FLOIM
Non-technical Barriers FactSheeT

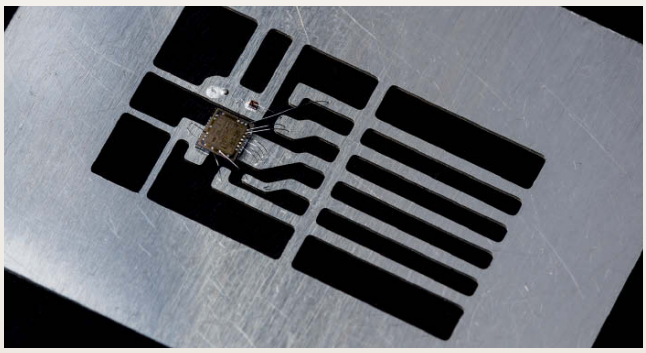
Barriers identification for the European Commission, policymakers & authorities

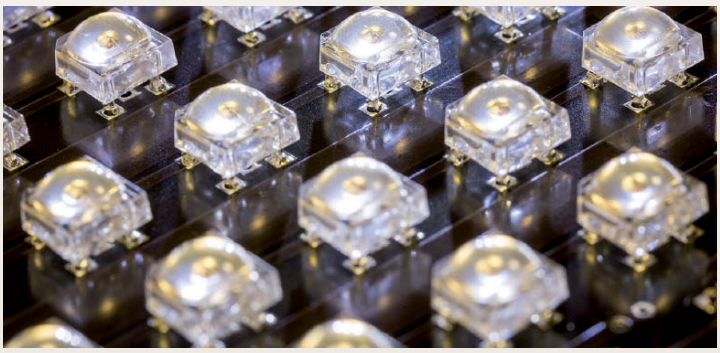
FLOIM
Flexible Optical Injection Moulding of optoelectronic devices

Factsheet /JULY 2022

Europe is the world's second largest manufacturer of photonics products, being today the European Photonics industry a fast-growing and thriving industry (5,000 companies, more than 300,000 highly skilled jobs and an annual turnover in excess of €60 billion). Miniaturized, integrated photonic devices are driving an increasing number of applications, while facing and increasing pressure to lower cost and increase flexibility. Currently, strong limiting factors in product cost reduction and quality assurance are concentrated in the later steps of device manufacture: optomechanics and assembling. The incorporation of transmission windows, beam forming optics, or any other optical system, together with the encapsulation and housing of the complete device, are still made with legacy methods, even manually in many occasions. *Mastering the advanced manufacturing of complex low cost and high quality optoelectronics components, will provide European industry with a key tool for excelling in advanced applications and differentiating their products, while keeping production in Europe.*

FLOIM project has developed and validated a flexible and innovative manufacturing process chain to handle complex designs that include opto-electronic functionalities, through the development of an integrated and single-step functional embedding technology based on thermoplastic injection moulding, that will substitute a number of operations usually required in production of optoelectronics, including microoptics production, handling, optomechanics attachment, positioning, alignment and encapsulation. The resulting FLOIM manufacturing platform has revealed **unprecedented productivity in freeform fabrication ofoptoelectronic devices, triggering the manufacturing of new and powerful components for a broad variety of industrial products, in information and communication applications, transport industry, lighting, manufacturing, etc.** The cost-efficiency and high productivity attained results in a highly competitive manufacturing solution as well as new manufacturing processes that boast extraordinary energy and resource efficiency contributing to green manufacturing, **ensuring the leading position of the European industry.**





Factories of the Future
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FLOIM in citizens daily life

LED lighting with embedded functional optics
More efficient and eco-friendly lighting, with integrated functional optics, at a reduced cost. Suitable for lighting on demand.

Flexible screen in vehicles A pillar for increased visibility
Elimination of the A pillar blind spot for car drivers, resulting in an increase of road safety, specially for pedestrians and bikers.

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Miniaturized scanning head for optical encoders
Allowing for higher positioning accuracy, this will mean a breakthrough in the manufacturing industry.

Fiber Optic Transceiver for datacom
More compact components will allow for higher data density transmission, improving fiber optics communication speeds and decreasing the size of devices that use them.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 820661

The **FLOIM consortium** intends to contribute to the debate on innovation in Europe by detecting new challenges to overcome and endorsing the proposals promoted by the European Commission, the PPP "Factories of the Future", now "Made in Europe" (EFFRA), and the European Photonics Community (Photonics21) which are considered key by the **FLOIM consortium**.

Barriers to Implementation

Skills availability and Technology de-risking

With increasing challenges and introduction of new technologies, the need for adequate skill sets in innovative manufacturing continues to grow. However, innovative manufacturing companies currently face shortages of skilled workers. Indeed, photonic technologies, as well as impacting machine tool developments, require well-trained individuals who satisfy companies' needs for personnel capacity, at all levels of photonic-based production.Photonic and advanced manufacturing technologies, like those developed in FLOIM, require continual training of employees so that the results from research facilities and development departments can be transferred to production quickly and as smooth as possible.

A coordinated public-private plan to define skill sets and curricula for professions in photonics is needed.

Complementarily, many photonic technologies developed in R&I funded projects are still in low TRLs. Risk averseness of industry and private investors in Europe is refraining adoption of these breakthrough technologies.

Mechanisms to overcome barriers

Skilled people and flexible infrastructure

• To provide training for entrepreneurs and workforces, to support the design of long-term training and Master's courses/industrial doctorates for students as well as to foster on-the-job training and traineeships for students with a Pan-European approach. Training contents should include technologies resulting from R&I projects funded by the Framework Programme. In this sense, a pathway between projects and Education and Training organisations would foster this interaction, as well as initiatives by these actors to promote careers related to photonics and advanced manufacturing. Both actions could benefit from schemes within ERASMUS programme (Knowledge Alliances, Sector Skills Alliances) or through the EIT-KICs.

•The establishment of photonic innovation hubs, as is already being done with the Digital Innovation Hubs, might generate space for creative ideas and developments, not only providing infrastructure in the form of machines and devices but also ensuring the transfer of knowledge through connections with academic and research institutions. These hubs should cover the whole value chain, from disruptive research and low TRL facilities, through SME incubators to pilot lines for testing, upscaling, pre-commercial exploitation and provide hands-on training and suitable training facilities.

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Barriers to Implementation

Standards and Regulations

One of the hurdles in adopting photonics and advanced manufacturing technologies in the industry include the lack of regulations and standards around them. These include guidelines with regards to safety&security, ethics, testing, legislation&regulation, and protocols for environmental protection and risk management. Effective standardisation processes for shortening time to market are needed.

Funding

Availability of financial resources for investments in technology are limited, even more restricted in the case of European Photonics industry, which is mainly comprised of SMEs, therefore, advancing on the innovation path to take results, like those developed in FLOIM from TRL 6 to TRL 9 will entail a high mobilization of private funds.

Lack of awareness

In photonics, there is a general lack of awareness amongst the potential adopters about the needs, how it extends the value proposition, design space and service offer in their business. This is especially important for SMEs due to their regional operation. Photonics needs to become a pervasive discipline at all levels and, in doing so, awareness is vital for the successful exploitation of the enormous potential of photonics technologies in a digital society. Beyond, raising awareness among society and other relevant agents (investors, banks, etc.) is essential in demonstrating the benefits and business potential of photonic technologies.

Mechanisms to overcome barriers

Creation of committees and new regulations

- A special committee with individuals composed of scientists, engineers, government advisers and others who have the expertise can be formed to spearhead the creation of specific standards required, mainly focused on optical design, simulation, materials performance (testing and manufacturing), and interoperability in digitalised manufacturing.
- Improved collaboration between standard-setting organisations in Europe and internationally to establish common standards and facilitate their proper enforcement and compliance.
- New and stringent regulations promoting greener manufacturing processes and products will also reinforce the adoption of the FLOIM technologies.

Promotion of existing and new funding instruments

- Fostering synergies by enabling mechanisms to orchestrate and take advantage of available public funding and support for innovation at regional and national levels (Smart Specialization Strategies, Digital agendas, ESIF funds, etc) and EU level (I4MS, ECI, EIE, EIT-Digital, EEN, etc.) as well as private investing initiatives (business angels, VC, etc.)
- Public Procurement of Innovative solutions (PPI). Further promote this kind of instruments to boost a particular new market for innovative solutions, helping innovative companies reach economies of scale to grow their business.
- The creation of Innovation Factory Photonics aiming to facilitate the commercialisation of research results, and lowering their entry threshold in the industry. An Innovation Factory would work as a virtual institution offering solutions for the complete photonics value chain (from precompetitive research and development activity leading to TRL5-6 maturity to a pilot line and pre-series production facilities), helping SMEs across Europe to speed up their innovation processes without having to worry about manufacturing investments before the market is proven.

Awareness and outreach activities

- Popularization of photonics and its economic and social benefits should be pursued through suitable communication, educational instruments and specific content developed depending on the target population (campaigns through educational and governmental institutions, mainstream media, social media…).
- Closer collaboration with programmes in the "Science and Society" area would be highly beneficial, aimed at increasing a wider awareness of photonics.
- Enhance visibility of photonics through the participation of Framework Programme-funded photonics projects in events promoted by the EC: EU Industry Days, Industry Week, R&I Days - Science is Wonderful Exhibition, etc.

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PROJECT IDENTITY

PROJECT NAME
Flexible Optical Injection Moulding of optoelectronic devices (FLOIM)

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Flexenable Limited - Cambridge, UK
Research Centre for Non Destructive Testing GmbH - Linz, Austria
Fraunhofer Gesellschaft Zur Foerderung der Angewandten Forschung E.V. - Munchen, Germany
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FUNDING SCHEME
European Union Horizon 2020 Framework Programme for Research and Innovation (2014-2020) - INDUSTRIAL LEADERSHIP - Leadership in enabling and industrial technologies - Advanced manufacturing and processing, call H2020-NMBP-TR-IND-2018-2020, topic "Innovative manufacturing of opto-electrical parts" Grant Agreement No 820661

DURATION
September 2018 - August 2022

BUDGET
EU contribution: 6,742,238.75 €

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http://www.floimproject.eu/
https://twitter.com/FloimProject
https://cordis.europa.eu/project/id/820661/

FOR MORE INFORMATION
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FURTHER READING

FLOIM publications:

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