



HTSM is the Dutch focal area that develops advanced technological products and systems. With annual R&D investments of 2.3 billion euro and a production value of 74 billion euro, HTSM is an essential, sustainable source for the creation of high-level employment in the Netherlands.

The three innovation programs shown below are partners in this focal area.

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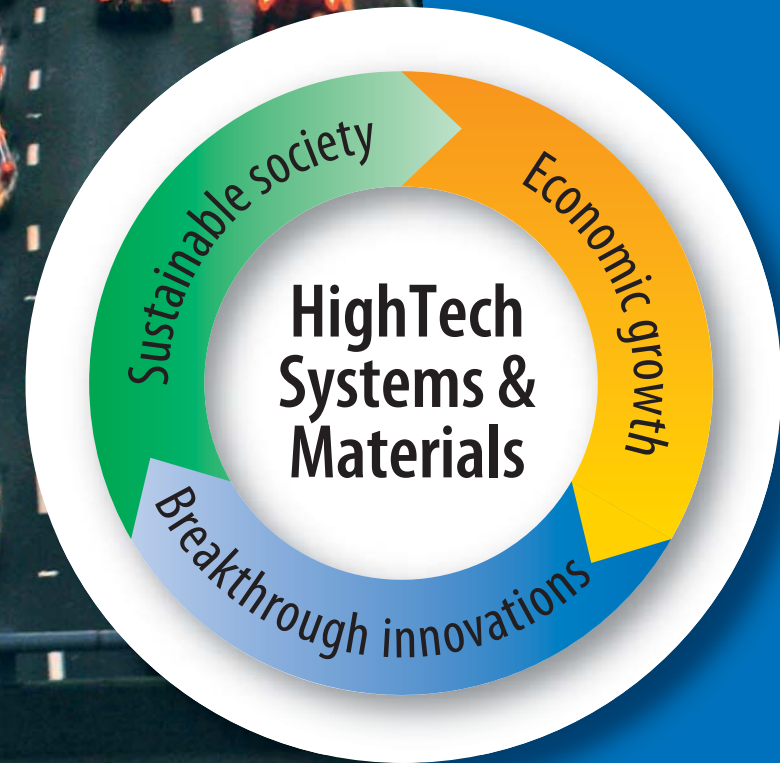
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Vision document



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## Six cases of innovative solutions for society's needs

### Philips

Clean drinking water is becoming increasingly scarce. That's why Philips, together with M2i, is developing a low-cost sensor that can detect heavy metals – a crucial factor in monitoring the quality of drinking water. Philips regards this as a strong business opportunity in emerging economies.



### FEI Company

FEI Company is a fast-growing manufacturer of the world's most accurate microscopes. These electron microscopes allow bacteria, viruses and even individual atoms to be imaged. The analyses that can be performed with these microscopes are vitally important in combating viral diseases (SARS, HIV) and cancer. The photo shows how the HIV virus penetrates a cell.

## Health

### Thales

Piracy, drug smuggling and illegal waste discharges are increasing threats for which Thales has developed new solutions: multimedia rotating sensor systems that can detect small objects. This is especially important in coastal waters. For Thales it represents a broadening of the market, and for the Netherlands more sustainability and export incomes.



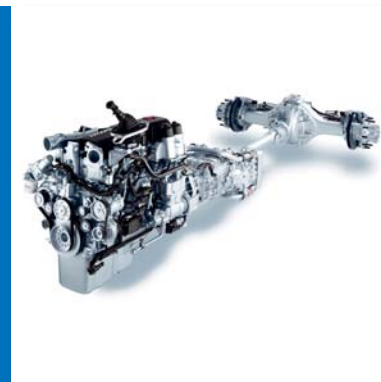
### HTAS Consortium

If cars could follow each other optimally, traffic congestion would be reduced by 75%. HTAS is working on a system for cooperative cruise control, in which vehicles communicate with each other and with the traffic control center. Companies and government (*Rijkswaterstaat*) intend to develop the system further with the aim of reducing traffic congestion and shortening journey times by 25%, while at the same time building up a strong position in this new export market.

## Mobility

### DAF

DAF has for 50 years been a leader in engine development, for example with intercooled turbocharging and electronic fuel injection. This has made a major contribution to environmental improvement and reduction of CO<sub>2</sub> emissions. Thanks partly to its reliable and efficient engines, DAF's exports have grown to 5 billion euro, a top position in Europe.



### NXP

With its green chip program NXP is far ahead of legislation. Thanks to the 'silicon on insulator' technology, the energy efficiency of the power supplies that NXP supplies for PCs and mobile phones has already been increased to 90%. For standby mode, NXP is working on technologies that will reduce energy consumption to one-tenth of today's levels.

## Sustainability

**In the Netherlands HTSM is:**

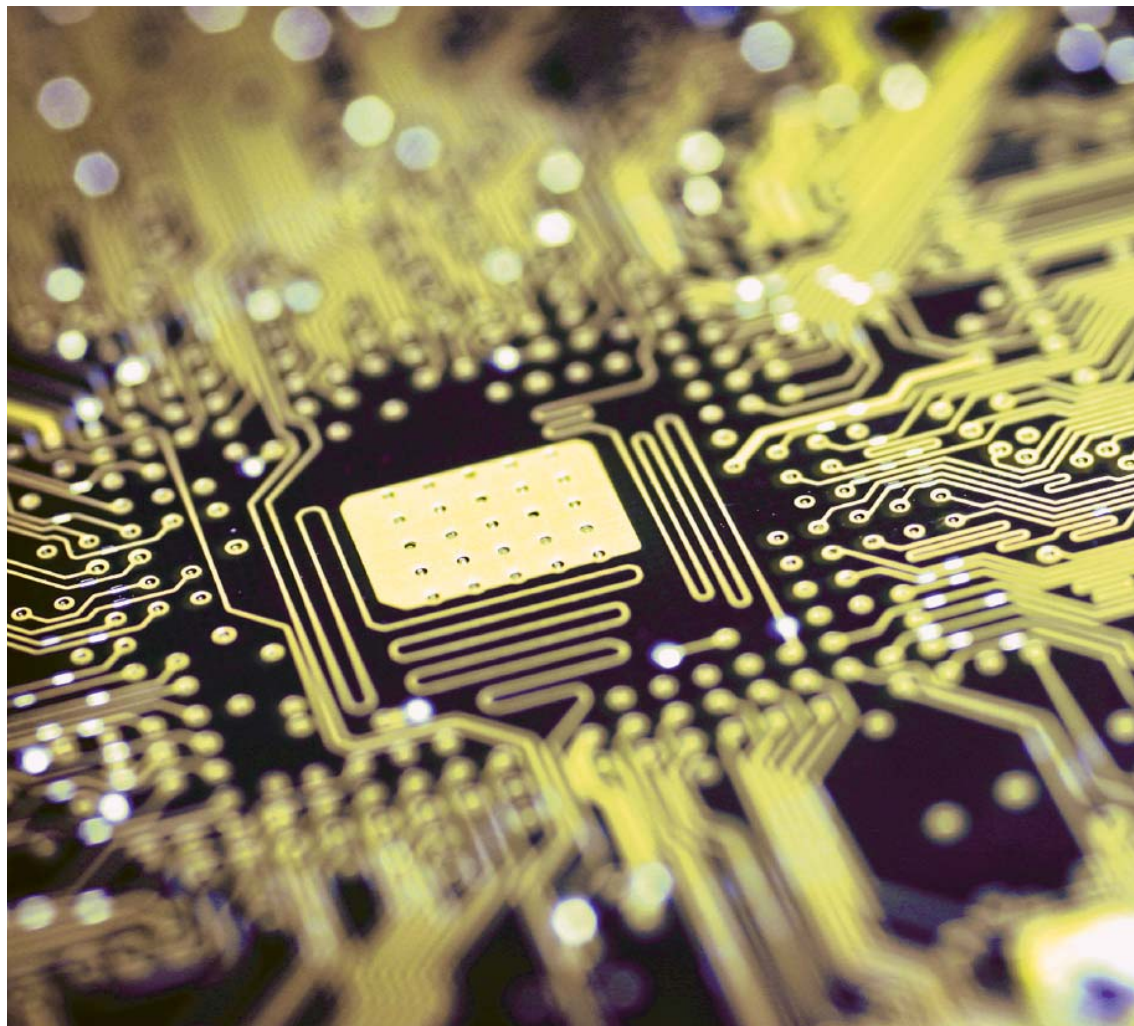
The No. 1 in technology, with annual investments of 2.3 billion euro.

The No. 1 in export, with sales of 42 billion euro.

A strong growth sector, with revenues increasing by 4% per year.



is:



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### Driver for sustainability and welfare

High Tech Systems & Materials is a unique cluster of companies in the Netherlands and Europe. In particular it is a source of new opportunities in healthcare and far-reaching improvements in sustainability and mobility. HTSM provided the Netherlands with the X-ray systems to combat heart disease, and is now succeeding in reducing the costs of healthcare with minimally invasive interventions.

The cluster has supplied the most sustainable trucks for European road transport, the most reliable baggage handling systems for airports, and innovative nanomaterials to convert electricity directly into light. The cluster is now striving to again make double-digit percentage gains in sustainability and effectiveness by putting vehicle guidance systems and 'electronification' into practice. The energy saving lamp was also developed within HTSM, and work is now being done on gaining market leadership in even more efficient LED lighting.

Indeed, market leadership! Because HTSM also intends to make an economic contribution to the prosperity of the Netherlands. That is already being done convincingly with 42 billion euro of exports per year.

Those exports have grown significantly in the past ten years. That means the HTSM industries are not disappearing from the Netherlands. On the contrary, they are growing and flourishing because the HTSM companies repeatedly succeed in developing the best products. And in staying ahead of the global competition, through entrepreneurship and innovation. The cluster intends to continue doing that. Together with young people in the Netherlands who are taking up these challenges. And thanks to the Dutch government, which recognizes the importance of these initiatives and provides support for the development of this unique innovation and technology structure.

### HTSM is working on well-being and welfare

#### Health:

Developing medical systems (for example MRI) and ensuring the safety of people and goods (for example detection and radar).

#### Mobility:

Developing equipment for handling goods, people and information (printing, handling, sorting, identification) and effective large-scale traffic management.

#### Sustainability:

Developing constantly improving, energy-efficient lighting, cleaner engines, powertrains and the generation and use of solar energy.

### HTSM has three major innovation programs:

#### Point-One

Focusing on a wide range of equipment and ICT systems for healthcare, communication, convenience, experience and security.

#### HTAS

Focusing on environment and mobility in automotive.

#### M2i

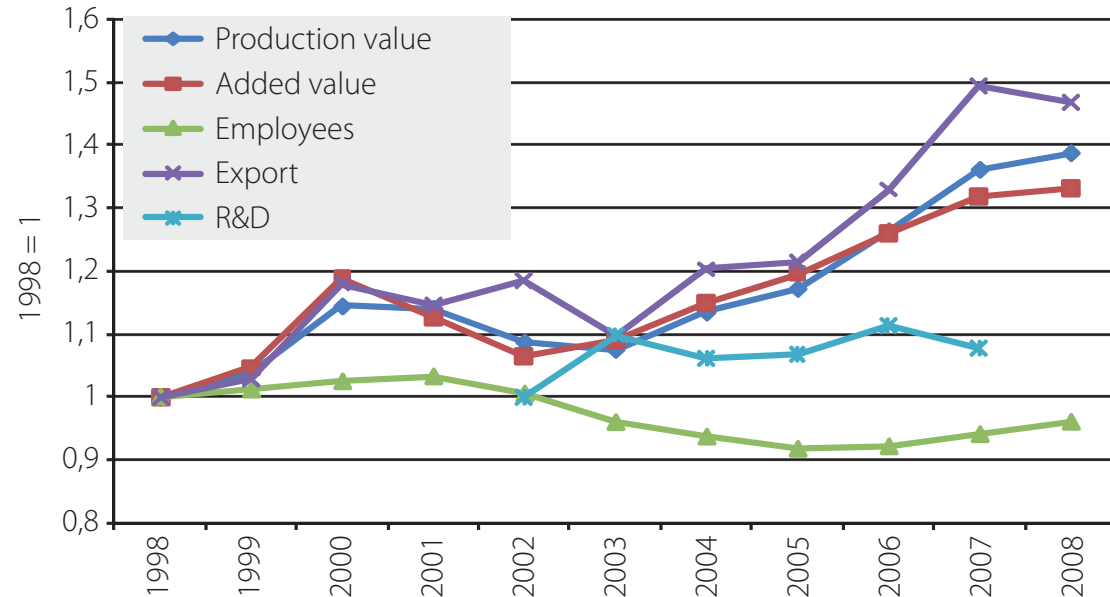
Focusing on breakthroughs in materials technology through improved and new materials.



## Global top cluster that is growing and flourishing

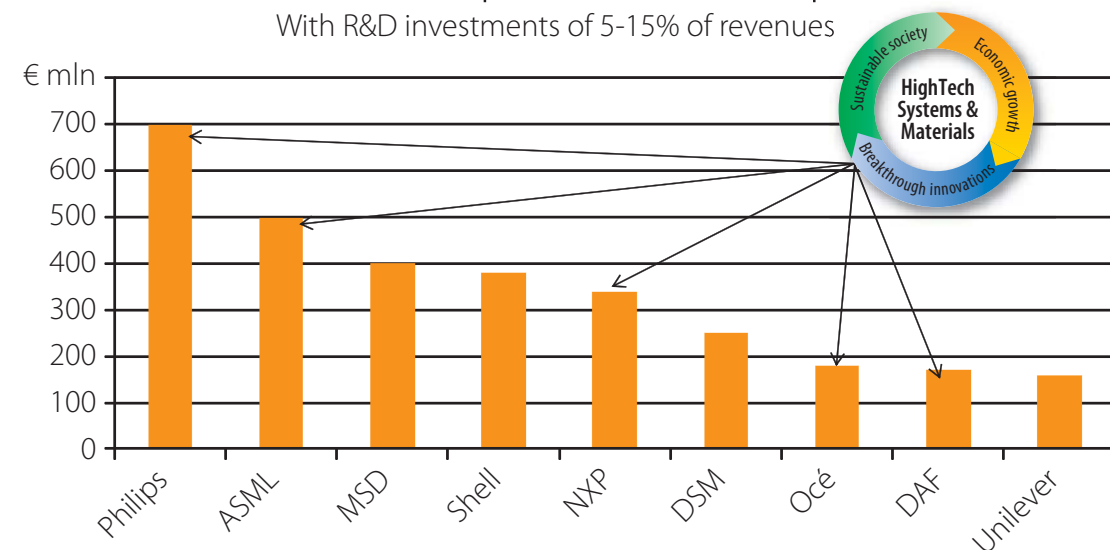
More than 100 years ago, pioneers such as Philips, Van Doorne (DAF) and Van der Grinten (Océ) started building up international businesses in technological products, in what was then the relatively poor country of the Netherlands. The time of those pioneers has passed, but their heritage is growing and flourishing in a dynamic industrial cluster, in which large and small companies are constantly making new inventions and conquering new markets with breakthrough technologies. For example in the fast-developing nanotechnology business: carbon nanotubes for automobile bumpers, solar cells with a nanostructure, low-cost sensors for blood measurements, EUV lithography systems for even smaller integrated circuits, and electron microscopes that allow individual atoms to be imaged. In the past ten years the exports by the HTSM cluster have increased by 13 billion euro. The HTSM companies together invest more than 2.3 billion euro per year in the development of new products. They export to the whole world, and especially to the growth markets of China and India. That means there are excellent opportunities for further growth, particularly because the cluster succeeds time and time again in leading the way with the best and most innovative solutions.

## Growth of HTSM



## 5 HTSM companies in the top 10

With R&D investments of 5-15% of revenues



HTSM total	2008	% growth (10 years)
Production value (€ bln.)	74	38.8%
Exports (€ bln.)	42	46.8%
Added value (€ bln.)	20	33.1%
R&D (€ bln. in 2007)	2.3	7.8%



## Solutions for health-mobility-sustainability

The HTSM industry contributes to solutions for numerous societal issues such as healthcare, the aging population, security, energy and the environment. Each job in the sector creates only a small environmental burden.



There is a great need in clinics to reduce the cost of interventions and make them less stressful for patients. This is possible using Image Guided Intervention & Therapy, in which the surgeon follows what is happening inside the body on a monitor display. Work is being done by 17 HTSM companies, including Philips, on a broadly based implementation of this technique. As well as improved care, a top position in this new export market is also the goal.



## Health

Philips developed the first working car navigation system in 1996. The breakthrough of this technology was made by TomTom, which conquered the world market with its ingenious architecture and clear, menu-driven displays. Together with its subsidiary TeleAtlas, TomTom has more than 3,000 employees and revenues of around 1.5 billion euro. TomTom is now innovating further in traffic management systems that improve traffic flows and safety.



## Mobility

The energy-saving lamp was invented by Philips. Today Philips and NXP are working together on perfecting LED lighting, which can be up to five times as energy efficient as the traditional incandescent lamp. The challenge is to optimize the electronics and to develop applications that each require different technology solutions. LED lamps are already widely used in appliances, and are also rapidly gaining ground in automotive lighting, in the home and in utilities. Philips and NXP are among the leading innovators in this field.



## Sustainability

*This makes the High Tech Campus an essential, sustainable source for the creation of high-level employment in the Netherlands, both in industry and in the services sector.*  
 RSM Erasmus University head offices study

*M2i is unique because of its partnerships with other innovation programs and focal areas.*  
 Focal areas progress committee, 2008

*The knowledge level and knowledge dynamics are high.*  
 Focal areas progress committee, 2008

*For innovative, international companies the Netherlands must by 2020 take a top five place among attractive investment locations.*  
 Chris Buijink, Ministry of Economic Affairs, in 2010 article about the economy

Program	National	International	Total
HTAS	€ 200 M	€ 20 M	€ 220 M
M2i	€ 85 M	€ 5 M	€ 90 M
Point-One	€ 200 M	€ 700 M	€ 900 M



**Attractive community for talented people**

With annual R&D investments of more than 2.3 billion euro (43% of the industry total), HTSM is by far the largest innovation cluster in the Netherlands. HTSM is also recognized internationally as a top technology cluster that participates intensively in European programs and has links for ICT and energy with the EIT (European Institute of Innovation and Technology). The cluster hosts joint technology programs in which universities and companies work together on new applications based on breakthrough research.

Many of these partnerships focus on the enabling technologies that are used in a broad range of applications. Those technologies comprise:

- Nanoelectronics: driving progress in healthcare and services
- Embedded systems: making appliances intelligent and user-friendly
- Mechatronics: raising systems to breakthrough performance levels
- Material innovation: pushing boundaries and providing big sustainability benefits.

HTSM's applications can be found everywhere. Focal areas are: products for consumers, traffic and transport, healthcare, laboratories and industry.

All this makes HTSM the ideal community for talented scientists and technologists who want to work on creating breakthroughs.

*A number of companies are among the European or world leaders in their fields. As well as that, the larger companies structurally create promising spin-offs.*  
Focal areas progress committee, 2008

*The Netherlands is a prominent player on the market for trucks and buses, and a strong European participant in R&D.*  
Focal areas progress committee, 2008

*EU legislation to reduce the environmental and climatic burden of products and processes offers opportunities for the innovative companies in the focal area.*  
Focal areas progress committee, 2008

*Exports by HTSM in 2006 were € 35 billion, or 15% of the total for the Netherlands.*  
Focal areas progress committee, 2008

*The systems industry has a high barrier to entry.*  
Focal areas progress committee, 2008

*Further development of strong knowledge clusters and regions increases the competitive strength of the Netherlands, and thereby forms a strong attraction for international companies and knowledge workers.*  
Chris Buijink, Ministry of Economic Affairs, in 2010 article about the economy

*The following generations will benefit most of all from a strong economic structure, and not only from a balanced budget.*  
Chris Buijink, Ministry of Economic Affairs, in 2010 article about the economy



**Source of economic growth for today and tomorrow**

The HTSM industry has a strong international competitive position thanks to the strength and creativity of the Dutch cluster. The business model has also proved to have a long-term resistance to competition from low-labor-cost countries. SMEs are growing: the cluster contains numerous start-up and fast-growing companies. The difficulty of the technological combinations and the barrier to entry in the market give this cluster a strong competitive position. That makes HTSM a long term source of export revenues for the Netherlands, both today and tomorrow. Direct and indirect employment and local expenditure make HTSM a strong economic driver for the Netherlands.

Challenge	Strengths of the Netherlands	Revenues € bln.
<b>Health:</b>	Leading in medical systems	<b>24</b>
• Aging population	Leading in identification	
• Terrorism	Protective equipment Area control systems	
<b>Mobility:</b>	Leading in navigation	<b>25</b>
• Congestion	Leading in trucks	
• Security	Leading in IC production technology	
• Data processing	Traffic management	
<b>Sustainability:</b>	Leading in sustainable lighting	<b>25</b>
• CO <sub>2</sub> emissions	Leading in sustainable engines	
• Energy consumption	Leading in sustainable materials	
• Material analysis	Sensor systems for environmental management	
• Electric vehicles	Vehicle electrification	

Wim van der Leegte built his metal company in one generation into an enterprise with 7,000 employees and revenues of 1.5 billion euro. The company also supplies buses, machines and high-tech modules. His company, VDL Group, is growing both organically and through acquisitions. VDL shows the excellent competitive strength of the HTSM industry in the Netherlands on global markets.

After ten difficult years of technology development, the start-up company ASML gained a modest share of the semiconductor lithography market. In the following ten years it grew into the market leader with superior technology, a 70% market share and revenues of 3 billion euro. In the coming ten years the company intends to grow in adjacent markets.

## Large companies

Vanderlande has doubled its revenues to 600 million euro in the past ten years. At the same time the technology has evolved from mechanical to complex computer-controlled systems. Vanderlande regularly wins top projects in baggage handling, for example at Shanghai, Moscow, London Heathrow, Las Vegas and Amsterdam Schiphol airports.

Nucletron, a Dutch start-up in 1975, is leading the way with equipment and software for cancer treatment by radiotherapy, for example for breast, prostate and esophageal cancer. In the past two years, and with new management and innovative products, Nucletron's revenues have grown to 115 million euro. With sales in 100 countries, Nucletron expects to achieve double-digit growth in the coming years.

## Fast-growing companies

Over a six-year period high-tech start-up Verum has developed a methodology for automatic software generation that delivers an error-free product, together with time and cost savings of 30%. Verum, which works closely together with other HTSM companies, gained a European patent for its method in 2010. The company is now ready for rapid growth in the coming years.

High-tech start-up Lightmotif has developed a method to apply surface texturing at a micro and nano scale. This surface texturing allows special surface properties such as self-cleaning, friction, absorption and reflection to be achieved. These properties can be applied to numerous kinds of products in large numbers. Up to now the company's revenues are doubling each year.

## Start-up companies



## World-class results

Over a ten-year period from 1999 to 2008 the HTSM industry has achieved impressive results, for example:

- growth in revenues from 54 to 74 billion euro, a 39% increase;
- constantly increasing exports reaching 42 billion euro, a growth of 47%;
- tremendous innovative power, with annual investments of 2.3 billion euro by the companies;
- an increasing self-organizing capability, with high levels of synergies.

These results have been achieved by excellent companies, such as:

- Philips Healthcare, which has become world market leader in heart and artery therapy;
- ASML, which has grown from a small company into world market leader in semiconductor lithography;
- TomTom, which has grown from a small company into world market leader in navigation;
- FEI Company, which has grown into the absolute leader in electron microscopy;
- NXP, which has gained a leading position in mixed signal processing;
- DAF, which has climbed from no. 6 to no. 2 in the European truck market;
- Océ, which is world market leader in high-speed A4 and wide-format printers.

The entrepreneurship and technological skills with which these market positions have been gained are still strongly represented in this focal area. Together they form the basis on which the HTSM industry will continue to grow and excel in the coming ten years.

High-quality technological education and training at all levels are important aspects of the technology programs. As well as contributions to regular courses, new programs are also initiated, such as an interdisciplinary automotive Master's program and an executive program for system architects.



## Education and training

*The cluster has always been characterized by strong partnerships within the chain and interactions between companies and universities.*

Focal areas progress committee, 2008

*The strong involvement of knowledge institutes and the close partnerships also result in high levels of knowledge.*

Focal areas progress committee, 2008

*The system builders work for the global market, which is one of the reasons for the sector's exceptionally high exports.*

Focal areas progress committee, 2008



## Success through public-private partnerships

Government, industry and education are together responsible for the success of HTSM. The result is a technological ecosystem that helps to keep companies in the Netherlands and attracts international companies. Within this partnership the government provides essential support in the following areas:

- Joint technology programs that facilitate the partnerships of companies with universities and technology institutes, and open the door to participation in European technology programs. The most important are Point-One, HTAS and M2i, each of which fulfills these functions in its own field.
- Matching facilities that keep the huge innovation costs of the companies on a level playing field, with competitively priced locations.
- High-quality technology education at all levels.
- Promoting the image and awareness of the industry as attractive for employment and promising for investments, and creating an environment in which it can flourish.
- Jointly promoting networks and chains in which companies, institutes and government authorities participate in innovative breakthroughs for society's needs, with (if applicable) the government as launch customer. The natural governmental partners of the HTSM industry in this respect are the ministries and departments responsible for Economic Affairs; Transport; Public Works and Water Management; Infrastructure and the Environment; Education, Culture and Science; Defence; and Public Safety and Justice.

## SMEs

HTSM is an incubator for SMEs, which in turn make a major contribution to the success of HTSM.

Many of today's larger system companies have been founded in the past 20 years as start-ups or spin-offs. For example ASML was once a small group within Philips Research. Dozens of smaller innovative system companies are internationally successful in niche markets, and several of them have the potential to grow further into 'the next ASML'.

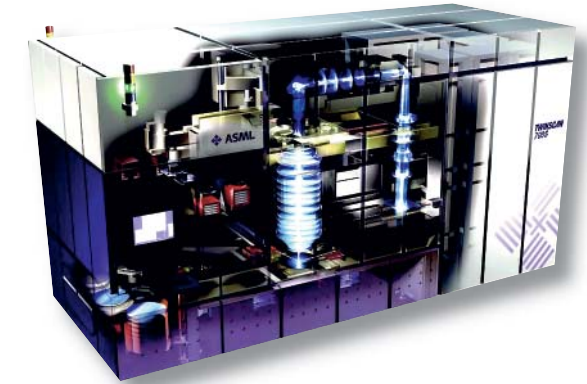
The suppliers also have a very important role to play. With their flexibility and specialized knowledge they make a big contribution to the success of the larger companies. The top suppliers grow into companies with an international reach, which are also successful on the global market.

The smaller and medium-size companies are active in all market segments and fields of technology, for example:

Automotive: Gemco, DTI, AGV, Epyon

Mechatronics: Frencken, NTS, KWME, Norma, CCM

ICT: Neways, Sioux, Prodrive, Verum.



ASML lithography system for IC production



DAF heavy truck

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# Structure of the technology cluster

