



D8.6 POLICY FACTSHEETS, FIRST VERSION

Project Acronym:	DiDIY
Project Name	Digital Do It Yourself
Grant Agreement no.	644344
Start date of the project	01/01/2015
End date of the project	30/06/2017
Work Package producing the document	WP8 - Dissemination, future roadmap and sustainability
WP Lead Partner	FKI
Other Partner(s) involved	all
Deliverable identifier	D8.6
Deliverable lead beneficiary	FKI
Due date	M12 (December 2015)
Date of delivery	26/12/2015
Version	1.0
Author(s)	all partners
Classification	PUBLIC
Document Status	APPROVED
<i>This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 644344.</i>	
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Executive summary

Deliverable D8.6, Policy Factsheets, first version, includes the first releases of a series of fact sheets, aimed at being concise and clearly written, prepared on research findings as they arise, giving information for policy advisors, about the impact of DiDIY in the main topics of the Project, i.e., reshaping the organization and work forms, reshaping education and research, modelling new creative culture and processes, and modifying the current concept of DiDIY-related rights and responsibilities, particularly in relation to Intellectual Property Rights.

Revision history			
Version	Date	Created / modified by	Comments
0.0	10/12/15	FKI	First, incomplete draft, maintained in hackpad so to allow all partners to provide their contributions.
0.1	15/12/15	all partners	Extensions and fixes.
0.2	20/12/15	all partners	Extensions and fixes.
0.3	22/12/15	FKI	Extensions and fixes.
0.4	24/12/15	LIUC	Fact sheets formatted with the agreed layout.
1.0	26/12/15	LIUC	Approved version, submitted to the EC Participant Portal.



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1. Scope and objectives

The fact sheets included in this Deliverable are aimed at presenting the main facts on DiDIY as identified in the research activities of the Project. They are believed to be useful to all who are interested in better understanding the complex phenomenon that is DiDIY, and to policy advisors and decision makers in particular.

Hence each fact sheet has been designed so to be easily and effectively readable by everyone, and is e-published through the Project website so to reach the widest number of readers possible.

The original plan about the publication of these fact sheets, as also specified in the Project Grant Agreement, was to release four fact sheets, each in a different date: December 2015, June 2016, December 2016, and June 2017, the identified topics for such four fact sheets being:

- reshaping the organization and work forms;
- reshaping education and research;
- modelling new creative culture and processes;
- modifying the current concept of DiDIY-related rights and responsibilities, particularly in relation to Intellectual Property Rights.

This first year of research activity gave us some evidence that DiDIY is even more complex and even less known than we initially supposed. The decision was then made to increase the focus on these fact sheets, by releasing here the first version of all four fact sheets above together with one more fact sheet to introduce the very concept of DiDIY (what will be e-published might be a visually improved version of them). The plans are then that in the following dates one or more of such fact sheets will be updated and re-published.



Annex 1: Fact sheet – Introduction to DiDIY



Fact sheet

Introduction to DiDIY



Digital Do-It-Yourself ("DiDIY" for short) is a complex phenomenon, involving social, cultural, technological, economic and psychological dimensions, stemming from the new ability to **mix physical and informational components** into simple and affordable systems such as 3D printers and Arduino boards.

We call it "Atoms-Bits Convergence", to emphasise that what is happening could become **a new alphabet of knowledge**, hence a new ABC, that may ground and reshape our society thanks to the widespread availability of digital tools that are much cheaper and easier to use than they were just a few years ago, and to the increasing familiarity of many people with such tools. The emergence of the Internet of Things, as the world-wide inclusive ABC system, is further amplifying the potentialities of DiDIY.

But where these changes are going to lead us is still to be determined, and is at least partly dependent on the choices that the relevant actors (governments, industries, public administrations, schools and universities, ...) are making and will make in the immediate future.

This fact sheet provides the bases to discover DiDIY and its impacts on European society. It is part of a series of fact sheets produced by the European research Project DiDIY, aimed at providing inputs to find together answers to questions such as:

Is Europe really ready for DiDIY? Does Europe really want DiDIY? Does Europe really need DiDIY?

Fact: DiDIY is already everywhere

Computers, digital communication networks and production systems controlled by digital devices have been used for decades. The novelty of DiDIY is that these systems, or at least scaled down versions of them, **are widespread and used in every field of human activity**, even outside of the workplace, that is in personal, or otherwise non-professional settings. Today DiDIY is already used to produce many different things, from toys to medical devices and homes, weapons, clothes, furniture, agricultural machinery, jewelry and environmental monitoring systems. Most designs **are developed collaboratively, or published with open licenses**, in online communities like Thingiverse (www.thingiverse.com), Arduino forums (forum.arduino.cc), Instructables (www.instructables.com), or OpenDesk (www.opendesk.cc). You can find many real-world examples of DiDIY in action in the DiDIY Project blog (www.didiy.eu/blog) and Resources area (www.didiy.eu/resources).

Fact: DiDIY is a complex phenomenon

DiDIY is both **something that someone:**

- **does, an activity** for the production, modification or maintenance of objects or services; in this sense DiDIY is objective, and manifests itself as tools, products, structure of collaborations, etc;
- **has, a mindset**, and then a producing and consuming culture; in this sense DiDIY is subjective, and manifests itself as motivations, competences, social contexts, etc.

This combination of the physical and the social activates a self-reinforcing process that is **transforming DiDIY into a powerful socio-technical system**. Consequently, its evolution and regulation should be driven by social and cultural strategies, not technology.



Fact: DiDIY changes the ways we deal with physical objects

DiDIY offers possibilities of personal fabrication and repair / maintenance that **are blurring the distinction between producers and consumers**, thus creating new options for making all of us prosumers, and challenging the very definition of what a product is at all levels, from legal to marketing.

Fact: DiDIY forces society to rethink what is wrong or right

With DiDIY people can easily produce physical objects of all sorts, and this may be for the wrong or for the right:

- self production of objects that may directly hurt people, be they weapons or, much more likely, unsafe furniture or car parts, **presents objective risks**, that must be thoroughly evaluated;
- widespread DiDIY manufacturing **may bring huge benefits to society**, from reduced waste and pollution (DiDIY spare parts!) to support for new art forms, or more effective teaching methods.

Both scenarios certainly require the adaptation of existing laws, or the creation of new ones, in order for the whole society to benefit as much as possible from DiDIY, while minimising the associated risks.

Fact: DiDIY reshapes arts, schools, and workplaces

All the facts already mentioned have one clear consequence: DiDIY **will contribute to change**, in ways not yet fully studied or understood, the ways in which Europeans study, work, express their creativity and, in general, deal with the physical and non-physical goods in the knowledge society. These impacts are described in other DiDIY fact sheets, available in the "Results" section of the DiDIY website (www.didiy.eu/project/results).

Please let us know your opinion, and how you already use or plan to use DiDIY in your school, university, NGO, business or public administration, by visiting us at www.didiy.eu

To know more about Digital Do It Yourself...

Please visit www.didiy.eu to contact the DiDIY Project research team and read our already available results, including but not limited to:

- more specific fact sheets on the impacts of DiDIY in organization, work, creativity, education, research and intellectual property;
- foundational interpretation of DiDIY;
- Knowledge Framework on DiDIY;
- current DiDIY support and awareness in Europe.



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Annex 2: Fact sheet – Impact of DiDIY on organization and work



Fact sheet



Impact of DiDIY on organization and work

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Fact: The “Yourself” in DiDIY can also be a company, not just an individual

The “yourself” in DiDIY is originally meant to be an individual, but the widespread availability of networked digital information processors, the interest or the need to share knowledge and the current state of markets, in which adaptability and rapid innovation are keys for survival of any company, **have created new dimensions of DiDIY** and new reasons for companies to adopt, or let their employees adopt, DiDIY practices. In these dimensions, the “yourself” can be a group, a class, a community of practice, a company, or an industrial cluster, and in perspective the whole society as such. Hence the digital tools are transforming the Do-It-Yourself into a Do-It-Together.

Fact: DiDIY makes it possible for professionals and companies to build their own tools

DiDIY can be used to build not only some products, but also the tools with which one may then build other products. For example, a cabinet maker may build by herself, with DiDIY techniques, the CNC router or lathe that she will then use in her professional activity. In similar fashion, a pottery maker or an orthodontist may 3D print the casts and tools they would then use in their job. In other words, the ability to produce an increasing diversity of objects means that DiDIY is not restricted to hobbies and non-professional activities. Thanks to DiDIY, single artisans, farmers, artists, fashion designers and, in general, small/medium enterprises in all sectors of the economy **have the possibility to build their own custom tools in-house**, with a much greater control on their capabilities than in the past, and often at much smaller costs.

**Fact: DiDIY leads makers and enterprises to create new cluster-based business models**

Leveraging on the Do-It-Together mindset, DiDIY leads to new forms of aggregations. At the individual level makers evolve from sharing knowledge into cooperating into organizations with different business models. At the enterprise level, the availability of knowledge sharing digital platforms enables companies to give life to collaborative practices that can evolve in structured finalized joined activities (research and development, internationalisation, etc), which can then further develop into formalized clusters of enterprises.

Fact: DiDIY shakes organisational roles by enabling disintermediation of experts

By exploiting the availability and ease of use of DiDIY, organisational roles typically dependent on experts (internal or external to the organisation) can carry out, autonomously, innovative practices. With Arduino boards and sensors, workmen in the production plants can set up a pilot project to monitor the production flow without or limitedly asking support to the IT department; with 3D printers R&D employees can create prototypes of new products without requiring support from R&D consulting firms; marketing employees can set up a marketing campaign by creating a mobile app, without or limitedly asking support to the IT department.

Fact: DiDIY turns supply chains upside down by making it possible to produce spare parts locally

The rise of DiDIY may have a radical impact on supply chains: it will allow businesses to manufacture and customize spare parts locally that they previously would have had to ship from distant locations, thereby allowing them to cut down transportation costs and to respond faster to consumer demand. This will carry benefits for consumers but also for the environment, for example because of reduced harmful emissions due to transport of goods. However, it can also be a source of concern if jobs get lost in the process, and the re-training of workers is no straightforward matter, and if manufacturing gets shifted away from low-wage countries, with potentially damaging consequences for their economies.

Please let us know your opinion, and how you already use or plan to use DiDIY in your school, university, NGO, business or public administration, by visiting us at www.didiy.eu

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Annex 3: Fact sheet – Impact of DiDIY on education and research



Fact sheet



Impact of DiDIY on education and research

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Fact: DiDIY builds on the sharing of knowledge, and through it greatly benefits learning and research

It is part of human nature to show one's knowledge, and sharing it is an excellent way to do it. Digital networks have brought the cost of sharing knowledge to almost zero, thereby paving the way of peers producing collective pools of knowledge. A large part of that knowledge, even in the fields of DiDIY, is **licensed under equal conditions as open access or free knowledge**. Good examples of these practises are online communities like Thingiverse (www.thingiverse.com), Arduino forums (forum.arduino.cc), OpenDesk (www.opendesk.cc), and Instructables (www.instructables.com). You can find many real-world examples of DiDIY in action, both in education and research, and in other fields, in the DiDIY Project blog (www.didiy.eu/blog) and Resources area (www.didiy.eu/resources).

Fact: DiDIY greatly facilitates the production of prototypes and other artefacts to be used in educational contexts

Devices for digital fabrication, such as 3D printers, **make it much easier for design and engineering students to produce prototypes of their creations**. Many other applications are possible, in STEM (Science, Technology, Engineering, Maths) subjects but also other fields of education. For example, history students can build very detailed three-dimensional models of historical artefacts for examination, while medical or biology students can do the same with human organs or tiny life forms. In order to maximise the benefits of DiDIY in education, however, coordination among all stakeholders (museums and schools, individual teachers, etc) is needed, as well as more support for teachers (ad-hoc training and documentation on DiDIY technology, information on how to minimise costs and waste of material in DiDIY manufacturing, etc).

**Fact: DiDIY is already reshaping education and at present is mainly used for STE(A)M**

Throughout all industrialized countries, in Europe and elsewhere, DiDIY is being **incorporated in schools** from primary education to university, as well as exploited in extracurricular activities such as CoderDojos, Robotics contexts, creation of in-school FabLabs, cooperation with existing Fablabs or MakerSpaces, etc. Its main learning uses are linked to Science, Technology, Engineering (Arts), and Mathematics (STE(A)M). Early adopters of DiDIY in education were teachers and trainers in technical schools, where learning arises naturally as part of an investigation or construction project and pupils spend time on individual project work. Progressively this approach is being used also outside technical schools, but at a lower pace.

Fact: DiDIY has the potential to deeply affect education, well beyond what happened in the digital revolution

In most cases, DiDIY uses in classrooms are matched with a methodology of working that is completely different from the past. Digital technologies and social media **allow students to learn from each other in informal settings anywhere and anytime**, making learning in and out of school increasingly porous. Therefore learning institutions have a problem, because they compete with learning that takes place in recreational space and is more fluid. With this constantly changing landscape, education will become less institutionalized and more personalized and we will see in education more students who move from being just consumers to becoming producers of knowledge.

Fact: There are complex obstacles to overcome in the uses of DiDIY for research purposes

DiDIY already plays an important role in communities like the Citizen Science Alliance (www.citizensciencealliance.org) that "collectively develop, manage and utilise internet-based citizen science projects in order to further science itself". However, the role of DiDIY in research **has to be fully exploited yet**, also due to the novelty of the technologies involved. Besides, it is questionable whether students at this level may still be regarded as DiDIYers, instead of professionals or semi-professionals. Many question the fact that DiDIY research can be regarded as fully "scientific", and there are complex issues related to both liability and Intellectual Property Rights. However, a huge community is exploiting DiDIY for research purposes, industry mainly for prototyping and universities and R&D centres in all fields, including highly sensible ones like medicine and bio-engineering.

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Annex 4: Fact sheet – Impact of DiDIY on creativity



Fact sheet



Impact of DiDIY on creativity

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Fact: DiDIY enables international networks of creative idea-building and inspiration

The internet connects people across national borders and enables creative individuals and groups to find inspiring others who share their passions. With their DiDIY mindset they can work separately or together to design innovative and beautiful things. By scaffolding each others’ learning – building knowledge and skills up bit by bit, through supportive online exchange and conversation – they **can reach new levels of creativity, imagination and opportunity**.

Fact: DiDIY fosters a culture of making and tinkering

Whilst people have always been able to make things and tinker with technological tools, DiDIY **opens up new scenarios and opportunities** where very particular and complex things can be designed on screen and then immediately produced as physical objects, and where electronic systems equipped with sensors and actuators can be easily developed to create new custom relationships between persons and physical objects through the internet.

Fact: DiDIY supports sustainability through an ethos of fixing and remaking

Where modern societies are often built on an ethos of disposable consumerism, DiDIY **highlights the power of fixing and remaking goods**. 3D printing and other technologies enable people to create the “spare parts” which will make something work again, or to develop innovative solutions to make things usable in new ways.



Fact: DiDIY gives more people an opportunity to express their creativity

The possibility, typical of DiDIY, to create artefacts (including ones that are not, strictly speaking, three-dimensional objects, e.g., paintings, or even music) by working with simple and affordable digital tools does not only give new venues to express themselves to people who were already doing it, or however are able to do it, with non-digital tools. DiDIY also **gives the same possibilities to individuals who may have never been able to express their creativity otherwise**, e.g., to become sculptors, thanks to 3D printing, even to people who, for whatever reason, may not use chisels or similar tools.

Fact: DiDIY is a key dimension of the Maker Movement, which is revolutionising how people think about consumerism

The Maker Movement, and the general resurgence of craft and making, **raise radical questions about the nature of the society** in which we live. The cheap consumer goods which seemed to be the answer to 20th century desires are beginning to be seen as the cause of 21st century problems. At the same time, as everyday creativity leads to the recognition that "I can do this", individuals are empowered to take more control over their own lives.

Fact: DiDIY has been taken up by cultural institutions as a way of rethinking their mission

The novel and engaging processes of DiDIY **have been adopted by cultural organisations which are trying to re-orient their activities toward more hands-on and generative processes**. For example libraries and museums are now incorporating maker spaces within their walls, so that they can become places where new knowledge and things are invented and made, rather than where already-existing things are merely exhibited.

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Annex 5: Fact sheet – Impact of DiDIY on rights, responsibilities and Intellectual Property



Fact sheet



Impact of DiDIY on rights, responsibilities and Intellectual Property

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Fact: DiDIY poses challenges to exclusive Intellectual Property Right (IPR) systems

As 3D printing, and digital fabrication in general, grow, there is evidence of infringement of exclusive IP rights, such as copyright, patents, design rights and trademarks, albeit on a small scale. At the same time current IPR systems **are only partially fit to protect commons based approaches**, as free/open licenses are generally based in copyright, which can protect the shared works only partially.

Fact: Commons based hardware projects provide an alternative to exclusive IPR systems

Traditional, exclusive IPR protection like patents requires parties to request permission to contribute to the adaptation and further development of hardware designs and thus hinders collaborative development. A growing number of communities sharing their intellectual and creative DiDIY efforts under non-exclusive, free license arrangements **shows successful alternatives to the traditional exclusive IP licensing arrangements**. So called Open Design, Open Source Hardware, or Free Hardware Design refer to projects that are published under free licenses providing all community members the rights to build, adapt, copy and share original or modified versions. Hundreds of thousands of such commons hardware projects can already be found on online sharing platforms such as Thingiverse, Libre3D, OpenBuilds, Open Hardware Repository, Fritzing and Wevolver. You can find many real-world examples of DiDIY in action also in the DiDIY Project blog (www.didiy.eu/blog) and resources area (www.didiy.eu/resources).



Fact: DiDIY activities can benefit from IPR exemptions for private, non-commercial uses

As is the case for traditional DIY and repair activities, DiDIY activities tend to be for private, non-commercial use (sale of self made objects is always an option, but this typically is not the original intent). Many IPR legislations **include exemptions for such uses**, in particular in copyright, design rights and patent rights. Trademarks are infringed by use in the course of trade of the same mark on similar goods. When there is no trade at all, these should not be applicable. These exemptions could be strengthened to encourage DiDIY activities, extending the life and usefulness of physical products and contributing to a more sustainable planet.

Fact: Commons based Open Hardware Designs present different business models

Whereas traditional business models typically required large upfront investments that on its turn required hierarchical control structures to earn back the investments, Open Source Hardware **works differently**. Typically communities form around such projects where the burden of R&D is shared between various members. As the designs are shared under non-exclusive conditions anyone can engage in the production and sale of the products resulting from these designs. Much can be learned from the Free Software and Open Source Software ecosystems that have so successfully been producing myriad of software projects over the last 30 years. A combination of business models is used. First, the sale of physical products based on shared designs typically occurs at cost price plus margin. Second, leading developers in the community with a demonstrated track record of their skills can offer added value services of various types.

Fact: DiDIY requires to rethink product liability

Product liability is a consequence of the so called "duty of care", which is a legal obligation to adhere to a standard of reasonable care when manufacturing and selling products. The advent of DiDIY, however, problematises this issue, by enabling many more individuals to make products that may contain defects that might prove unsafe. The DiDIY practice of making artefacts oneself - as hobbyist, amateur or inhouse - **does not necessarily follow the same standards**, typically is not certified and tends to be non-market. This ultimately has consequences for the social contract and the way we think about product responsibility and risks.

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