



SEMICON RESEARCH & DEVELOPMENT CENTERS
Clusters closely collaborating nationally

UNIVERSITY
OF TWENTE.

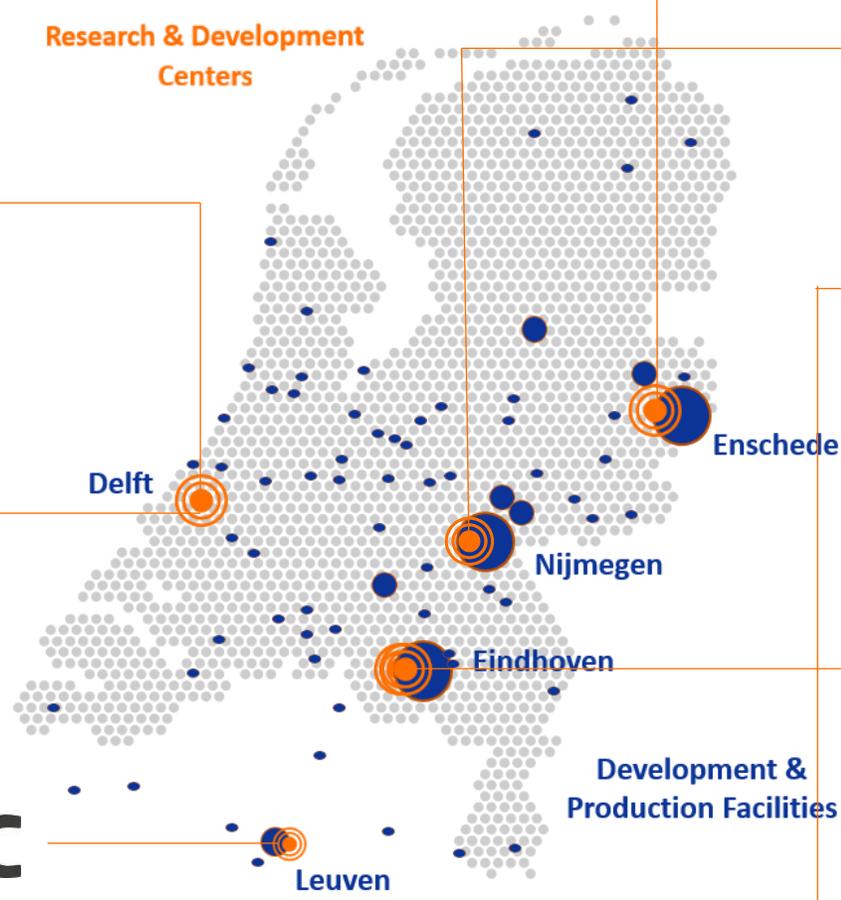
MESA+
INSTITUTE FOR NANOTECHNOLOGY

**Twente
Board**

**CHIPTECH
TWENTE**



Research & Development
Centers



Enschede

Nijmegen

Eindhoven

Development &
Production Facilities

Leuven

Delft



UNIQUE DUTCH HIGH TECH ECOSYSTEMS

High Tech Campus Eindhoven

HIGH TECH CAMPUS
EINDHOVEN

HTC Eindhoven in Numbers

- 260 companies
- 12.500 employees
- Total 350.000 m
- **43% of all Dutch patent applications come from the Campus**
- 25.000 sqm R&D facilities
- 1 billion private R&D
- Global Top 7 incubator for start-ups



Collaboration

High Tech Campus in Eindhoven, the **smartest km2 in Europe** is an ecosystem of 260 high tech companies. It's home to more than 12,500 innovators, researchers and engineers. Each company at High Tech Campus Eindhoven shares a common goal: developing new technologies and applications that help solve social problems and challenges, and successfully bringing these to the market. The combination of business and technology is central to many collaborations on the Campus shown by the **highest patent density**. From multinationals like NXP or Philips to small and medium-sized companies, research institutes, service companies and scale- and startups, collaboration is in our DNA.

Technical Facilities

- Philips Engineering
- Eurofins Material Science Netherlands: Material Analysis Lab
- Eurofins Material Science Netherlands: Reliability Lab
- Signify Electromagnetic Compatibility & Wireless Connectivity Lab
- AI Innovation Center

Present (Integrated) Photonic Companies + Organisations

- PhotonDelta
- EFFECT Photonics
- Smart Photonics
- NXP
- PhotonFirst
- HighTechXL

Leading Companies

- Multinationals such as ASML, NXP, Philips, Signify, Demcon, Etteplan, Intel, Shimano, Siemens, Symopsys, Thermofisher, TMC.

Photonics Research Institutions

- Holst Centre
- Philips Research
- Innovation Lab
- 5G Hub Eindhoven



UNIQUE DUTCH HIGH TECH ECOSYSTEMS

Noviotech Campus

Noviotech in Numbers

- 70+ companies
- 3400+ employees
- 250.000 m²
- 6 key sectors:
 - Semiconductors
 - Radio Frequency
 - Chip Integration
 - Bio Technology
 - Digital Health
 - Medical Technology

Collaboration

The Noviotech Campus can be seen as the center of health and related high tech in the Netherlands. The Noviotech Campus community works from the research in medicine discovery to the developments in a new generation chips.

Community building and a flourishing ecosystem where (chip) companies work closely together is at the heart of the campus. All six key sectors cooperate to accelerate innovation.

While the collaboration between parties on the campus is strongly present, the Noviotech Campus is located in Nijmegen and has collaboration opportunities with other companies, knowledge institutions and academics in the rest of the region.

Shared Facilities

Radboud Research Facilities is a collaboration between the Radboud University, RadboudUMC, Donders Institute for Brain, Cognition and Behaviour. Noviotech Campus members can use the equipment, facilities, knowledge and expertise of these organisations

High Tech DNA

- 3 world-class chip companies (NXP, Ampleon and Nexperia)
- Strong focus on high tech and packaging
- Strong chip ecosystem and collaboration between integrated photonic and semicon partners

Noviotech photonics and semicon companies

- NXP
- Nexperia
- Holland Semiconductors
- Photronics
- EPR
- ITEC Equipment
- Sumitomo Electric
- Sencio
- NTS
- CITC
- Nexperia
- Ampleon





UNIQUE DUTCH HIGH TECH ECOSYSTEMS

Kennispark Twente



Kennispark in Numbers

- 450+ companies
- 13,100 employees
- 350,000 m²
- Second largest campus in the Netherlands
- Presence of one of the largest nanotechnology institutes in the world: MESA+

Collaboration

The innovation campus Kennispark Twente in Enschede is one of the top 3 of most important science parks of The Netherlands. It is a dynamic location where companies work on developments and innovations that make a difference.

Kennispark Twente aims to be a meeting point for top-class European knowledge, technology and innovative businesses. Through sharing expertise and cooperative innovation new possibilities, concepts and product can be developed. Innovating together means arriving at the intended result more quickly.

Shared Facilities

Kennispark Twente has several open innovation centres and platforms to develop and share knowledge related to high-tech systems and materials. Several R&D facilities are available to both companies and universities, for example:

- High Tech Factory
- Design Lab
- Mesa+ Nanolab

Companies

- Demcon (HQ)
- Quix Quantum
- Phix Photonics Assembly
- Bosch | ItoM
- Eurofins | MASER
- Micronit
- Lionix International

R&D Focus

- Focus on technological developments with a high social relevance: *High Tech – Human Touch*
 - Smart materials, software & security, medical technology, chip technology & advanced manufacturing





UNIQUE ELEMENTS OF THE NETHERLANDS

Main Strengths of the Semiconductor Industry

- ❖ The Netherlands, Japan and USA are the three countries in the world to have a **complete value chain** within its borders.
- ❖ Vibrant, deep and rich **ecosystem** with state of the art EUV equipment by ASML and front-end process and integration & packaging equipment by companies as Boschman, BESI, ASM, Solmates and Sempro.
- ❖ Netherland's unique strength is **equipment and components**. Proven track record with decades of semicon **industrialization** experience, resulting in strong supply chain and expertise for High Tech Systems and Materials.
- ❖ The Netherlands has a **prominent position in the EU chip design** industry within Europe with strong record in analogue chips but also automotive electronics, radar, LiDAR, NFC, Power Electronics and new key technologies.
- ❖ Strongly upcoming industries: **Photonics** (InP and SiN), **Quantum** and **Heterogeneous** Integration.

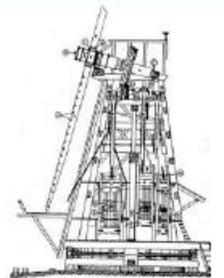
We have a long history of innovations...

Innovation	Year
Microscope	1590
Crankshaft	1594
First submarine	1620
First electric vehicle	1835
Electrocardiography (ECG)	1903
Artificial kidney	1943
Automatic transmission (CVT)	1958
Compact disc	1979
Wifi	1991
Bluetooth	1994
Tom Tom navigation	2004

COMPACT
disc
DIGITAL AUDIO



TOMTOM



 High Tech NL

Netherlands organizations that are developing connections with Japan



DEEPTECH

Semicon

Quantum

Nanotech

Photonics

ASML **NXP** **Holland Semiconductors** **CITC** **Holst Centre** **BRAINPORT Eindhoven** **Ministry of Economic Affairs and Climate Policy**

ASM **PHILIPS** **VDL** **High Tech NL** **UNIVERSITY OF TWENTE** **Ministerie van Onderwijs, Cultuur en Wetenschap** **Netherlands Enterprise Agency** **Netherlands Innovation Network**

PRODRIVE TECHNOLOGIES **boschman advanced packaging technology** **Besi** **CHIPTECH TWENTE** **MESA+ INSTITUTE** **PITC** **NWO** **Nationaal Groeifonds**

Methods2 Business **Twente Board** **imec** **TNO** **EHCI Eindhoven Hendrik Casimir Institute** **TU/e** **TU Delft**

Quantum Delta NL **Bronkhorst** **QuTech** **ivx4** **SALLAND Engineering Test Technology Center** **SMART PHOTONICS independent ITP Foundry** **oost.nl** **Brainport Industries**

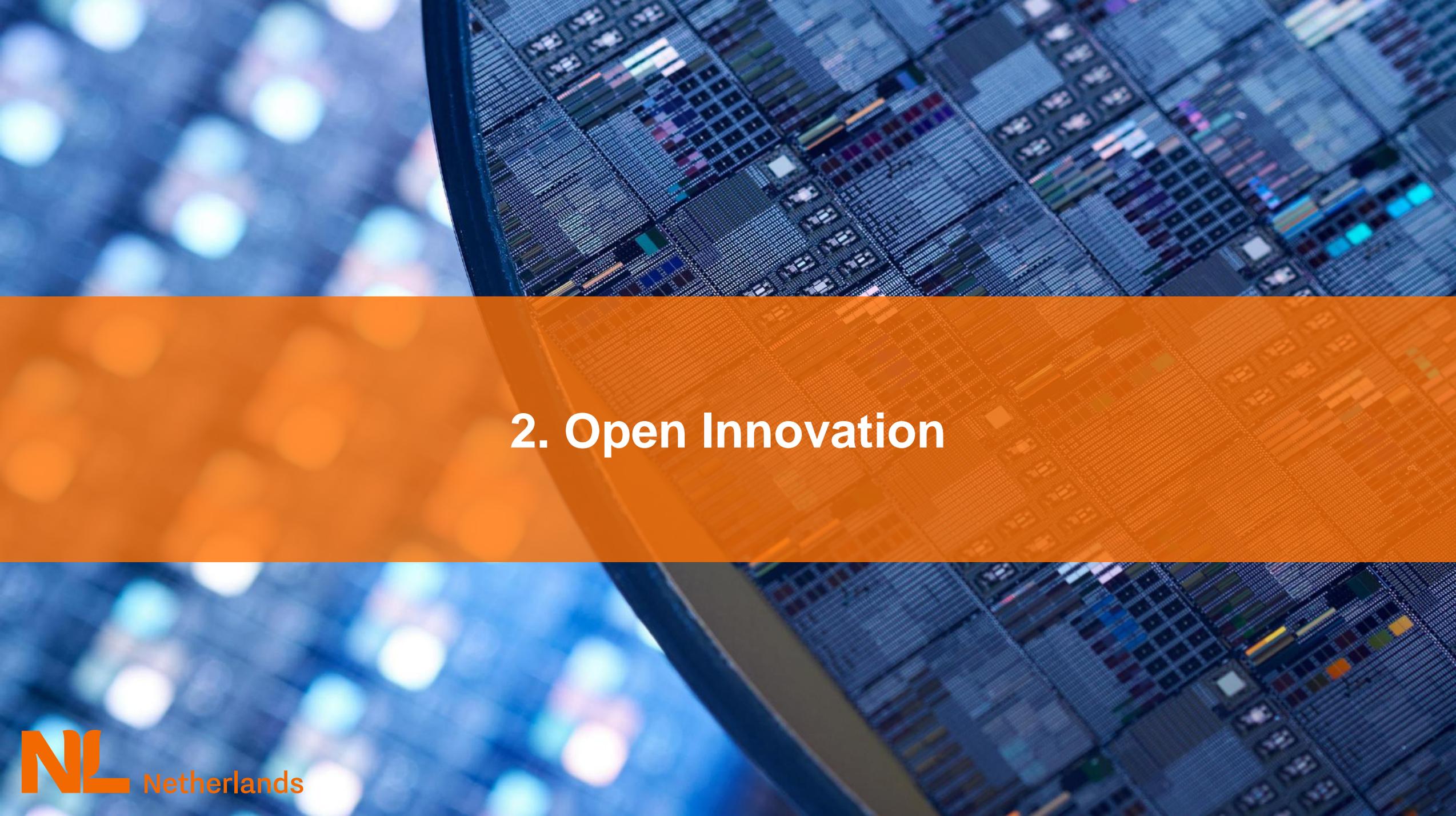
Quantum.Amsterdam **QUIX QUANTUM** **PhotonDelta Gateway to Integrated Photonics** **Systematic** **SCIL Nanoimprint solutions**

Delft Circuits Hardware for quantum engineers **QBLOX** **LEVITECH** **DENS solutions** **DEMCON**

SINGLE QUANTUM **innatera** **MinacNed Association for Microsystems and Nanotechnology** **TEMPRESS the spirit of progress** **EFFECT PHOTONICS** **SIoux TECHNOLOGIES** **NEARFIELD INSTRUMENTS**

NL Netherlands **Occam-Dx make it count** **APPSILON ENTERPRISE** **ANL Applied Nanolayers** **QBayLogic The key to FPGA-ASIC design** **TeraNova** **VSparticle** **ADMESY coemitters | spectrometers | lightmeters**

sempro **itec** **astrape** **fastmicro cleanliness control** **NTS GROUP** **MECAL - High-tech / Systems advancing technologies**

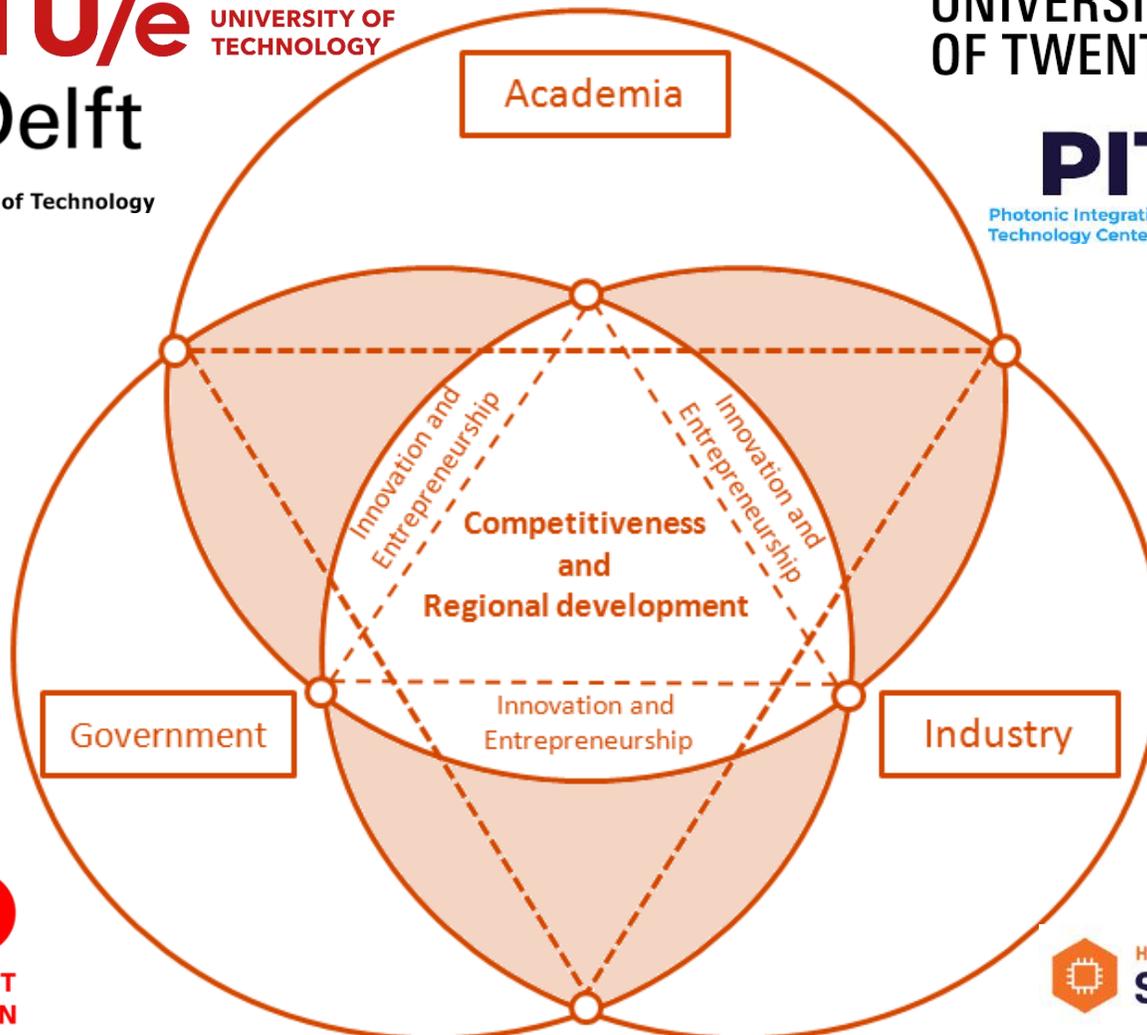
The background of the slide features a close-up, angled view of a microchip or integrated circuit. The chip's intricate circuitry, including various colored pads and grid patterns, is visible. The background is softly blurred, showing out-of-focus bokeh lights in shades of blue and white, creating a high-tech, futuristic atmosphere.

2. Open Innovation



UNIQUE SKILLS TO ENABLE COLLABORATION

Triple Helix Collaboration Model





UNIQUE SKILLS TO ENABLE COLLABORATION

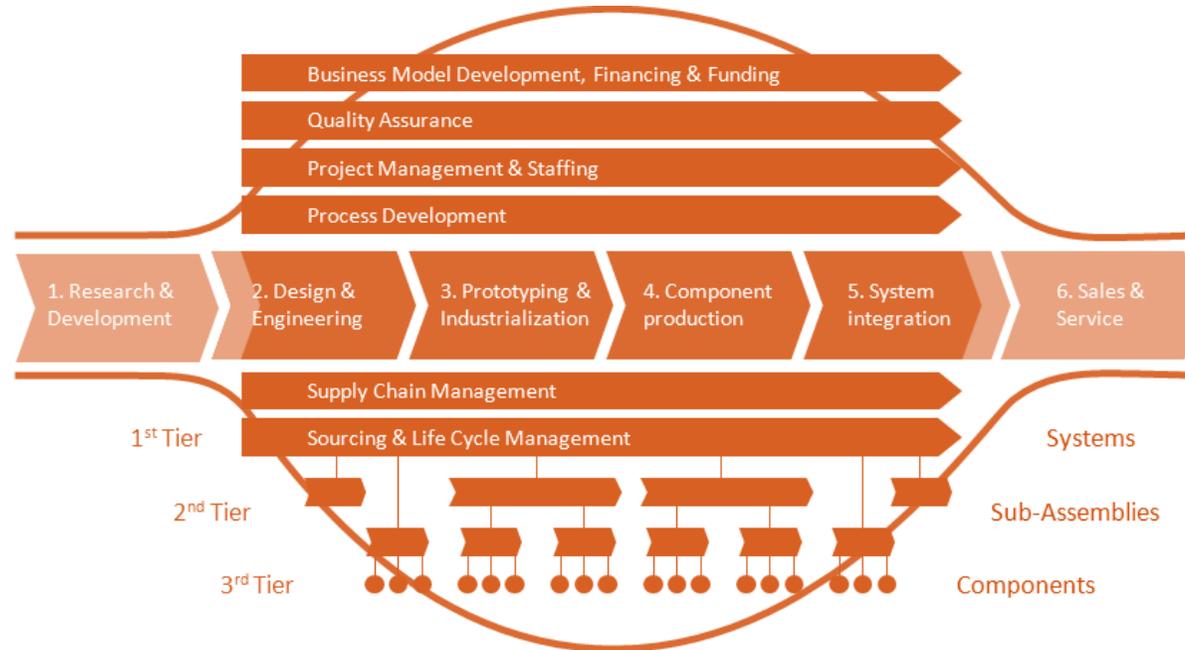
Open Innovation through System Engineering

Example:

ASML



Complete value chain
within 200km



International open
Innovation

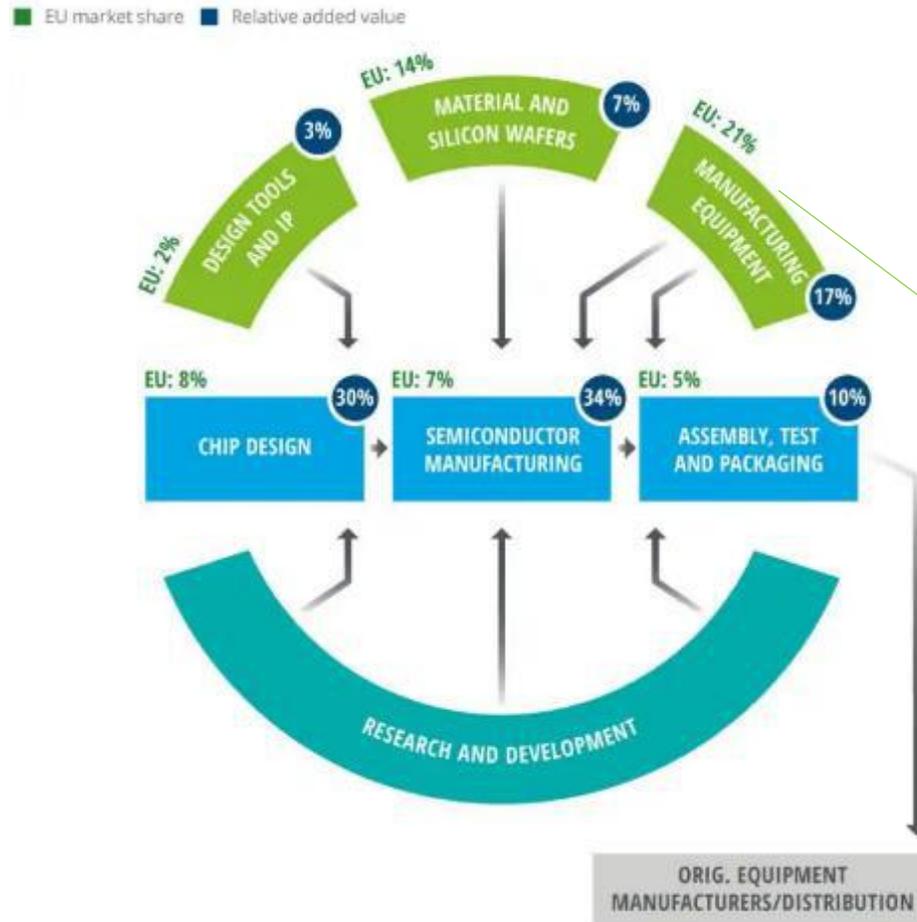


3.1 Dutch Strengths: Manufacturing Equipment



THE MAIN SEGMENTS OF SEMICON SUPPLY CHAIN

Relative market share and added value for EU



Sources: European Commission, CSET, IC Insights, BCG/SIA, SEMI.

Source [Deloitte 2022](#)

Equipment: Dutch companies have 33% global share

- ❖ 49 companies
- ❖ 17.240 NL FTE
- ❖ €18,8B estimated turnover NL
- ❖ Customers are foundries

Strengths

- (EUV) Litography
- Atomic Layer Deposition
- Advanced Packaging
- Metrology : scanning Probe Microscopy
- Photoresist
- Dicing
- Molecular beam epitaxy
- Etching

ASML

ASM
INTERNATIONAL



Besi

B **boschman**
advanced packaging technology

LEVITECH

sempro

itec
equipment • automation test

N **NEARFIELD**
INSTRUMENTS

SOLMATES
THIN FILM EQUIPMENT

Trymax
PLASMA TECHNOLOGY SOLUTIONS

TEMPRESS
Innovating the future

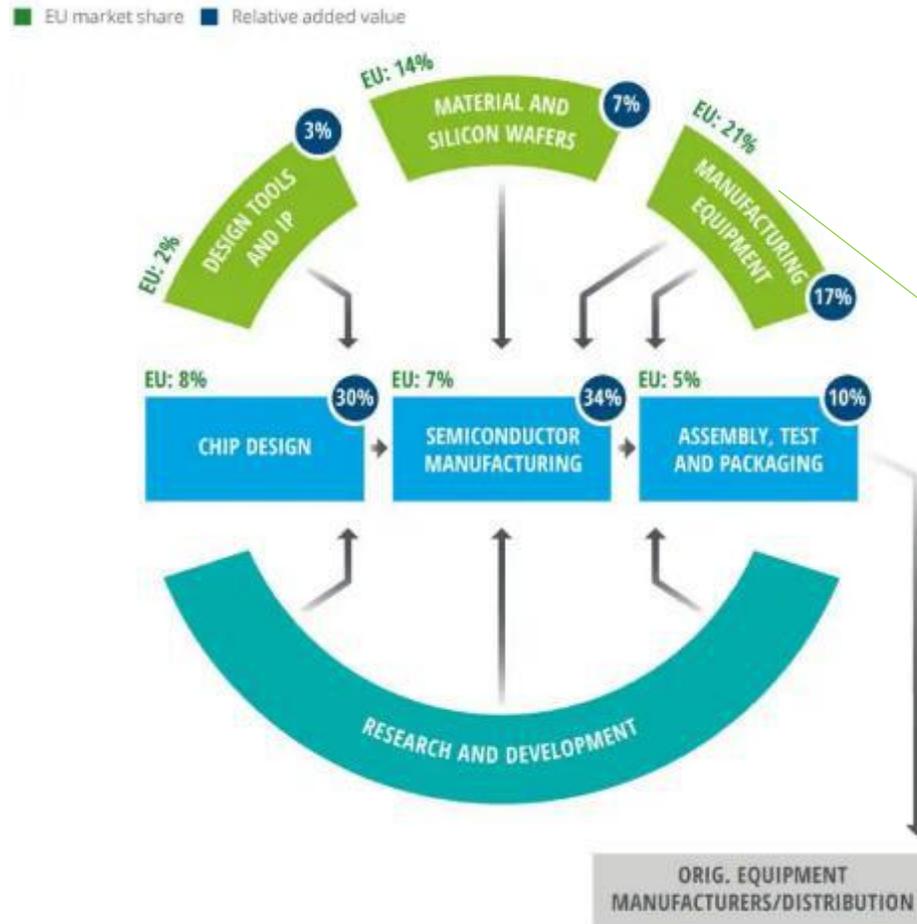


3.2 Dutch Strengths: Key components and equipment modules



THE MAIN SEGMENTS OF SEMICON SUPPLY CHAIN

Relative market share and added value for EU



Sources: European Commission, CSET, IC Insights, BCG/SIA, SEMI.

Source [Deloitte 2022](#)

Equipment components: Dutch semicon expertise

❖ 49 companies

Largest segments

- Positioning systems
- Mechatronics
- Metal components
- Environmental conditioning
- Laser

Active in sub-segments

- Wafer-stocking, positioning, stabilizing
- Mask stabilizing
- Laser
- Optical components
- Power equipment
- Cooling systems
- Clean rooms
- Metal, glass, ceramic
- Particle beam



A close-up photograph of a microchip mounted on a blue printed circuit board (PCB). The chip is square with a prominent green logo on its top surface. The background shows the intricate circuitry of the board, including various traces and components.

3.3 Dutch Strengths: Chip Design



THE MAIN SEGMENTS OF SEMICON SUPPLY CHAIN

Relative market share and added value for EU

Chip Design: Analogue and new key technologies

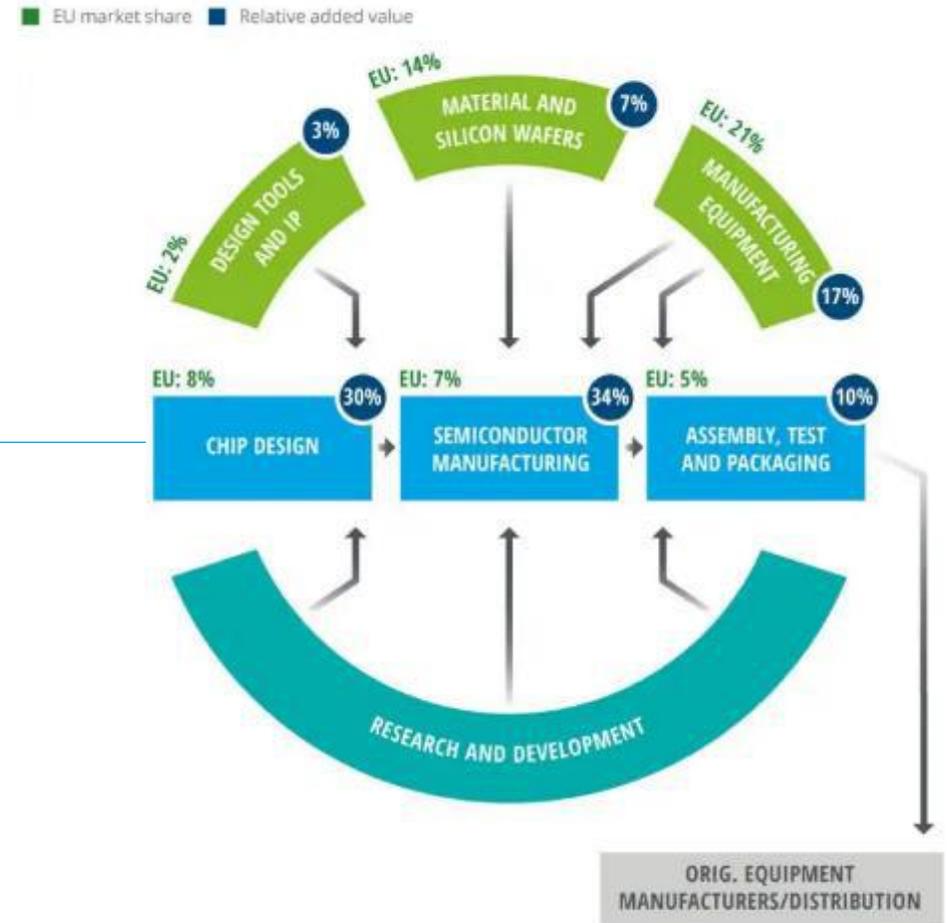
- ❖ 60+ companies
- ❖ More-than-Moore: analogue chips
- ❖ Compound: GaN, GaAs, Sic, etc

Strengths

- Radar, LiDAR, NFC, RF
- Power Electronics
- New Technologies including Integrated photonics and quantum

Products & Markets

- Amplifiers, filters, antennas, radar
- Mobile, smartphones, smartwatches
- Telecom 5G/6G
- Aerospace & Defense
- Automotive



Sources: European Commission, CSET, IC Insights, BCG/SIA, SEMI.



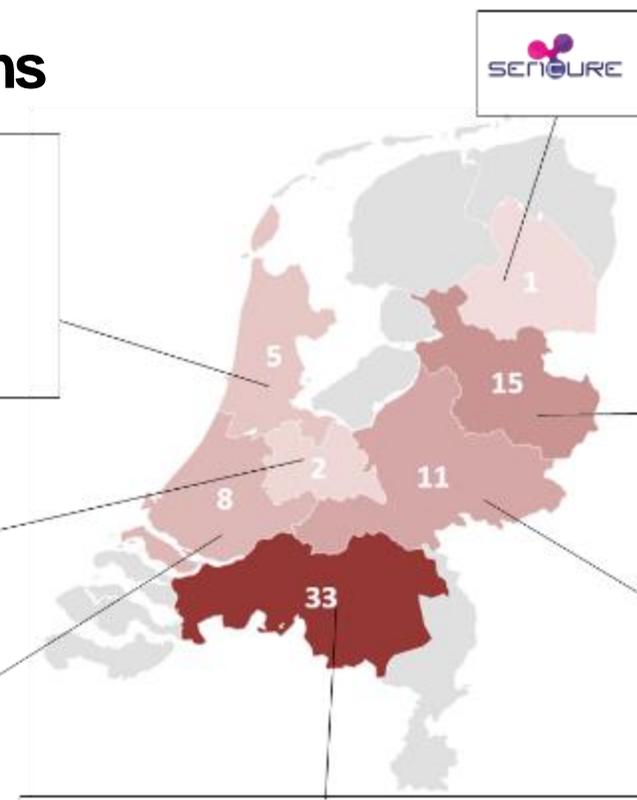
CHIP DESIGN

Companies and locations

digibio
GJ Partners BV
PHOTONFIRST
QORVO
EquipC supply chain*

Ansys
ALTRAN
part of Capgemini

delft semiconductor
innatera
Technolution
riscure
BOLGATTY
HITECH UNWIRED
XI
QUALINX
SystematIC



SENIOURE
bruco INTEGRATED CIRCUITS
dizain-sync
AnSem
RoodMicrotec
Lionix INTERNATIONAL
Flora Technology
ItoM
W
SENIOURE
TELEDYNE DALSA
A Teledyne Technologies Company
memSIC
QXIGN
micronit
QBayLogic
QUIX QUANTUM

shared EDA
nexperia
MPS
Linxens
QUALCOMM
Mini-Circuits
AMPLEON
pinkRF
infineon
EcoCircuits
*fastree 3D

GWL
amun
AXELERA
TELEDYNE DALSA
SIEMENS
TEGEMA
An Etteplan company
NXP
ANALOG DEVICES
Anteverta
Silicon Integrated
PHOTONFIRST
XINVS
ST
Methods Business
ItoM
ALTUM RF
nonoPHAB
Holist Centre
STI
Dream Chip
RAY-LINKS
RAY-Links
Synopsys
EFFECT
PHOTONICS
Staal technologies
VTEC
LASERS & SENSORS
BRIGHT PHOTONICS
TU/e
EHCI
INTRINSIC ID
MARVELL
PhotonDelta
SMART PHOTONICS
PHILIPS
Innovation Services
ON
verum.
SystematIC