



PHOTONICS PUBLIC PRIVATE PARTNERSHIP

Photonics21 – Photonics cPPP Progress Monitoring Report 2019

Produced in 2019 based on data from 2018

Disclaimer:

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Executive Summary

Photonics is one of that “deep-technologies” for Europe and as such crucial for the future competitiveness of European strategic industries. Most recently the European Investment Bank labeled it as one of these “important building blocks of the next digital revolution, which will be based on deep technologies”¹. By developing and disseminating latest photonics technologies for a broad variety of end user industries, photonics massively supports making Europe’s economy more competitive on a global scale and, by that, secures growth and jobs. Regarding this large innovation potential of photonics technologies was the basic reason for the European Commission in Horizon 2020 to establish the Photonics contractual Public Private Partnership (cPPP) and by that step-up the public-private relations built in the European Technology Platform Photonics21 with its more than 3000 experts from science and industry.²

The Photonics cPPP represents a long-term commitment between the European Commission and the Photonics industry to jointly invest in Europe for *fostering photonics manufacturing, job and wealth creation in Europe, accelerating Europe’s innovation process and time to market in Photonics* as well as *mobilizing, pooling and leveraging public and private resources to provide solutions for major societal challenges* facing Europe.

As a major guideline for steering the progress of the PPP and setting R+I priorities the Photonics industry and academia jointly had prepared the Photonics cPPP roadmap “Towards 2020 – Photonics driving economic growth in Europe” in 2013 in an open and transparent process. Since then the Photonics cPPP this multiannual roadmap is checking bi-yearly the progress of the various R+I focus themes. A then updated and actualized 2-years work programme assembled by the experts in the community are provided to the European Commission to be included into the Horizon2020 Photonics KET calls.

As a major task in 2018, the Photonics Community worked on a new strategic multiannual roadmap for the time period 2021-2027 of Horizon Europe following the 2017 published Vision paper “Europe’s Age of Light”³ which showed on a mission and vision level the contribution of photonics for the digital transformation in nearly all important end-user markets as well as the impact on health and well-being.

Under the Photonics cPPP in Horizon 2020, the public support for photonics by the European Commission has been increased to a dedicated ring-fenced budget of €700M. Moreover, Photonics related projects can be found in almost all H2020 programmes, covering all high relevance application markets for tomorrow’s society and economy. The share of “photonics related projects” in H2020 is with 8.4% much higher as one might assume, considering the relative share of the Photonics in the European industry in terms of turnover (around 3.3%). These figures, highlighted in a study performed by Tematys at the end of 2017 on behalf of Photonics21⁴, have just been updated⁵ and the conclusions are still valid: in total, and excluding ERC and MCSA projects, 794 projects could be identified in H2020 in the period 2014-2018 that are either directly photonics-based projects, or projects for which photonics is a technology enabler or even a critical enabler.

The study also proofs that the PPP has demonstrated a 5x fold leverage of the Photonics PPP projects. This slightly exceeds the strong commitment the photonics industry in Europe gave to leveraging public funds with private sector investment by a factor of 4. As a matter of fact, the European SME based Photonics industry is investing about 10 billion Euro per year in Research and Innovation in Europe and by that belongs to the most innovative industries in Europe.

¹ European Investment Bank, Innovation Finance Advisory, European Investment Bank Advisory Services (2018): Financing the digital transformation – Unlocking the value of photonics and microelectronics, Luxembourg, 2018. P. 9.

² Photonics21 is an industry driven stakeholder organization representing more than 1700 photonics affiliations.

³ European Technology Platform Photonics21 c/o VDI Technologiezentrum GmbH, Photonics21 Secretariat (2017): Europe’s age of light! How photonics will power growth and innovation”, Photonics21 Vision Paper, Brussels / Düsseldorf / Berlin / Frankfurt am Main, 2017.

⁴ European Technology Platform Photonics21 c/o VDI Technologiezentrum GmbH, Photonics21 Secretariat (2018): Photonics – a critical Key Enabling Technology for Europe – Role and impact of Photonics in H2020, Düsseldorf / Paris.

⁵ To be published.

Operational since 2014, the Photonics cPPP has started about 100 Horizon 2020 Photonics KET (PPP) research and innovation projects, up to now with a public investment of about €460M (*More details to be found in §2 and 3.3*).

The Photonics cPPP is looking back on a very successful year 2018 – as underlined by the following milestones (*More details to be found in §2 and §3*):

- 14 new Horizon 2020 projects started with a total budget of € 85.288.725,02. - 87 industrial participants – representing 53 % of total participants - demonstrating a strong industrial commitment fiercely driven by end-user needs.
- Following the community based Strategic Vision Document “Europe’s age of light! How photonics will power growth and innovation”, 9 work groups with about 500 experts from the community involved were engaged to discuss the next Strategic Multiannual Roadmap.
- Following the successful set-up in the last year, a further “European Photonics Venture Forum” (EPVF) was conducted in Barcelona, bringing together >30 high tech investors and >30 photonics start-ups to responded to the so far unmet capital demand of innovative young photonics companies.
- Teaming up with member states and regions: The Photonics cPPP triggered joint funding activities between the PPP, member states and regions (e.g. in the ERANET Cofund) and linked the Photonics PPP strategy with regional Smart Specialization Strategies (S³). More than 15 regions are involved in the photonics S³ initiative, North Brabant being in the lead.
- Nearly 19Mio. readers were reached through Photonics cPPP project impact and success stories which were reflected by 217 articles in the media

More generally, and looking back at 4 years of activities, it can be stated that most objectives of the Photonics cPPP –have been achieved (*More details to be found in §3.1*):

- European Photonics industry has grown by 62% (CAGR +5%) in the last 10 years, Since 2005, the European photonics industry has shown a solid long-term growth of 5% - turning out twice of the growth of the global GDP and despite the financial crisis experienced 2008/2009.
- In the same time (2005-2015), the number of people employed in the European Photonics industry has shown an impressive overall growth of + 23% (CAGR +2.1%) – leading to 290.000 people employed in this sector in 2015. This trend is expected to continue, and current estimations assume that 42.000 new jobs could be created by 2020 compared to 2011.
- Moreover European Photonics Industry could successfully defend leading market position (30 – 50 % of global share) in its core segments Production Technology, Measurement and Machine Vision, optical Components and Systems and Medical technology and Life Science. All together it holds a strong # 2 position on the globe behind China but before Japan and US.
- Photonics related projects in H2020 cover all most of the megamarkets such as personalized Health Care, Industry 4.0., Secure Digital Society, Smart Cities and Homes & Digital Infrastructure and many more.
- European photonics companies are highly committed to research and innovation. The private sector’s involvement in H2020 in the photonics segment is better-than-average with e.g. photonic SMEs succeeding better than average in submitting SME Instrument (SME-INT) projects.

The Photonics PPP conducted an update on the study on the Photonics impact in Horizon 2020 as well as on measuring KPIs using an updated online survey. Progress made in relation to the specific Key Performance Indicators (KPIs) has been measured among the 100 project participants – project coordinators and participants - in Horizon 2020. The high response rate of 130 people and the results shown concerning growth expectations, time-to-market, leverage effects, spin-offs and new job creations–underline the success of the Photonics cPPP. (*More details can be found in §3.2*)

Over the last years, the Photonics cPPP has developed to become a successful and increasingly effective partnership. Specifically it is successful in involving the broad Photonics SME based community in the development and implementation of the European Innovation strategy in Photonics and with Photonics for many application areas. Key to involvement of SMEs is the fully open, democratic and transparent

decision-making process of Photonics21 and the lean and effective structure of the platform – well accompanied by the new and lean SME instrument in Horizon 2020 which is used by many Photonics SMEs. As a matter of fact, Photonic SMEs have had a higher than average success rate in submitting ‘SME Instrument’ (SME-INT) projects, especially for the phase 2 calls. Nearly 15% of the projects which were funded under both phases 1 and 2 from 2014 to May 2017 were photonic projects. The consistency of the projects submitted by the photonic related SMEs was also recognized as 11.35% of the companies which signed a SME-INST-1 also signed a SME-INST-2, compared to the average 5.57% for all H2020. *(More details on lessons learned can be found in §4)*

1. Introduction: The Photonics cPPP

On 17th of December 2013 Vice-President Neelie Kroes signed the agreement setting up the contractual Photonics Public-Private Partnership (Photonics cPPP). In recognition that – as one of six Key Enabling Technologies (KET's) in Europe – Photonics plays a major role for driving growth and employment in Europe and contributes to solve the major societal challenges such as aging society, energy efficiency, inclusion and smart living, the Photonics cPPP aimed at promoting and strengthening European photonics in a very competitive market⁶ with strong non-European players like China or South-Korea.⁷

Against the background of the preparation of the 9th Framework programme *Horizon Europe*, the Photonics PPP has invested in an important strategy and roadmapping process involving aside of the whole European Photonics community also external experts in intense workshop sessions. This resulted in the Vision Paper for Photonics published end of 2017 demonstrating in 9 key megamarkets and application areas the ambitions Photonics has.⁸ For example: by developing and fostering the use of core photonics technologies, food production will become more transparent and safe. Road transport will become nearly accident-free saving thousands of lives. Medical treatment can start earlier through instant diagnosis of diseases allowing citizen to live longer and healthier lives. Thousands of new manufacturing jobs will be created in Europe by introducing versatile laser-based technologies.

Based on this visionary approach of the impact of photonics for future application areas, the set-up of the Multiannual Strategic Roadmap started in 2018 and will lay the ground for discussing research priorities to be funded in the upcoming bi-yearly EC Work Programmes – starting with 2021/2022.

In the 9 work areas of the Vision Paper the Strategic Roadmap lists in two-years block views the technological challenges, the key milestones to move from Science to market, the necessary Research and innovations steps needed as well as the joint actions required with other disciplines to get there. The bi-yearly review and update process by the PPP secures that the targets get adapted and updated to the latest technical and economic needs.

⁶ The global market for photonics applications amounted for €447 billion (in 2015) - nearly doubled in the respective period 2005-2015 and is expected to exceed €615 billion in 2020.

⁷ See also §4.

⁸ European Technology Platform Photonics21 c/o VDI Technologiezentrum GmbH, Photonics21 Secretariat (2017): Europe's age of light! How photonics will power growth and innovation", Photonics21 Vision Paper, Brussels / Düsseldorf / Berlin / Frankfurt am Main, 2017.

2. Main activities and achievements during 2018

2.1 Implementation of the calls for proposals evaluated in 2018

Photonics PPP projects demonstrate a strong industrial commitment and are driven by end-user needs.⁹

In the work programme 2018-2020, the **ICT-03-2018-2019** and **ICT-04-2018** calls addressed photonics related proposals and covered Research and Innovation Actions (RIA), Innovation Actions (IA) and Coordination and Support Actions (CSA).

ICT-03-2018-2019: Photonics Manufacturing Pilot Lines for Photonic Components and Devices

Acknowledging the fact that “Photonics is driving innovation in many different application areas”, the challenge behind this call “is to help European companies become more competitive by improving their business/production processes as well as products and services by means of photonics technology. The aim is to accelerate the design, development and uptake of photonics technology, by a wide range of industrial players, in particular SMEs by providing low-barrier access to volume production of advanced photonics components available to a wide range of industrial players, in particular SMEs which would otherwise not have easy access. Photonics Manufacturing Pilot Lines should form the basis for future Photonics Digital Innovation Hubs.”¹⁰

The focus of this call lay on Manufacturing Pilot Lines, i.e. on “actions [that] should provide open access to manufacturing of advanced photonics components and systems and offer related services including design and characterization”.

ICT-04-2018: Photonics based manufacturing, access to photonics, datacom photonics and connected lighting

This call addressed the specific challenge of reinforcing “the innovation ecosystem by providing access to advanced photonics technology to researchers and thereby accelerating the deployment of the next generation of disruptive photonics technologies” – more specifically:

- “to build capabilities for automated mass manufacturing of datacom photonics in Europe”, [...]
- to support “the integration of lighting with the Internet of Things, offering new functionalities beyond illumination”, [...]
- to promote the “development and application of innovative photonics based manufacturing solutions [that] will open new ways of producing more goods with fewer raw materials, less energy and less waste.”¹¹

The focus was on the following themes:

a) Innovation Actions

i. Access to advanced photonics for researchers: The objective is provide photonics and non-photonics researchers with a one-stop-shop access to a wide range of existing cutting edge technology platforms as well as services needed to facilitate their use (such as design, measurement and packaging).

ii. Enabling automated mass-manufacturing of datacom photonics products: Actions should demonstrate automated manufacturing of optical transceivers with transfer rates above 1Tb/s at competitive costs according to the interconnection distance. Actions should cover all manufacturing steps of proven designs

⁹ All figures in the following paragraph: EC, DG CONNECT.

¹⁰ European Commission, Work Programme 2018-2020, 5.i. Information and Communication Technologies, European Commission Decision C(2018) 7238 of 13 November 2018, p. 12.

¹¹ European Commission, Work Programme 2018-2020, 5.i. Information and Communication Technologies, European Commission Decision C(2018) 7238 of 13 November 2018, p. 13-14.

from chip manufacturing to photonic/electronic integration through to packaging and testing, and final demonstration in a real environment. Standardisation should be addressed.

iii. Connected Lighting: The action should focus on integrating lighting infrastructure with the Internet of Things and demonstrating new functionalities such as visible light communication for indoor positioning and broadband data communication. Development and integration of new technologies as security and multicast communication into open architectures must be demonstrated in real environments. Standardisation of a reference architecture must be one of the main goals of the action.

b) Research and Innovation Actions

i. Highly Productive Ultra-Short Laser Systems for Fast Materials Processing: the development of ultra-short pulse laser systems with pulse durations in the nanosecond regime down to the femtosecond regime and with average beam power levels of at least 1kW enabling fast materials processing with minimal heat impact on the work piece. Pulse energies and wavelengths must be appropriate for the intended application. Proposals may include also the related monitoring and closed loop control aspects. The developed system should be demonstrated with a relevant industrial application.

ii. Tailored Laser Beams for Laser-based Manufacturing: new methods and schemes of beam shaping providing the optimal energy delivery on the work piece with a high spatial and temporal resolution. Proposals may include also the related monitoring and closed loop control aspects. The developed system should be demonstrated with a relevant industrial application.¹²

As a result of the 2018 calls, 14 new projects for a total budget of over € 71 million have just started. In 2018, under the Call for Photonics Manufacturing Pilot Lines for Photonic Components and Devices, (ICT-03-2018) one Innovation Action (IA) for 14M€ was selected, while under the Call for Photonics based manufacturing, access to photonics, datacom photonics and connected lighting (ICT-04-2018), 5 IAs and 8 RIAs (Research and Innovation Actions) for 71M€ were funded – in all, 14 projects for 85M€.¹³

The following table gives an overview of the number of projects funded as well as the budget allocated in the frame of last year's calls:

Type(s) of action	Number of projects funded	Total Budget	Total EC Contribution
RIA	8	€ 42.363.773,76	€ 42.363.773,75
IA	6	€ 50.561.432,50	€ 42.924.888,26
CSA	0	0	0

Source: EC, Cordis.

An overview on the budget allocated as well as the participants in the H2020 ICT-30-2017 call is given in §3.2 when discussing the operational aspects of the PPP.

The Photonics PPP projects, resulting from the 2018 calls, started in the last months of 2018 or 2019. An overview of the entire portfolio of the funded Photonics PPP projects can be found in the annex of this report (Stand: March 2019) as well as on www.photonics21.org/ppp-projects, where a summary of all the funded projects is provided, and divided by topic areas. Each project has a brief description of its objectives and is regularly updated.

¹² European Commission, Work Programme 2018-2020, 5.i. Information and Communication Technologies, European Commission Decision C(2018) 7238 of 13 November 2018, p. 14-15.

¹³ <https://ec.europa.eu/digital-single-market/en/news/fourteen-new-photonics-projects-have-been-launched>.

2.2 Mobilisation of stakeholders, outreach, success stories

Photonics PPP Annual Meeting: Mobilizing stakeholders to promote a European industrial Photonics strategy

Industry and academia join forces in the scope of the PPP to develop and implement a joint European industrial strategy in Photonics.

The Photonics Public Private Partnership Annual Meeting, organized by VDI Technologiezentrum in its function as Photonics21 Secretariat, is the central community building and networking event for photonics in Europe. It has become the most important event for exchange, discussion and networking between C-level representatives from industry, research and politics. The two days Photonics PPP Annual meeting marks the starting point for any strategy development and implementation activity.

The Photonics21 PPP Annual Meeting 2018, entitled #next.photonics_forum "Winning the future - Europe's age of light" was held on 8th/9th March 2018 in the Royal Museum of Fine Arts and the Bluepoint Conference Centre in Brussels. More than 300 key stakeholders of the European photonics community attended the event and the annual gathering set about defining the challenges that lie ahead in photonics research & innovation and its applied fields. Lucilla Sioli, Director for Digital Industry within DG CONNECT, paid homage to the Photonics PPP as being "one of the best and most efficient contractual PPP's we have ever seen in the Commission". Keynote speaker Carl Buhr, the European Commission's deputy head of cabinet, discussed the challenges and opportunities of a digitized world in which photonics plays a vital role. Several notable speakers further contributed to the symposium, such as Jean-François Hebert, Vice President Sales Global Accounts High Tech Industry, Dassault Systèmes SE and Prof. Dr. Michael Totzeck, Fellow Corporate Research and Technology Carl Zeiss AG University of Konstanz.

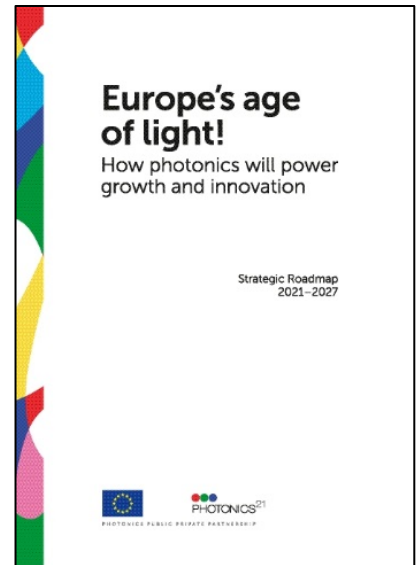
The second event day focused on the Photonics21 workshop sessions as official kick-off event for the European photonics strategy process. During the eight workshop sessions, the workshop participants started the interactive discussions about the future photonics research and innovation challenges. The inputs of the different workshop sessions contributed to the further strategy process to work out a new European photonics strategic roadmap in preparation of the new EU framework programme Horizon Europe.

In fall 2018, the Photonics21 Secretariat started the preparation of the Photonics PPP Annual Meeting 2019 as a High-Level Event leading towards the strategy for a Photonics PPP in Horizon Europe. In The focus stood an evening Symposium where Nobel Laureat Physics - Prof. Gerard Moreau – represented the Science side, Dr. Stefan Träger, CEO of Jenoptik AG the Industry side and Dr. Carl Buhr, Deputy Chief of Cabinet of Commissioner Gabriel, the political side.

European Photonics Strategic Roadmap 2021-2027

In designing a new strategy for European photonics, Photonics21 has built on the Photonics PPP's proven collaborative approach. In preparation of Horizon Europe, Photonics21 consulted in the course of 2018 with the European photonics community, including more than 3,000 people affiliated to more than 1,700 companies and research organisations. In a series of 12 workshops and based on the Photonics21 vision document "Europe's Age of Light! How photonics will power growth and innovation" the European photonics community developed the new European Photonics Strategic Roadmap, which was published and handed over to the European Commission on 27th March 2019 alongside the Photonics PPP Annual Meeting 2019.

The Photonics21 secretariat coordinated the overall strategy process, prepared the workshop sessions and was responsible to ensure an open and transparent community process where all members of the different Photonics21 work groups were invited to provide their feedback to the thematic chapters of the roadmap.



The new photonics roadmap outlines the future photonics research and innovation challenges for the next 7 years in following areas:

- Information & Communication
- Industrial Manufacturing & Quality
- Life Sciences & Health
- Emerging Lighting, Electronics & Displays
- Security, Metrology & Sensors
- Design & Manufacturing of Components & Systems
- Photonics Research, Education & Training
- Agriculture & Food
- Automotive & Transport

Following the publication of the photonics roadmap the Photonics21 community will prepare concrete proposals for photonics call topics for the new EU framework programme Horizon Europe work programme 2021-2022 based on the identified research and innovation challenges as outlined in the new photonics roadmap.

A pdf version of the photonics roadmap is available for download at the Photonics21 website:

<https://www.photonics21.org/ppp-services/photonics-downloads.php>

Improving access to venture capital for Photonics start-ups and SMEs in Europe: "European Photonics Venture Forum"

As the Photonics PPP Task Force Finance – in close cooperation with the European Investment Bank (EIB) figures out, Photonics SMEs (as well as most other deep technologies) is often lacking access to capital due to the fact that Venture Capital funds – even those investing in hardware – often face difficulties understanding the complex photonics technologies and adjunct markets?

One of the targets of the Nextpho21 Project therefore is to support and facilitate that particular high-potential and high growth SMEs can be better served with financial investments beyond H2020 grants.

One major building block in this efforts is the support and involvement of the Photonics PPP in the European Photonics Venture Forum (EPVF).

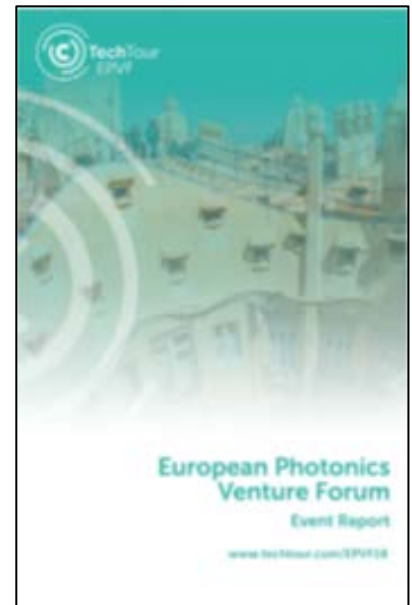
The European Photonics Venture Forum (EPVF) is a meanwhile well-established event, taking place yearly in different regions and bringing “together entrepreneurs, investors, corporates and policy makers in an intense and high-energy programme of pitching, ideas sharing, networking and direction setting”.¹⁴

The 2018 edition was the fourth edition of the European Photonics Venture Forum (EPVF) and was organized as part of the H2020 Innovation Action, Actphast 4.0, and in conjunction with the coordination and support action Nextpho21, both co-funded by the European Commission, part of the programme ICT-30-2018 - photonics KET 2018, as well as with strong support of high-ranking members of regional, national and European photonics organisations:

- ICFO (The Institute of Photonic Sciences),
- SECPhO (Southern European Cluster in Photonics and Optics)
- Fotónica21 (the Spanish Technology Platform for Photonics)
- EPIC (European Photonics Industry Consortium)
- ECOP (European Centres for Outreach in Photonics)

The main objectives of EPVF 2018 were to “- market the photonics sector to a wider investor community; -create channels to finance the sector; - select and promote high-potential photonics businesses; - support the funding in the sector”.¹⁵

More than 30 selected start-ups and scale-ups, as well as more than 80 investors/industry experts attended the EPVF2018. This year for first time, the EPVF hosted a specialized investor-only session aiming to unite both public and private investors involved in the Photonics domain in order to discuss potential collaboration for supporting photonics companies and overall the development of the photonics industry as key enabling technology. “The speakers shared best practices on supporting photonics entrepreneurs and industry in the “network of network” approach in an exclusive investors’ only meeting setting. The investors’ meeting and discussion was supported and attended by representatives of the European Commission, European Investment Bank, PhotonDelta, ACTPHAST 4.0, as well corporate investors.”¹⁶



The next particularly opportunity to demonstrate the economic impact of photonics will be the upcoming European Photonics Venture Forum 2019 which will take place in the frame of the “Laser.World of Photonics 2019” an community networking fair in Munich. Here the most of the innovative photonics companies will be present and the Startup-World organised in the scope of the fair provides an additional incentive for venture and corporate venture capitalists to attend the event. Photonics PPP will also award the winner of the “Prototype-your-idea” contest in the frame of this EPVF.

In addition to this other measures are planned and work in progress to support access to finance for the high-tech sector photonics. Amongst those are assembling a list of Investors (mainly Business Angels and Venture Capital) which are specifically interested in Photonics and probably also have a proven track record. Other ideas comprise dedicated marketing actions such as an advisory group on C-Level from Photonics companies for start-up’s and SMEs or Investment Reports.

European photonics success and impact stories

¹⁴ European Photonics Venture Forum, Event Report, www.techtour.com/EPVF18, p. 3.

¹⁵ European Photonics Venture Forum, Event Report, www.techtour.com/EPVF18, p. 18.

¹⁶ European Photonics Venture Forum, Event Report, www.techtour.com/EPVF18, p. 7.

Preparation of European photonics success and impact stories

Photonics21 provides a central dissemination service to H2020 Photonics KET (PPP) projects. Topics are selected according to the expected impact of the project on a specific end-user industry and the assumed interest of the general public. By engaging with a professional public relation agency specialised in technology and science communication, the stories get professionally edited and distributed with appealing graphics to increase the chance of uptake by target media. Close coordination of messaging and content of success stories is done with the project coordinators and the European Commission project officers responsible for the project.

Distribution of photonics impact stories to end-user industry trade media

Photonics success and impact stories prepared are distributed to end-user industry trade media representing major photonics markets, such as *Automotive News Europe*, *Medical News Today*, etc. The stories promote the respective Horizon 2020 Photonics KET (PPP) projects to end-user industry in order to trigger collaboration.

Distribution of photonics impact stories to international opinion forming media

Photonics success and impact stories are distributed to international renowned public opinion forming media and websites having a broad readership. Target media include *The Times*, *The Independent*, *Daily Mail*, *Yahoo.com*, *MSN.com*.

Overview on 2018 Press releases of PPP Projects:

Headline	H2020 Photonics PPP Project
New patrolling robots to eradicate petrol plant explosions	REDFINCH
Photonics to help dairy industry with new 5-minute scan	MOLOKO
EU Scientists harness photonics to develop faster, high capacity, low power internet network that never hangs	PASSION
New deadly-bacteria detector to prevent water companies from closure	WaterSpy
Scientists develop laser fabric that cures skin diseases	PHOS-ISTOS

Source: VDI TZ GmbH.

Further news arising from the projects themselves were then distributed to the photonics community through the Photonics21 dissemination channels website, newsletter, LinkedIn and Twitter.

Campaign Review 2018:

Key Indicators:

- 217 articles (117 End User Media)
- global readership of over 19.9 million people
- advertising value totalling +€420K
- Science, Technology, Medical, Health, Electronics among most popular sectors

Photonics Campaign Objectives

To promote photonics technology and its community of industry and research

Quick facts

Table showing at-a-glance media coverage of the 8 identified stories for 2018.

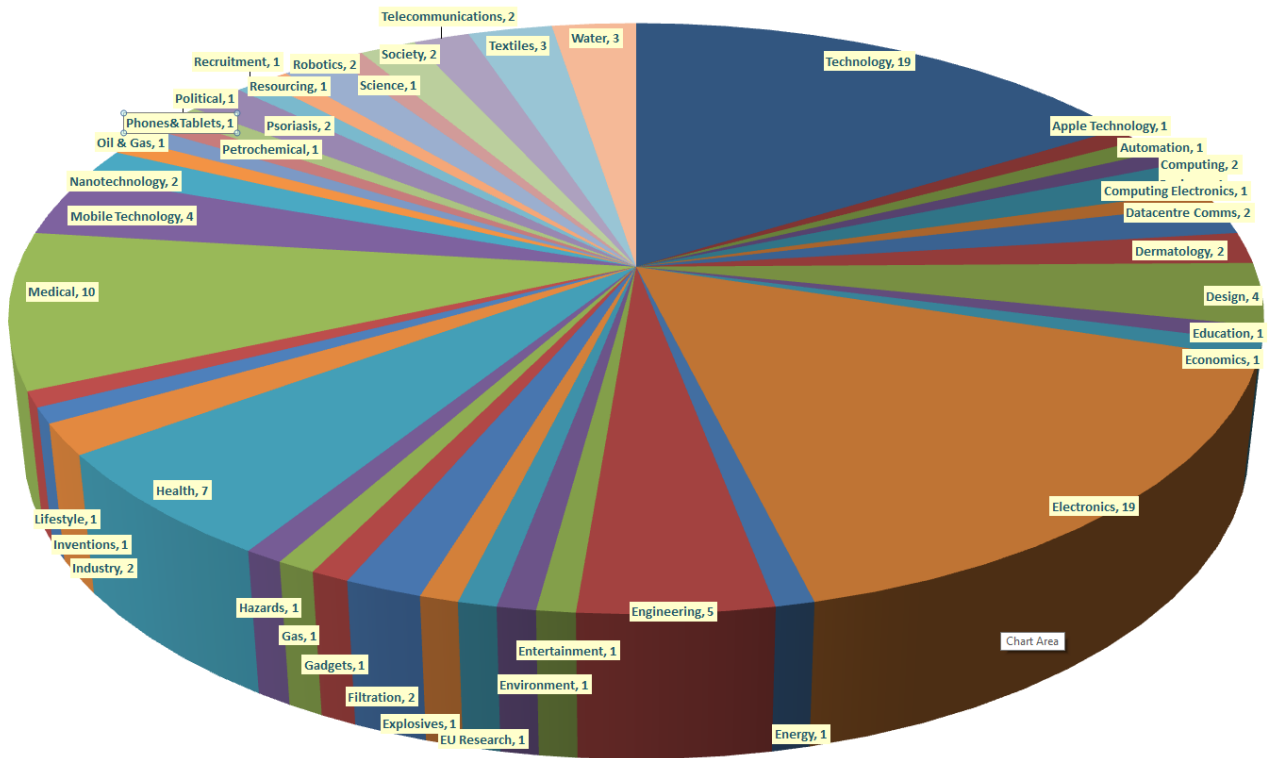
Matter PR Code	Project Name	Press Release	Articles	Photonics	End User Media	News	Unique Monthly	Refined Readership
18 P01	Vision Paper	<i>Photonics to create 1 million new Jobs by 2030</i>	13	6	5	2	2,855,739	50,995
18 P02	PHOS-ISTOS	<i>Scientists develop Laser Fabric that cures Skin Diseases</i>	88	3	44	41	278,977,547	11,607,575
18 P03	Annual Meeting	<i>Summit to show Photonics vital to Digitization of Industry</i>	5	3	2	0	311,410	5,977
18 P04	MOLOKO	<i>Photonics to Help Dairy Industry with 5-Minute Scan</i>	12	5	6	1	838,520	93,169
18 P05	WATERSPY	<i>New Deadly Bacteria Detector to prevent Water Companies from Closure</i>	15	5	8	2	388,080	69,017
18 P06	REDFINCH	<i>Laser Sensor to spot Gas Leaks on Oil Refineries</i>	26	3	21	2	2,789,290	309,921
18 P07	PASSION	<i>Light Speed Internet to enable Smart Cities</i>	41	9	21	11	74,745,802	6,795,073
18 P08	LUMENTILE	<i>New Photonic Tiles to turn Bedroom Walls into Cinema Screens</i>	17	4	10	3	6,745,240	1,053,944
Totals			217	38	117	62	367,651,628	19,985,671

Source: MatterPR.

End User Media Breakdown

In keeping with the strategy to promote photonics outside of the community of light, of the 217 articles produced, 117 are in end user media publications.

Photonics cPPP PMR 2019 – Main activities and achievements during 2018



Source: MatterPR.

In total four videos were created in 2018 which have boosted the photonics media coverage:

- [PHOS-ISTOS](#)
- [PASSION](#)
- [LUMENTILE](#)
- [TRESCLEAN](#)

(Click links for videos)

H2020 PASSION PROJECT



Photonics21 Project PASSION - Screenshot of the project video

Source: <https://vimeo.com/280722300>

Scientists develop laser fabric that cures skin diseases



Photonics21 Project PHOS-ISTOS - Screenshot of the project video

Source: <https://vimeo.com/272628658>

Photonics cPPP PMR 2019 – Main activities and achievements during 2018

Matter PR Code	Project Name	Press Release	Articles	Photonics	End User Media	News	Unique Monthly	Refined Readership
18 P02	PHOS-ISTOS	<i>Scientists develop Laser Fabric that cures Skin Diseases</i>	88	3	44	41	278,977,547	11,607,575
18 P07	PASSION	<i>Light Speed Internet to enable Smart Cities</i>	41	9	21	11	74,745,802	6,795,073
18 P08	LUMENTILE	<i>New Photonic Tiles to turn Bedroom Walls into Cinema Screens</i>	17	4	10	3	6,745,240	1,053,944
Totals			146	16	75	55	360,468,589	19,456,592

Source: MatterPR.

2.3 Governance

The Photonics cPPP has grown from the Photonics21 European Technology Platform, which was launched in 2005 with the aim to be the first European platform to bring together stakeholders from industry, academia, and policy in photonics. Since its establishment, the platform has steadily grown and today includes around 1700 organisations – two-fifths of them being companies – with more than 3300 members. In its self-understanding it is an industry-driven platform – which gets reflected also by the governance rule that at least 50 % of the Board of Stakeholder members need to come from industrial affiliations.

The rise from a niche technology sector to one of the most important industries for the future of Europe is a remarkable achievement and, in part, the result of a firm commitment from the European photonics industry. The photonics stakeholders have continuously worked on updating the European R&D Photonics strategy in an open, transparent, democratic and participative decision-making process, involving many experts across Europe and abroad. This open and transparent process is a cornerstone of the Photonics PPP as well as of the Photonics21 platform and its governance structures and open elections.

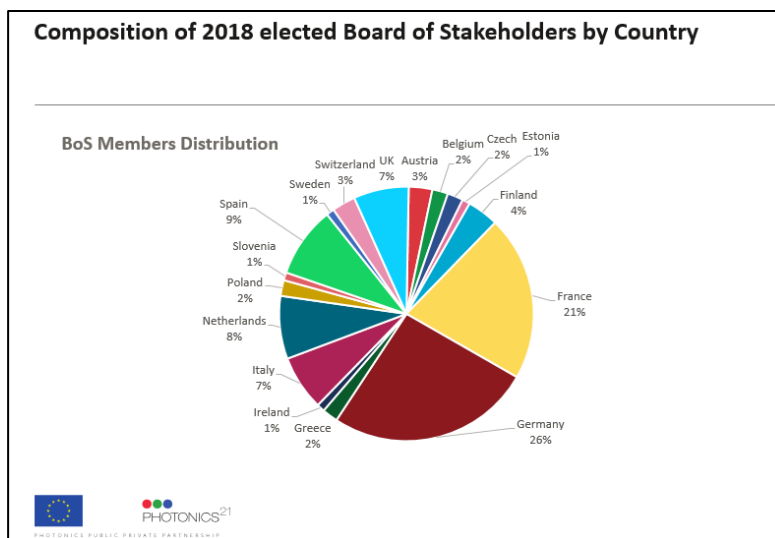
The governance structure as well as the principles of the decision-making process in the Photonics cPPP were presented in detail in several previous publications – for more information, please refer, for instance, to last year's cPPP Progress Monitoring Report¹⁷.

As in the last years since the constituency of the PPP in 2018 there was also held an Online Board of Stakeholder Election which in detail is described in the Terms of reference (ToRs).

In the 2018 election 42 candidates applied for the 39 open seats. In total 282 voters registered – representing 286 different affiliations – of which finally 240 casted a valid vote within October 22nd 2018 and November 6th, 2018.

The new – and current Board of Stakeholders is structured with 50 % Industry members, 35 affiliations coming from research and 15 others – mainly representatives from industry associations and national photonics platforms.

The geographical distribution is fairly wide and finds representatives from many countries. To avoid a too large dominance of the bigger photonics countries (in terms of market share) the maximum number of members from one country is limited to 50 %.



Source: VDI TZ GmbH.

¹⁷ European Technology Platform Photonics21 c/o VDI Technologiezentrum GmbH, Photonics21 Secretariat (2018): Photonics cPPP – Progress Monitoring Report 2018, Düsseldorf.

Dialog with the European Commission through the Photonics PPP Partnership Board

2018 represents the fifth year of activity for the Photonics21 Association and the Photonics21 Association continued its intensive dialogue with the European Commission a PPP Partnership Board on reaching the Photonics PPP objectives (measured in KPIs) and proceeded the follow up reporting and KPI measuring requirements of the European Commission following the cPPP Mid-term Assessment. This comprises also a more close cooperation and contact with other cPPPs for seeking opportunities for cross cutting themes.

In 2018 two regular Partnership Board Meeting took place in the frame of the PPP Annual Meeting 2018 in Brussels in March and the Photonics21 BoS Meeting in November in Brussels. Main Topics discussed in the Partnership Board meeting were around the status and positioning of Photonics in the next framework programme Horizon Europe and the future scope and focus.

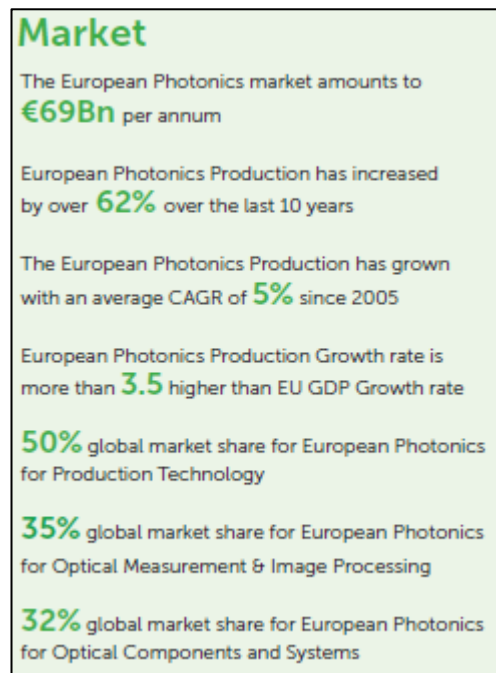
3. Monitoring of the overall progress since the launch of the cPPP

3.1 Achievement of the goals of the cPPP

The general objectives of the Photonics cPPP are **(1) to foster photonics manufacturing, job and wealth creation** in Europe through a long-term investment commitment by both industry and the European Commission; **(2) to Accelerate Europe’s innovation process** and time to market by addressing the full innovation and value chain in a number of market sectors where European photonics industry is particularly strong; as well as **(3) to mobilise, pool and leverage public and private resources to provide successful solutions for some of the major societal challenges facing Europe**. On the basis of a multi-annual roadmap, the cPPP Parties intend to develop and implement a multi-annual research and innovation agenda with the specific objectives of a) *Improved Competitiveness*; b) *Strengthened Innovation* as well as c) *Socio-Economic Benefits*.

Improving Competitiveness of European Photonics (Objective a)

As highlighted in last year’s cPPP Progress Monitoring Report¹⁸, the “Market Research Study Photonics 2017”¹⁹ as well as the “PPP Impact Report 2017”²⁰ underlined that the efforts made to increase the production capacity and to strengthen the competitive capabilities of Europe’s photonics industry have paid off. The main figures related to these positive effects are summarized in the next charts.



Photonics Public-Private Partnership: Market-related figures.

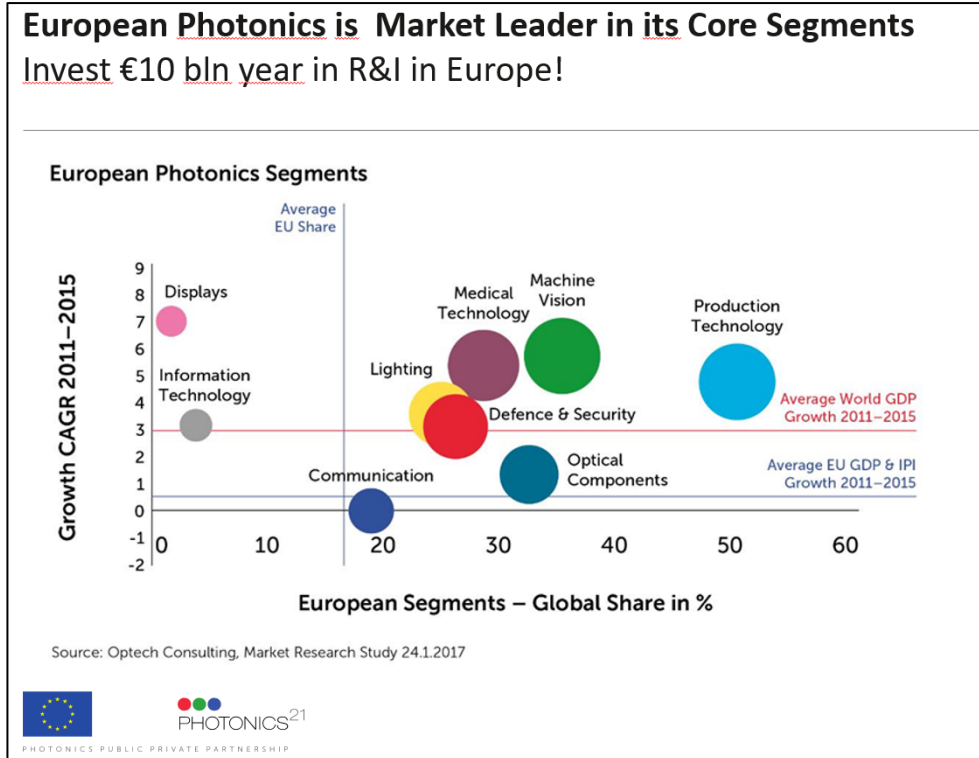
Source: PPP Impact Report 2017.²¹

¹⁸ European Technology Platform Photonics21 c/o VDI Technologiezentrum GmbH, Photonics21 Secretariat (2018): Photonics cPPP Progress Monitoring Report 2018, Düsseldorf.

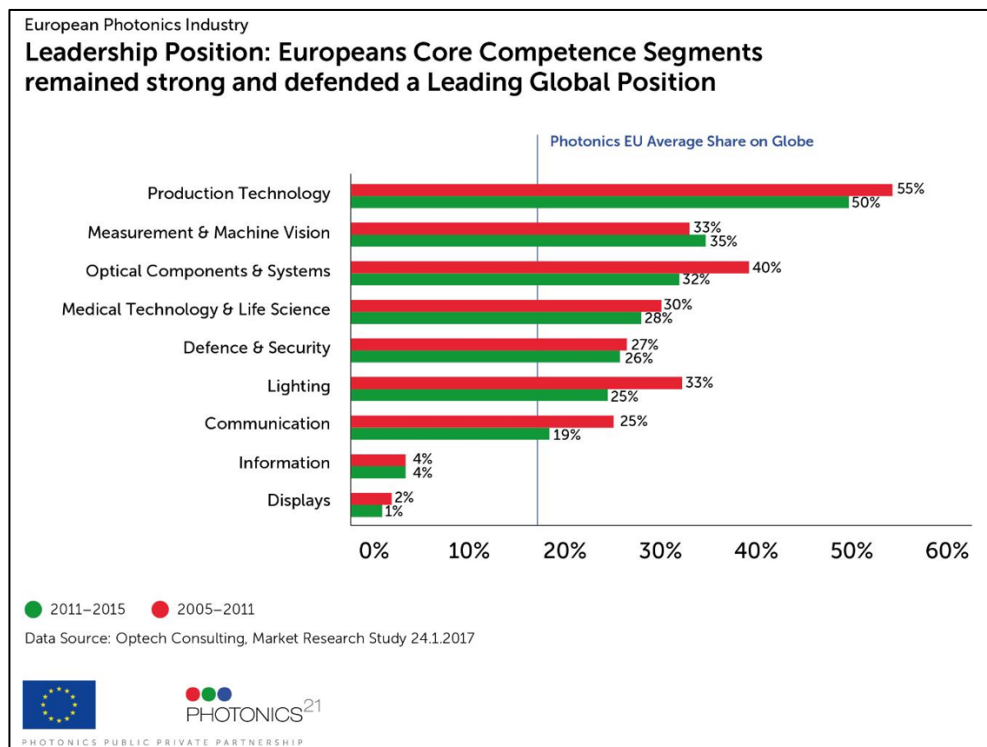
¹⁹ European Technology Platform Photonics21 c/o VDI Technologiezentrum GmbH, Photonics21 Secretariat (2017): Market Research Study, Photonics 2017, Brüssel / Düsseldorf / Tägerwilen, May 2017.

²⁰ European Technology Platform Photonics21 c/o VDI Technologiezentrum GmbH, Photonics21 Secretariat (2017): Jobs and Growth in Europe – Realizing the potential of Photonics, PPP Impact Report 2017, Düsseldorf.

²¹ European Technology Platform Photonics21 c/o VDI Technologiezentrum GmbH, Photonics21 Secretariat (2017): Jobs and Growth in Europe – Realizing the potential of Photonics, PPP Impact Report 2017, Düsseldorf. P. 11.



Photonics cPPP: Contributing to ensuring high long-term growth in European core photonics segments
Source: VDI TZ GmbH.



Photonics cPPP: Consolidating european leadership in core competence segments
Source: VDI TZ GmbH.

Despite the fact that a new full-fledged market research study was not done in 2018, there are indications that the solid growth trend of the photonics industry is tracking on. The German Industry Association “Spectaris” reports in their trend analysis for 2018 that the 1000 companies in the field of optical technologies expect a growth 8-9 % in 2018 accompanied by an increase of employment of > 5 %.²² (Verweis auf <https://www.spectaris.de/fachverband-photonik/zahlen-fakten-und-publikationen/>)

Strengthening the innovation capacity of the European photonics industry (Objective b)

PPP Pilot Lines and Prototyping Projects - Boosting industry's digital innovation capacities and bridging the valley of death

The Pilot Lines funded in the frame of the cPPP intend to give European industry access to photonics solutions and manufacturing, allowing the opportunity to test and validate ideas and new products prior to market entry. SMEs are a specific target since they often lack the financial resources and the infrastructure needed to bridge the gap between ‘lab and fab’ and to develop, test and manufacture new products. Following pilot lines have been established so far:

- PIXAPP - PIC assembly and packaging pilot line, focusing on silicon photonics
- PIX4Life - visible-light detection and imaging systems for biomedical applications.
- PI-SCALE - pilot line for organic LEDs (OLEDs)
- MIRPHAB – fabrication of mid-IR photonic sensors for chemical sensing and spectroscopy

At the end of 2018, two new pilot lines were created: the Open-Innovation Photonics pilot for North-West Europe (OIP4NWE), a €13.9 million project supported by the Interreg North-West Europe program and the other InP pilot line, InPulse, that will be funded through the Horizon 2020 E.U. framework program via the Photonics Public-Private Partnership (PPP).²³

In addition to these Pilot Lines, 3 PPP Prototyping Projects were created over the last years, providing development support, mentoring and prototyping services to companies. The ongoing project ACTPHAST 4.0²⁴ provides photonics and non-photonics companies and researchers with one-stop-shop access to a wide range of existing cutting edge photonics technology platforms from Europe’s top research centres. The ACTPHAST4.0 network offers a single streamlined way to access 200 of the best experts and technologies from 24 of Europe’s leading photonics research institutes, covering the entire supply chain to accelerate the demonstration of exciting new scientific breakthroughs towards a working prototype. Statistics collected by the Photonics PPP project ACTPHAST 4.0 and its predecessor ACTPHAST to measure its impact on European innovation are quite impressive: up to now, 93 innovation projects have been promoted. The supported companies came from 18 EU member states and 91% of them were SMEs. ACTPHAST 4.0 and ACTPHAST have reached companies beyond the Photonics sector: 48% of the companies supported are “non-photonics companies” of various sectors (e.g. healthcare, transport, consumer goods, industrial manufacturing, etc.). With the support of ACTPHAST, 31% of the companies supported are able to conduct an innovation process in photonics for the first time and they could achieve an advancement of 2 levels of TRL scale thanks to the support by ACTPHAST.²⁵

The European Commission’s Innovation Radar lists while searching “Photonics”²⁶ 51 innovations labeled as “great” and developed from 64 Innovator Organizations, which they classify along the categories “Excellence Science”, “Deep Tech”, “Enabling Technologies and Components”, “Industrial Technologies” and “Secure Networks and Computing”.

²² <https://www.spectaris.de/fachverband-photonik/zahlen-fakten-und-publikationen/>

²³ https://www.osa-opn.org/home/industry/2018/december/photonic_pilot_lines_expand_in_europe/, last accessed on 2019/03/15.

²⁴ <https://actphast.eu/>.

²⁵ ACTPHAST 4.0 (2018): Accelerating Photonics innovation for SMEs: a one-stop-shop-incubator, <https://actphast.eu/sites/default/files/uploads/presentation/actphast-4-0-presentation.pdf>, last accessed on 2019/05/13.

²⁶ See: European Commission – Horizon 2020 – Innovation Radar under <https://www.innoradar.eu/>.

End user industry involvement in PPP projects ensures quick market uptake of innovation²⁷

One of the strengths of the European Photonics industry lies in having global market leaders in several core industrial segments as well as in already established links with application industries – this was one of the findings of the SWOT-analysis of the European Photonics industry, as conducted by the EC a few years ago. The Photonics PPP aimed to build on this strength and promote the involvement of end-user industries in the PPP projects.

Photonics21 and its partners are holding regional end-user industry workshops, e.g. “Photonics for Smart Farming” or “Photonics for Industry 4.0” in photonics future market areas. End user industry workshops will serve two purposes. It will provide an opportunity to get direct feedback from end-user industry on the photonics industrial strategy. These workshops will furthermore establish links and synergies between photonics SMEs as technology providers and end-user industries in the regions, to set up new collaborations and to foster broader deployment of photonics innovation. The National Technology Platform consortium partners responsible for the individual workshops will share the results and feedback of each workshop with the Photonics21 community as part of the Photonics21 strategy development process. Strategic partnerships of end-user industry companies and photonics startups are an effective approach enabling growth of start-ups by getting into contact with first customers.

By the end of 2018, 4 end user workshops had been conducted. This is very much in line with the aim of 15 workshops throughout the whole project. To maintain a common branding we had developed a corporate design for these workshops. Through the Photonics21 website the workshops were announced and could also be shared in other channels. For quantifying the impact of the end user workshops, a questionnaires were developed in 2016. Using this questionnaires the success can be measured and compared to other workshops. Below, the end user workshops conducted in 2018 are presented

Overview end-user workshops conducted 2018:

Partner	Title	Location	Date
VSLP	Photonics 4 European Industry of the Future	Geneva	13.6.2018
UPC	Photonics 4 Ceramics	Castellon	05.07.2018
JSP	Photonics 4 Forestry	Koli	10.10.2018
PA	Photonics 4 Industrial Production	Vienna	29.10.2018

Source: VDI TZ GmbH.

Member States start joint Photonics call under the EUREKA scheme: Activities of the Photonics21 Mirror Group

MIRROR GROUP OF THE



PHOTONICS PUBLIC PRIVATE PARTNERSHIP



The Mirror Group constitutes the public side of the industry-led Photonics21 Board of Stakeholders. It supports and reflects, or “mirrors”, the activities of Photonics21 at a policy level and from a governmental perspective.

The Mirror Group was established in July 2007. It is composed of representatives from relevant European, national and regional public authorities such as ministries involved with research and innovation, funding agencies and the European Commission. In general, the Mirror Group functions as an inter-governmental panel for exchange, discussion and concerted planning on photonics-related research policy in Europe.

²⁷ European Technology Platform Photonics21 c/o VDI Technologiezentrum GmbH, Photonics21 Sekretariat (2019): Photonics21 – Photonics PPP Annual Activity Report 2018.

In 2018, the Photonics21 Mirror Group prepared the first joint EUREKA / Photonics21 Mirror Group call Photonics for advanced manufacturing, which has been published on 25th March 2019.



The participating bodies from Austria, France, Germany, Israel, Poland, Switzerland and the United Kingdom have launched the joint call for proposals Photonics for advanced manufacturing, which intends to fund joint research and development in the area of photonics. Applicants are expected to undertake research aiming at marketable products, services or technologies with high market potential in the participating countries and/or Europe. This call will be administered under the regulations of the intergovernmental EUREKA network.

Photonic technologies to be investigated particularly include (but are not limited to):

Laser machining, additive manufacturing, selective laser sintering, photonic curing, optical process control / process analytical technology (PAT), 3D optical sensing and imaging incl. spectral and hyperspectral imaging, millimeter wave imaging and lidar, lithography (photo-, stereo-, laser-based).

Industry sectors addressed particularly include (but are not limited to):

Electronic and computer components, electro-mechanical engineering, transportation and automotive manufacturing including for sport competition, aviation/aerospace, material, chemical and pharmaceutical industry, food control industries, safety and quality engineering and manufacturing technologies.

This initiative continues the cooperation within the Photonics21 Mirror Group comprising research funders in the field of photonics in Europe (including associated countries) who in the past jointly implemented a number of transnational calls under the ERA-Net / Cofund scheme of the EC research framework programmes.

Further information on the call is available on the Photonics21 website
<https://www.photonics21.org/news/>.

Socio-Economic Benefits of the Photonics cPPP (Objective c)

The following figures which were presented in the “PPP Impact Report 2017” underline the positive contribution of the photonics cPPP in terms of jobs creation and preservation. More details on this topic can be found in last year’s cPPP Progress Monitoring Report²⁸.



Socio-economic figures related to the Photonics cPPP.

Source: PPP Impact Report 2017.²⁹

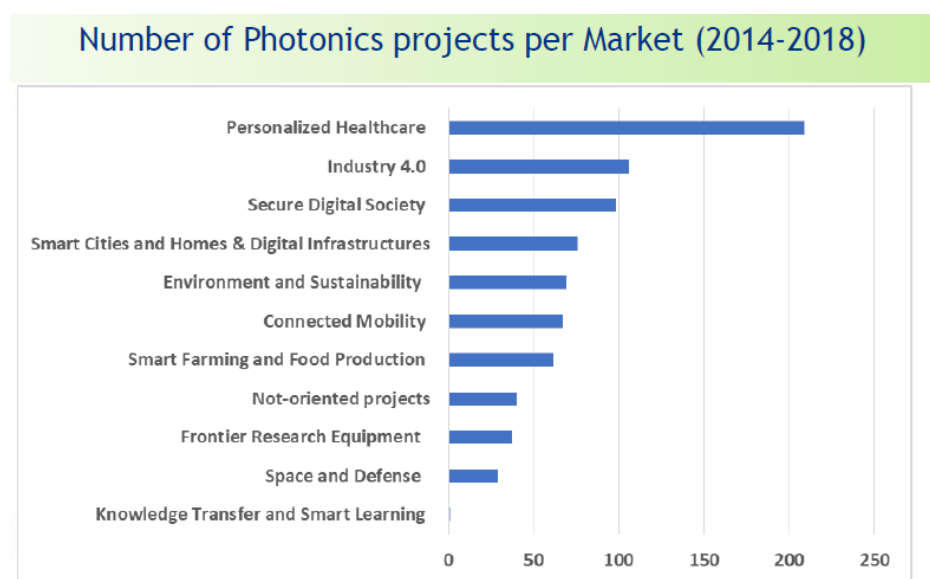
²⁸ European Technology Platform Photonics21 c/o VDI Technologiezentrum GmbH, Photonics21 Secretariat (2018): Photonics cPPP Progress Monitoring Report 2018, Düsseldorf.

²⁹ European Technology Platform Photonics21 c/o VDI Technologiezentrum GmbH, Photonics21 Secretariat (2017): Jobs and Growth in Europe – Realizing the potential of Photonics, PPP Impact Report 2017, Düsseldorf. P. 11.

Photonics cPPP PMR 2018 –Monitoring of the overall progress since the launch of the cPPP

Furthermore, the issue of skills creation and lifelong learning in photonics, which is absolutely essential to support the growth in the long-term of the European Photonics segment, is / was at the core of several cPPP Projects which have been funded over the last years³⁰. More details on the aspect can be found in §3.2 when focusing on the Common Priority Key Performance Indicators.

Photonics plays an essential role when coping with major current and future socio-economic challenges, as highlighted by a study carried out in fall 2017 and published in 2018³¹: as a matter of fact, Photonics related projects can be found in almost all H2020 programmes and they cover all application markets of high relevance for tomorrow's society and economy from personalized healthcare, industry 4.0, smart cities to securing the digital society, connected mobility – to name but a few. Furthermore, Photonics plays indeed the role of an enabling technology for new and innovative products, services and developments in areas far beyond obvious lighting application fields. This analysis on the role and contribution of Photonics in past and current H2020 projects has just been updated and the update shows: the conclusions drawn in 2017 are still valid – as highlighted in the following charts:

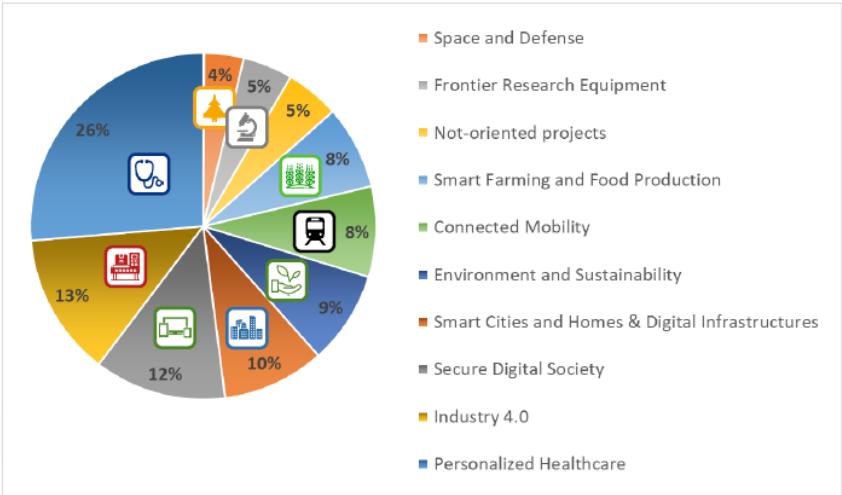


Source: Tematys, 05/2019, to be published.

³⁰ For more details, please refer to: European Technology Platform Photonics21 c/o VDI Technologiezentrum GmbH, Photonics21 Secretariat (2018): Photonics cPPP Progress Monitoring Report 2018, Düsseldorf.

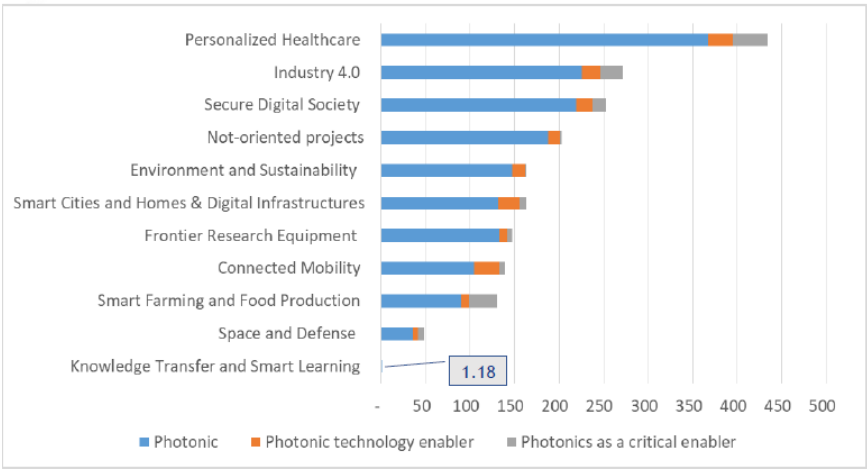
³¹ European Technology Platform Photonics21 c/o VDI Technologiezentrum GmbH, Photonics21 Secretariat (2018): Photonics – a critical Key Enabling Technology for Europe – Role and impact of Photonics in H2020, Düsseldorf / Paris. For more details on the results of the study, see Annex Part 6.

Number (%) of Photonics projects per Market (2014-2018)



Source: Tematys, 05/2019, to be published.

Allocated Grant (M€) per Market (2014-2018)



Source: Tematys, 05/2019, to be published.

3.2 Measuring progress: Key Performance Indicators

In order to measure the overall progress of the Photonics cPPP, to control the bold commitment of the European Photonics industry, but also the functioning of the PPP itself, Key Performance Indicators (KPIs) were laid out in both the Horizon 2020 regulations as well as in the PPP contract. The KPIs cover the impact of the Photonics cPPP on the Industrial Competitiveness and Economy, its socio-economic impact as well as some operational aspects of the PPP (efficiency, openness and transparency of the PPP Consultation Process) and some performance aspects (a. o. time to contract, levels of response to calls, progress against technology roadmap timetable, Participation of Industry & SMEs in PPP projects).

The list of Key Performance Indicators presently used is given in the Annex – Part 1. Some of the KPIs are common to all cPPP under Horizon 2020 (*Common Priority Key Performance Indicators*), some of them were specifically designed for an individual or several cPPPs (*Specific Key Performance Indicators for the Photonics cPPP*), and some of them deal with the PPP contribution to programme goals (*Programme Level Key Performance Indicators*).

As in the past, the evaluation of the Key Performance Indicators (KPIs) has been performed combining desk research, additional market and impact studies on behalf of the Photonics²¹ Secretariat/Association as well as via an online survey among the project coordinators of past and current Photonics PPP projects. Additionally, some interviews were carried out with selected SMEs in order to assess the specific impact of the Photonics cPPP on SMEs.³² The table below gives an overview of the SME interviews planned or already done.³³

Overview of SME interviews planned and status³⁴:

Name of the SME	Country	Status
MirSense	France	Interview done
New Infrared Technologies	Spain	Interview done
Technobis	Netherland	Interview done
VLC Photonics	Spain	Interview planned
VIGO Systems	Poland	Interview planned
Ficontec	Germany	Interview to be planned

Source: Tematys, 05/2019.

Online Survey – Methodology & Main results

The online questionnaire was based on the questionnaires used in the past but refined in March/April 2019 in order to take into consideration the EC evaluation of last year's cPPP Progress Monitoring Report, in particular regarding the evaluation of the common Priority Key Performance Indicators. The survey was carried out in April 2019.

Number of survey participants and response rate

Within Horizon 2020, the Photonics PPP conducted 100 projects with a total funding close to € 460 mio. (cf. §3.3). In total, 1017 project partners participated in these 100 projects, some partners of course participating in different PPP Projects, so that the number of different affiliations involved in PPP Projects was about 600.

³² Parts of these tasks have been subcontracted to Tematys.

³³ Interviews that have not been done yet will be added to the report in the next weeks and the report will be updated.

³⁴ The number of SMEs that have been contacted for an interview exceeds the number of SMEs presented in the table, but unfortunately many requests have not been answered.

Photonics cPPP PMR 2018 –Monitoring of the overall progress since the launch of the cPPP

The online questionnaire was addressed to all current and past photonics PPP Projects coordinators and – and this is an important difference compared to the methodology used the years before – the project coordinators were asked to forward the online questionnaire to *all project partners*. Involving not only projects coordinators in the survey, but also partners which are only responsible of parts of the projects, enables to get more various insights on individual experiences and effects of the Photonics cPPP, in particular, at company level. We called on 100 Projects Coordinators to answer the 38 questions of the Online Survey, unfortunately 7 project coordinators could not be reached due to change in jobs or retirements and inability to find a successor or a valid new email address.

In total we got 130 responses in the time from April 8th to May 11th 2019, representing 45 different projects³⁵, 31 being still ongoing whereas the other 14 have been already completed. This represents a quite good response rate – 45% of all Photonics cPPP addressed and 48% of all projects actually reachable per email – for this type of online survey, especially against the background of having many Photonics cPPP projects completed in the meantime and the persons involved in these projects being no longer available and/or not willing to take part in such a study.

Accuracy vs. limitations of the online survey

Companies account for 46% and RTO/Universities and research for 47% of all answers, the remaining 7% relate to “other” organizations like associations, etc. These figures should be put in relation with the number of industrial participants in Photonics cPPP projects in the period 2014-2018 (cf. tables below):

- RTOs and Universities displayed with 47 % the highest response rate – slightly above their percentage of participation (41 %) in PPP projects.
- Industries account for 55% of all participations in cPPP Photonics projects, but only for 46% of all respondents. Companies are therefore – as could have been expected – slightly underrepresented in the survey outcomes, however the divergence is still within an acceptable range and it can be expected that this will not affect the validity of the results of the online survey.
- More specifically, SMEs displayed a response rate of 34% - fairly above the 27% of participation in PPP Projects- whereas the response rate of large companies is with 12% far below the actual participation of big companies in PPP Projects (28%). This means that SMEs are quite *overrepresented* and big companies significantly *underrepresented* among the survey respondents. There might therefore be a slight bias regarding the analysis of companies’ answers, and this should be beard in mind. However, given the fact that one of the focuses of this year’s questionnaire was to get more reliable information of the impact of the PPP of SMEs than it had been done in the past years, the bias towards SMEs in the among the companies’ respondents may even be positive.

Distribution of funding and project participants in Photonics cPPP projects:

Period	2014-2018
Total Funding for Projects (in €)	459 645 834
Number of Participants in Projects	1017
Industrial Participation (# of Companies)	556
% of total participants	55%
of which are SMEs (# of SMEs)	275
SME % of industry participants	50%
SME % of total participants	27%
Budget for Industry (in €)	201 461 240
% of total funding	44%

Source: European Commission, DG CONNECT, 03/19.

³⁵ For 2 of the 130 answers collected, the name of the project the respondent is participating in was not given.

Comparison between survey responses and Photonics cPPP Participation per type of organization:

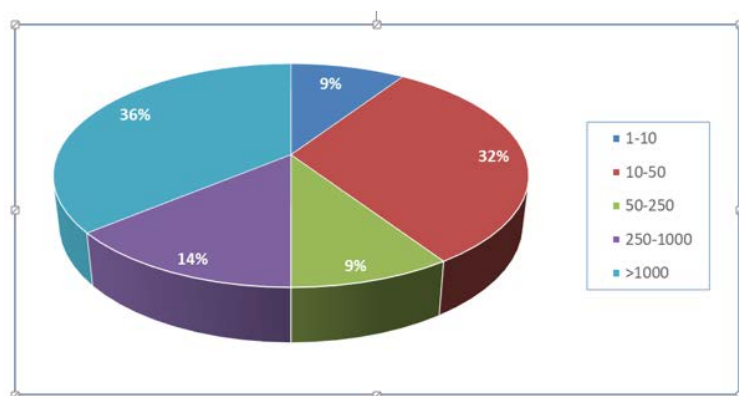
	Survey Respondents		Participations	
	Number	%	Number	%
SME	44	34%	275	27%
Big company	15	12%	281	28%
RTO/University/Research	61	47%	415	41%
Other	10	8%	46	5%
<i>Total</i>	<i>130</i>	<i>100%</i>	<i>1017</i>	<i>100%</i>

Source: Tematys, 05/19.

Structure of Photonics industry vs industrial structure in the Photonics PPP

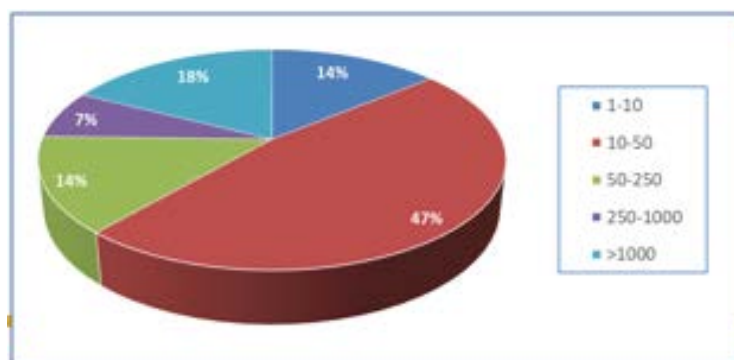
It is interesting to note that the structure of companies involved in the Photonics PPP is slightly different from the structure of the overall Photonics industry in Europe³⁶:

- Very small companies (<10 employees), representing about 50% of all Photonics companies in Europe, represent only 9% of the companies involved in Photonics PPP Projects – but 14% of the survey respondents from the industry;
- Very big companies (>1000 employees), representing only 4% of all Photonic companies in Europe, account for 36% of the companies involved in Photonic PPP Projects – and for 18% of all survey respondents from the industry.



Distribution of the companies involved in the Photonics cPPP projects – per size

Source: Tematys, 05/2019.



³⁶ Estimations by Tematys, Stand: 05/2019.

Distribution of the companies per size among the survey respondents

Source: Tematys, 05/2019.

We present an overview of the results of the survey in the following; more details can be found in the Annex Part 4.

Expected growth in the next 3 years

With regard to the growth expectations following the project within the next 3 years the SMEs expect a much higher growth than the larger companies (or are more optimistic). On average the value for SMEs is 22.2% of expected growth (turn-over) whilst the larger industries only expect a growth of 7.7%. The average expected growth for all companies is therefore about 15% over 3 years – which is fairly in line with the overall photonics industry CAGR of 5% (cf. §3.1 Competitiveness). Interestingly, the SME expectations are quite uniform and independent of the company size.

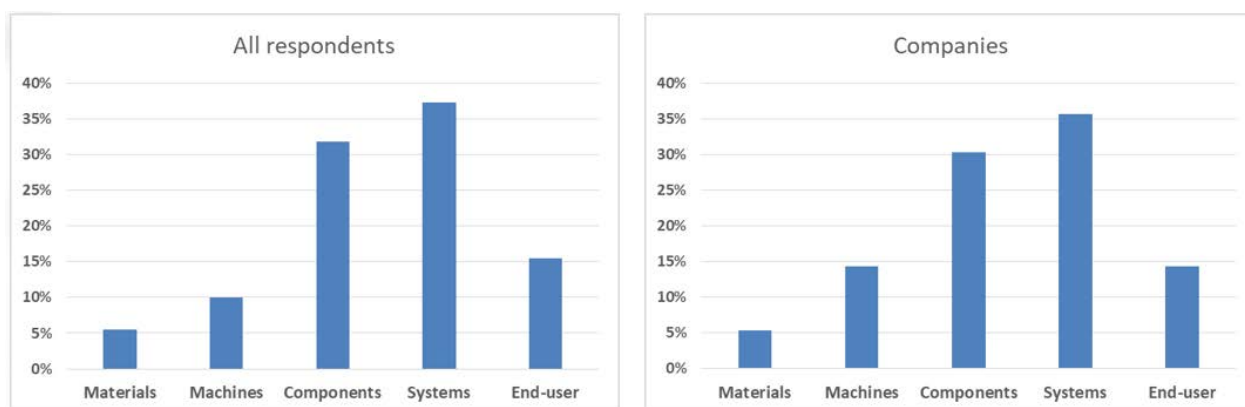
Expected Growth in the next 3 years – according to company respondents:

Expected Growth	Big companies	SMEs
No growth	13%	2%
1-5 %	27%	10%
5-10 %	40%	19%
10-20 %	13%	21%
20-30 %	7%	21%
>30%	0%	26%
Average	7.7 %	22.2 %

Source: Tematys, 05/2019.

Value Chain exposure of the Project Participants

Comparing the activities along the Photonics Value chain, the project participants demonstrate a close working together from Science to Industry as the pictures below show a very similar focus on materials, machinery, components, systems and End Users.



Activities along the value chain – all respondents vs companies

Source: Tematys, 05/2019.

New systems and/or technologies developed in PPP Projects

The average number of new systems or technologies developed is 3,3 per project. By nature – high numbers come from the pilot lines. The zero numbers are mainly related to CSAs or Associations. For more details, cf. Annex Part 4, slides related to Question 10 of the survey.

Patents applied linked to the PPP Projects

The average is around one patent applied per participant. 50% of the survey respondents declare to not apply for any patent in relation to the PPP project. These figures may seem quite low, but it should be kept in mind that 1) some respondents are coming from CSA that do not develop any patentable component or process; 2) many companies may prefer to have applied for a patent before starting a project and sharing their knowledge with other consortium partners; 3) the number of patents usually applied for in Photonics might depend on the Photonics segment, suggesting that this figure might not be representative for the overall Photonics industry. For more details, cf. Annex Part 4, slides related to Question 11 of the survey.

Commercialization – Time to market

Around 44% of the respondents declare that they will at the end of the project either directly be able to sell a product or to follow up with a prototype – corresponding to a TRL-level of 8-9. Even among those respondents declaring to need some more developments, more than 50% estimate the time-to-market to be 1-2 years after completion of the PPP project – corresponding to a TRL-Level of about 7. These figures suggest that there was quite a step done towards a higher TRL level and that the H2020 target to have more innovations brought to the market has been (at least partly) reached. For more details, cf. Annex Part 4, slides related to Questions 13 and 14 of the survey.

Midterm - Investment in new Assets

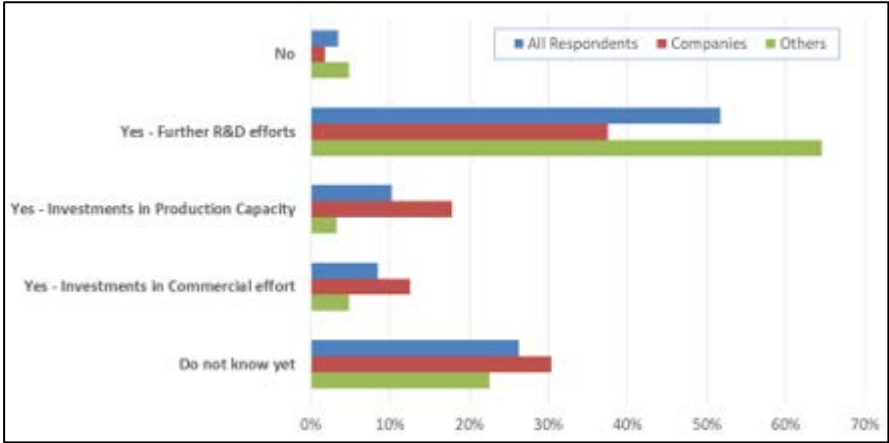
Most (about 70 %) of the Project Participants plan to invest in new assets within the 3 years following the projects. 27 % do not know yet – what can be due to the fact that in larger companies the Strategic Planning for new capacities is divided from those departments involved in the projects. Interestingly, the proportion of companies planning to invest is quite the same both for SMEs and for big companies.

A majority goes to R+D efforts followed by Production capacity and also Commercial Efforts.

Comparing Companies and RTOs – by nature the investment in Production capacity and Commercial efforts are higher in the company area and the Scientific Area shows more investment in the R+D efforts.

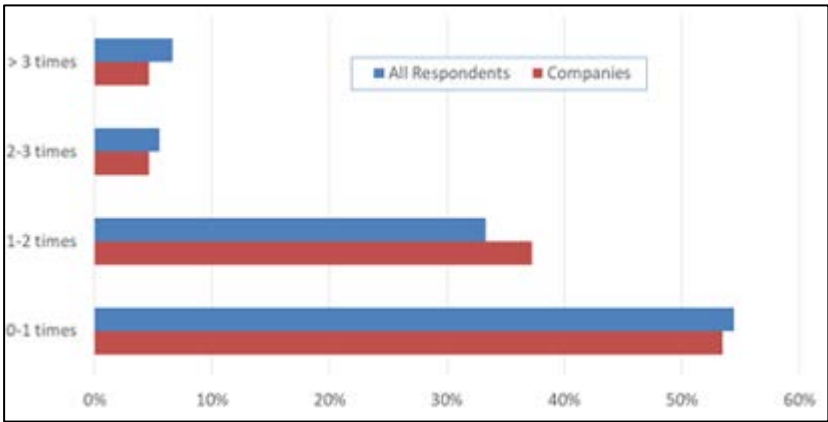
With regard to the multiple of the Project Budget, the most respondents say they will spend 1-3 times – a bit different when looking into multiples for R+D, Production capacity and Commercial Efforts.

For more details, cf. Annex Part 4, slides related to Questions 22-26 of the survey.



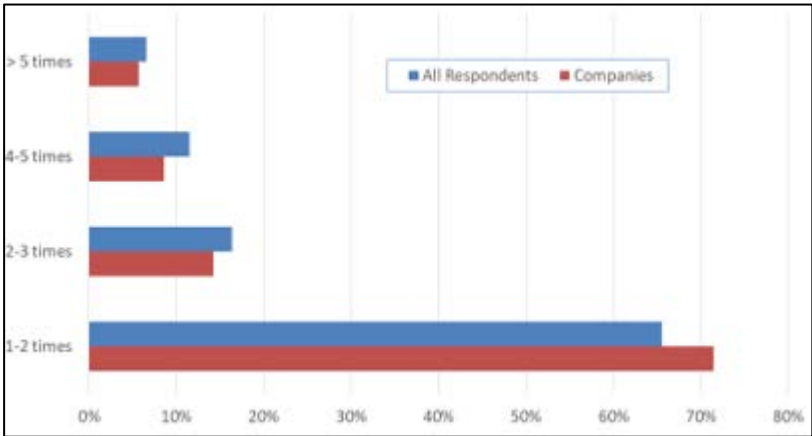
Investments planned in the follow-up of the project.

Source: Tematys, 05/2019.



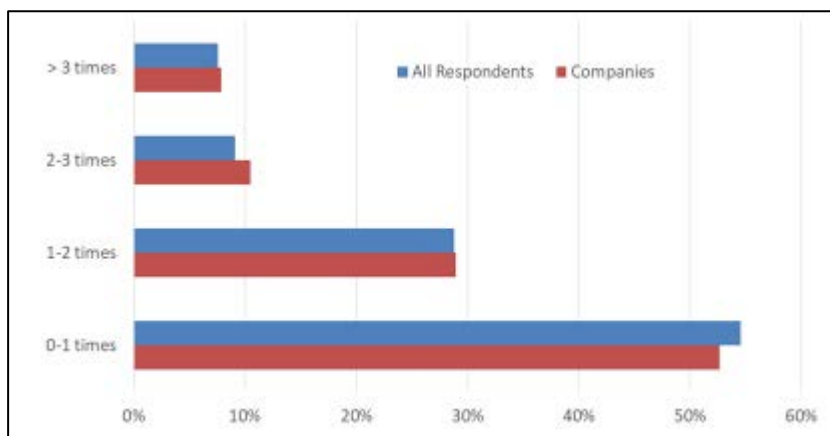
Investments planned in R&D in the follow-up of the project – as a multiple of the project grant.

Source: Tematys, 05/2019.



Investments planned in production in the follow-up of the project – as a multiple of the project grant.

Source: Tematys, 05/2019.



Investments planned in commercial efforts in the follow-up of the project – as a multiple of the project grant.

Source: Tematys, 05/2019.

Cross cutting Effects of projects with other areas

A high percentage of about 85 % of Project Participants expect positive effects from the Horizon 2020 project to their other activities. Only 5 % neglect such effects. For more details, cf. Annex Part 4, slides related to Question 29 of the survey.

New Jobs created as follow up from the Project

Most Project Participants (about 70%) claim that they will create new jobs as a follow up from the project. The number is, however, lower for big companies (about 45%) which may have the following reasons: either the people involved in the projects have no idea about the resource planning which normally is done by other departments; and/or large companies always have a trade of matured products and “cash cows” which also require a resource shift and re-allocation to the new products instead of creation of new jobs.

In the short term – means directly related to the project – the majority claim to create 0- 5 jobs – only a very few claim to have more than 5 jobs to be created.

With regard to the functions needed when creating new jobs there is a broad variety of answers covering – aside from the R+D functions - also such cross cutting jobs like quality management, IT skills, Marketing skills.

For more details, cf. Annex Part 4, slides related to Questions 27-28 and 31 of the survey.

Common Priority Key Performance Indicators

In the beginning of 2019, and based on the recommendations of the EC evaluators made in 2018, the methodology used to assess the 4 common priority Key Performance Indicators was refined by the Photonics21 Secretariat and the subcontractor Tematys, leading to the following definitions and methodological aspects.

Overview of methodology used for the calculation of the Common Priority KPIs:

KPI	Name of KPI/Indicators	Data used	Methodology
KPI C1	Mobilised Private Investments / Leverage		
	A1 - Direct Leverage 1	1	Direct calculation
	A2 - Direct leverage 2	2	Aggregate and scale figures
	B1 - Indirect leverage 1	2	Aggregate and scale figures
	B2 - Indirect leverage 2	4	Use Secondary data
KPI C2	Number of new skills and/or job profiles		
	Number of jobs created or forecasted	2 & 4	Aggregate and scale figures Compare/use Secondary data
	New job profiles and skills	2 & 3	Survey and complement with interviews
	Exemplar case studies	3 & 4	Interviews + Clusters reports
KPI C3	Impact of a cPPP on SMEs in Euros/Qualitative analysis		
	Participation rates of SMEs	1	Direct calculation
	Map the SME community	2	Aggregate and scale figures
	Inclusion of some examples	3 & 4	Interviews + Clusters reports
KPI C4	Significant Innovations		
	Number of innovations including products, processes, methods, technologies ...	2	Aggregate and scale figures
	Inclusion of some examples	3 & 4	Interviews + associations reports

Source: VDI TZ GmbH / Tematys, 05/2019.

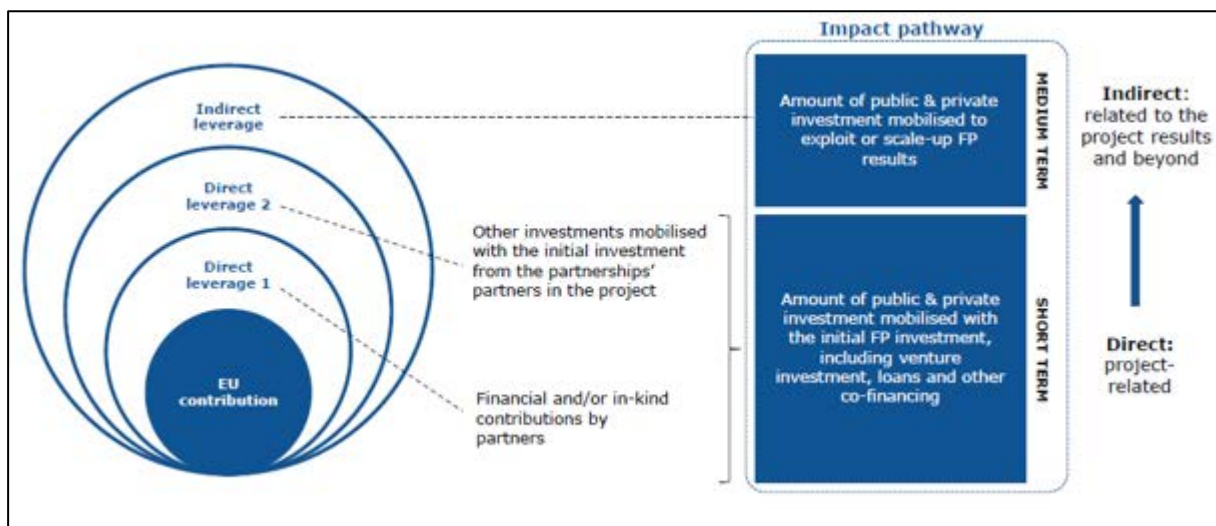
KPI C1: Mobilised Private Investments / Leverage

The leverage of private investments, including expenditure linked to funded projects, is one of the core reasons for the public side to agree upon a public-private partnership. Therefore a representative approximation of the level of industrial engagement within a given cPPP must be estimated and presented. The data provided should contain information at two levels:

- Total amount of actual private expenditure mobilised in cPPP projects;
- Estimation of private investment mobilised in other R&D activities related to the cPPP, including investments after end of the projects.

With regard to the potential leverage effects of the cPPPs, several types of leverage have been defined (s. figure below):

- Direct Leverage A1 defined as the financial and/or in-kind contributions by partners to support project execution. This corresponds to direct investment in funded actions and can be measured in Cordis as the difference between total cost of a project and EC contribution (provided cPPP projects can be identified in Cordis)
- Direct leverage A2 defined as all other investments mobilised with the initial investment from the partnerships' partners in the project to support project execution. This relates to expenditures not covered by direct funding and not recorded in Corda.
- Indirect leverage: defined as the investment mobilised to exploit or scale-up results (i.e. generated thanks to the projects, but not supporting the projects themselves). Two parts need to be differentiated:
 - Indirect leverage B1: Data on the Follow-up of the project to be monitored via survey/interview to get a sample of data, then aggregate and scale figures at the level of the cPPP.
 - Indirect leverage B2: Data on the overall industry effort to be monitored via survey/interview to get a sample of data, then aggregate and scale figures at the level of the cPPP.



Definition of leverage effects

Source: EC, 2018.

Direct Leverage A1

The Leverage Effect A1 is about € 60 mio. – which corresponds with 30 % of the EC funding. The Calculations is as follows:

Budget/contribution	Total 2014-2018 (M€)
Total Budget	505 321 805
EC contribution	445 454 059
Total Industry contribution Leverage A1 (€)	59 867 746
Total EC contribution for Industry (€)	201 461 240
Leverage A1 (%)	29,7%

Remarks:

In H2020 projects :

- The total costs in CSA and RIA are paid 100% by EC (so 0% “Leverage” for industry),
- The costs in IA are paid 70% by EC for industrial partners (so 30 (industry) / 70 (EC) = 43% “Leverage” from industry).

The PPP projects can be CSA, RIA and IA. So the total leverage is between 0% and 43% and closer to 43% because there are more industrial partners in IAs.

Direct Leverage A2

Calculation:

- 1st Step:** Estimation of the percentage of Companies planning to invest in new assets or that did it already – based on the outcomes of the survey:

To reach project outcomes, did you have or do you plan to invest in new asset(s)?	Big companies		SMEs	
No	10	67%	25	61%
Yes	5	33%	16	39%
Total	15	100%	41	100%

- 2nd Step:** for those who invest, estimation of the average level of investment, as well as the part covered by the grant – based on the outcomes of the survey:

If yes, what is the level of investment?	Big companies					
< 100 k€	2	50%	37,5			
100 k€ - 500 k€	2	50%	150,0			
Total	4	Average investment	187,5			
If yes, what is the level of investment?	SMEs					
< 100 k€	11	58%	46,3			
100 k€ - 500 k€	5	26%	78,9			
500 k€ - 1 M€	2	11%	78,9			
1 M€ - 3 M€	1	5%	105,3			
Total	19	Average investment	309,5			
What is the part covered by the grant?	Big companies					
1-5 %	1	3	17%	0,5		
10-20 %	1	15	17%	2,5		
20-30 %	1	25	17%	4,16666667		
> 30 %	3	40	50%	20		
Total	6	Grant part %	27	Company part %	73	
What is the part covered by the grant?	SMEs					
1-5 %	3	3	14%	0,42857143		
5-10 %	4	7,5	19%	1,42857143		
10-20 %	4	15	19%	2,85714286		
20-30 %	2	25	10%	2,38095238		
> 30 %	8	40	38%	15,2380952		
Total	21	Grant part %	22	Company part %	78	

- 3rd Step:** scaling up the results of step 1 and step 2 at the level of the whole Photonics cPPP:

Period 2014-2018	Number of participations	% investing	Average investment (k€)	Companies part	Total investment (M€)	Companies part (M€)	Leverage factor
SMEs	275	39%	310	78%	33,2	25,9	3,5
Big companies	281	33%	188	73%	17,4	12,7	2,7
All companies	556	36%	250	76%	50,7	38,7	3,2
All respondents	1017	39%	310	72%	123,0	88,5	2,6

The direct Leverage Factor for all project Participants is therefore 2.6. For Industry it turns out to be 3.2 – whereas big companies display a leverage of 2.7 and SMEs a leverage of 3.5.

Photonics cPPP PMR 2018 –Monitoring of the overall progress since the launch of the cPPP

Summing up the results of the leverage A1 and A2, the private investment to support project executions is the following:

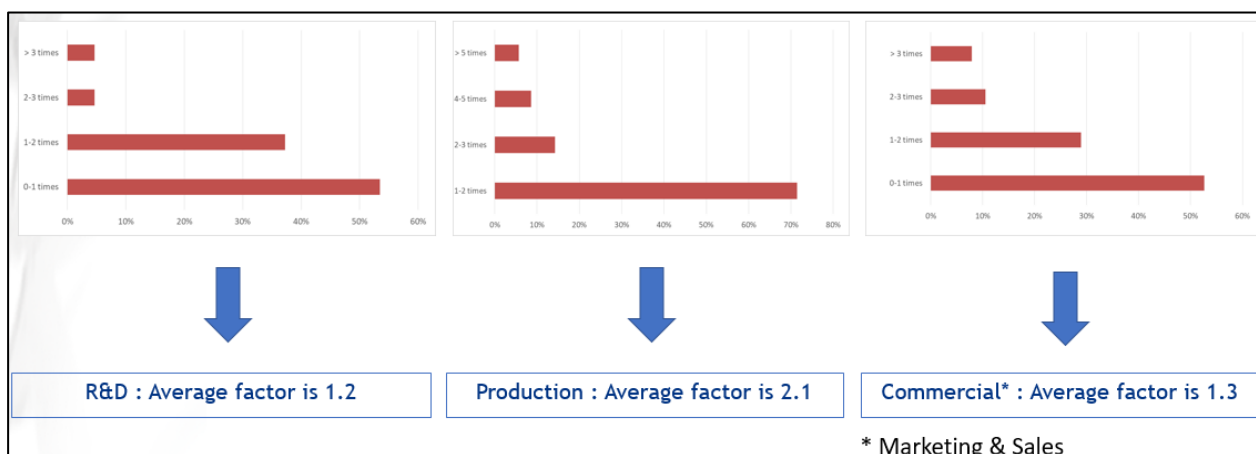
Leverage A1 / Industry contribution: 59.9 M€

Leverage A2 / Industry contribution: 38.7 M€

Total Leverage A / Industry contribution: 98.6 M€ (Total private investment in projects in the cPPP)

Relating these figures to the 201.5 M€ EC funding for companies over the period 2014-2018, the total leverage A amounts to 48.9% of this contribution.

Indirect Leverage B1:



Leverage B1: Investments planned in the follow-up of the projects.

Source: Tematys, 05/2019.

For EC contribution	100	➡ The total leverage factor is 5 !
Investment in Projects	50	
Follow-up in R&D investments	120	➡ This means that for 201.5 M€ which represents the EC contribution for companies : the total Leverage of investment by companies in the projects and in the follow-up of the projects is 5 times this amount.
Follow-up in Production investments	210	
Follow-up in Commercial investments	130	
Total Leverage B1	460	➡ The Total Leverage is 1 Billion € !
Total Leverage (A+B1)	≈ 500	

Calculation of the Leverage B1.

Source: Tematys, 05/2019.

Indirect Leverage B2: This indicator focuses on the overall industry R&D investment effort and, more specifically, on investments and resources spent that support the objectives of the cPPP and that have been triggered / encouraged by the existence of the cPPP, but that are not following up the activities or results of the cPPP Projects as such.

The Photonics cPPP aimed at **leveraging Research & Development in Photonics**.³⁷ Never before have the European Industry and European Policy worked so closely together in such an important technology domain. Acknowledging the importance of this Public-Private Partnership for fostering Photonics in Europe, the European Photonics Industry committed itself to increase significantly the level of private funding allocated to R&D in Photonics and, in particular, to match every Euro spent by the European Commission in the PPP with four Euro spent by Industry. The European Photonics industry also engaged to support SMEs and young workers through the creation of new jobs and skills.³⁷ In fact, and as the following figures already presented in last year's Progress Monitoring Report display, the measures taken have been efficient and lead to increased investments in Photonics R&D in Europe:

Nearly 10 billion EUR industry investments on Photonics Innovation in Europe in 2015³⁸: In total European Photonics Industry showed in 2015 Innovation Spending (R&D spending and Capex) in Europe in the size of € 9.6 billion – about € 6.4 billion for R&D spending and € 3.1 billion for Investment (Capex).³⁹

R&D intensity in the Photonics industry amounts to nearly 10%⁴⁰: On average, European Photonics companies spent in 2015 9.7% of their revenues for R&D. In addition, they invested in average 4.7% of their revenues (Capex / sales) bringing the total R&D and investment quota to 13.8%.⁴¹

Of course, the R&D intensity does vary, depending on the Photonics segment as well as on single companies. For instance, R&D intensity at ASML, the largest Photonics producing company in Europe, is very high, amounting to 17.7%. The R&D intensity is comparably high in the communication segment (e.g. 17.7% for Adva Optical and 16.6% for Alcatel Lucent). The situation is similar when considering the Capex / sales ratio, which is particularly high for companies “operating in product segments requiring costly manufacturing equipment and facilities”.⁴²

In fact, the R&D intensity of companies of the Photonics segment may vary from 3% to 18% and the Capex / sales ratio ranges from 2% to 11%.

R&D intensity in the Photonics industry much higher than in most other industry sectors⁴³: The European Photonics Industry is devoting much more funding to R&D than many other industry sectors do: the figure of 9.7% of its revenues spent by the European Photonics Industry for R&D has to be compared to the average industrial R&D intensity in Europe of about 3.2%⁴⁴. When differentiating by industry sectors, it appears – according to a PwC Study - that the R&D intensity in the European Photonics industry is much higher than in most other industry sectors – even beyond the Aerospace & Defence sector, the automotive sector, the Industrials sector, and the Chemicals & Energy sector.⁴⁵

³⁷ European Technology Platform Photonics21 c/o VDI Technologiezentrum GmbH, Photonics21 Secretariat (2017): Jobs and Growth in Europe – Realizing the potential of Photonics, PPP Impact Report 2017, Düsseldorf.

³⁸ Ibid.

³⁹ European Technology Platform Photonics21 c/o VDI Technologiezentrum GmbH, Photonics21 Secretariat (2017): Market Research Study, Photonics 2017, Brüssel / Düsseldorf / Tägerwil, May 2017.

⁴⁰ European Technology Platform Photonics21 c/o VDI Technologiezentrum GmbH, Photonics21 Secretariat (2017): Jobs and Growth in Europe – Realizing the potential of Photonics, PPP Impact Report 2017, Düsseldorf.

⁴¹ European Technology Platform Photonics21 c/o VDI Technologiezentrum GmbH, Photonics21 Secretariat (2017): Market Research Study, Photonics 2017, Brüssel / Düsseldorf / Tägerwil, May 2017.

⁴² Ibid.

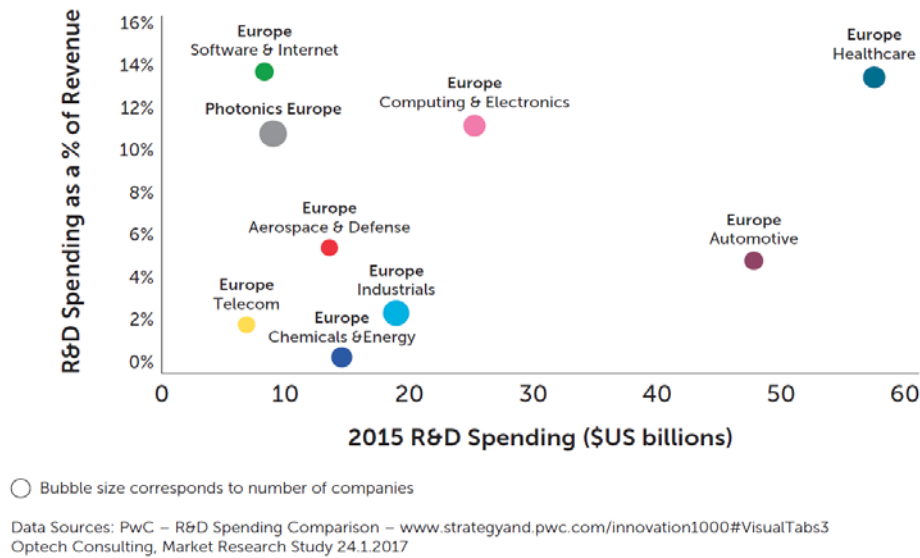
⁴³ European Technology Platform Photonics21 c/o VDI Technologiezentrum GmbH, Photonics21 Secretariat (2017): Jobs and Growth in Europe – Realizing the potential of Photonics, PPP Impact Report 2017, Düsseldorf.

⁴⁴ Cf. The 2016 EU Industrial R&D Investment Scoreboard.

⁴⁵ Cf. PwC, The 2016 Global Innovation 1000 Study: Comparison of R&D Spending by Regions and Industries, PriceWaterhouse & Coopers. <http://www.strategyand.pwc.com/innovation1000#VisualTabs3>, last accessed on 2017/02/22.

European Photonics Industry

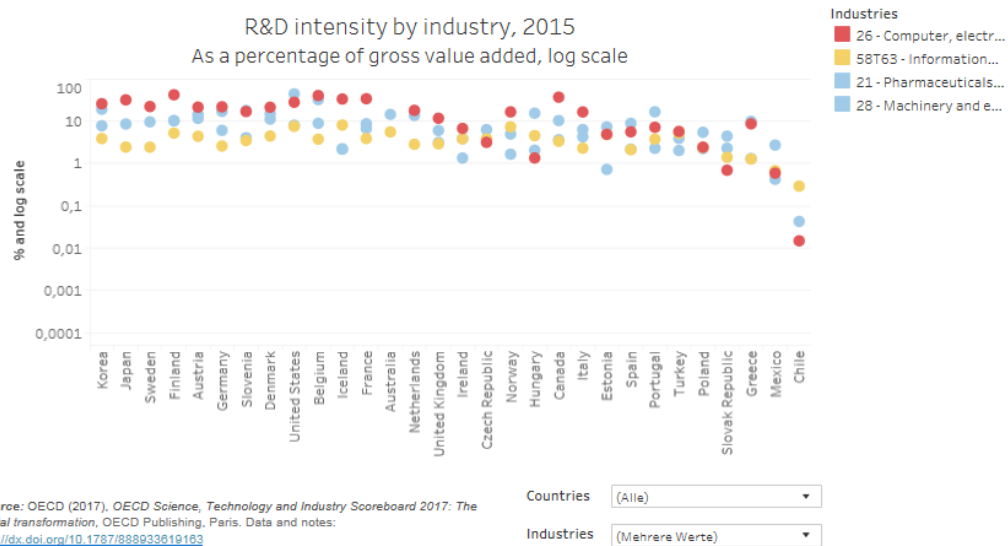
Photonics Industry well positioned in terms of R&D spending as percentage of revenue above Industrials, Chemicals & Telecom



R&D Spending in the Photonics Industry compared to other sectors

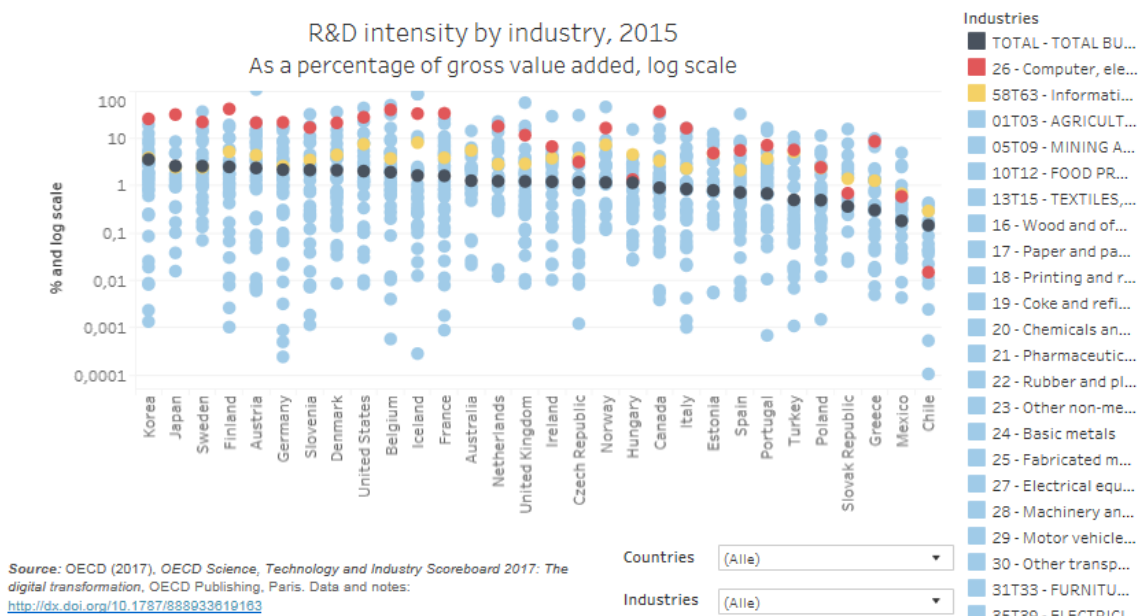
Source: Key Data Photonics Research Study 2017, <https://www.photonics21.org/ppp-services/photonics-downloads.php>

Also the OECD “BERD” analytics confirm the above average rate of most of the main photonics industries as being shown in the below interactive graphics for selected photonics areas compared with the entire industry.⁴⁶



International comparison of R&D intensity by industry – Focus on Computer, electronic and optical products (Cat. 26), Information and Communication (Cat. 58T63), Pharmaceuticals, Medicinal chemical and botanic products (Cat. 21) and Machinery and Equipment (Cat. 28). -

Source: OECD 2017, OECD’s Analytical Business Enterprise Research and Development (ANBERD) database: <http://www.oecd.org/innovation/inno/anberdanalyticalbusinessenterpriseresearchanddevelopmentdatabase.htm>, last accessed on 2018/09/06



International comparison of R&D intensity by industry – All industries considered

Source: OECD 2017, OECD's Analytical Business Enterprise Research and Development (ANBERD) database:
<http://www.oecd.org/innovation/inno/anberdanalyticalbusinessenterpriseresearchanddevelopmentdatabase.htm>,
 last accessed on 2018/09/06

KPI C2: New skills and/or job profiles

Of course, – and as underlined by the EC evaluators last year –, measuring the impact of the Photonics cPPP on job creation is quite challenging both due to the time lag effects as well as due to the complex interrelationship between influencing factors. However, several survey questions (cf. Annex Part 4, questions 27-28 and 31-34) allow to draw a picture of the effects of the Photonics cPPP in terms of jobs and skills:

In terms of job creations – during the project or as a direct follow-up of the project in the next 3 years – big companies declare the creation of 5.6 jobs in average per project (→ total 1570 at the scale of the cPPP) and SMEs declare the creation of 7.2 jobs in average per project (→ total 1980 at the scale of the cPPP). In total, the estimated number of jobs created in companies either during a PPP Project or as a direct follow-up of a project is therefore 3550.

Given that about 56% of the respondents plan to create 1-5 jobs in the next 3 years, as a direct follow-up from the project (cf. Q28), it is interesting to have a look at the type of jobs to be created (cf. Q 31):

- Not surprisingly, most of these planned jobs would be in the domain “R&D and application development” (nearly 80% of the responses).
- However, nearly 25% of the planned jobs could be related to “production and quality & safety control”, about 22.5% further jobs could be related to “sales and marketing” and nearly 18% further jobs could be created for “product management” → this may indicate that a specific product / component could achieve technical maturity and market readiness as a follow-up of the project.

What is quite interesting is the fact that the skills needed to bring the project results forward to the market are often already available in the company (40.22% of the respondents) or only need to be partly trained (46.74% of the respondents). In only 41.30% of the cases, there is a need for partly hiring new people with new skills. In very limited cases, only 4.35% of the respondents, the skills needed are not available at all in the company, requiring to completely hire new people.

Astonishing enough a high percentage of the project participants claim that skills needed are available in house or only need some training in-house to enable talent.

- A pretty similar – and also astonishing result we got whilst asking on the training needs. Only a very few people claimed that it needs entire new curricula and training.
- 46 % say that training is available and also easily accessible – another 38 % state that training exists but probably needs to be a bit extended and another 22 % thinks training exists but needs some update.

KPI C3: Impact of a cPPP on SMEs

According to the 2018 evaluators' assessment report, the purpose of this KPI is to understand the economic evolution of SMEs benefitting from the cPPP in quantitative and/or qualitative terms. Approaches suggested by the EC include the assessment of turnover and/or the mapping of the SME community represented by each cPPP. Based on the outcomes of the survey, the following figures and facts can be highlighted (cf. Annex Part 4):

- The SME participation in the Photonics cPPP projects amounts to about 27% of the overall industry participation – compared to 18.1 % for profit SMEs in all H2020 projects, 20.4% for all SMEs in H2020 projects and 23.3% in all projects resulting from ICT Calls (without SME instrument) – cf. table below. The cPPP seems on the one side therefore to be a very valuable instrument to mobilize SMEs and promote their involvement in R&D projects. On the other side, these figures underline the fact that the cPPP calls, which are the result of extensive discussions involving the whole Photonics21 players, do actually meet the needs of SMEs, leading to a bigger participation.
- SMEs involved in Photonics cPPP projects expect an average growth of 7% p.a. – compared to an average growth of about 3% in the overall photonics industry.
- 85% of the SMEs expect the project results to positively affect other areas of their company's activities.
- SMEs declare the creation of 7.2 jobs in average per project (cf. above).

Overview of SME participation in H2020:

Type	Program/call	Participation
All SMEs	H2020	20.4 %
For profit SMEs	H2020	18.1 %
All SMEs	ICT calls*	23.3 %
All SMEs	Photonics PPP	27 %

**Without SME Instrument*

Source: Tematys, 05/2019.

The results of the SMEs interviews carried out in May 2019 will be presented in the following. Of course, these are only some examples, without any claim of comprehensiveness. However, the experiences displayed in the following support the view that the participation in a Photonics cPPP project has a positive effect on SMEs involved.

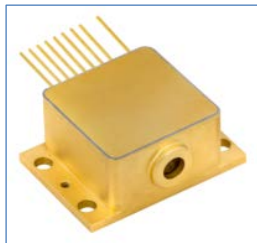
MirSense

France

<http://mirsense.com>



Brief company description



Left: uniMir, single Mode DFB QCL

Right: multiSense: QCL based spectrometer module for gas analyzers

MirSense is a start-up company which develops and produces QCL (Quantum Cascade Lasers) and QCL-based advanced photonic devices such as compact sensors for real-time, high sensitivity trace detection and chemical analysis of gas, liquids and solids by infrared laser absorption spectroscopy.

MirSense technologies are the outcome of over 15 years of R&D in III-V lab, a common laboratory between Nokia, Thales and the CEA-LETI. The core technology is one of the outputs of a FP7 project: MIRIFISENS.

Photonics PPP projects

MirSense is participating in 2 Photonics PPP projects: a Pilot Line (MIRPHAB) and a Research and Innovation Action (REDFINCH - mid infraREd Fully Integrated CHEmical sensors). This project is developing integrated optical sensors for chemical detection in both gases (leak detection in petrochemical plants) and liquids (protein analysis in the dairy industry).

In these projects, MirSense developed innovative technologies and architectures that allows the sensors to be 5 or 10 times smaller, easier to implement and cheaper to build. These sensors can now be used in other new applications.

Impact of Photonics PPP


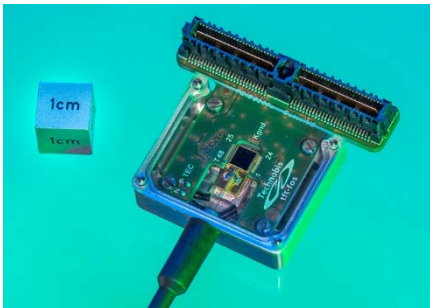
Photonics PPP projects and funding (> 1 M€) allow to “make a bridge” to speed up the development of the technology but also to accelerate the fundraising. One year ago, MirSense closed a €2M funding round led by two venture capital investors, XAnge and Supernova Invest. For such a small company, this would not happen without the PPP funding.

This is a very good example of the direct **leverage effect of the Photonics PPP on Private Investments**.

Interview carried out by Tematys, 05/2019. Interview protocol also by Tematys, 05/2019.

<p>New Infrared Technologies Spain www.niteurope.com</p>	
<p>Brief company description</p> <div data-bbox="499 434 1094 687">  </div> <p><i>TACHYON 16K - Uncooled MWIR camera for industry</i></p> <p>New Infrared Technologies (NIT) is a company located in Madrid (Spain), which develops and commercializes industrial solutions for real-time process monitoring and smart control of industrial processes.</p> <p>These solutions are based on self-produced infrared cameras, manufactured with a unique technology, sensitive in the medium wavelength infrared (MWIR, 1-5 microns), with high-speed capabilities and uncooled operation at room temperature.</p> <p>Photonics PPP projects</p> <p>At present time, NIT is involved in 5 Photonics PPP projects aiming very different objectives from the development of a very innovative IR spectrometer for air quality assessment to the development of a real time monitoring system able to assess in-line quality of a surface texturing with ultrafast lasers. The markets are eager of introducing these new solutions and at the end of Innovation Actions, the time to market is typically small, typically around 1 year.</p> <p>As an example, in collaboration with other partners of MASHES project, NIT has been able to develop CLAMIR (Control for Laser Additive Manufacturing with InfraRed): a system for closed-loop control of the laser power applied to metal Laser Additive Manufacturing processes. At the end of the project, this system was ready to be marketable as a product.</p> <p>Impact of Photonics PPP</p> <p>Photonics PPP projects positively affect NIT activities. It is a key tool for technological SME companies for developing innovative products and solutions. It allows NIT to be in partnership with main actors in the industrial, technological and scientific tissue in Europe and gives NIT the opportunity of bringing the technology of the company to a new areas of application of big interest from the technological and commercial points of view.</p>	

Interview carried out by Tematys, 05/2019. Interview protocol also by Tematys, 05/2019.

<p>Technobis The Netherlands www.technobis.com</p>	
<p>Brief company description</p> <div data-bbox="579 389 1011 696">  </div> <p><i>Fiber sensing systems based on Photonic Integrated Circuit (PIC)</i></p> <p>One of the main specialization of Technobis is the development and supply of fibre optic sensing systems and applications. All developments are spectrometry or interferometry based. Starting with free-space optics 17 years ago, nowadays all new developments are based on integrated photonics.</p> <p>Technobis is the leading provider of Application Specific Photonic Integrated Circuit (ASPIC)-based fibre sensing systems for demanding market segments such as high tech, aeronautics, space, medical and automotive industries.</p>	
<p>Photonics PPP projects</p> <p>Technobis is participating to different projects and, in particular, to two Pilot Lines: PIXAPP and InPulse.</p> <p>Photonics projects allows Technobis to develop some technologies that are directly marketable as products (for example, the SuperGator and the PolyGator developed in InPulse). The SuperGator is a high-speed fibre optic interrogator and, although the project still runs, there is already market interest and quotation requests. The PolyGator is a multi-purpose interrogator that will answer to market interest already posted.</p>	
<p>Impact of Photonics PPP</p> <p>Photonics PPP projects had definitely a positive effect on Technobis. It provided opportunity to match technology roadmaps, products development and promotion in almost all extents. Technobis took a 'leap of faith' in exploration of fibre optic sensing based on the new and innovative integrated photonics platform. Being part of the projects created technology awareness and allowed to exploit that in an affordable and beneficial way. It allowed promotion of the technology in stringent markets like aerospace, space, medical, automotive, energy, etc. Overall, the participation in projects did not only help to develop the technology and market, but also the associated ecosystems as well as strong collaboration with partners.</p> <p>There is a strong leverage effect on private investment. In fact, following scale-up ambitions co-developed with consortia partners (InPulse, PIXAPP), Technobis strongly invest in manufacturing and packaging equipment as well as in associated skills development.</p>	

KPI C4: Significant Innovations

Based on the survey outcomes, the following facts and figures can be highlighted:

- In average, 3.3 new systems or technologies are developed per Photonics cPPP project. → The total number of new systems or technologies developed within the cPPP is therefore of about 330.
- In average, each PPP project participant applies for one patent, leading to an estimated number of about 1000 patents for the whole Photonics PPP.

Specific and Programme Level Key Performance Indicators for the Photonics cPPP

The detailed estimations of these KPIs, mostly collected from the survey but also from previous studies by Photonics 21, can be found in Annex Part 2 and Annex Part 3.

In the following, some operational aspects of the Photonics cPPP will be displayed.

Operational aspects of the PPP

Efficiency, openness and transparency of the PPP Consultation Process: The Photonics PPP is based on an open and transparent community involvement through Photonics21 addressing more than 3000 photonics end user industry experts. The fully democratic and transparent decision-making process implemented to identify Photonics R&I priorities (Horizon2020 Photonics PPP calls) guarantees that implementation does not only take place at European Commission programme level, but also on the ground at company and research organisation level by the people involved in the process.

Efficiency of the implementation of the call for proposals evaluated in 2018: The following table displays the evaluation results of the proposals submitted to the cPPP calls closed in 2018.

Evaluation results on the cPPP calls closed in 2018

Call Reference	Submitted proposal			Evaluation results		Success rate%
	Submitted proposals	Eligible proposals	% of retained	Above threshold	Selected for funding	
H2020-ICT-3-2018	2	2	100%	1	1	50
H2020 – ICT-4-2018	34	34	100%	25	13	38.2

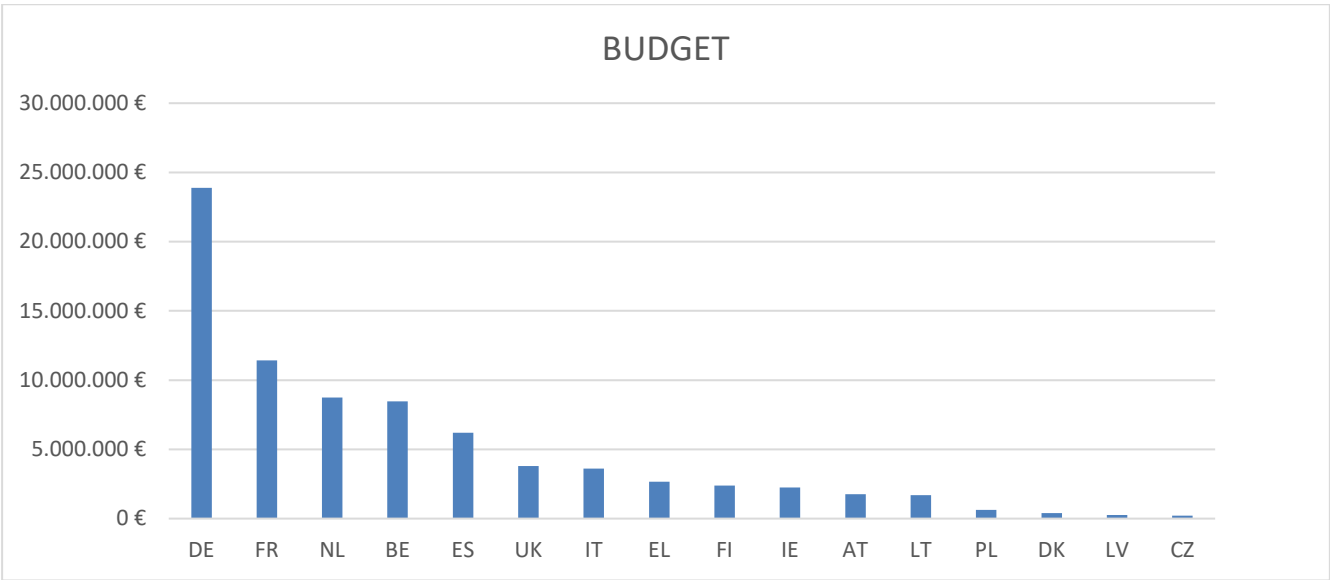
Source: EC, DG CONNECT

Number of participations in the cPPP calls closed in 2018 and success rate by organisation type in 2018⁴⁷

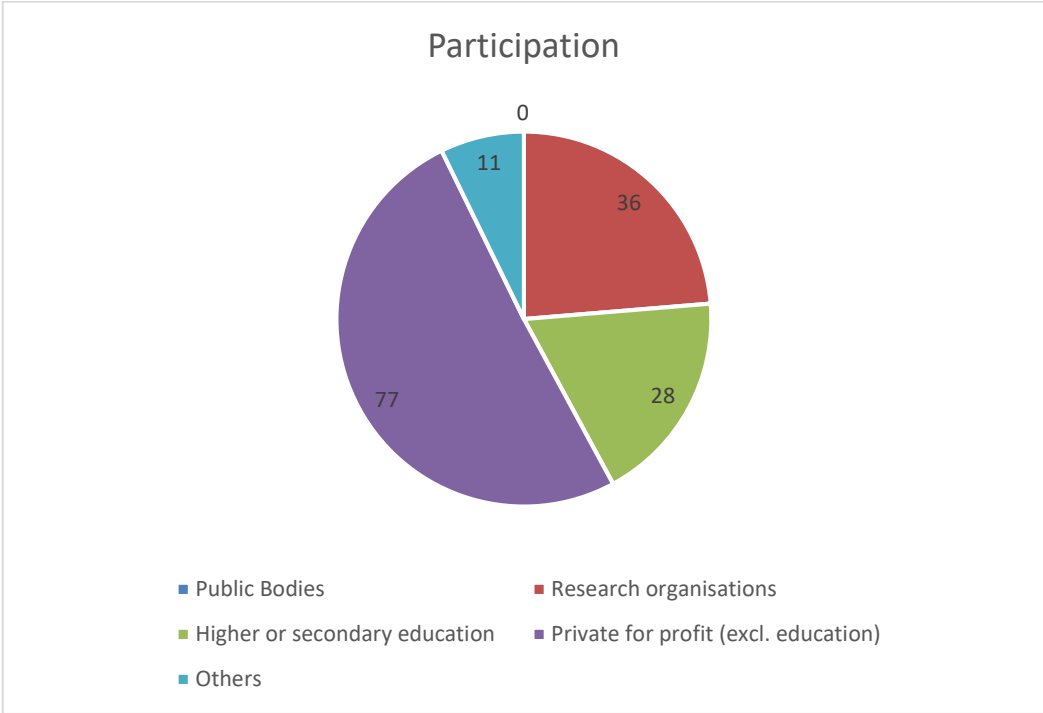
Type participant	Nr of participants in the Proposals	Nr of participants in the funded Projects	Participants success rate	Share of participation
Public Bodies	1	0	0%	0%
Research organisations	80	36	45%	18%
Higher or secondary education	68	28	41%	14%
Private for profit (excl. education)	194	77	40%	39%
Others	32	11	34%	6%
Total	375	152	32%	100%
SMEs	116	44	38%	22%

Source: EC, DG CONNECT

⁴⁷ Please notice that this table excludes third parties.



EC Funding per Country in cPPP Calls closed in 2018⁴⁸
 Source: EC, DG CONNECT



Number of participants per Type of organisation in cPPP projects selected for funding in 2018
 Source: EC, DG CONNECT

⁴⁸ Please notice that the date classification provided in the tables C and Figure A and B is based on data self-declared by the participants at the moment of proposal submission, and quite a high number of "unclassified data" appear as "other". However, data provided in table 1 was extracted from the CORDA database, after the signature of the Grant Agreement and has been manually checked and amended if necessary.

Furthermore, Photonics PPP was valued best in class by independent expert group of the European Commission as part of the Horizon2020 mid-term evaluation⁴⁹:

Overview of evaluation results of the Horizon 2020 PPP:

Table 7. Multi-dimensional analysis of all cPPPs. Evaluation levels: WOT="Well on Track", STG="Shift the Gear" and NE="Not evaluable".

Evaluation dimension	5G	BigData	EeB	EGVI	FoF	HPC	Photonics	Robotics	SPIRE
Open discussion on roadmaps	WOT	WOT	WOT	NE	WOT	WOT	WOT	WOT	WOT
Challenging and updated roadmaps	WOT	WOT	STG	STG	WOT	NE	WOT	WOT	STG
High number of industry and RTO (representativeness)	WOT	WOT	WOT	STG	WOT	STG	WOT	WOT	WOT
Portal of project results	WOT	NE	WOT	STG	WOT	WOT	WOT	WOT	WOT
Dissemination activities	WOT	WOT	WOT	NE	WOT	WOT	WOT	WOT	WOT
KPI reporting	WOT	STG	WOT	STG	STG	STG	WOT	STG	WOT
Methodology to compute Leverage KPI	STG	STG	STG	STG	STG	STG	STG	STG	STG
Easy access to information and membership (newcomers)	WOT	WOT	WOT	WOT	WOT	WOT	WOT	WOT	WOT
Links to other cPPPs and EU Actions and Instruments	STG	WOT	WOT	WOT	WOT	WOT	WOT	WOT	STG
Inclusion of SMEs	STG	WOT	WOT	STG	WOT	STG	WOT	STG	WOT
Inclusion of EU13	STG	WOT	WOT	STG	WOT	WOT	WOT	STG	WOT

Source:
European

Commission, DG Research and Innovation, Mid-term review of the contractual Public Private Partnerships (cPPPs) under Horizon 2020.⁵⁰

⁴⁹ <https://publications.europa.eu/en/publication-detail/-/publication/6de81abe-a71c-11e7-837e-01aa75ed71a1/language-en>, last accessed on 2018/09/06.

⁵⁰ Ibid.

3.3 Evolution over the years

Looking at the evolution of the Photonics platform, some basic trends should be mentioned:

There has been an increased involvement of members in the Photonics community and a closer cooperation with regions and clusters as well as actions supporting SMEs with laboratory and testing resources. Several measures and instruments have been implemented to optimize the innovation ecosystem in photonics, bridging the “valley of death” and ensuring quick market uptake of photonics innovation. An ongoing active involvement and collaboration with the strategic CSA and pilot and prototyping projects ensure a coordinated set of services towards the respective target groups like SMEs, cluster or regional authorities. Likewise, a network of Photonics Digital Innovation Hub under the “Industrial Modernisation Platform” has been promoted, offering end-to-end prototyping and pilot production facilities for the end-user industry.

A better access to finance for start-ups but also for SMEs in the growth phase remains an ongoing issue of concern and is still on a high priority of the agenda of the PPP.

Closer cooperation and networking down the value chain and involvement with megamarkets is the third – and whilst looking in the future – probably the largest challenge to meet of the PPP.

Photonics is one of these “important building blocks of the next digital revolution, which will be based on deep technologies”⁵¹. – this is the key statement in the recent 2018 European Commission and European Investment Bank report on “Financing the digital transformation”. This was seconded by a recent letter of three Nobel Laureates stating that “Photonics is simply essential for powering the future European digital economy...”⁵².

In this role as a key enabler, Photonics has become even more important for Europe’s future in many decisive areas and mega markets: Industry 4.0, Health, diagnosis and therapy of diseases, fighting cancer, securing save and sustainable food, smart farming, 5G, artificial intelligence, Internet of Things, Robotics, Quantum technology, additive manufacturing and many other technologies and applications. Light technologies, components and systems, are critical elements of many critical European strategic value chains from the automotive industry to the aeronautics sector.

Having this said, it has and will become increasingly important to include downstream value chain partners / end-users and associate experts in the work of the PPP to add to the members of the current PPP representing companies mainly from the supply side, research institutes and universities.

The photonics community has started to work on these changes. The current Horizon2020 partnership has already initiated more than 30 joint strategic actions with end user industry. It also launched several cross-regional networks of innovation hubs across Europe which the EU often supports by complementing funds coming from ERDF budget.

The Annual Meeting in 2019 also has set up networking sessions with other PPPs to early on and commonly work on future call topics and secure that downstream industries are involved in setting the specifications for the core photonics components and segments.

Overview of funding since 2014

Overall, the EC has funded 101 Photonics PPP Projects under the Horizon 2020 frame since 2014 to the totaling approximately €459.6M.

⁵¹ European Investment Bank, Innovation Finance Advisory, European Investment Bank Advisory Services (2018): Financing the digital transformation – Unlocking the value of photonics and microelectronics, Luxembourg, 2018. P. 9.

⁵² Mourou G., Hell, S. W., Hänsch, T. W. (2018): An open letter to the European Commission regarding the absence of visibility and support for Photonics Technologies in the next MFF 2021-2027. 20th December 2018. Available under: <https://www.photonics21.org/news/Verlinkungen/2019/Nobel-Laureates-Letter-of-Concern.pdf>, last accessed on 2019/05/28.

Photonics cPPP PMR 2018 –Monitoring of the overall progress since the launch of the cPPP

With regard to the 2018 calls, the industrial participation within PPP Projects accounts for 53% of which 53% were SMEs, which totals to an overall SMS participation of 28 % (cf. Table below).

An overview of the recent years in Horizon 2020 is provided in the table below. It shows that the distribution of the industrial partners on the one hand and other partners on the other hand varies slightly from year to year which to some extent is depending on the respective call topics and the associate industry structure. Overall, the industry participation is with 55 % in the time period of Horizon 2020 continuously high; the same can be said of the SME participation that is 50 % of the overall industrial participation over the time.

Overview on funding of Photonics cPPP in the period 2014-2018

Subject	2014	2015	2016	2017	2018	2014-2018
Total Funding for Projects (in €)	87.861.568,12 €	95.306.838,23 €	94.800.954,01 €	96.387.748,75 €	85.288.725,02 €	459.645.834,13 €
Number of Participants in Projects	215	209	230	200	163	1.017
Industrial Participation (# of Companies)	111	106	118	134	87	556
% of total participants	52%	51%	51%	67%	53%	55%
of which are SME's (# of SMEs)	62	58	67	42	46	275
SME % of Industry participants	56%	55%	57%	31%	53%	50%
SME % of total participants	29%	28%	29%	21%	28%	27%
Budget for Industry (in €)	45.846.170,94 €	33.306.845,17 €	45.219.997,46 €	33.921.088,91 €	43.167.137,52 €	201.461.240,00 €
% of total funding	52%	35%	48%	35%	51%	44%

Source: European Commission, DG CONNECT, 03/19.

4. Outlook and lessons learnt

Looking in the future the Photonics PPP – as all deep-technologies – will face technical, economical and societal challenges to be successfully met with a comprehensive strategy.

Economic challenges⁵³:

Europe holds a strong position with a highly competitive SME based photonics industry (#2 only after China) investing 10 billion Euro per year in R&I in Europe), around 300,000 people employed directly and a world-class research community proven by 4 Nobel Laureates from the field of photonics in the last decade.

In many Photonics areas, European Photonics is leading the world – e.g. in production technology, optical components and systems, measurement and automated vision and medical technology. In these areas Europe holds more than one-third / up to half of the world market.

Competitor regions and governments, have already integrated the tremendous potential impact of photonics into their economic and industrial competition strategies and innovation policies. By 2020, the South Korean government will have increased its investment into photonics to €2.8 billion per year. Likewise, China's central government is increasing its spending in photonics by 40% per year to €1 billion in 2020 complemented by regional investments, often a multiple of the central government expenditure.⁵⁴

For Europe to compete with other regions of the world to master this key enabling technology, a comprehensive and ambitious strategy is needed. Already today, European industry is falling short of people with skills in photonics.

As a result of these global investments into photonics, Europe's place as a market leader is not guaranteed and requires a continuous comprehensive and ambitious strategy for collaboration – public-private as well as private-private.

However, to Europe's advantage is its dynamic, open, and well-connected community and landscape and ecosystem. It spans the complete innovation system, from a base of world-class research groups, a strong SME-based industry and a few larger companies. Most of these photonic players are active in regional photonics clusters, as well as national technology platforms, which is to be expected given the various industrial sectors that photonics supports.

An advantage is also a strong supply & value chain spanning from components to systems, materials and have close cooperation with end-users. This collaboration along value chains and also across technologies places Europe in a strong position to provide an excellent return of investment.

Social/impact on citizens/areas of public interest:

The below list gives an overview on the areas of Photonics impact for the planned Missions and Partnership Areas defined by the EU Commission for Horizon Europe.

⁵³ For more details on facts and figures, please refer to previous publications by Photonics21, for example: European Technology Platform Photonics21 c/o VDI Technologiezentrum GmbH, Photonics21 Secretariat (2017): Jobs and Growth in Europe – Realizing the potential of Photonics, PPP Impact Report 2017, Düsseldorf.

⁵⁴ EAC- Euro Asia Consulting PartG (2015): Political Steering Processes in Asia Aimed at the Photonics Industry. Executive Report. Published By Spectaris, VDMA, BMBF. Berlin, Dusseldorf, Frankfurt, Munich – June 2015.

Photonics cPPP PMR 2018 – Outlook and lessons learnt

EU Missions	Photonics Areas of Impact
Adapting to climate change, including societal transformation	Metrology, contribution to lower material use, higher yield, less waste, lower energy usage for production
Cancer	Photonics Screening and guiding 3-D imaging methods
Healthy oceans, seas, coastal and inland waters	Metrology / Sensors and Photonics Components Photonics in Agriculture
Climate-neutral and smart cities	Low Power devices - sensors, LED, organic PV Urban Farming (Light) Energy Savings by LEDs
Soil health and food	via Metrology / Sensors Photonics in Agriculture Photonic on a chip / ASIC- self calibrating, fault tolerant, self diagnosing, multi-analytic
Partnership Areas	Photonics Areas of Impact
Faster development and safer use of health innovations for European patients, and global health.	New components, Quantum Cascade Lasers, More sensitive detectors Applications: Real time Proteomics, genomics, metabolomics. Personalized Medicine, Origin of diseases beyond risk factors, Mobile photonics devices for instant point of care detection/Diagnosis and treatment, Human centric Light (HCL)
Advancing key digital and enabling technologies and their use, including but not limited to novel technologies such as artificial intelligence, photonics and quantum technologies.	For Cybersecurity: LI-FI instead of WI-FI; Quantum secured Communication For Supercomputer: Quantum & optical instead of CMOS as processing unit / Light transmitting circuits / Fiber optic cables For IoT - Targets of WG 1+6+5 / For 4.0. - Targets of WG 2
European leadership in metrology, including an integrated metrology system.	Photonic sensor systems - embedded photonics for IoT meeting the requirement of systems - not components, miniaturization, multi analyte, maintenance free, platform concepts, cost-effectiveness, robustness, low power
Accelerate competitiveness, safety and environmental performance of EU air traffic, aviation and rail.	Real time and latency (bandwidth, reliability, speeds) LIDAR - vital real time- higher resolution, quicker response time Sensors Free Space optical solutions
Sustainable, inclusive and circular bio-based solutions.	
Hydrogen and sustainable energy storage technologies with lower environmental footprint and less energy-intensive production.	By material treatment, weight reduction material savings, waste reduction / Yield
Clean, connected, cooperative, autonomous and automated solutions for future mobility demands of people and goods.	Real time and latency (bandwidth, reliability, speeds) Adaptive Driving Beam for mainstream vehicles Sensing capabilities LIDAR / Sensors / Free Space optical solutions Virtual Displays, Augmented Reality Light solutions / Night vision (

Source: VDI-TZ GmbH

Research & Innovation challenges:

As demonstrated in the recent published roadmap, there is an ongoing and continuous need of developing photonics components and systems to enable future digital and technology challenges we all will face – e.g. Artificial Intelligence, Cyber Security, Quantum technology to become performing.

Many of those challenges require faster, cheaper, real-time enabled, bandwidth increased, multi-analytic, low energy consuming optical systems and components.

Working on those – in close cooperation with the users and finally disseminate them to broad and impactful markets - will be in focus of the R+I efforts – and also will secure an enhanced European competitiveness and economic success.

PMR: Annex

Annex – Part 1 - List of Key Performance Indicators (KPIs)

Common Priority Key Performance Indicators

KPI C1: Mobilised Private Investments

KPI C2: New skills and/or job profiles

KPI C3: Impact of a cPPP on SMEs

KPI C4: Significant Innovations

Specific Key Performance Indicators for the Photonics cPPP

KPI S1: Maintain / Increase the (European) market share of the global photonics market

KPI S2: (Develop) New photonics R&I capabilities

KPI S3: (Improve) the innovation potential of photonics companies and notably of SMEs

KPI S4: Number of people directly employed by the photonics industry

KPI S5: Education, training and skills development

KPI S6: Scale of diffusion of photonics in application areas and in solutions addressing societal challenges

KPI S7: R&I investments of the photonics industry in the PPP objectives

KPI S8: Efficiency, openness and transparency of the PPP Consultation Process / Metrics

KPI S9: PPP Project Performance

KPI S10: Success stories relating to key developments in photonics by H2020 funded projects

KPI S11: Coordination of the PPP Implementation with the Member States and the Regions

KPI S12: Dissemination and Awareness

Programme Level Key Performance Indicators

KPI PL1: Patents

KPI PL2: Standardisation activities (project level) / Contributions to new standards (PPP level)

KPI PL3: Operational performance

KPI PL4: H2020 - LEIT - Number of joint public-private publications

Annex – Part 2 Specific Key Performance Indicators for the Photonics cPPP⁵⁵

	KPI domain	Key Performance Indicator (KPI)	Value in {2017}	Baseline at the start of H2020 (latest available)	Target (for the cPPP) at the end of H2020	Comments
1	Industrial Competitiveness and Economy Impact	KPI 1: Maintain / Increase the (European) market share of the global photonics market	<p>European share of the global photonics market: 16.5% in 2015</p> <p>62% Growth of the European photonics industry in the period 2005-2015</p> <p>European Photonics Production Growth rate more than 3.5 higher than EU GDP Growth rate</p> <p>High long-term growth in European core photonics segments</p> <p>Compared to 2011, European Photonics core segments remained strong and could defend a leading world position up to 50 % - far beyond the average EU industry share of 15.5 %.</p>	In 2012, the global market share of Europe was 18%	By 2020, keep a global market share of at least 18%	<i>Extensive data were collected in the scope of the PPP Impact Report 2017⁵⁶ as well as of the Market Study⁵⁷</i>
2	Industrial Competitiveness and Economy Impact	KPI 2: (Develop) New photonics R&I capabilities	6 PPP Pilot Lines and 3 PPP Prototyping Services help end user industry to speed up product development			<i>Cf. Photonics 21 – Photonics PPP Annual Activity Report 2018⁵⁸</i>

⁵⁵ The data displayed in the following table are based on the results on the online survey conducted in April/May 2019 among the coordinators and participants of the Photonics cPPP projects. As such, they might not be exhaustive or might reflect only part of the actual situation.

⁵⁶ European Technology Platform Photonics21 c/o VDI Technologiezentrum GmbH, Photonics21 Secretariat (2017): Jobs and Growth in Europe – Realizing the potential of Photonics, PPP Impact Report 2017, Düsseldorf.

⁵⁷ European Technology Platform Photonics21 c/o VDI Technologiezentrum GmbH, Photonics21 Secretariat (2017): Market Research Study, Photonics 2017, Brüssel / Düsseldorf / Tägerwilen, May 2017.

⁵⁸ European Technology Platform Photonics21 c/o VDI Technologiezentrum GmbH, Photonics21 Secretariat (2019): Photonics21 – Photonics PPP Annual Activity Report 2018.

Photonics cPPP PMR 2018 – Annex Part 2

3	Industrial Competitiveness and Economy Impact	KPI 3: (Improve) the innovation potential of photonics companies and notably of SMEs	<p>The pilot lines foresee open access, and SME are either involved already in the project or will be involved in a later stage.</p> <p>End user industry involvement in PPP Projects ensuring quick market uptake of innovation</p>			<i>New open access infrastructures and services to design, prototyping, manufacturing or testing, etc., and involvement of SME stakeholders</i>
4	Socio-economic Impacts	KPI 4: Number of people directly employed by the photonics industry	By the end of 2015, the EU Photonics industry employed 290.000 people – compared to 271.000 employees in the sector in 2011. This represents a CAGR of +1.7%.	In 2012, there were 300 000 direct jobs	by 2020, increase by at least 10% new jobs in photonics	<i>Forecast: +42.000 jobs in 2020 compared to 2011. Cf. PPP Impact Report 2017⁵⁹.</i>
5	Socio-economic Impacts	KPI 5: Education, training and skills development	<p>Activities targeting training and learning:</p> <ul style="list-style-type: none"> - for children and teachers - for universities - for companies and employees - for the general public 	An FP7 initiative 'the Photonics Explorer' is quite successful and is further expanding by external sponsorship		<p><i>Number of specific activities undertaken to attract young minds to photonics or the number of young students addressed by educational material on photonics</i></p> <p><i>Cf. §3.1 in the Photonics cPPP Progress Monitoring Report 2018</i></p>

⁵⁹ European Technology Platform Photonics21 c/o VDI Technologiezentrum GmbH, Photonics21 Secretariat (2017): Jobs and Growth in Europe – Realizing the potential of Photonics, PPP Impact Report 2017, Düsseldorf.

6	Socio-economic Impacts	KPI 6: Scale of diffusion of photonics in application areas and in solutions addressing societal challenges	<p>Involvement of end-user industry: Cf. §2.2</p> <p>Success stories: Cf. §2.2</p> <p>Photonics related projects in almost all H2020 programmes / Photonics related projects covering all application markets of high relevance for tomorrow's society and economy from personalized healthcare, industry 4.0, smart cities to securing the digital society, connected mobility – to name but a few.</p>			<p><i>Representative examples of photonics in application areas and of breakthrough solutions for specific societal challenges</i></p> <p><i>A study on the role and contribution of Photonics in past and current H2020 projects was initiated by VDI TZ and carried out from September to December 2017. The study aimed at examining whether, in Horizon 2020 Photonics plays indeed the role of an enabling technology for new and innovative products, services and developments in areas far beyond obvious lighting application fields.</i></p> <p><i>This study has just been updated in March-April 2019 and the results are still valid.</i></p>
7	Socio-economic Impacts	KPI 7: R&I investments of the photonics industry in the PPP objectives	Nearly 10 billion EUR industry investments on Photonics Innovation in Europe in 2015			<p><i>Extensive data can be found in the PPP Impact</i></p>

Photonics cPPP PMR 2018 – Annex Part 2

			<p>R&D intensity in the Photonics industry amounts to nearly 10%</p> <p>R&D intensity in the Photonics industry much higher than in most other industry sectors</p>			<i>Report 2017⁶⁰ (published in 2017)</i>
8	Operational aspects of the PPP	KPI 8: Efficiency, openness and transparency of the PPP Consultation Process Metrics	Fully democratic structure and transparent decision-making processes: Cf. §2.3			
9	Operational aspects of the PPP	KPI 9: PPP Project Performance	Cf. Outcomes of the online survey §3.2 and Annex Part 4			
10	Operational aspects of the PPP	KPI 10: Success stories relating to key developments in photonics by H2020 funded projects	<p>Photonics PPP project impact and success stories reflected in end-user media: in over 217 articles in newspapers, magazines, and websites in more than 15 countries, representing an advertising value in excess of around €420K; estimated readership of over 19.9 million people.</p> <p>Cf. §2.2</p>			

⁶⁰ European Technology Platform Photonics21 c/o VDI Technologiezentrum GmbH, Photonics21 Sekretariat (2017): Jobs and Growth in Europe – Realizing the potential of Photonics, PPP Impact Report 2017, Düsseldorf.

Photonics cPPP PMR 2018 – Annex Part 2

11	Operational aspects of the PPP	KPI 11: Coordination of the PPP Implementation with the Member States and the Regions	<p>Linking up the Horizon2020 Photonics PPP actions with member states and regions to maximize impact of the Photonics PPP</p> <p>Coordinating the regional and European photonics strategy – joined implementation to link regional Smart Specialisation strategies</p> <p>Cf. §2.2</p>			<p><i>-End-user workshops</i></p> <p><i>. Cooperation meetings with national technology platforms, etc.</i></p> <p><i>Cf. PPP Annual Activity Report 2018.</i></p>
12	Operational aspects of the PPP	KPI 12: Dissemination and Awareness	<p>Photonics PPP project impact and success stories reflected in end-user media</p> <p>Promoting the visibility of Photonics and of the Photonics21 Platform in social media</p> <p>Cf. §2.2</p>			

Annex – Part 3 Contribution to Programme-Level KPI's⁶¹

	Key Performance Indicator	Data	Baseline at the start of H2020 (latest available)	Target (for the cPPP) at the end of H2020	Comments
1	Patents	<i>Survey Outcomes, cf. Annex Part 4, Questions 11 and 12.</i>	5,2 per €10M funding	H2020: 3 patent applications per €10 million funding	H2020 indicator in Annex II – Council Decision 2013/743/EU Cf. Discussion in §3.2
2	Standardisation activities (project level) Contributions to new standards (PPP level)	<i>Survey Outcomes, cf. Annex Part 4, Questions 16 and 17.</i>	<i>Number of activities leading to standardization: 2 (Based on 8 successful FP7 projects finished)</i> <i>Number of working items in European Standardisation Bodies: 4 (Based on 8 successful FP7 projects finished)</i> <i>Number of pre-normative research files – prEN - under consultation in ESBs: Not reported</i>	No target	Baseline categories slightly different from the data collected in the online survey – not allowing a direct comparison.
3	Operational performance	Not known.	256 (baseline, as displayed in the cPPP PMR 2016).		

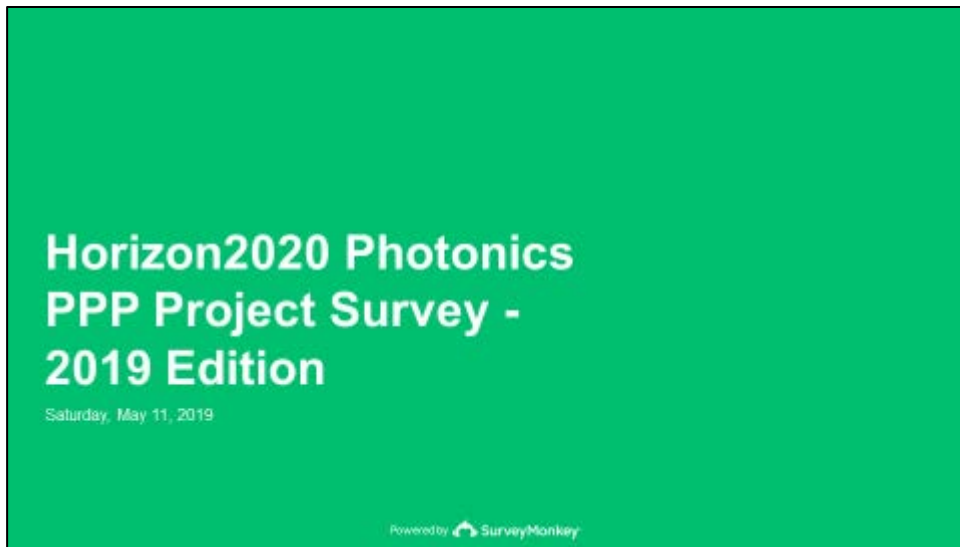
⁶¹ The data displayed in the following table are based on the results on the online survey conducted in April/May 2019 among the coordinators and participants of the Photonics cPPP projects. As such, they might not be exhaustive or might reflect only part of the actual situation.

Photonics cPPP PMR 2018 – Annex Part 3

4	H2020 - LEIT - Number of joint public-private publications	<i>Survey Outcomes, cf. Annex Part 4, Question 15.</i>			
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Annex – Part 4: Survey Results

The online survey was conducted in April 2018 using SurveyMonkey⁶². The detailed results of the survey are displayed in the following slides:⁶³

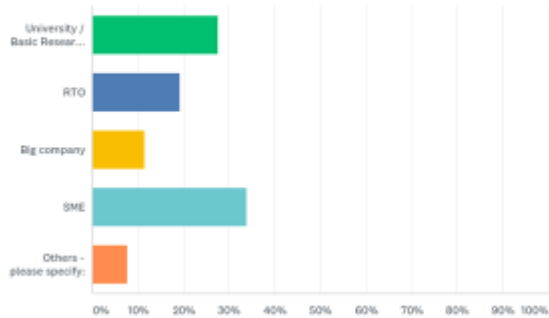


⁶² SurveyMonkey Inc., San Mateo, California, USA, www.surveymonkey.com.

⁶³ Slides created by SurveyMonkey and edited by VDI TZ GmbH.

Q3: Type of Organization: Are you attending the Horizon 2020 project as:

Answered: 130 Skipped: 0



Powered by SurveyMonkey

Q3: Type of Organization: Are you attending the Horizon 2020 project as:

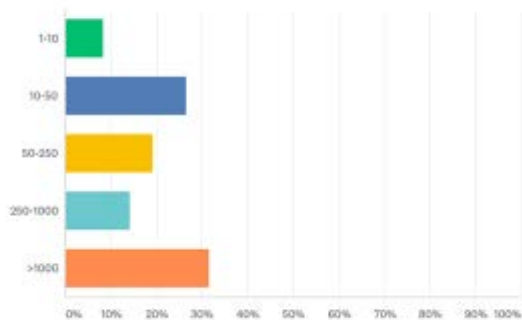
Answered: 130 Skipped: 0

ANSWER CHOICES	RESPONSES	
University / Basic Research / HEI	27.69%	36
RTO	19.23%	25
Big company	11.54%	15
SME	33.85%	44
Others - please specify:	7.69%	10
TOTAL		130

Powered by SurveyMonkey

Q4: Size of your company (numbers of employees):

Answered: 120 Skipped: 10



Powered by SurveyMonkey

Q4: Size of your company (numbers of employees):

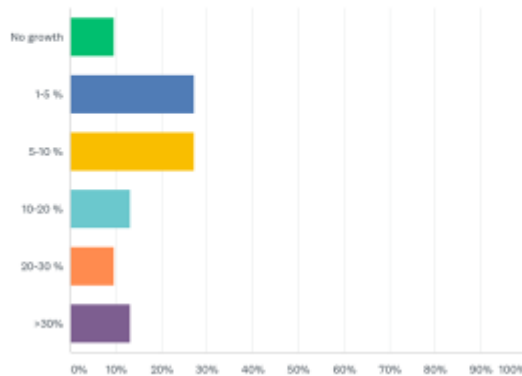
Answered: 120 Skipped: 10

ANSWER CHOICES	RESPONSES	
1-10	8.33%	10
10-50	26.67%	32
50-250	19.17%	23
250-1000	14.17%	17
>1000	31.67%	38
TOTAL		120

Powered by  SurveyMonkey

Q5: How do you estimate the growth perspective for your company within the next 3 years?

Answered: 114 Skipped: 16



Powered by  SurveyMonkey

Q5: How do you estimate the growth perspective for your company within the next 3 years?

Answered: 114 Skipped: 16

ANSWER CHOICES	RESPONSES	
No growth	9.65%	11
1-5 %	27.19%	31
5-10 %	27.19%	31
10-20 %	13.16%	15
20-30 %	9.65%	11
>30%	13.16%	15
TOTAL		114

Powered by  SurveyMonkey

Q6: Area of Activity of your company:

Answered: 116 Skipped: 14



Powered by SurveyMonkey

Q6: Area of Activity of your company:

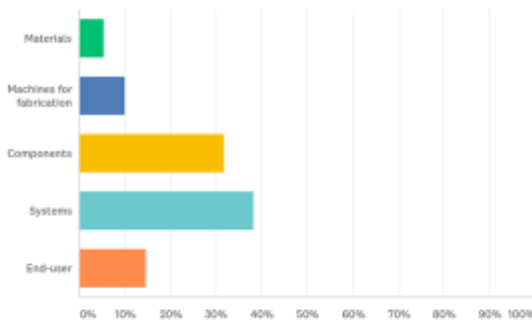
Answered: 116 Skipped: 14

ANSWER CHOICES	RESPONSES	
Production Technology	13.79%	16
Machine Vision	2.59%	3
Optical Components	13.79%	16
Lighting	2.59%	3
Telecommunication	10.34%	12
Medical and Life Science	12.93%	15
Defence & Security	0.00%	0
Agriculture & Food	1.72%	2
Displays	2.59%	3
Other - please specify:	39.66%	46
TOTAL		116

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Q7: Please indicate the range of your companies activities along the value chain:

Answered: 110 Skipped: 20



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Q7: Please indicate the range of your companies activities along the value chain:

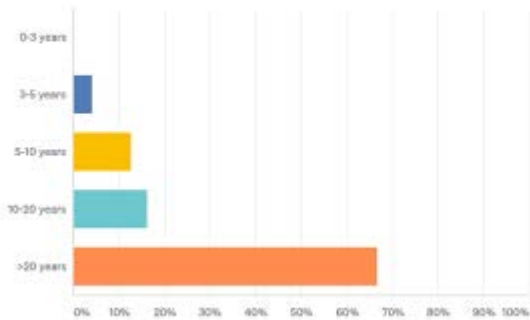
Answered: 110 Skipped: 20

ANSWER CHOICES	RESPONSES	
Materials	5.45%	6
Machines for fabrication	10.00%	11
Components	31.82%	35
Systems	38.18%	42
End-user	14.55%	16
TOTAL		110

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Q8: Company's Age:

Answered: 117 Skipped: 13



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Q8: Company's Age:

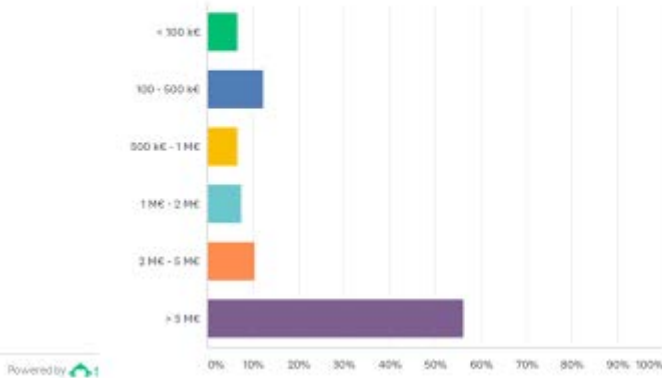
Answered: 117 Skipped: 13

ANSWER CHOICES	RESPONSES	
0-3 years	0.00%	0
3-5 years	4.27%	5
5-10 years	12.82%	15
10-20 years	16.24%	19
>20 years	66.67%	78
TOTAL		117

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Q9: Company's Equity

Answered: 105 Skipped: 25



Q9: Company's Equity

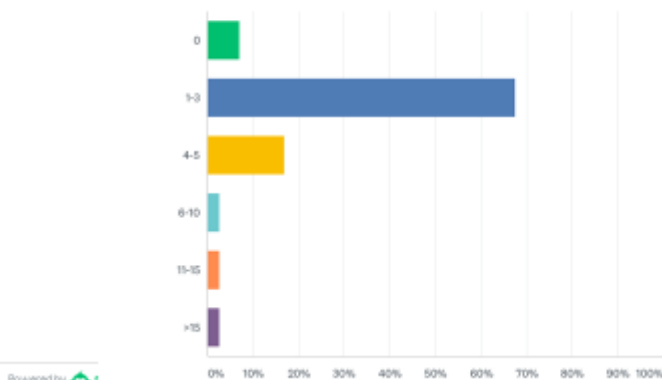
Answered: 105 Skipped: 25

ANSWER CHOICES	RESPONSES
< 100 k€	6.67% 7
100 - 500 k€	12.38% 13
500 k€ - 1 M€	6.67% 7
1 M€ - 2 M€	7.62% 8
2 M€ - 5 M€	10.48% 11
> 5 M€	56.19% 59
TOTAL	100

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Q10: How many new systems and/or technologies did you develop or do you plan to develop in the Project? (For project coordinators only)

Answered: 71 Skipped: 59



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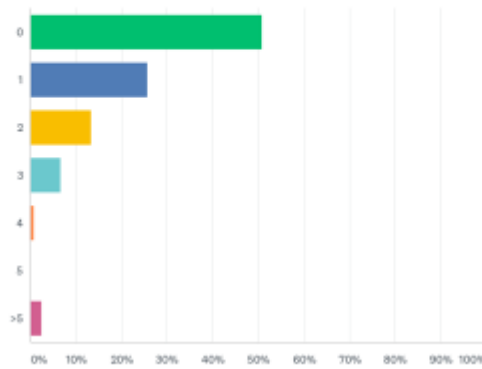
Q10: How many new systems and/or technologies did you develop or do you plan to develop in the Project? (For project coordinators only)

Answered: 71 Skipped: 59

ANSWER CHOICES	RESPONSES	
0	7.04%	5
1-3	67.61%	48
4-5	16.90%	12
6-10	2.82%	2
11-15	2.82%	2
>15	2.82%	2
TOTAL		71

Powered by  SurveyMonkey**Q11: How many patents linked to the project have you already applied for / do you plan to apply for?**

Answered: 120 Skipped: 10

Powered by  SurveyMonkey**Q11: How many patents linked to the project have you already applied for / do you plan to apply for?**

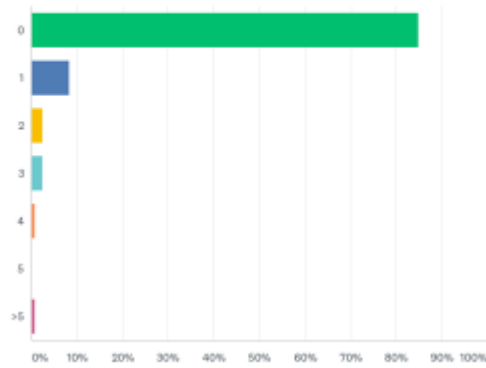
Answered: 120 Skipped: 10

ANSWER CHOICES	RESPONSES	
0	50.83%	61
1	25.83%	31
2	13.33%	16
3	6.67%	8
4	0.83%	1
5	0.00%	0
>5	2.50%	3
TOTAL		120

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Q12: How many patents linked to the project have been granted up to now?

Answered: 120 Skipped: 10



Powered by SurveyMonkey

Q12: How many patents linked to the project have been granted up to now?

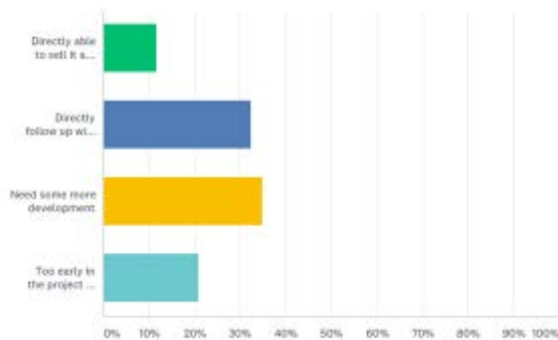
Answered: 120 Skipped: 10

ANSWER CHOICES	RESPONSES	
0	85.00%	102
1	8.33%	10
2	2.50%	3
3	2.50%	3
4	0.83%	1
5	0.00%	0
>5	0.83%	1
TOTAL		120

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Q13: At the end of the project, what is your estimated time to market?

Answered: 120 Skipped: 10



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Q13: At the end of the project, what is your estimated time to market?

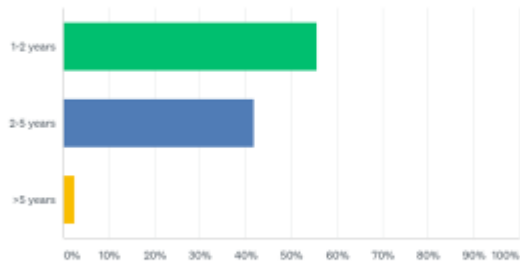
Answered: 120 Skipped: 10

ANSWER CHOICES	RESPONSES	
Directly able to sell it as a product	11.67%	14
Directly follow up with a prototype	32.50%	39
Need some more development	35.00%	42
Too early in the project to answer	20.83%	25
TOTAL		120

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Q14: If you estimate that some more development is needed before entering the market, please estimate:

Answered: 79 Skipped: 51



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Q14: If you estimate that some more development is needed before entering the market, please estimate:

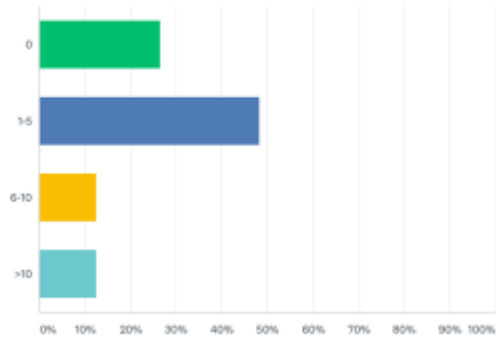
Answered: 79 Skipped: 51

ANSWER CHOICES	RESPONSES	
1-2 years	55.70%	44
2-5 years	41.77%	33
>5 years	2.53%	2
TOTAL		79

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Q15: How many joint public-private publications have been issued in the scope of the project?

Answered: 120 Skipped: 10



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Q15: How many joint public-private publications have been issued in the scope of the project?

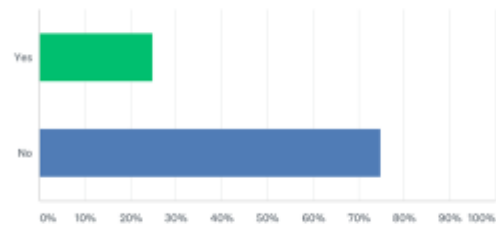
Answered: 120 Skipped: 10

ANSWER CHOICES	RESPONSES	
0	26.67%	32
1-5	48.33%	58
6-10	12.50%	15
>10	12.50%	15
TOTAL		120

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Q16: For the purpose of the project, do you lead or take part to standardisation activities or to contribution to new Standards?

Answered: 120 Skipped: 10



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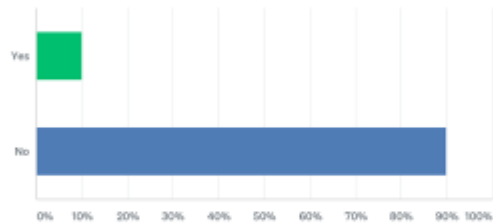
Q16: For the purpose of the project, do you lead or take part to standardisation activities or to contribution to new Standards?

Answered: 120 Skipped: 10

ANSWER CHOICES	RESPONSES	
Yes	25.00%	30
No	75.00%	90
TOTAL		120

Powered by  SurveyMonkey**Q17: If there are no standardisation activities related to the project, do you think this is missing for the exploitation of the project results?**

Answered: 90 Skipped: 40

Powered by  SurveyMonkey**Q17: If there are no standardisation activities related to the project, do you think this is missing for the exploitation of the project results?**

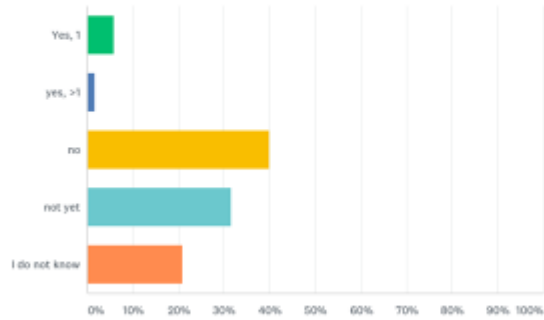
Answered: 90 Skipped: 40

ANSWER CHOICES	RESPONSES	
Yes	10.00%	9
No	90.00%	81
TOTAL		90

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Q18: Has any spin-off / start-up arised from the Project or is planned to be created?

Answered: 120 Skipped: 10



Powered by SurveyMonkey

Q18: Has any spin-off / start-up arised from the Project or is planned to be created?

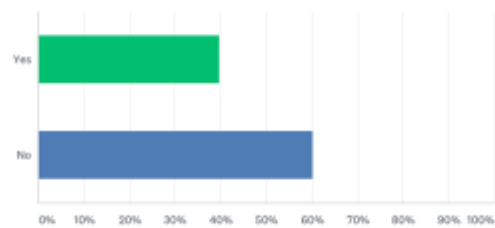
Answered: 120 Skipped: 10

ANSWER CHOICES	RESPONSES
Yes, 1	5.83% 7
yes, >1	1.67% 2
no	40.00% 48
not yet	31.67% 38
I do not know	20.83% 25
TOTAL	120

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Q19: To reach project outcomes, did you have or do you plan to invest in new asset(s)?

Answered: 118 Skipped: 12



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Q19: To reach project outcomes, did you have or do you plan to invest in new asset(s)?

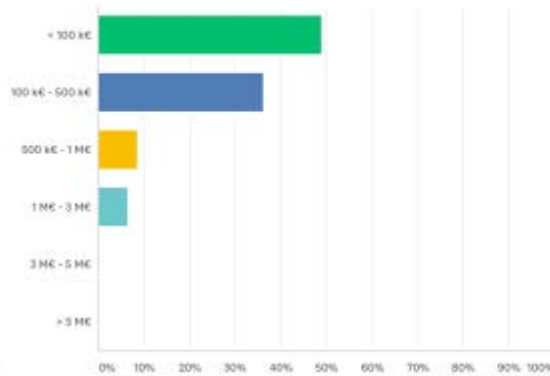
Answered: 118 Skipped: 12

ANSWER CHOICES	RESPONSES	
Yes	39.83%	47
No	60.17%	71
TOTAL		118

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Q20: If yes, what is the level of investment?

Answered: 47 Skipped: 83



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Q20: If yes, what is the level of investment?

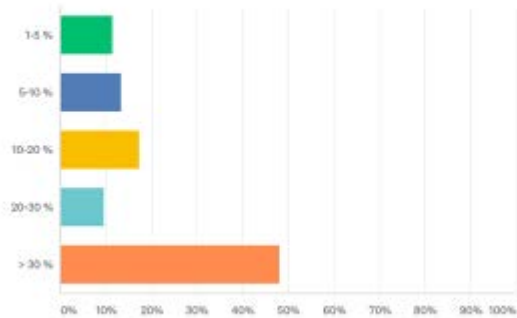
Answered: 47 Skipped: 83

ANSWER CHOICES	RESPONSES	
< 100 k€	48.94%	23
100 k€ - 500 k€	36.17%	17
500 k€ - 1 M€	8.51%	4
1 M€ - 3 M€	6.38%	3
3 M€ - 5 M€	0.00%	0
> 5 M€	0.00%	0
TOTAL		47

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Q21: What is the part covered by the grant?

Answered: 52 Skipped: 78



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Q21: What is the part covered by the grant?

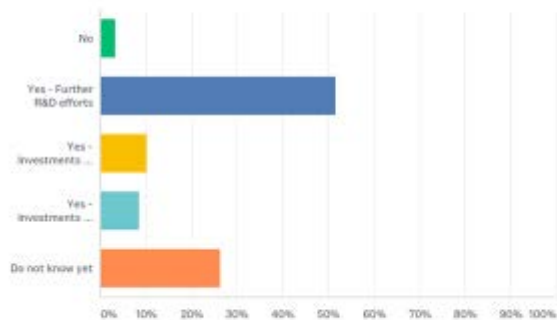
Answered: 52 Skipped: 78

ANSWER CHOICES	RESPONSES	
1-5 %	11.54%	6
5-10 %	13.46%	7
10-20 %	17.31%	9
20-30 %	9.62%	5
> 30 %	48.08%	25
TOTAL		52

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Q22: Do you plan to further invest in the follow-up of the project?

Answered: 118 Skipped: 12



Powered by SurveyMonkey

Q22: Do you plan to further invest in the follow-up of the project?

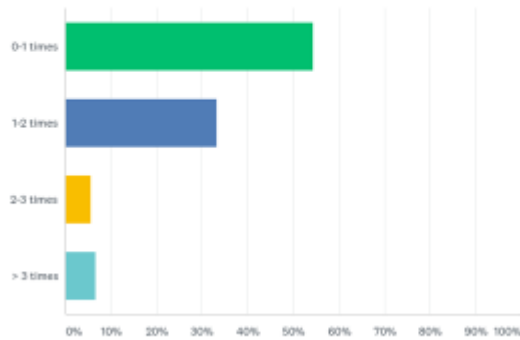
Answered: 118 Skipped: 12

ANSWER CHOICES	RESPONSES
No	3.39% 4
Yes - Further R&D efforts	51.69% 61
Yes - Investments in Production Capacity (incl. Pilots / Demonstrators)	50.17% 12
Yes - Investments in Commercial effort (incl. staff / tools)	8.47% 10
Do not know yet	28.27% 31
TOTAL	118

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Q23: Regarding further R&D efforts, how do you estimate the R&D efforts will be compared to your project Budget?

Answered: 90 Skipped: 40



Powered by  SurveyMonkey

Q23: Regarding further R&D efforts, how do you estimate the R&D efforts will be compared to your project Budget?

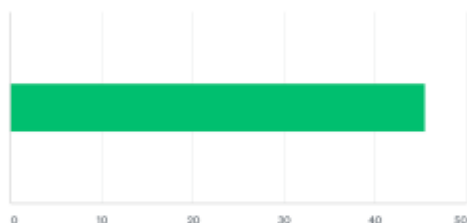
Answered: 90 Skipped: 40

ANSWER CHOICES	RESPONSES
0-1 times	54.44% 49
1-2 times	33.33% 30
2-3 times	5.56% 5
> 3 times	6.67% 6
TOTAL	90

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Q24: If you plan further R&D efforts, how do you estimate the cost share of the private and public sides?

Answered: 68 Skipped: 62



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Q24: If you plan further R&D efforts, how do you estimate the cost share of the private and public sides?

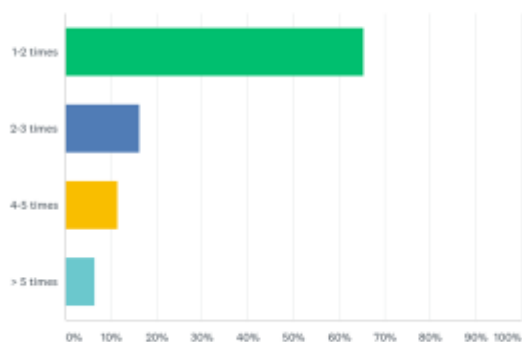
Answered: 68 Skipped: 62

ANSWER CHOICES	AVERAGE NUMBER	TOTAL NUMBER	RESPONSES
	45	3,093	68
Total Respondents: 68			

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Q25: Regarding production investments, how do you estimate the production investment will be compared to your project budget?

Answered: 61 Skipped: 69



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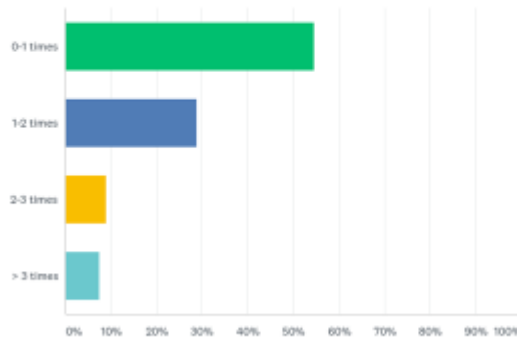
Q25: Regarding production investments, how do you estimate the production investment will be compared to your project budget?

Answered: 61 Skipped: 69

ANSWER CHOICES	RESPONSES	
1-2 times	65.57%	40
2-3 times	16.39%	10
4-5 times	11.48%	7
> 5 times	6.56%	4
TOTAL		61

Powered by  SurveyMonkey**Q26: Regarding commercial efforts, how do you estimate the commercial efforts will be compared to your project budget?**

Answered: 66 Skipped: 64

Powered by  SurveyMonkey**Q26: Regarding commercial efforts, how do you estimate the commercial efforts will be compared to your project budget?**

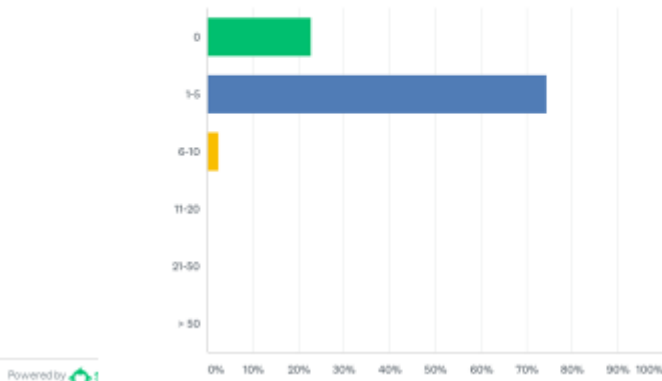
Answered: 66 Skipped: 64

ANSWER CHOICES	RESPONSES	
0-1 times	54.55%	36
1-2 times	28.79%	19
2-3 times	9.09%	6
> 3 times	7.58%	5
TOTAL		66

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Q27: Please roughly estimate the number of new jobs that have been created from the project in your company:

Answered: 118 Skipped: 12



Q27: Please roughly estimate the number of new jobs that have been created from the project in your company:

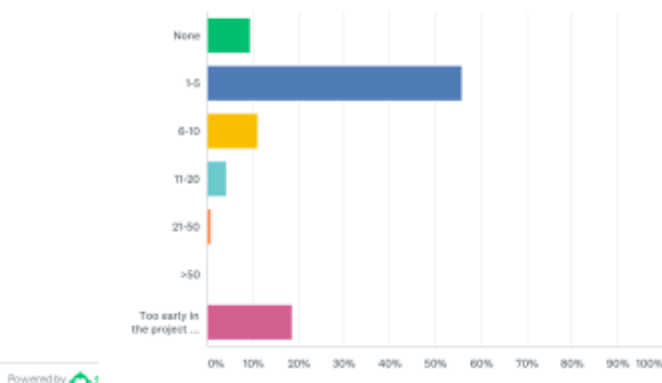
Answered: 118 Skipped: 12

ANSWER CHOICES	RESPONSES
0	22.88% 27
1-5	74.58% 88
6-10	2.54% 3
11-20	0.00% 0
21-50	0.00% 0
> 50	0.00% 0
TOTAL	118

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Q28: Please roughly estimate how many jobs may be created as a follow-up from the project in your company within the next 3 years:

Answered: 118 Skipped: 12



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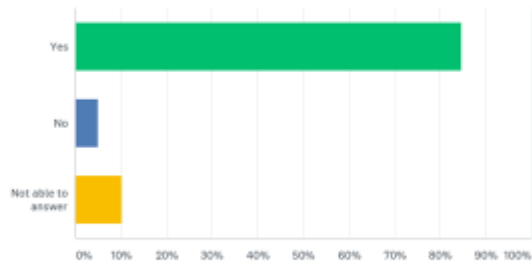
Q28: Please roughly estimate how many jobs may be created as a follow-up from the project in your company within the next 3 years:

Answered: 118 Skipped: 12

ANSWER CHOICES	RESPONSES	
None	9.32%	11
1-5	55.93%	66
6-10	11.02%	13
11-20	4.24%	5
21-50	0.85%	1
>50	0.00%	0
Too early in the project to answer	18.64%	22
TOTAL		118

Powered by  SurveyMonkey**Q29: Do you think the project results will positively affect other areas of your company's activities?**

Answered: 118 Skipped: 12

Powered by  SurveyMonkey**Q29: Do you think the project results will positively affect other areas of your company's activities?**

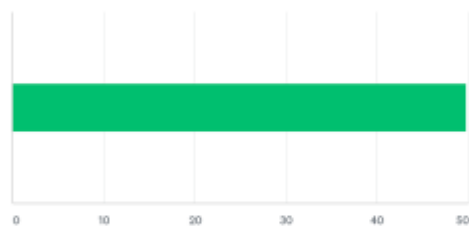
Answered: 118 Skipped: 12

ANSWER CHOICES	RESPONSES	
Yes	84.75%	100
No	5.00%	6
Not able to answer	10.17%	12
TOTAL		118

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Q30: If yes, at what level will your activity be impacted?

Answered: 82 Skipped: 48



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Q30: If yes, at what level will your activity be impacted?

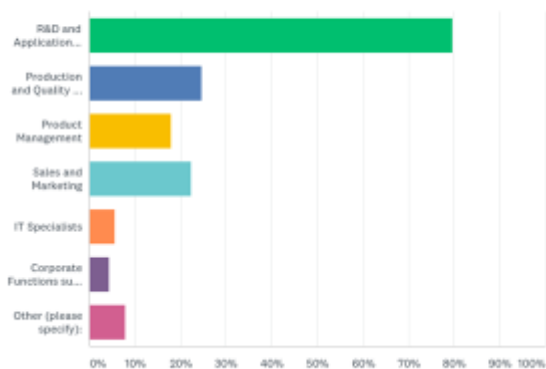
Answered: 82 Skipped: 48

ANSWER CHOICES	AVERAGE NUMBER	TOTAL NUMBER	RESPONSES
	50	4,082	82
Total Respondents: 52			

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Q31: If some jobs are planned to be created in your company as a follow up from the project (cf. question 28): which functions do you foresee to be needed?

Answered: 89 Skipped: 41



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Q31: If some jobs are planned to be created in your company as a follow up from the project (cf. question 28): which functions do you foresee to be needed?

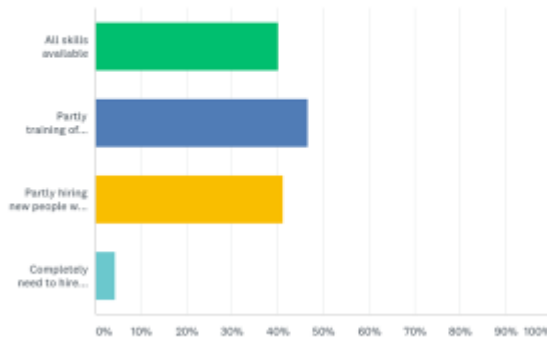
Answered: 89 Skipped: 41

ANSWER CHOICES	RESPONSES
R&D and Application Development	79.78% 71
Production and Quality & Safety Control people	24.72% 22
Product Management	17.88% 16
Sales and Marketing	22.47% 20
IT Specialists	5.62% 5
Corporate Functions such as Accounting and Controlling, Law, HR	4.49% 4
Other (please specify):	7.87% 7
Total Respondents: 89	

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Q33: Do you have the skills needed in-house or do you need to either hire or train people?

Answered: 92 Skipped: 38



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Q33: Do you have the skills needed in-house or do you need to either hire or train people?

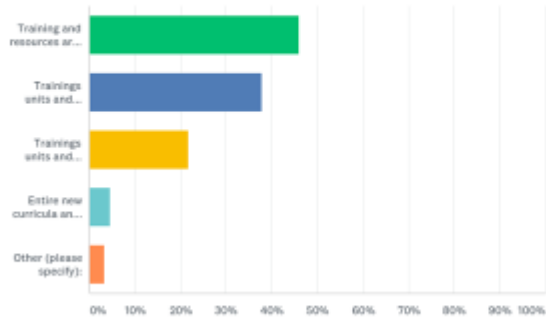
Answered: 92 Skipped: 38

ANSWER CHOICES	RESPONSES
All skills available	40.22% 37
Partly training of in-house people	46.74% 43
Partly hiring new people with new skills	41.30% 38
Completely need to hire new people	4.35% 4
Total Respondents: 92	

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Q34: Are the new type of skills and appropriate training already existing and easy to access?

Answered: 87 Skipped: 43



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Q34: Are the new type of skills and appropriate training already existing and easy to access?

Answered: 87 Skipped: 43

ANSWER CHOICES	RESPONSES
Training and resources are existent and easily to access	45.90% 40
Trainings units and resources exist but need to be enlarged	37.93% 33
Trainings units and resources exist but are content wise mature and need update	21.54% 19
Entire new curricula and training units need to be set up to create new resources	4.00% 4
Other (please specify):	3.45% 3
Total Respondents: 87	

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