies of co-design and Social Practice Theory, debate around related issues such as materials, skills and sustainability;
- in WP3, WP4, WP5, and WP6 activities, 16 human-centred co-design workshops were held in Italy and Spain. Through the workshops, TT1 tested and validated a specific design process and the related tools, focusing on the importance of creativity in achieving innovation, and identifying a design and creativity based model able to generate innovation in different areas (education, society, work, etc) through the exploration of Digital DIY as a mindset and a social practice. The method used for the workshops is a human-centric participatory methodology, applied in contexts where innovation is pursued (e.g., companies, institutions and organisations), applying the potential of creativity and Design Thinking while co-creating with the people involved in the Project. Through co-design workshops, both laypeople and DiDIY practitioners were involved in the testing and refinement of the Digital DIY design process, creating tools that speak in a language that is simplified, clear, and easily understandable. The research team joined experts from the DiDIY field with professionals from the areas investigated by the Project, in order to identify the DiDIY enabling elements which they think are fundamental, according to their own experience and knowledge. Co-design workshops' participants were identified and selected on the basis of well-defined profiles: educators, primary school teachers, makers, craftsmen, lawyers, policymakers, digital experts, representative from companies, and Fab Lab managers. In this way, we gave the opportunity for such an approach to be adapted and used as an empowerment tool by people of different Digital DIY communities. Empowerment tool is meant here as something that allows people to “take control” of their ideas in a participative and pro-active way, in a system where self-improvement through the development of new skills and actionable knowledge is pivotal. The experiences in each workshop have contributed to continuous experimentation, verification and implementation of project-building processes, and of specific activities and related tools, which have been utilized to produce the guidelines;
- WP8 by designing the graphic layout for different products to support the dissemination plan, including: the Project website, in collaboration with WP8 Leader, which required the assessment of (more than 10) Drupal options according to licensing requirements, budget and graphic/functional desirable features (the detailed description of this is in an Annex of deliverable D8.2); the Project logotype, inspired by the flows of knowledge involved in DiDIY (the detailed description of this is in an Annex of deliverable D8.2); the Project brochure, to be released in both printed and digital formats; the Project website banners, to

link the different WP description pages; the Project fact sheets, to communicate main Project findings; the integration of contents regarding creativity in the online courses task.

B2.9.2 Lessons learned and relevance of the research

Co-design is proposed not only as a research model but as a tool to enhance DiDIY practices. The group investigated, as part of the workshops, how co-design could be implemented as a working tool for people involved in DiDIY. The tools of investigation that we created will have an impact on how to elicit and foster people engagement in making activities intended for their improvement of skills and empowerment. This tools also became part of the final output (the DiDIY Toolkit and Guidelines) that has been used as a strategic mean to the development of DiDIY projects. They represent the more tangible outcome to be used by researchers, private and non-profit organizations operating for social innovation.

B2.10 Transversal Task 2: DiDIY and ethics

As a Transversal Task, TT2 is constantly active. TT2 Leader is Vincent C. Müller, AC.

B2.10.1 Main activities and outcomes

Faced with the task of “ethical issues” we decided that we should not try to work on a holistic analysis of “issues” in each of the relevant WP, but rather identify significant problems, that occur in a significant range of DiDIY activities. Our research identified the main problems of a) safety and risk, b) allocation of responsibility, c) threat to intellectual property rights and d) reshaping work and education. We summarised these findings in short accessible text that provides a brief explanation (www.didiy.eu/node/2462) of the ethical issues. In our context, we generally use the “narrower” notion of DiDIY, i.e., we cover activities where some Atoms-Bits Convergence (ABC) occurs, though we keep an eye on the “broader” notion of digitally enabled DIY.

We decided to tackle these problems issues by example through work that lends itself to academic papers. The research has lead to drafts, at various stages of completion, of papers on:

- state of the art: DiDIY and product liability;
- digital synthetic biology and biohacking;
- 3D bioprinting and human enhancement (completed);
- digital and physical risk;
- DiDIY, cyber-weapons, gun control and file control.

Intermediate results have been presented in the Project blog and listed on www.didiy.eu/ethics, relating to topics such as DiDIY and product liability; the ethics of 3D bioprinting; digitally manufactured weapons and gun control. We also presented draft versions of these papers as invited workshop contributions or as individually invited papers in Munich, [Bielefeld], Leeds, Sheffield, Paris, Copenhagen and Geneva. On the basis of these papers, we produced four deliverables: D3.3, “Ethical issues and work”, D4.6, “Ethical issues in education/research”, D5.6, “Institutions and creative DiDIY”, D6.2, “Ethical impact for regulation”.

We made a sub-site for our issue of ethics, the central page of which is www.didiy.eu/ethics. Here we list the work already performed and in particular together with WP6 we make our bibliography



on the issue publicly available: www.didiy.eu/ethics-literature. This bibliography is a major contribution to an area with next to no extant academic structure to draw upon.

Of course, we also contributed to the overall activities of the Project, in particular to the Knowledge Framework and the fact sheets.

B2.10.2 Lessons learned and relevance of the research

The area of TT2 is almost totally undiscovered in the academic discussion. So, in this case, the progress beyond the state of the art consists in structuring the problems, identifying the major issues and the possible approaches, including links to extant research in related areas, such as intellectual property rights, product safety, medium-term risk, etc, as outlined above.

The impact of this work beyond a clearer image of the problems and a better awareness in the community is mainly on policy: we can still catch this development early and decide whether extant control mechanisms need to be refined in order to avoid significant risk, such as the inability of allocating responsibility, or further erosion of intellectual property rights, and the threats from uncontrolled DiDIY.

The areas of research on which we focused most of our attention include what follows.

First, the impact of DiDIY on product liability. The blog entry mentioned above represented a first step in our reflection on this issue. It was then further developed into several sections for deliverable 5.6 on “Institutions and Creative DiDIY”. After reviewing the challenges posed by the rise of DiDIY for current European laws on product liability, as well as the few solutions that have been proposed in the existing academic literature, we suggest that while these challenges do need to be taken seriously, an aggressive response at the legal level is not called for. For example, there are strong links between the practice of DiDIY and the free, open-source movement (whether at the level of the software, hardware, and digital blueprints used to make a DiDIY product). Introducing measures that would increase the liability of the creators of such open-source products would almost certainly stifle innovation in this field and might well, if sufficiently stringent, spell the end of the movement and of the various benefits it provides to society. As a result, we suggest that less radical solutions – sometimes generated by the participants themselves – are more likely to strike the right balance between the value of promoting such innovation and respecting everyone’s autonomy, on the one hand, and on the other hand the need to protect consumers from defective products and to ensure that they know the level of risk they might be taking when deciding to use an open-source tool to make a DiDIY product.

Second, the general threats from DiDIY. There is a substantial amount of discussion about the impact of the digital revolution on intellectual property (IP) rights and the need to revise extant legal systems. There are also known fundamental socio-economic changes for entire industries that are traditionally based on intellectual property, especially the music and video industry, advertising and publishing – largely due to the inability to control violation of IP rights because digital files allow multiple realisation and perfect replication, as well as enabling anonymity. The digital realm also has a strong cultural preference for a “state of nature” and “free information”, being opposed to “control”. It is thus assumed that these changes affect “the media” – but not design and production of artefacts. We argue that this assumption is false because the digital revolution is now supplemented by a revolution in digital systems that automatically transform bits-to-atoms (prominent examples are 3D printers and industrial robots) and atoms-to-bits (as in sensor systems and 3D scanning). Even though there are practical limits to these technologies, digital making will



undermine IP rights on 3-dimensional design, just as digital media technologies did for 2D design and arts. Furthermore, it will remove the distinction between threats in the digital realm (“cyberspace”) and the physical realm so that cybersecurity and physical security will really be a single problem: 3D printed guns, killer-robots and biohacking are cyberthreats, just like the hacking of digital systems of some opponent. Whatever moves into the digital realm moves into a “state of nature”: we may well get the worst of both worlds, with the uncontrollability of the digital but the impacts of the physical.

Third, the potential use of DiDIY tools by so-called “bio-hackers”, a term referring to individuals who experiment with their own bodies using technology, whether in order to enhance their own capacities, and/or for other purposes such as artistic creation. They might for instance print human tissue using a 3D bioprinter, or implant a small Arduino-controlled computer under their skin, e.g. for the sake of gathering and sending biometric data. While there is a significant DIY component to this practice, it might also require assistance from professional surgeons, and to that extent it raises the question whether these professionals will be guilty of malpractice if they agree to perform the relevant surgical procedures, which do not serve a medical goal. Our conclusion is that it is ethically permissible for surgeons to honour such requests as long the expected risks are not unreasonably high, given the importance of respecting individual autonomy, as well as the potential benefits of carrying out such experimental procedures, whether for art or for biomedical research (where bio-hackers willing to serve as research subjects might obviate the need to perform questionable animal experiments for non-therapeutic purposes). At the same time, given the non-medical nature of the goals associated with such requests, medical professionals should also remain free to decline them if they see fit.

B3. Impact

As planned, and proved by, for example, the final DiDIY fact sheets, or Guidance e-manual, the multidisciplinary competencies of the consortium have not simply been proven useful to approach the multifaceted issues related to DiDIY. On one hand, deliverables like, to name just one, the final Knowledge Framework already constitute a rigorous scientific description of DiDIY, as well as solid foundation for further research of this sociocultural phenomenon. On this front, the independent expert who led the DiDIY team in a CEB/ESS seminar (see D8.13 for details) wrote in his final report what follows.

- The concept of DiDIY is socially provocative as it offers a sharp alternative to the model which became dominant in the 20th century, where cultures became more often about passive consumption of professionally made things. As DiDIY culture rejects this sit-back position, replacing it with an active and engaged approach to the world, it requires that we rethink learning, social aspirations, our relationship to the environment, and social organisation.
- What needs to be investigated is what has been called “the social meaning of creativity” in open innovation processes, with exchanges between physical and (digital) informational, through human-centric design methods and processes: the definition of a new mindset,



proactively generating creativity, allowing to take advantage of the changes in the digital landscape evolutions while identifying business opportunities.

It is important to note that, soon after the CEB seminar, the investigation mentioned above produced, among other things, the deliverable D5.2, Social impact of DiDIY, the DiDIY Manifesto, six videos exploring the impacts of DiDIY (www.didiy.eu/online-videos-didiy-case-studies), and other deliverables of WP5. On the other hand, the same competencies, the approach to the problem and all the results of the DiDIY research have done a first big step, by no means definitive, but still important and useful, toward an important goal: make all the risks and opportunities of DiDIY, but also the best ways to deal with the first and exploit the seconds, much more accessible than before to policy makers, educators, and the other stakeholders who, in the near future will have to deal with DiDIY, whether they want it or not.

One proof of this impact is the *kind* of feedback received, especially in the last year of the project, which shows that the research activities first, and then the ones of dissemination and communication, have been right on target. One easy example of this is the fact that the Facebook posts and tweets that received the most favourable reactions have consistently been those closer to the initial, official objectives of the Project:

develop a human-centric and multi-perspective approach to the scientific study of Digital DIY, in order to:

- *better understand its impacts on all areas of society*
- *support both education and policy making on Digital DIY, through models and guidelines driven by social and cultural strategies, not technology*

Finally, we find useful to point out that, during the European Maker Week in May 2016, the representatives of several central institutions of the European Union spoke of digital (DIY) manufacturing in terms that, in our opinion, confirm the relevance and timeliness of the DiDIY research. As a few examples of the interest shown by those institutions are described in Chapter 4 of D8.13, and in the DiDIY blog post titled “Encouraging words for DiDIY Project at European Maker Week 2016” (www.didiy.eu/blogs/encouraging-words-didiy-project-european-maker-week-2016).



C. Update of the plan for exploitation and dissemination of result

An updated version of a detailed, post-Project sustainability plan, which was first released as a draft in September 2016, has been incorporated in D8.13, the final dissemination and communication report. Since that plan is described in detail there, here we only mention that several dissemination activities performed in the last year of the Project have also been concrete steps for future exploitation and dissemination of the Project results.