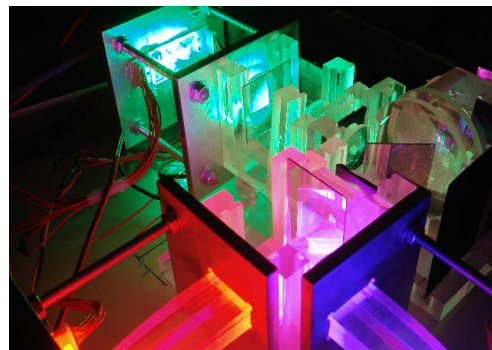
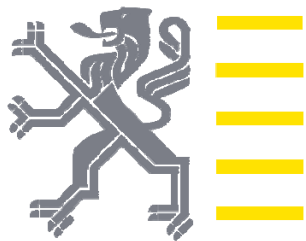
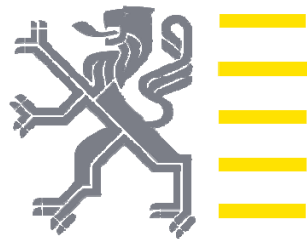
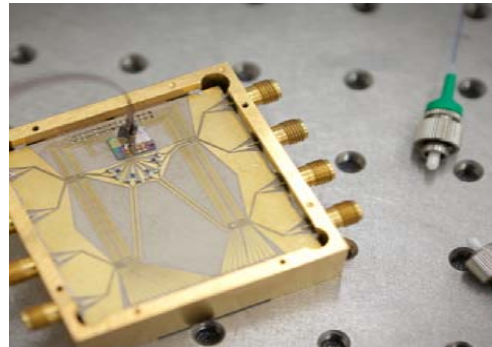


# TOWARDS 2020 - PHOTONICS AS A KEY ENABLING TECHNOLOGY (KET) FOR THE ADVANCEMENT OF SOCIETY AND ECONOMIC GROWTH IN FLANDERS

A MULTIANNUAL STRATEGIC RESEARCH & INNOVATION ROADMAP 2014-2020  
PREPARED BY THE FLANDERS PHOTONICS CONSORTIUM WITH THE SUPPORT OF IWT



# Presentation Agenda

- **About the Flanders Photonics Consortium**
- **Preparing the Roadmap**
  - Strategic importance of photonics in global context
  - EU vision for photonics as a Key Enabling Technology
  - Why do we need a Roadmap for Photonics in Flanders
  - Current state of the Photonics sector in Flanders
- **Results Achieved – Research & Innovation Actions in Flanders to 2020**
  - Information & Communications
  - Industrial Manufacturing & Quality
  - Life Sciences & Health
  - Emerging Lighting
  - Visualization & Displays
  - Security, Metrology & Sensors
  - Design and Manufacturing of Photonics Components & Systems
  - Education, Outreach, SME Supports & Disruptive Research
- **Anticipated Future Impact of Proposed Actions**

# The Flanders Photonics Consortium

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- The Flanders Photonics Consortium comprises over 30 organizations from across the spectrum of research and industrial activity in Flanders with a special interest in the future development of the photonics sector in the region who came together in mid-2013 to develop the roadmap

## *Members of the Flanders Photonics Consortium*



# PREPARING THE ROADMAP

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Where Are We Starting From.....  
And Where Do We Want To Be in 2020?

# Analysis of Current Position

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**Photonics is a major global industry with enormous economic potential**

- Total Photonics market €350bn (in 2011)
- Average yearly growth rate of 6,5% compared to 2011
- Estimated market size in 2020 ~ €615bn
- **European Photonics market ~ €64bn**
- **European market share 18%** (in 2011)
- Many market-leading industrial players
- Global market shares of European companies
  - Production technology 55%
  - Optical components & systems 40%
  - Measurement & automated vision 35%
  - Medical technology & life sciences 30%
- **More than 5000 photonics SMEs in Europe**
- **~ 300.000 employees**



# Analysis of Current Position

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**Photonics has achieved broad recognition and investment in the sector is growing strongly**

- One of the **Key Enabling Technologies** in EU
- Very visible in FP7 and now H2020
- Very well-organized community
  - Photonics21 European Technology Platform (ETP) has grown from 250 to over 2500 members
  - 40\* National Platforms and Regional Innovation Clusters
- EU Photonics Roadmap to 2020
  - Implementation underway through a **Public Private Partnership** (PPP) arrangement signed between the European Commission and Photonics21
  - Targeting **investment of ~ €700M in photonics under H2020**
- **2015 International Year of Light and Light-Based Technologies**



TOWARDS 2020 – PHOTONICS  
DRIVING ECONOMIC GROWTH  
IN EUROPE

Multinational Strategic Roadmap 2014–2020



PHOTONICS<sup>21</sup>



INTERNATIONAL  
YEAR OF LIGHT  
2015



# Why Do We Need a Roadmap for Flanders?

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- In implementing the PPP investment behind the EU Photonics Roadmap 2020, the Commission proposed the establishment of ex-ante **conditionalities linked to the funding objectives**.
- For Objective 1 'Research and Innovation', it is required that Member States and/or regions develop a **R&I strategy for smart specialisation (RIS3)** that is politically endorsed and identifies specialization fields fit to trigger knowledge-driven economic transformation in a region and are differentiating it from others / diversifying existing assets (instead of generic sectors or technologies), resulting in the concentration of resources on a limited set of priorities.
- The roadmap enables us to **focus on areas of core strengths and opportunities** for the region



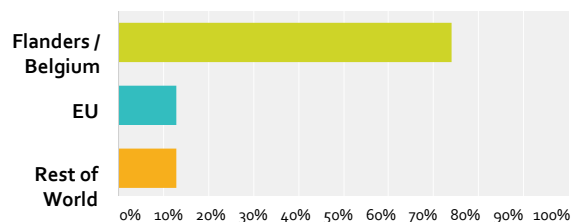
# Analysis of Current Position

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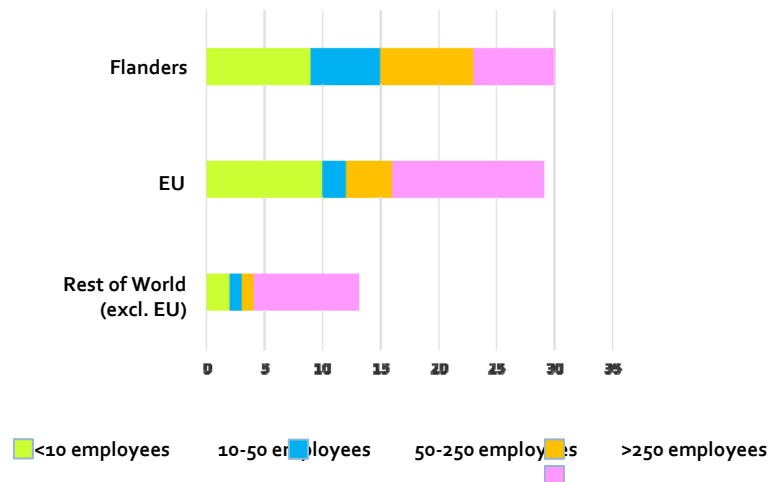
*Let there be light!*

## Survey of the photonics sector in Flanders in 2014

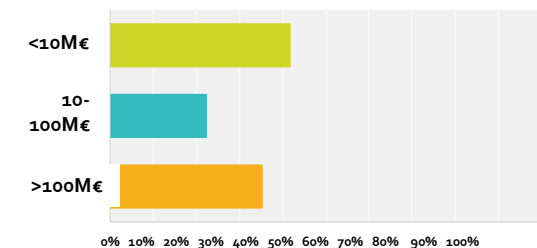
Q1: Where is your company's headquarters located?



Q2: How many employees do you have in Flanders, EU and ROW?



Q3: What is the size of your company's annual turnover\*?



\*based on sales in FY2013 for business activities based from Flanders only

### CONCLUSION #1:

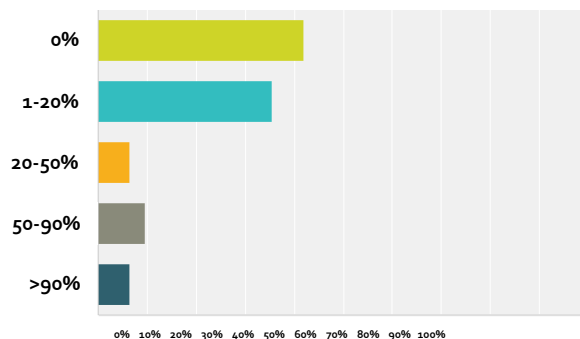
Flanders has a **strong indigenous industrial base in photonics**. The photonics sector within Flanders seems to have a good balance of small-, medium- and large-sized companies which are also strongly represented in Europe and globally, providing the basis for a vibrant ecosystem.



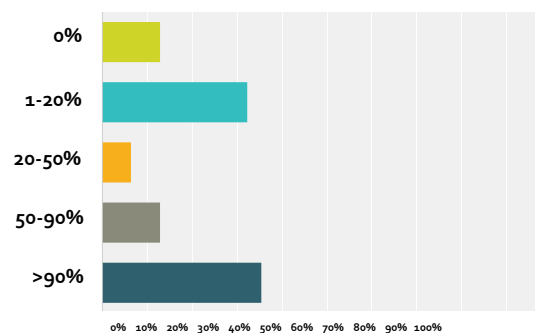
# Analysis of Current Position

## Survey of the photonics sector in Flanders in 2014

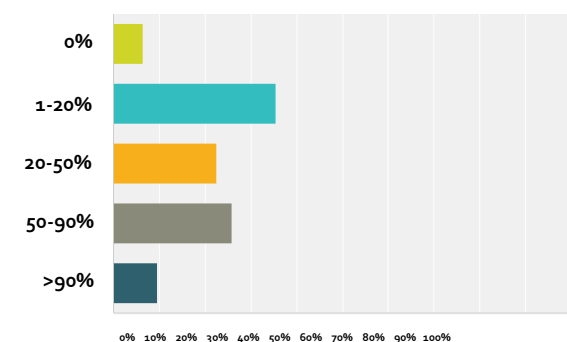
Q4: What percentage of your total sales volume\* is derived purely from stand-alone photonic components?



Q5: What percentage of your total sales volume\* is derived from products which rely on or are enabled by photonic components?



Q6: In the case where you have sales of products containing photonic components, what is the approximate average percentage value of the photonic components within these products?



*\*based on sales in FY2013 for business activities based from Flanders only*

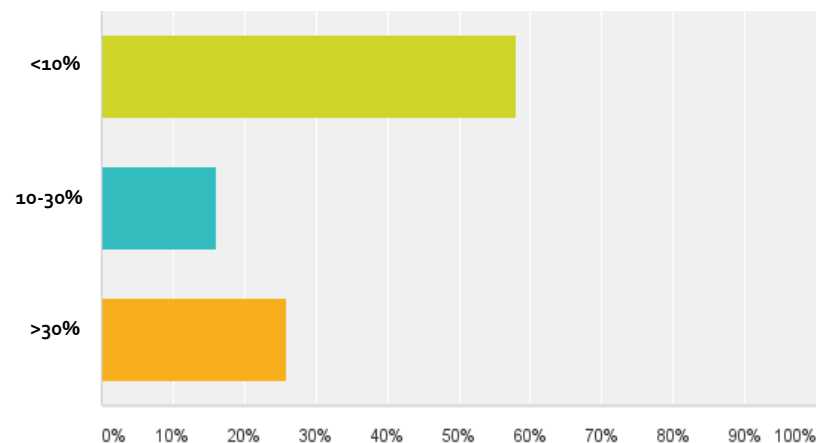
### CONCLUSION #2:

*The photonics sector within Flanders is significantly engaged in integrated value chain activity for the creation of high value photonics-enabled products, as opposed to simply selling stand-alone photonics components.*

# Analysis of Current Position

## Survey of the photonics sector in Flanders in 2014

Q7: What percentage of your supply chain partners are situated in Flanders?



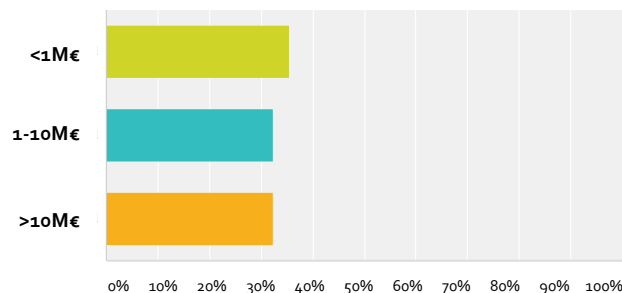
### CONCLUSION #3:

The value chain for the photonics sector in Flanders seems to be well-supported within the region itself with many companies tied in with **local suppliers**, albeit most of the sector is still reliant on a value chain which stretches beyond the Flemish border reflecting the global nature of the industry and **the strategic necessity of strong international linkages**.

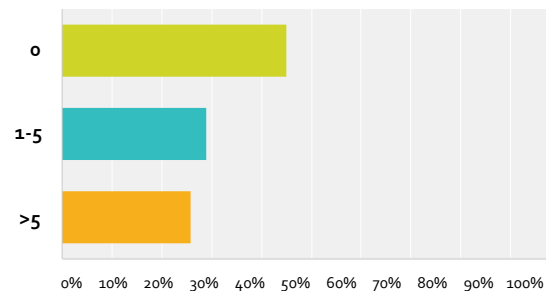
# Analysis of Current Position

## Survey of the photonics sector in Flanders in 2014

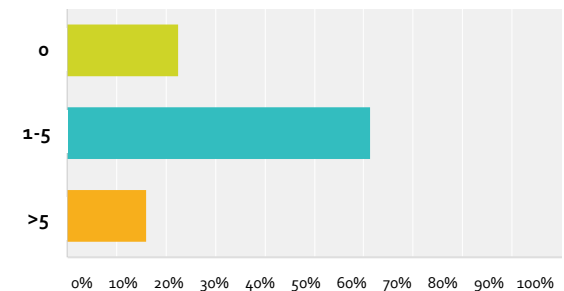
Q8: What is the approximate value of your annual R&D budget\*\*?



Q9: How many patents in photonics have been generated by your company in the last 5 years (i.e. since 2009) from R&D activities based in Flanders?



Q10: How many collaborations on photonics R&D initiatives have you been engaged in with Research Institutes or University labs within the last 5 years (i.e. since 2009)?



### CONCLUSION #4:

The photonics sector within Flanders is significantly engaged in investment in Research and Innovation, which appears to be reflected more in applied research projects with Universities and scientific institutes rather than in patent activity.

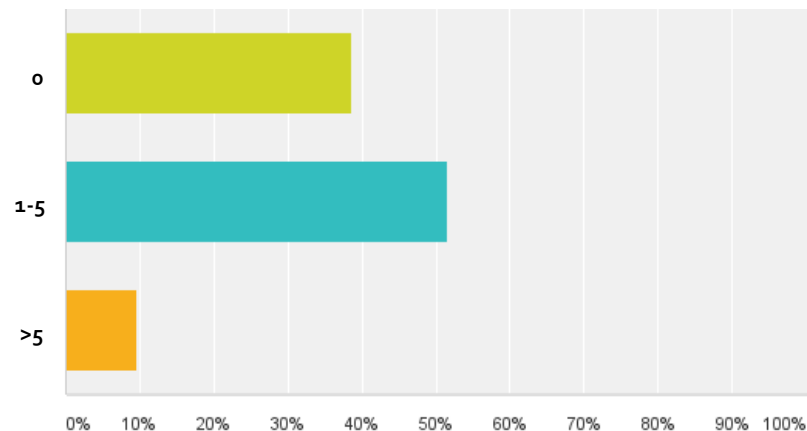
# Analysis of Current Position

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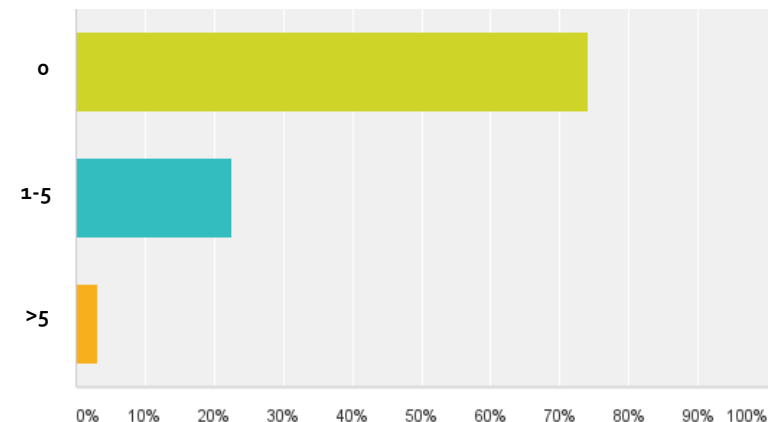
*Let there be light!*

## Survey of the photonics sector in Flanders in 2014

Q11: How many photonics-related funded (e.g. by IWT or EU) projects have you been involved in within the last 5 years (i.e. since 2009)?



Q12: How many hosted PhD students (e.g. IWT Baekeland/EU Marie Curie) in photonics have you taken on in the last 5 years (i.e. since 2009)?



### CONCLUSION #5:

However, while the overall level of photonics Research and Innovation in Flanders seems to be strong, there appears to be a significant cohort of companies in the photonics sector in the region that are not yet availing of some of the key supports that are available for increasing their level of research and innovation activity, reinforcing the need for coordinated strategic action across all stakeholders in the sector to maximize the potential benefits to the region.

# RESULTS: RESEARCH & INNOVATION ACTIONS FOR FLANDERS

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How Will We Get To The Place We Want To Be in  
2020?

# Structure of the Plan

## 7 Industrial Pillars (aligned with EU Roadmap)



Each pillar consists of the same 4 principles for its roadmap plan as shown below:

1. “Market-driven” addressing “mega-trends” and major societal challenges



2. Clear smart specialization strategy based on the value chain in Flanders



3. Application-oriented to bridge the “valley of death” across the TRLs



4. Identification of cross-KET synergies



# Example: Life Sciences & Health

## Mega-Trends: the major societal challenges and resulting market opportunities to be addressed

- Biophotonics is one of the most vibrant and promising of global markets. The current size of the worldwide healthcare market for optical technologies alone was estimated to be 23B€ in 2010, and to be growing at an 8% CAGR by 2015. Europe's share of the global market is estimated at about a third.
- New and efficient methods and devices need to be developed that allow maintenance of a quality life with affordable healthcare for ageing populations, and the introduction of new cost-effective photonics-enabled solutions to the healthcare market will play a major role in meeting this challenge. It is also anticipated that there will be a huge demand for photonics solutions in the quality control/assurance of food and drug production processes related to the healthcare market.
- These societal challenges present a number of major technological challenges to be overcome through Research & Innovation, e.g.:
  - Miniaturization of optical components for (point of care) screening devices
  - Development of novel materials
  - Enhancement of spectroscopy techniques
  - Novel detector systems



# Example: Life Sciences & Health

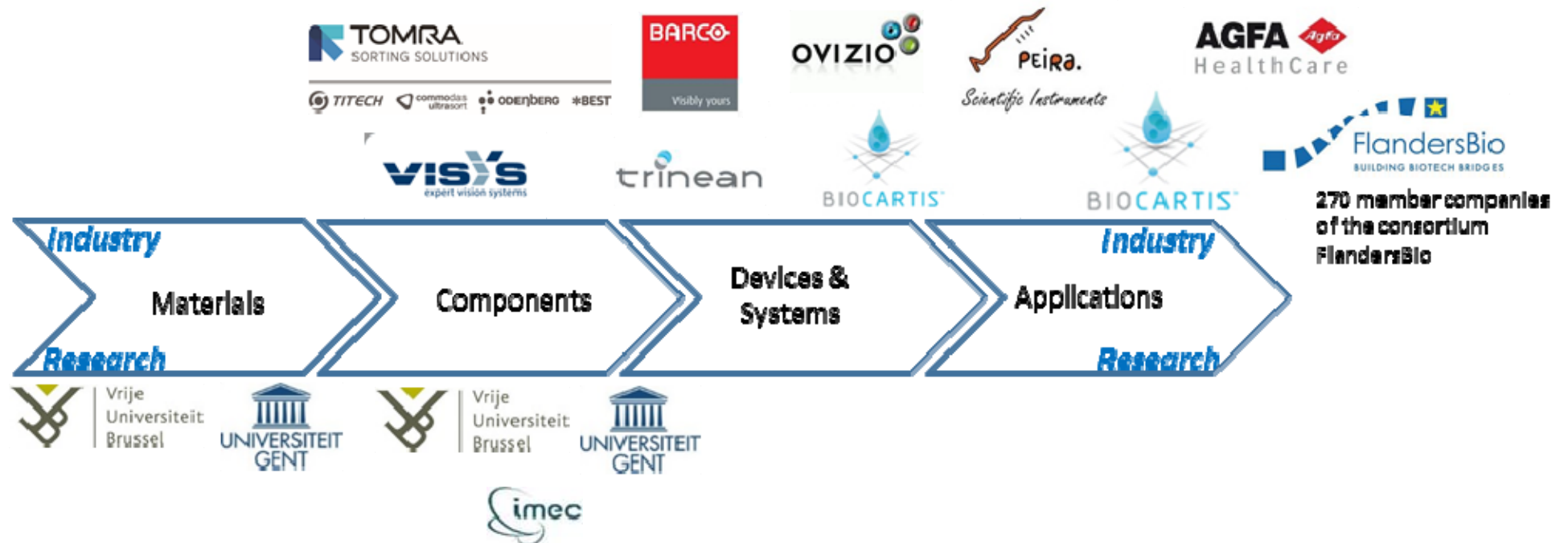
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Smart Specialization: the major core competences and value chain of Flanders in this area

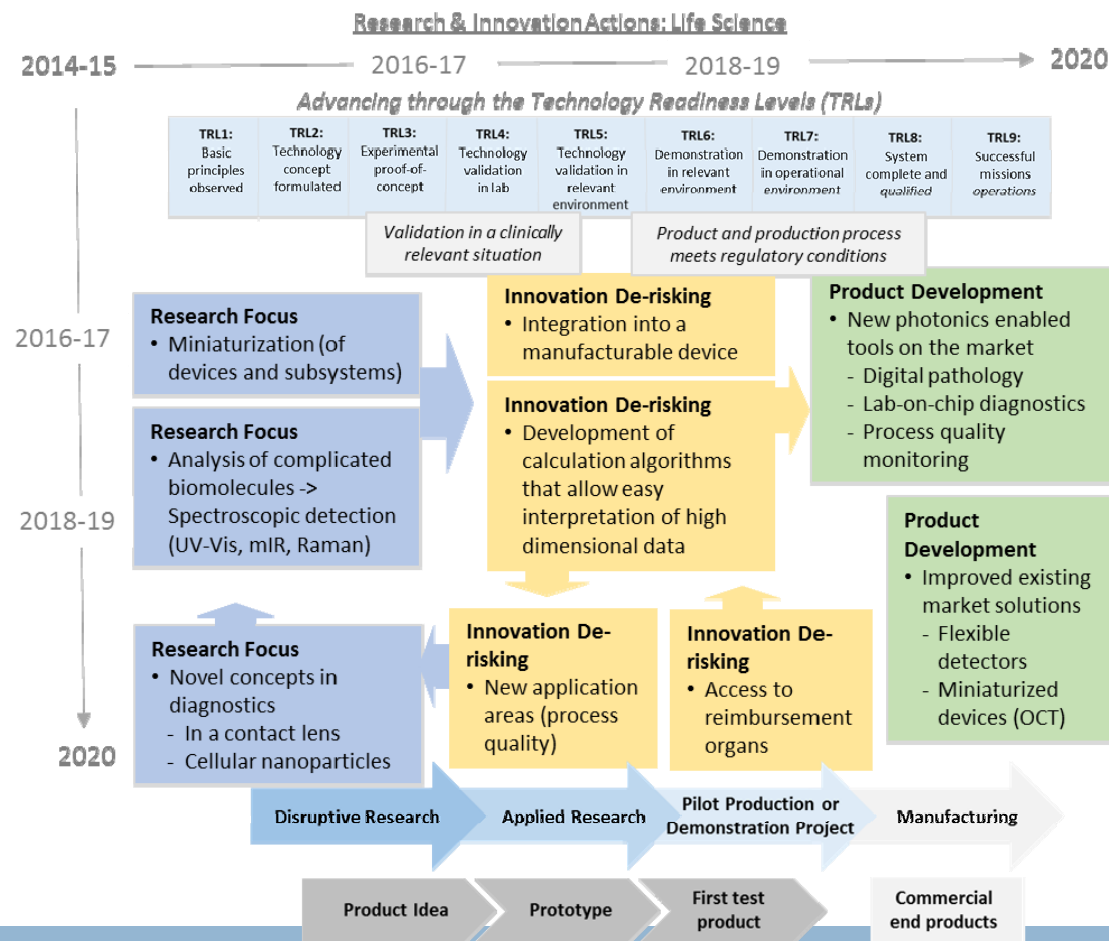
## **SMART SPECIALIZATION - FOCUSING ON CORE COMPETENCES & THE VALUE CHAIN**

### Value Chain for Photonics and Photonics-Enabled Companies in Flanders: Life Science



# Example: Life Sciences & Health

**Bridging the Valley of Death: the major photonics research & innovation actions for Flanders in this area**



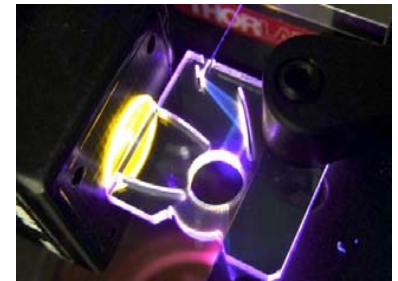
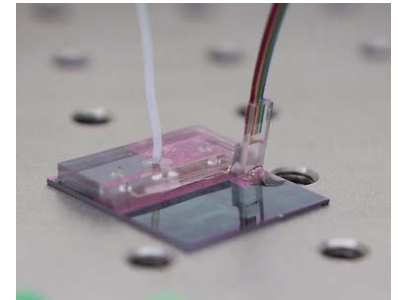
# Example: Life Sciences & Health

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## Cross-KET Synergies: alignment between photonics and other key enabling technologies in this area

- The development of new solutions for the life sciences sector is by nature multi-disciplinary and given the presence of strong clusters in the other KETs, more specifically in **Micro- and Nano-electronics** and **Industrial Biotechnology**, there is room for significant cross-KET alignment.
- Integration of micro- and nano-electronic components is essential to the development of miniaturized sensors and systems for the targeted applications such as lab-on-chip devices and implantable sensors. Actions should be implemented in order to team up with regional players in this specific field.
- Additionally, the biotechnology industry, which is one of the major innovative industries in Flanders, will be a key end user of the products developed through the photonics ecosystem. Hence, it can be considered as extremely important to insert the biotechnology community into the photonics innovation process by creating a platform in which ideas can be exchanged and joint initiatives can be accelerated.



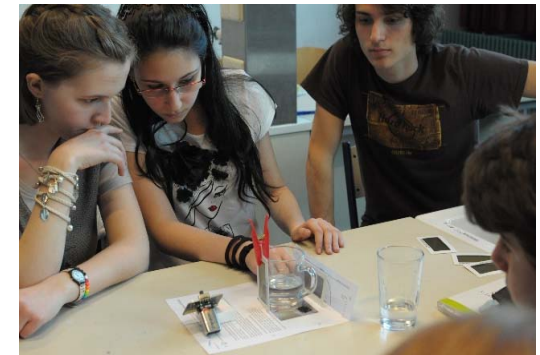
# Example: Education, Outreach & Research

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## Mega-Trends: the major societal challenges and resulting market opportunities to be addressed

- Actions targeting disruptive research, as well as outreach, education and training at all levels, will together have a major impact on Flemish **intrapreneurship**, **entrepreneurship** and **industrial competitiveness**, fostering highly innovative SMEs and large-scale companies, and ultimately ensuring the continuing success of photonics with the consequent benefits for economic growth and employment.
- However there are several substantial challenges to be overcome through concerted action over the next decade in order to deliver on this potential, e.g.:
  - On the research side, it has been proving harder and harder to attract the required numbers of high caliber people with the passion and drive for pushing the boundaries of science
  - in general there is currently limited mechanisms for industry training exchange, internships or scholarships for photonics students in Flanders compared to other EU countries like Germany and France for example, and this should be addressed in line with a smart specialization strategy, particularly around opportunities for cross-KET collaboration on PhD students
  - The links between research and industry should also extend to increased activity around the development of entrepreneurship in photonics amongst the student base
  - There is a lack of a defined funding vehicle in Flanders for outreach activity in the photonics domain



# Example: Education, Outreach & Research

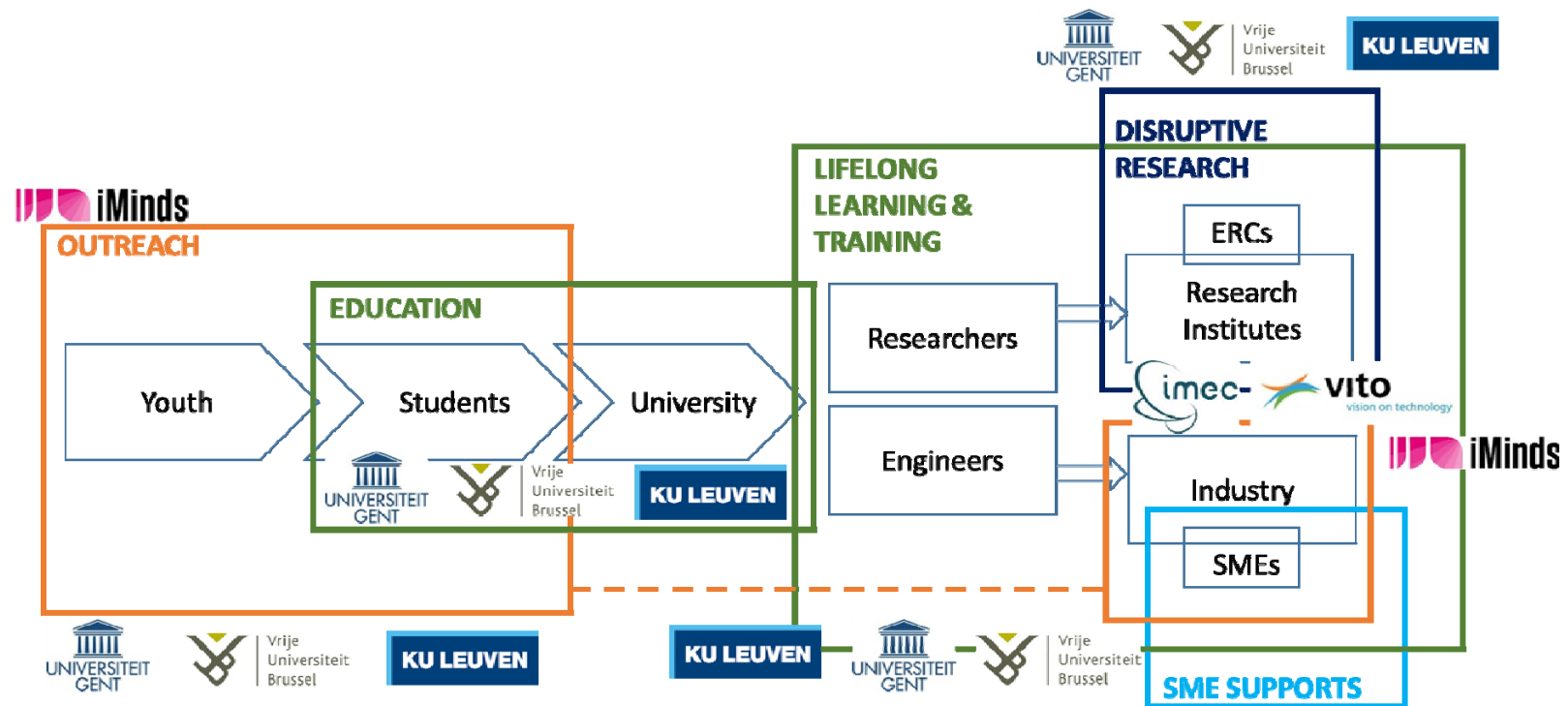
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Smart Specialization: the major core competences and value chain of Flanders in this area

**SMART SPECIALIZATION -  
FOCUSING ON CORE COMPETENCES & THE VALUE CHAIN**

Value Chain for Photonics in Flanders: Education, Outreach, SME Supports & Disruptive Research



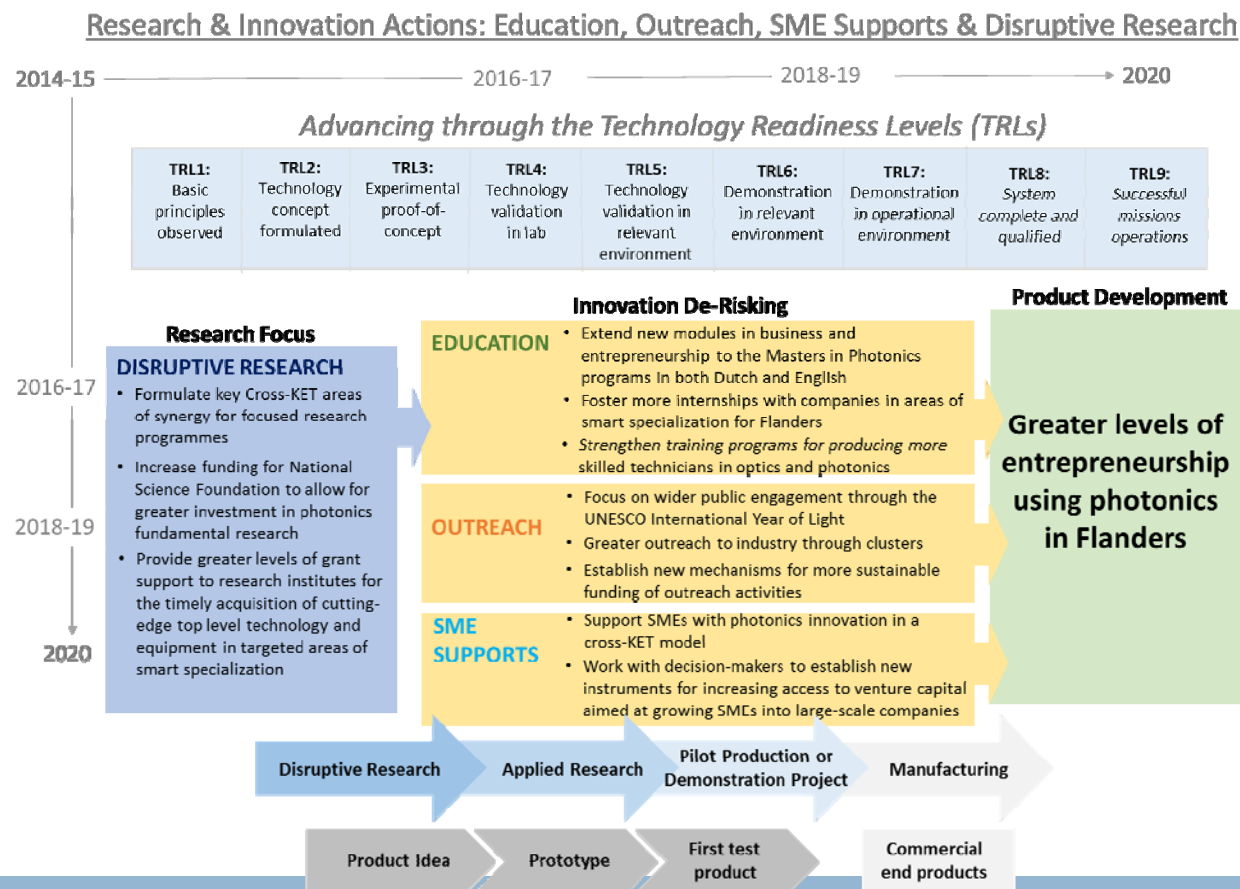


# Example: Education, Outreach & Research

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**Bridging the Valley of Death: the major photonics research & innovation actions for Flanders in this area**



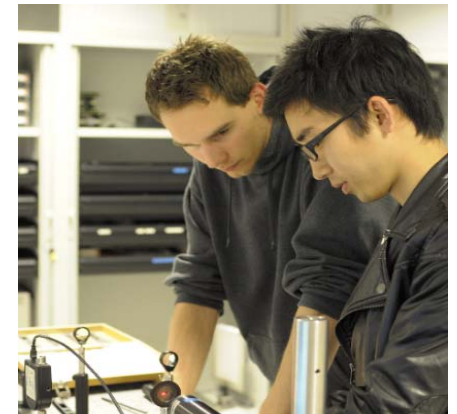
# Example: Education, Outreach & Research

FLANDERS  
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ROADMAP 2020

*Let there be light!*

## Cross-KET Synergies: alignment between photonics and other key enabling technologies in this area

- When it comes to education and training, outreach and SME supports, as well as highly innovative advanced research, the potential for enormous benefits to be derived from closer collaboration between the KET platforms in Flanders cannot be overstated. Just some of the areas of synergy which have been identified for immediate collaboration include:
  - **Micro- and nano-electronics** (e.g. in photovoltaics and photonic integrated circuits)
  - **Nanotechnology** (e.g. in nanophotonics)
  - **Advanced Materials** (e.g. in graphene photonics and polymer optics)
  - **Biotechnology** (e.g. in nanobiophotonics)
  - **Advanced Manufacturing** (e.g. in laser-based additive manufacturing and 3D-printing)
- Hybrid systems employing devices based on photonics and other KETs will be a cornerstone to the roadmap which addresses the innovation needs for smart cities and communities with maximum efficacy. By exploring and instigating cross-fertilization of ideas, activities and best practices in education and outreach programs across the KETs, not only will it provide for greater levels of efficiency by avoiding duplication of effort, but the potential for major innovation across all sorts of application domains can be greatly increased amongst researchers and companies across Flanders.



# ANTICIPATED FUTURE IMPACT OF ACTIONS

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What Will We Achieve From This Roadmap?

# Benefits arising from the Roadmap

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## Primary Benefits

- Accelerated time-to-market for new product innovations by Flemish Photonics companies in key specialist areas through more focused collaboration and TRL progression across the value chain, resulting in increased revenue and employment growth in the region.
- Greater access to increased levels of EU structural and Photonics PPP funding in support of targeted R&I investments as a result of mobilizing the Flemish photonics community into a leadership position in meeting the conditionalities of H2020.
- Consolidate the pioneering role of Flanders in the worldwide trend towards integrated photonics

## Additional Benefits

- Better data and knowledge sharing about the photonics sector in Flanders
- Raising public awareness, understanding and interest levels in photonics
- Sparking greater levels of networking and synergy between stakeholders at multiple levels including cross-KET

Z-Nieuws 17/04/14

vrijdag 18 april 2014 om 11u41



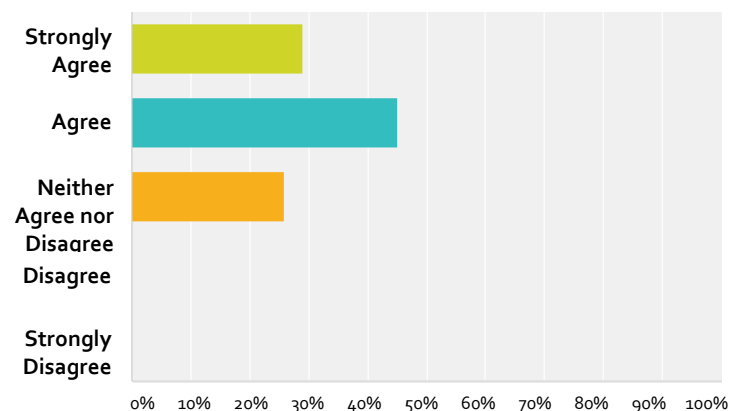
# Continuation Plans

## Survey of the photonics sector in Flanders in 2014

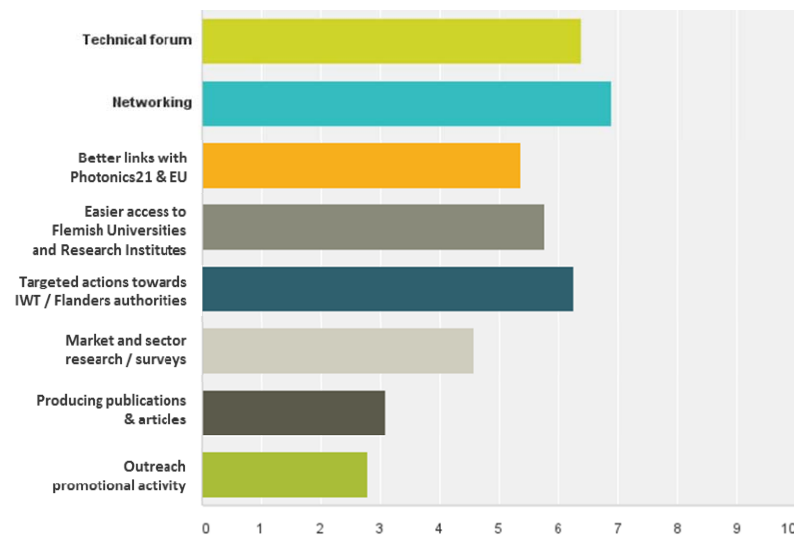
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Q13: Do you agree with the need for a continuation of this consortium after completion of the Roadmap document by looking for support (e.g. from IWT) for the establishment of a permanent Flanders Photonics Platform to represent the sector?



Q14: What would your main expectations be for the work that should be carried out by a permanent photonics platform for Flanders? Rank in order of importance where 1 = least important and 9 = most important.



### CONCLUSION:

*There is strong support within the photonics sector in Flanders for the establishment of a permanent Flemish platform to represent the sector here, with the main objectives being to support increased networking opportunities, providing a shared technical forum, and coordinating targeted actions with IWT and Government authorities.*

# Key Performance Indicators

The following key performance indicators (KPIs) have been identified for monitoring progress of the Flanders photonics roadmap to 2020:

- **The level of initial and ongoing commitment to the plan by the photonics sector in Flanders, both from research institutes and industry**, *as measured by the number of active participants from the sector contributing in kind and in cash to a permanent photonics platform for Flanders*
- **The level of initial and ongoing commitment to the plan by the wider stakeholders in the photonics sector in Flanders, i.e. Government and industry / KET clusters**, *as measured by the level of the IWT/public funding that goes into photonics-related R&I projects (including the funding of the photonics platform), and the level of active participation from these stakeholders in the work of the photonics platform*
- **The level of delivery of the plan itself on an annual basis**, *as measured by the extent to which the research and innovation (R&I) actions set out in the photonics roadmap are being achieved*
- **The level of impact from the delivery of the plan on an annual basis**, *as measured by the individual outcomes which must be set for each action taken by the participants directly involved*
- **The ultimate KPI to determine the strategic impact of the plan on a multiannual basis on economic growth in Flanders**, *as measured by the growth in the number & size of both photonics and photonics-enabled companies in Flanders over the full lifetime of the roadmap*



# A Final Word of Thanks

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- With special thanks to the project sponsors at IWT, and the following people who have played a central role in bringing this Roadmap document together

## **Consortium Lead**

Augustin Grillet, Barco

## **Chief Editor**

Peter Doyle, VUB

## **Industry Leads by section**

Jan Watté, TE Connectivity

Ben Depuydt, Umicore

Ronny Bockstaele, Trinean

Augustin Grillet, Barco

Lieve De Vos, OIP

Tom Collins, Caliopa (Huawei)

## **University Editors by section**

Dries Van Thourhout, UGent

Jürgen Van Erps, VUB

Bart Geers, UGent

Peter Hanselaar, KU Leuven

Francis Berghmans, VUB

Danaë Delbeke, UGent

Hugo Thienpont, VUB

## **Roadmap sections**

*Information & Communication*

*Industrial Manufacturing & Quality*

*Life Science & Health*

*Emerging Lighting, Visualization & Displays*

*Security, Sensors & Metrology*

*Components & Systems*

*Education, Outreach & Disruptive Research*