Fotoniikan kansallinen toimialaselvitys

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• Survey results
• Methodology and data

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Summary (1/3)

- Finland has at least 200 companies with photonics activities based on survey results
  - Most of the Finnish photonics companies are small with less than 5M€ annual turnover
  - Median Finnish photonics company has 15 employees
  - Majority of companies are manufacturing systems, instruments and components
  - Companies are targeting at several markets especially the industrial production and quality market

- At the industry level, the estimated total annual revenue of photonics business in Finland is over 850 meur

- Photonics business directly employs more than 3 500 workers in Finland

- Healthcare, cleantech and consumer electronics are examples of photonics boosted ecosystems in the Finnish industry
Summary (2/3)

• Finnish photonics companies are export-intensive with key export markets in Europe and Asia

• Finnish photonics companies are expected to grow fast during the next 3 years
  • turnover 27 % annually
  • market size (21 %) annually
  • number of employees 28 % annually

• Highest growth potential is in emerging lighting, electronics and displays

• Photonics companies call for assistance in finding partners both in Finland and foreign markets to boost their growth

• In international comparison, Finland has a great number of small photonics companies and high growth expectations
Summary (3/3)

• Over 30 photonics research groups operate in Finland employing more than 700 researchers
  • Most research groups (57%) operate with less than 1M€ annual research budget
  • Median Finnish photonics research groups has 15 employees
• Total annual research budget in Finland is more than 80 M€
• Photonics research in Finland has a focus on education and training, and life science and health applications
• Better access to finance and foreign partners would facilitate photonics research in Finland
Fotoniikkateollisuus Suomessa

• Suomessa yli 200 fotonikka-alan yritystä
  • Yli puolet on pieniä yrityksiä, joiden liikevaihto on < 10M€ (työntekijöitä keskimäärin 15)
  • Fotonikka-alan yritysten arvioitu liikevaihto on n. 1 miljardi euroa
  • Suoraan fotonikka-alan töitä tekee n. 4 000 työntekijää (vrt. Saksa 130 000)
  • Fotonikka-alan yrityksissä työskentelee kokonaisuudessaan 25 000 – 30 000 ihmistä

• Fotonikkaalatoimiala kasvaa Suomessa voimakkaasti
  • Yritysten päämarkkinan arvioidaan kasvavan n. 20 % vuosittain
  • Yritysten liikevaihdon arvioidaan kasvavan n. 27 % vuosittain
  • Työntekijöiden määrän arvioidaan kasvavan n. 18 % vuosittain

• Fotonikka on vientiala, päämarkkinana Eurooppa
  • Vahvasti vientiin suuntaavia yrityksiä on 48 % yrityksistä
  • Pelkästään kotimaahan keskittyneitä on 44 % yrityksistä
Mitä ftoniikkayritykset tarvitsevat

• Yritysten selkeä fokus on kansainvälisessä toiminnassa ja kasvussa
• Yritysten selkein tarve on kumppanit kotimaasta ja ulkomailta
  • 44% kumppanien löytäminen Suomessa
  • 40% vientimarkkinoille meneminen ja kumppanien löytäminen
  • 36% Markkina- ja teknologia-analyysit
Total annual revenue of photonics business in Finland is about Billion euro, and photonics business directly employs about 4 000 workers in Finland

- Finland has at least 200 companies with photonics activities based on survey results
  - Most of the Finnish photonics companies (68%) are small with less than 5M€ annual turnover
  - Median Finnish photonics company has 15 employees

- Current state of photonics industry in Finland
  - Estimated total annual revenue of photonics business in Finland is 850 - 1 500 meur
  - 3 500-4 800 employees of photonics companies are directly working with photonics in Finland. In total, photonics companies employ 25 000-30 000 workers.
Most important market for the photonics industry in Finland is industrial production / manufacturing and quality.

Type of market you are addressing with your products and/or services that apply photonics:

- Information and communication: 2%
- Industrial production / manufacturing and quality: 28%
- Life science and health: 13%
- Emerging lighting, electronics and displays: 15%
- Security, metrology and sensors: 15%
- Design and manufacturing of optical components and systems: 13%
- Research, education and training: 14%
Majority of photonics companies in Finland are manufacturing systems, instruments and components.
Finnish photonics companies are export-intensive

Share of exports of company’s photonics related products and/or services out of company’s current turnover

- 80-100%: 38%
- 60-80%: 8%
- 40-60%: 5%
- 20-40%: 5%
- 0-20%: 44%
Majority of Finnish photonics companies are founded in early 2000’s
Europe and Asia are the key export markets for Finnish photonics products and services.
Finnish photonics companies are expected to grow rapidly during the next 3 years

- Companies expect their key target markets to **grow 20.9% annually** for the next 3 years
- Companies expect their photonics related turnover to **grow 27.1% annually** for the next 3 years
- Companies expect number of employees is **estimated to grow 18.3% annually** for the next 3 years
Highest growth potential is in emerging lighting, electronics and displays.
Photonics companies call for assistance in finding partners both in Finland and foreign markets to boost their growth.

What type of assistance would facilitate the growth of the company:

- Finding foreign partners: 90%
- Finding Finnish partners: 85%
- Access to expertise: 66%
- Market and technology analysis: 65%
- Recruiting: 44%
- Finding investors: 40%
- Loans: 39%
- Training on exports regulations: 26%
- Other (specify): 23%
- Training on EU regulations: 21%
Examples of photonics boosted ecosystems in the Finnish industry

**Healthcare – personalized and digital care**

*Case example:* Effective screening of eye diseases and automatic pre-diagnosis in cloud services, photodynamic therapy

Photonics is applied in cameras for eye illumination and visible imaging of a retina, and therapeutic laser devices

**Cleantech – smart & clean processes**

*Case example:* Improved machine vision for waste sorting and industrial production

Photonics is applied in hyperspectral imaging, which generates more accurate information for process control

**Consumer electronics – high performance displays and interfaces**

*Case example:* Thin, flexible, efficient and uniform light guides for displays and smart interfaces

Photonics is applied in nano and micro level structures to guide light
Optomed’s solutions screen eye diseases and conduct automatic pre-diagnosis in cloud services

- Optomed is the world leading manufacturer of hand held retinal cameras.
- Optomed’s products are being used for screening of blinding eye diseases such as diabetic retinopathy, AMD and glaucoma.
- Main products are handheld retinal cameras for eye screening and automatic pre-diagnosis in cloud services.
- Customers are private and public hospitals, and private clinics. More than 4000 clinics are using products in over 60 countries.

Source: Optomed
Photonics is applied in Optomed cameras for eye illumination and visible imaging of a retina

- Photonics is applied in Optomed cameras for eye illumination and visible imaging of a retina.
- Illumination parts such as optical lenses, filters, LEDs, optical sensors are used in handheld camera products.
- Products are in connection with cloud service partners such as automatic disease diagnosis algorithm providers and eye screening programs.

Source: Optomed
Modulight is a pioneer in lasers & optics for personalized healthcare

• Modulight is at the forefront of lasers & optics for personalized medicine and better life.
• Modulight’s products are light based – typically containing lasers.
  • Products range from curative therapeutic devices such as laser for photo dynamic therapy to diagnostic tools used in R&D and quality control of the light activated molecules
  • Medical lasers for non-invasive oncology treatment and diagnostics
  • Lasers for defense & security applications
Specim’s new hyperspectral cameras enhance on-line quality control and waste recycling

- SPECIM, is one of the leaders in the international hyperspectral imaging industry with a strong market position in a variety of applications.
- Specim FX Series hyperspectral cameras enable the machine vision industry to enhance its on-line quality control process by providing more accurate information.
- The information saves both money and time and reduces the amount of unrecyclable waste.

Source: Specim
FX cameras collect more than two times light compared to the typical optics

• With the FX cameras, vision system integrators and machine builders can for the first time efficiently and competitively utilize the advantages of hyperspectral imaging.

• They can offer systems which help their clients to achieve more reliable, higher capacity sorting, produce higher quality products, and save raw materials, energy and environment.

• With the same speed and illumination, the FX cameras collect more than two times light compared to the typical optics in the current push-broom cameras.

Source: Specim
Nanocomp’s light guides for displays are thin and flexible

- Nanocomp is a global forerunner in micro- and nanophotonics design and manufacturing.
- The company focuses on roll-to-roll manufacturing of micro- and nanophotonics products for consumer electronics, laser sensing and special lighting sectors.
- Nanocomp offers
  - light guides for displays, which are thin and flexible, and improve efficiency and uniformity
  - customized and efficient optical film components for laser applications
  - other light management films
Nanocomp enables small and light components for gesture recognition

- Nanocomp will utilize nano and micro scale optical structures in own products.
- Nanocomp enables small and light components for gesture recognition (also used for human healthcare).
- Moreover, Nanocomp is developing new type illumination components for wearable devices.
Photonics research in Finland
Over 30 photonics research groups operate in Finland employing more than 700 researchers

- Finland has at least 30 research groups with photonics activities based on survey results
  - Most research groups (57%) operate with less than 1M€ annual research budget
  - Median Finnish photonics research groups has 15 employees

- Current state of photonics research in Finland
  - Total annual research budget in Finland is at least 80 M€
  - Total employment in Finnish photonics research is 700-900
Photonics research in Finland has a focus on education and training, and life science and health applications.

The key photonics related research fields in Finland:

- Information and communication
- Industrial production / manufacturing and quality
- Life science and health
- Emerging lighting, electronics and displays
- Security, metrology and sensors
- Design and manufacturing of optical components and systems
- Education and training
- Other
Better access to finance and foreign partners would facilitate photonics research in Finland.

What type of assistance would facilitate the research in your organization:

- **Access to finance**: 35%
- **Access to expertise**: 29%
- **Finding Finnish partners**: 20%
- **Finding foreign partners**: 16%
Typical respondent quotes

“There is lot of potential but how the research results would be transformed into industry more efficiently?”

“Future industry which’s technologies are already in usage”

“Market potential for growth in Finland, Europe and globally”
Finnish survey results in international context
## International comparison

Finland has a great number of small photonics companies and high growth expectations

### Comparison of international photonics markets

<table>
<thead>
<tr>
<th>Industry attribute</th>
<th>Europe</th>
<th>North America</th>
<th>Asia / Australia</th>
<th>Others</th>
<th>Global total</th>
<th>Finland</th>
<th>Sweden</th>
<th>Germany</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of photonics companies</td>
<td>1130</td>
<td>1395</td>
<td>750</td>
<td>490</td>
<td>3800</td>
<td>200</td>
<td>150</td>
<td>1000</td>
</tr>
<tr>
<td>Market size (billion euros)</td>
<td>180</td>
<td>220</td>
<td>120</td>
<td>80</td>
<td>600</td>
<td>0.9</td>
<td>2</td>
<td>30</td>
</tr>
<tr>
<td>Photonics employees</td>
<td>327 000</td>
<td>403 000</td>
<td>218 000</td>
<td>147 000</td>
<td>1 090 000</td>
<td>3500</td>
<td>6000</td>
<td>135 000</td>
</tr>
<tr>
<td>Global market share (%)</td>
<td>30</td>
<td>37</td>
<td>20</td>
<td>13</td>
<td>100</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>5</td>
</tr>
<tr>
<td>Annual market growth (%)</td>
<td>8-10</td>
<td>4.9</td>
<td>12-18</td>
<td>8.4</td>
<td>8.4</td>
<td>27.1</td>
<td>5-10</td>
<td>4</td>
</tr>
</tbody>
</table>

Source: SPIE, Photonics 21, GTAI, Photonics Sweden
Photonics in the Finnish Industry survey received a large number of responses

- Exploratory survey aims to identify photonics companies and research organizations, and market situation in Finland
- Survey received 275 responses and response rate was 32%
- Survey for companies received 184 responses, and 148 companies reported photonics activities in the survey
- Survey for research organizations received 91 responses
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