From vision to growth:
Role of research in building world-class excellence in future added value electronics

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VTT Technical Research Centre of Finland Ltd

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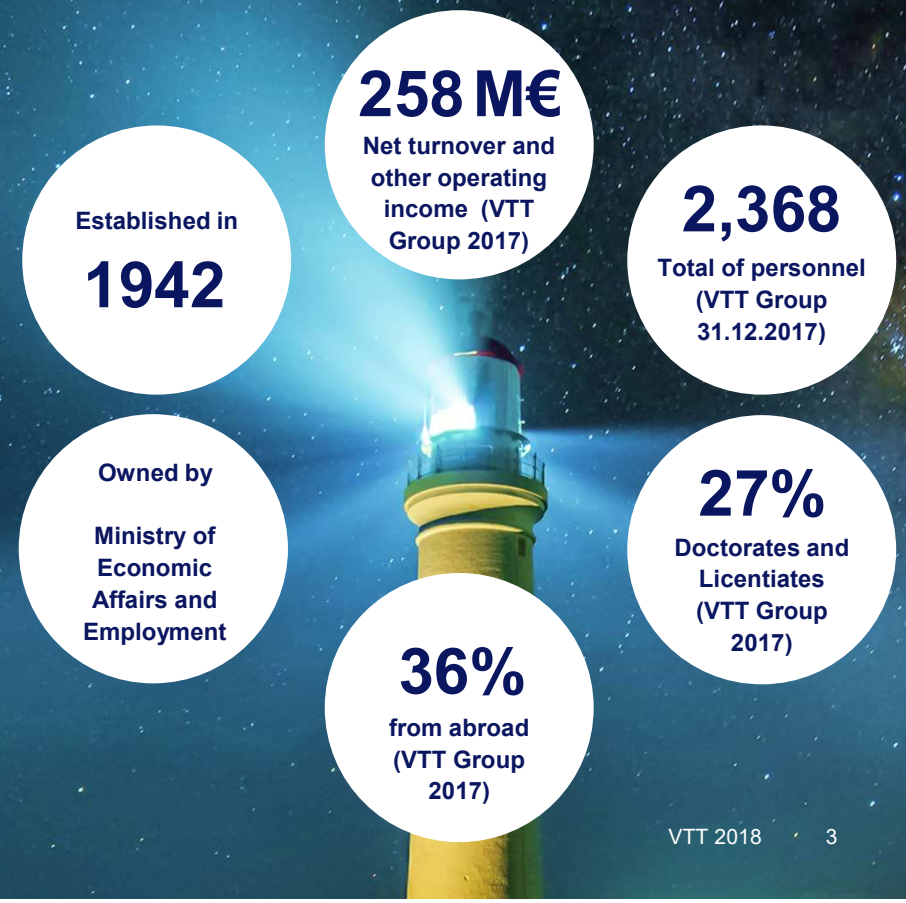
VTT – impact from excellence

VTT Technical Research Centre of Finland Ltd is one of the leading research, development and innovation organizations in Europe. We help our customers and society to grow and renew through applied research. The business sector and the entire society get the best benefit from VTT when we solve challenges that require world-class know-how together and translate them into business opportunities.

Our vision
A brighter future is created through science-based innovations.

Our mission
Customers and society grow and renew through applied research.

Strategy
Impact through scientific and technological excellence.



Established in 1942

258 M€
Net turnover and other operating income (VTT Group 2017)

2,368
Total of personnel (VTT Group 31.12.2017)

Owned by Ministry of Economic Affairs and Employment

27%
Doctorates and Licentiates (VTT Group 2017)

36%
from abroad (VTT Group 2017)

VTT strategy: we make an impact through scientific and technological excellence

VTT LIGHTHOUSES

Climate action

Resource sufficiency

Good life

Safety and security

Industrial renewal

VTT is a key actor in the Finnish innovation ecosystem

- **Innovation partner** to companies
- Finland's **biggest single actor in EU's framework programmes**
- Participates in ca. **30 national technology programmes** (Business Finland, Academy of Finland)
- **Strategic partnerships** with main universities
- Participates in **four Academy of Finland Centers of Excellence**

VTT's R&D infrastructure – an essential part of the national research infrastructure

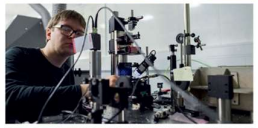
VTT's unique R&D infrastructure enables the development chain from basic research and process development up to prototyping and pilot manufacturing. Our research facilities are an essential part of the Finnish research infrastructure.

Examples of our R&D infrastructure

Bioruukki
The largest bioeconomy pilot and research facility in the Nordic countries.

Biotechnology and food research piloting environment
offers unique facilities for the development and customisation of bio and food industry technologies.

Micronova
World-class cleanroom facility, fully equipped for the fabrication of silicon, glass and thin film-based microsystems.



VTT MIKES Metrology
is the National Metrology Institute of Finland and performs high-level metrological research and develops measuring applications in partnership with industry.

Engine and vehicle laboratory
enables research on passenger cars as well as heavy-duty vehicles up to 60 metric tons to develop energy efficiency, emissions reduction and use of 2nd generation biofuels.

PrintoCent
World's first pilot factory for printed intelligence industrialisation.

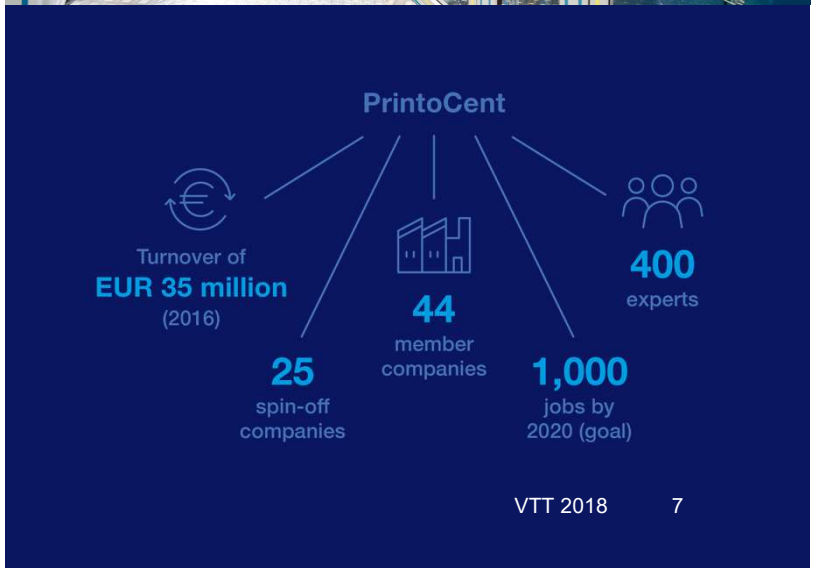
ROViR
Remote Operations and Virtual Reality Centre for the development of remote operations and virtual reality technology in industry.

A pilot-scale research environment for fibre processes
enables the development of novel products and supports the renewal of the pulp and paper industry.

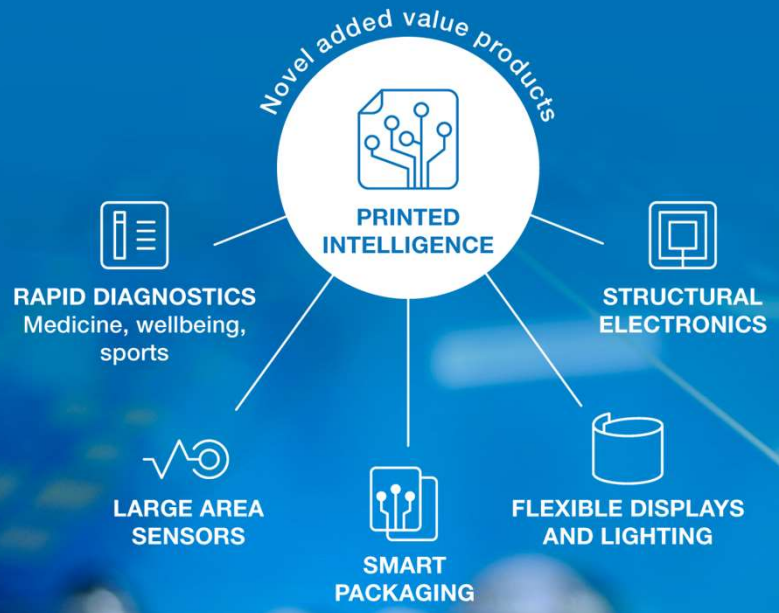
Centre for Nuclear Safety
for nuclear technology safety research.

The PrintoCent Innovation Centre is accelerating the commercialisation of printed intelligence

- Rapid transfer of research results in printed intelligence for industrial use
- Opportunity for companies to develop and experiment agilely with pilot manufacturing and product prototypes
- Surrounded by the EU's extensive cooperation network
- Entrepreneurship projects, training, innovation competitions and seminars
- With University of Oulu, Oulu University of Applied Sciences and BusinessOulu
- 10 000 new jobs within 15 years



Printed Intelligence enables new disruptive solutions



CASE: Flex-in-Glass

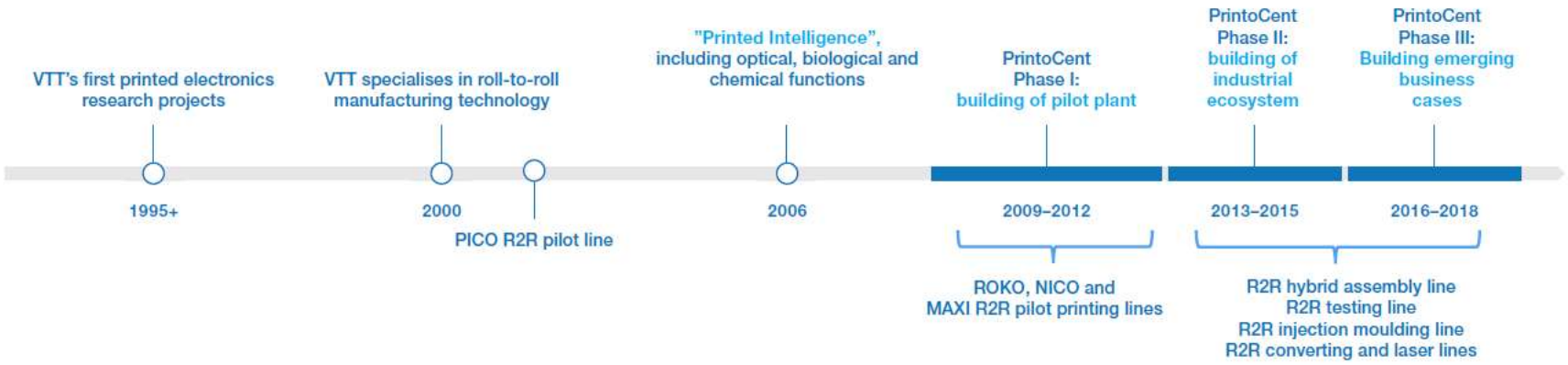
FLEXBRIGHT

NSG Group

Roll-to-roll manufacturing technology path towards new industries and business cases

The development of printed intelligence key enabling technology has taken 15+ years.

As expertise and technological capabilities grew, companies grasped the opportunities presented by printed intelligence.



Increasing investments enable to serve R/D partners and industry towards novel added value pilot manufacturing
European Regional Development Funding in remarkable role (>10 M€ investments).

Impact of EC funding for Printed Intelligence R/D in FP6, FP7 & H2020

FP6 OLLA

FP7 PriMeBits

FP7 PRIAM

FP7 ROPAS

FP7 POLARIC

FP7 FACESS


FP7 CELLO


FP7 GREEBAT


FP7 PHOTOSENS


FP7 ArtESun


FP7 IN-LIGHT

FP7 LASSIE
FP7 ROTROT
FP7 APPLE
FP7 POINTS
FP7 FLEXIBILITY

2007

2014

SmartEEs

InSCOPE

PI-SCALE

roll-out

SYMBIOTIC

ULTRAPLACAD

PRESTIGE

DECOCHROM

lumentile

TAG IT SMART

OPTintegral

ATLASS

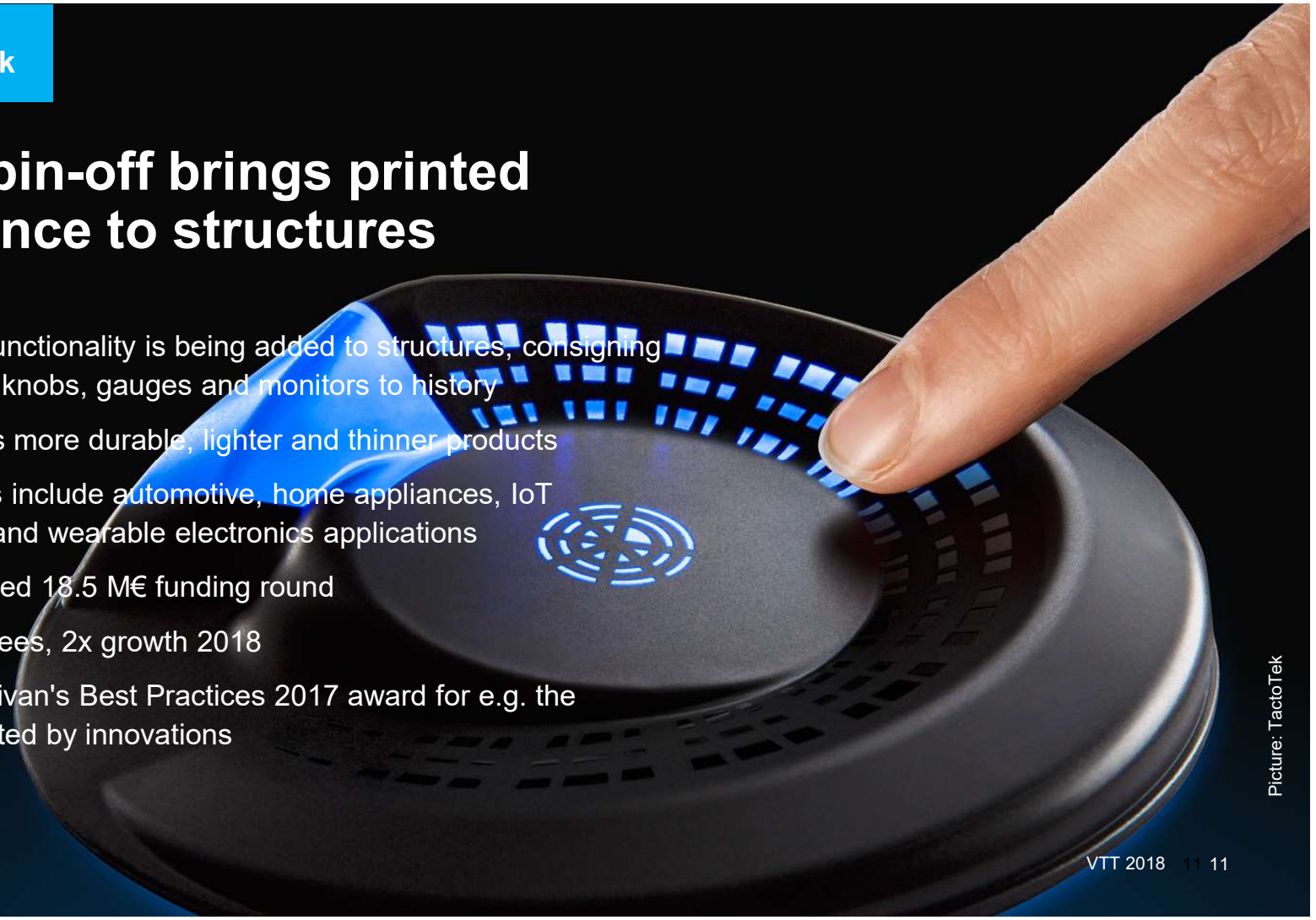
NanoCaTe

Networking and CSA projects: FP7-PRODI, FP7-PolyNEt, FP7-PolyMAP, FP7-OPERA, FP7-FlexNEt, FP7-COLAE

CASE TactoTek

VTT's spin-off brings printed intelligence to structures

- Electronic functionality is being added to structures, consigning mechanical knobs, gauges and monitors to history
- The result is more durable, lighter and thinner products
- Applications include automotive, home appliances, IoT equipment and wearable electronics applications
- Just published 18.5 M€ funding round
- 70+ employees, 2x growth 2018
- Frost & Sullivan's Best Practices 2017 award for e.g. the impact created by innovations



Picture: TactoTek

Micronova cleanrooms for micro- and nanotechnology

Micronova and its cleanrooms provide unique research infrastructure in the field of microelectronics and nanotechnology for VTT, Aalto University and companies

Micronova is recognised as a **national research infrastructure**

- **Otanano = Micronova, Cryohall, Nanomicroscopy Centre**

Micronova cleanroom facility is maintained and used jointly by VTT and Aalto University. Other organisations and companies also use the facility, some have their own dedicated areas.

Base for "Silicon to cloud" of Knowledge intensive products and services business area

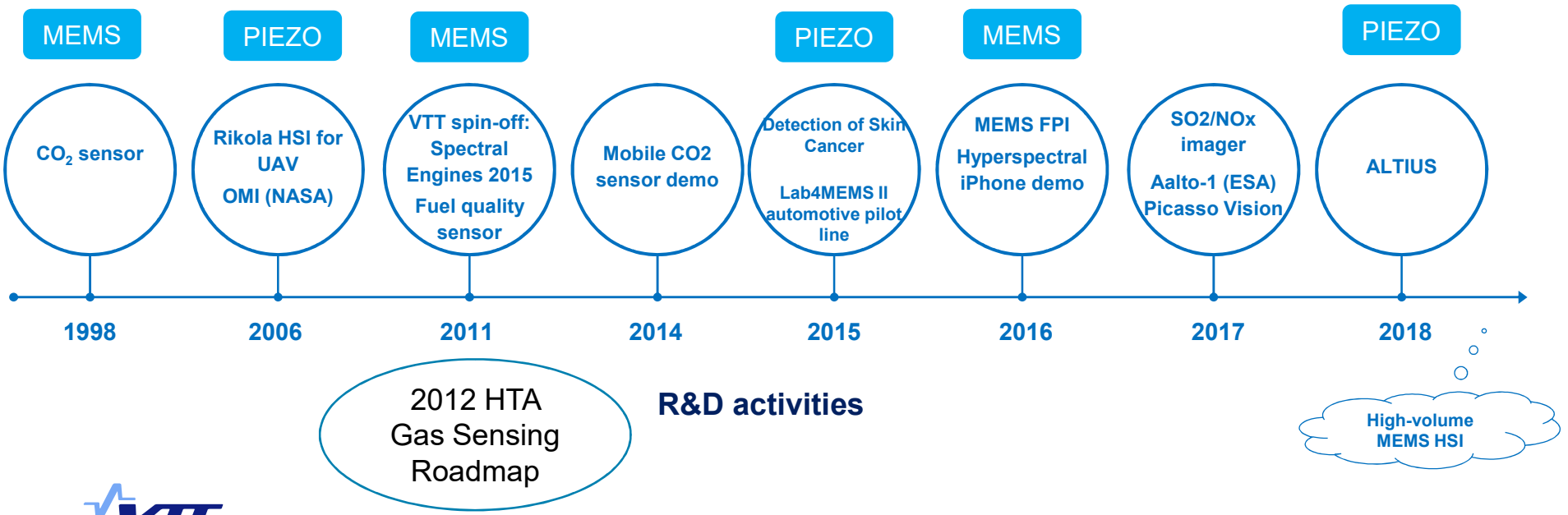
- VTT multidisciplinary environment opens up possibilities to versatile innovation
- Environment from innovation to production

Largest R&D cleanroom in Nordic countries fully equipped for fabrication of silicon based microstructures, including

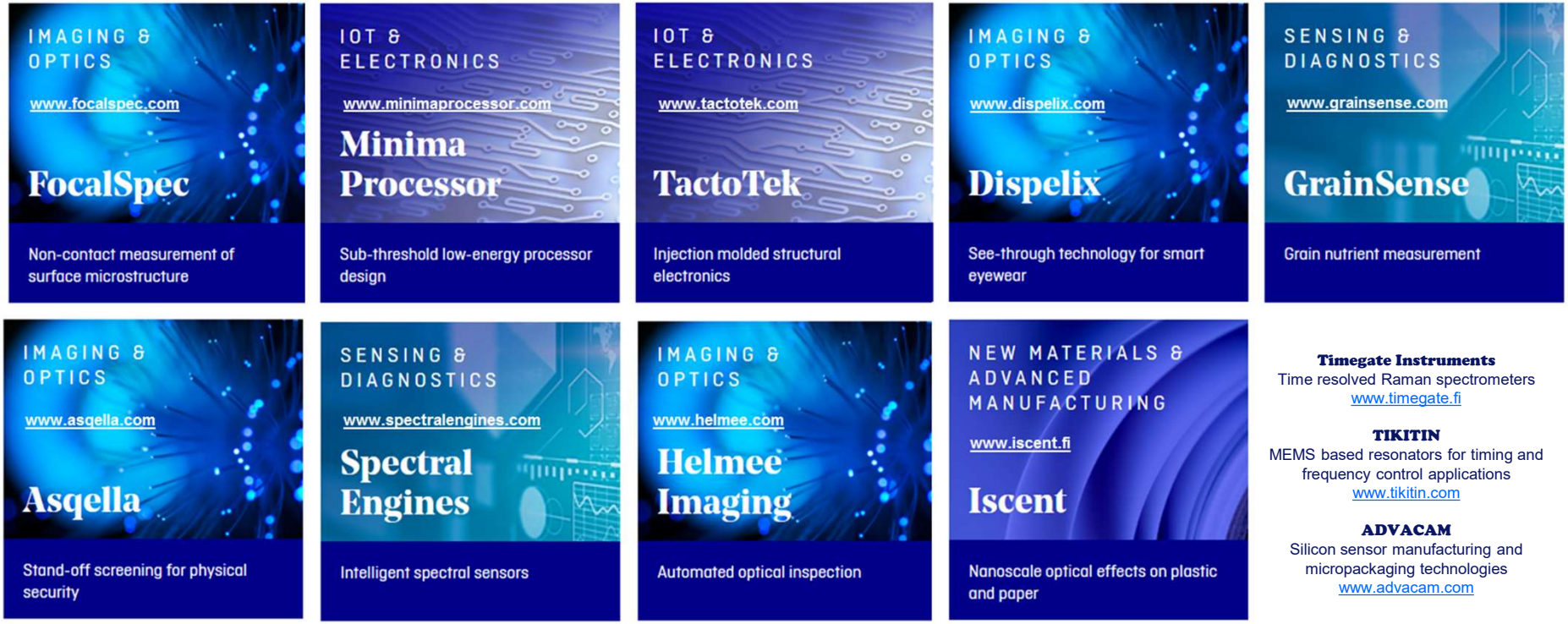
- MEMS
- Biosensors and photonic systems (also compound semiconductors)
- Nanoelectronic and quantum devices
- Active devices (radiation detectors, JFET)
- Millimeter wave devices, IPD

VTT's journey in microspectrometers

- **Technology development in research projects**
- **Customisation** of novel application solutions in contract projects
- **Several successfully commercialised sensing technologies**



VTT's 'deep tech' spin-offs during past 5 years



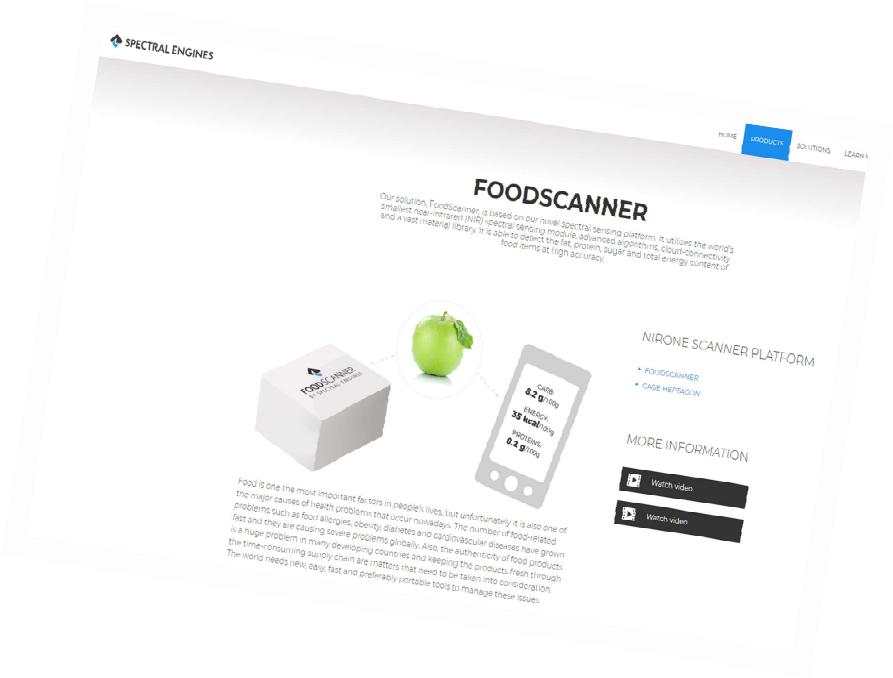
Timegate Instruments
Time resolved Raman spectrometers
www.timegate.fi

TIKITIN
MEMS based resonators for timing and frequency control applications
www.tikitin.com

ADVACAM
Silicon sensor manufacturing and micropackaging technologies
www.advacam.com

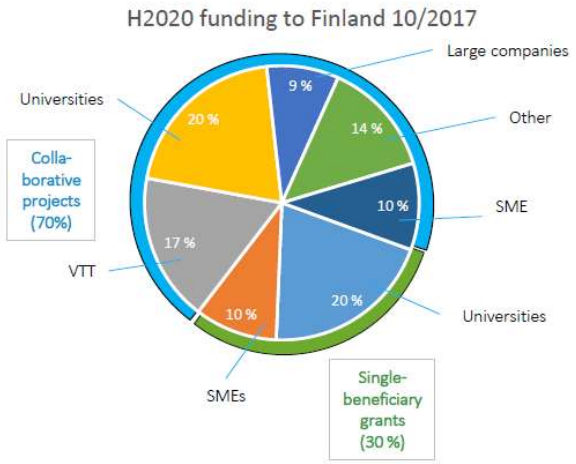
Spectral Engines food-scanning solution takes home the 1st price from EU Horizon

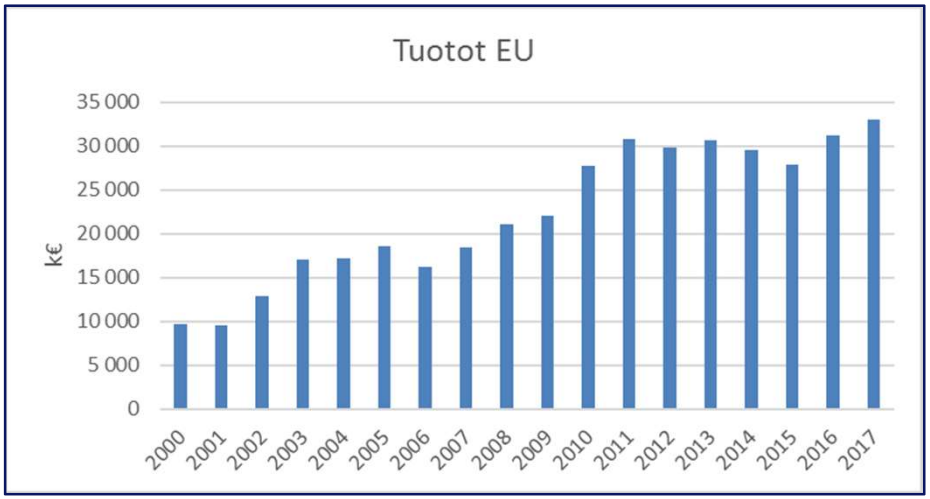
- In 2017 VTT-originated **Spectral Engines won** European Commission's **Horizon Prize Food Scanner category**
- Its mobile solution analyses precisely, quickly and efficiently food composition, nutrition facts and potentially harmful ingredients such as allergens. The challenge was also be able to provide feedback to users regarding their health and lifestyle.
- **The food scanner solution concept** utilises the world's smallest true NIR spectral sensing module, advanced algorithms, cloud-connectivity and a vast material library to reveal the fat, protein, sugar and total energy content of food items at good accuracy.



Funding trends and need for EU-wide cooperation

- During the past year the growth of EU funding has been increasing and it has an important effect in the support of long-term research and maintenance of costly R&D infrastructure and pilot environments
- EU-wide collaboration is needed even more in the future to be able to sustain high competitiveness and support the growth of new science-based innovations



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