BRABANT IS BRIGHT
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How Brabant's legacy of innovation is securing future investment

Introduction

The Netherlands province of North Brabant is a globally recognised hub for developing and manufacturing high-tech systems and materials, with a history of thriving innovation and where inventions happen.

From various lightbulbs and the CD player to revolutionary techniques for manufacturing semiconductors, and advances in X-ray machines, Brabant has made a significant contribution to many of the technologies that have become part of everyday life. Brabant is responsible for 54% of all European patent registrations from the Netherlands.

Being this prolific is no coincidence. Brabant has the highest level of R&D activity out of all the Netherlands provinces. The ratio of private-sector spending on R&D to GDP is 2.99% in Brabant, which is more than double the average in the Netherlands of 1.15%.

Home of the world's smartest kilometre and a recognised manufacturing hub for high-tech systems, Brabant is an environment that fosters collaboration to drive technological advances. Having such a high concentration of companies and highly skilled specialists within a relatively small space dramatically enhances developments and processes.

The province's world-class universities and specialist knowledge institutes are a major driving force behind technological breakthroughs, with further advances coming from the Brainport region, industry hubs, and living labs. Then there is the Triple Helix that runs through Brabant industries, bringing together government, business, and academia to make the province's industrial ecosystem robust by enabling cross-sector collaborations and maintaining business-friendly conditions.

Many regions have tried to replicate the success of Brabant, with limited success. So, what is the secret?

In this white paper, we explore the industrial heritage of Brabant, examine the culture of collaboration, and detail the pivotal role of Philips within all of this. We also determine what benefits investors can gain from moving their business to the highly innovative Dutch province, and get an insight into the future with the NXTGEN High Tech initiative. Expert commentary and insight are provided by Marc Hendrikse, executive chairman at Holland High Tech and veteran of Brabant's high-tech industries.

Key stats about Brabant

93%

Of people in Brabant speak more than one language, with almost everyone speaking English

75%

Of people in Brabant have either a university degree or a higher vocational qualification

40%

Of people in Brabant are highly educated

54%

Of all the Dutch patent applications are from Brabant

33%

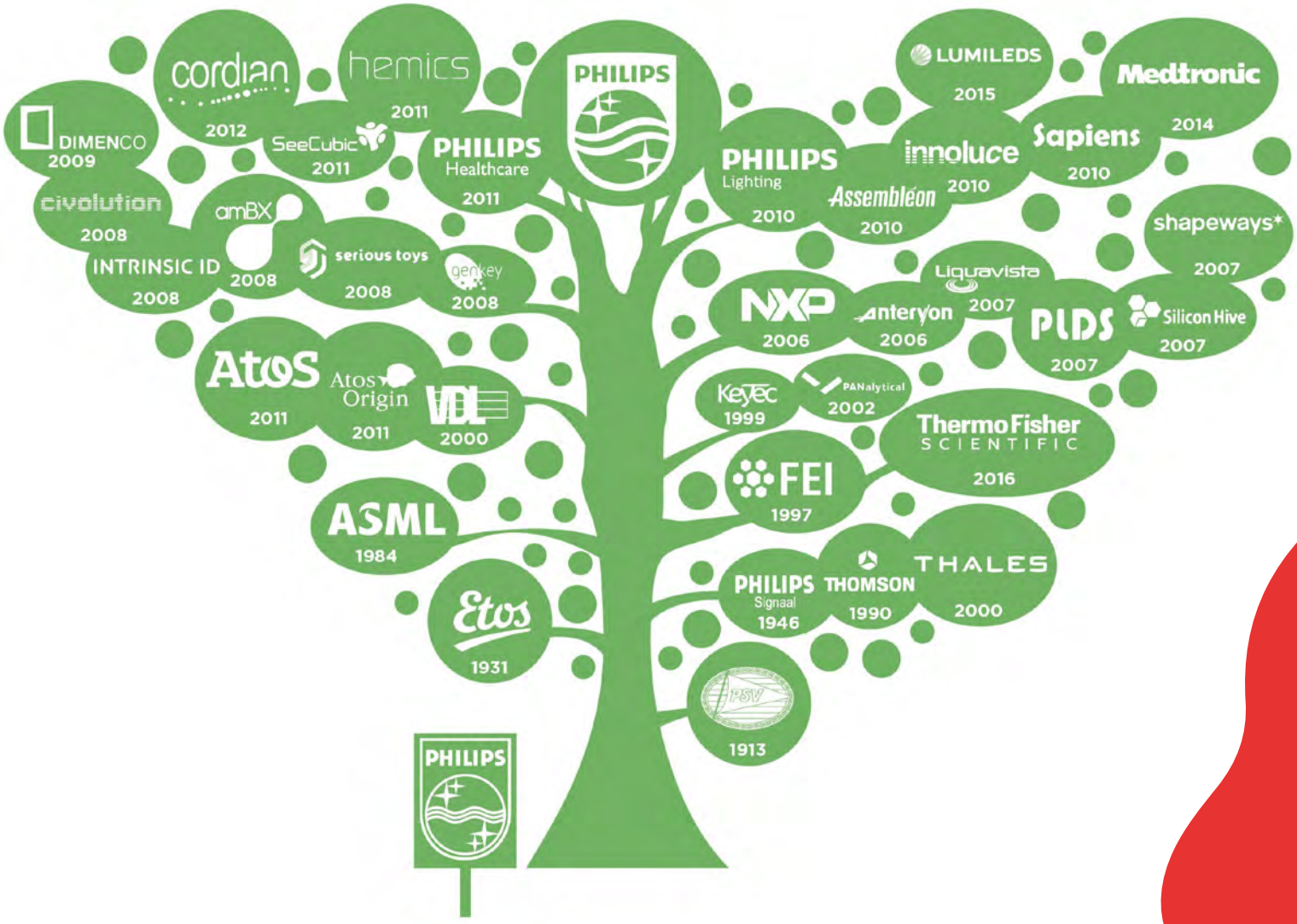
Of all private R&D spending in the Netherlands happens in Brabant

Higher education and specialist institutions in Brabant

Brabant is home to Eindhoven University of Technology (TU/e), and Jheronimus Academy of Data Science (JADS), Tilburg University, with universities of applies sciences in Fontys, AVANS, and Breda.

Furthermore, specialist knowledge institutes include Brainport Industries Campus, Eindhoven Engine, the Eindhoven Artificial Intelligence Systems Institute (EAISI), Holst Centre (TNO), Solliance Solar Research Institute, and the Dutch Institute for Fundamental Energy Research (DIFFER). These universities and knowledge institutes are a hotbed of innovation and fundamental to developing both new technologies and the next generation of talent.

Then there is the High Tech Campus, where approximately 250 businesses or organisations are based, which is a cornerstone of Brabant's tech ecosystem.



The Innovation Tree

In Brabant's long history of entrepreneurs launching companies, many have grown into successful SMEs and largescale OEMs. Alongside this, cross-collaborations between business and educational and research institutions have created a continuous flow of startups and scaleup companies, with new additions regularly forming and contributing to technological advances.

Philips is central to Brabant's status as a hub for technological breakthroughs and was a major builder of early industries in the province. And this legacy is still felt today. Dozens of world-renowned companies have developed, grown, and spun out of Philips over the last century as a result of the positive conditions that encourage innovation and growth in Brabant. Notably, the football club PSV Eindhoven was established in 1913 by Philips employees.

But more commonly, spinout companies include recognised providers of tech products and services. Many now have annual revenues in the billions of euros.

These include high-profile businesses such as:

- ASML, a global manufacturer of chip equipment
- ThermoFisher Scientific, manufacturer of advanced microscopes used by Nobel Prize winners
- Thales, a major international electronics manufacturer for aerospace, defence, and transport

The 2000s saw a rapid explosion of successful spinout companies with origins in Philips as the Triple Helix gathered momentum. More recent additions include chip designer and manufacturer NXP, biometric ID provider GenKey, and LED lighting manufacturer Lumileds.

A history of invention

One thing that is clear from the history of invention in Brabant is that they rarely stop at the first breakthrough. High-tech innovators in Brabant are restless, always looking to improve established processes and manufacturing techniques. The evolution of certain technologies is prevalent across Brabant.

Philips began manufacturing the Arga Lamp lightbulb in 1915, followed by mass production of the energy-saving lightbulb in 1980 with a screw base, then the LED bulbs came next in 2007.

While with X-rays, there was the first portable X-ray machine, Metaflix in 1927, followed by the X-RayONTV Monitor in 1957. Then in 1998, a further breakthrough enabled 3D X-ray images with a C-shaped arm offering 180o flexibility that moves around the patient. And in 2013, the latest advancement was the Alluraclarity, allowing doctors to carry out X-rays to generate high-quality images with low doses of radiation.

Meanwhile, the history of home entertainment has a lot to be thankful to Brabant for, with the province providing the technology behind the first live television broadcast in the Netherlands. Brabant is also where the world's first compact cassette tape, compact disc and CD player were all invented, as well as the world's first home video cassette recorder.

And in the high-tech industries, the LOCal Oxidation of Silicon (LOCOS) was established in the late 1960s, revolutionising the manufacturing of semiconductors in the microchips that continue powering data transfer in devices all around the world.

Brabant even saw an early version of a SatNav device back in 1985 by CARIN Navigation, 20 years before these devices started to become commonplace.

One of the reasons behind this long history of inventions is the culture of collaboration in Brabant that is difficult to replicate elsewhere.

“Especially in the beginning, it was this free-thinking. The culture stayed and other companies grew out of it. Startups also grew out of it. The High Tech Campus is still a sort of continuation of this philosophy,” says Hendrikse.

“That is something you cannot easily copy. Because in other cultures, these unwritten rules are far more restrictive, and it doesn't happen. You cannot copy this type of cooperation.

“If you look at the very accurate machines we work with in this region, for example, Japan is a country where they're also very good in these aspects. But the way they cooperate in Japan is totally different from the way they cooperate here in Brabant. It's not easy to copy that.”

“We work with very accurate machines in this region. Japan is also strong in this area. But the way they cooperate in Japan is totally different. It's not easy to copy Brabant.”

How Brabant's ecosystem works for businesses

To sustain and enhance these technological breakthroughs and upgrades, businesses and those wanting to set them up must embrace this culture and supportive climate of the ecosystem. And as global competition in becomes increasingly intense in the battle for high-tech talent, funding, and innovations, an environment such as Brabant's only increases in importance.

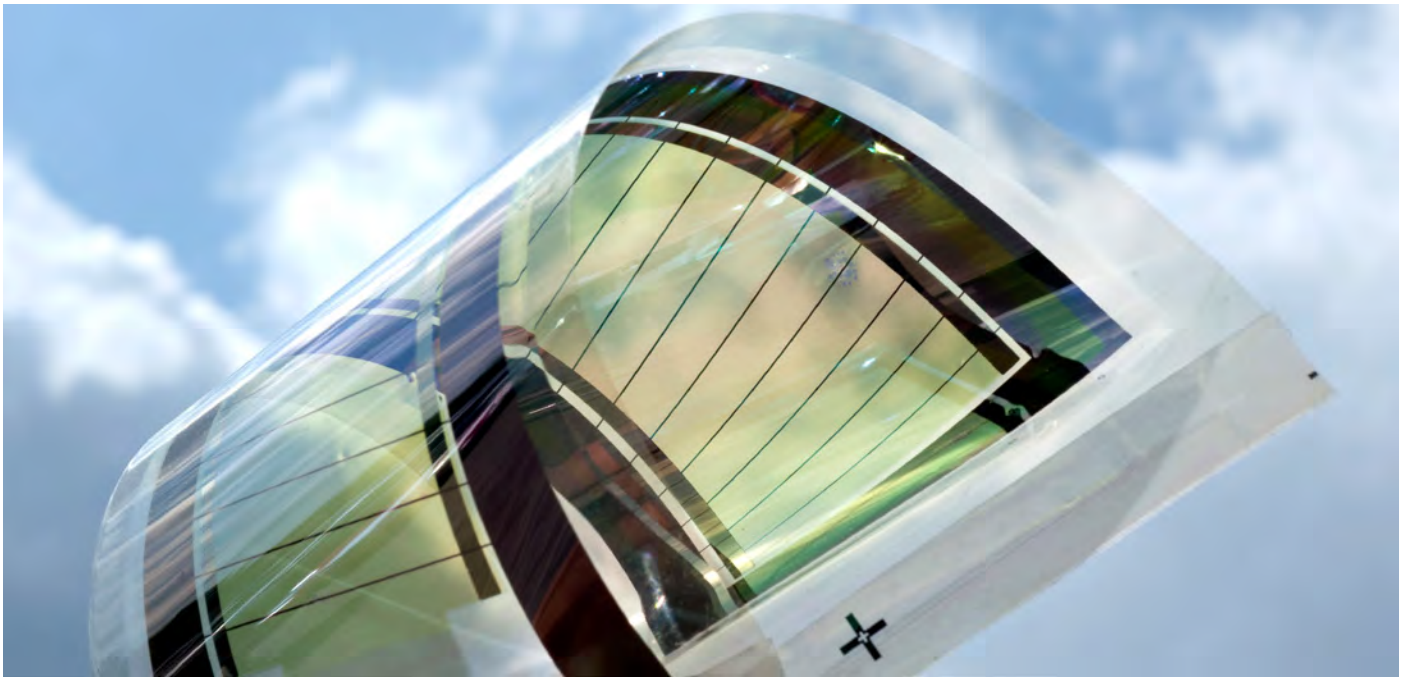
One of the biggest strengths of Brainport Eindhoven and the wider Brabant region is the presence of specialists at all levels of the supply chain, pooling ideas and collaborating across different verticals.

It is a region where partnerships are easy to form, enabling businesses to access skilled experts in high-tech manufacturing without having to hire them, keeping costs down. Outsourcing is widespread, with all parties working together to drive innovations. For example, additive manufacturers outsource the majority of hardware development to partners within Brabant.

The ecosystem and closeness of industries enable scientists to communicate directly with engineers on projects, with feedback and exchanges leading to the development of a solution through horizontal communication between specialists from different verticals.

"This sort of cooperation, and especially communication with respect for both functions, is unique in the world. Because usually, it's blue-collar or white-collar, and this communication doesn't take place. So, it doesn't arrive at a solution. But here, we can produce parts, in accuracies or difficulties because of this cooperation – that is not so easy for other areas to produce," says Hendrikse.

"For machine building, we're still the world champions with this system architecture. But that also is due to this culture where everybody challenges the others' position. Together, we reach a conclusion that is the best for the system."



The technologies of tomorrow

If anyone wants to know what the future looks like, they should see what technologies are being developed in Brabant through the Triple Helix and the robust ecosystem. There are almost certainly technologies in development that will make a positive difference in everyday lives within the next decade or so.

Brabant is a specialist hub for artificial intelligence, with various businesses and organisations accelerating AI with robotics to create the autonomous machines essential for Industry 4.0, for example, the automatic guided vehicles helping to plug the workforce shortage in warehouses. Vital projects are taking place in facilities such as Brainport Industries Campus' Factory of the Future Experience Center and Gate2's Cyber-Physical Factory.

LionVolt began as a startup from Holst Centre and is now developing solid-state batteries that could revolutionise energy storage to achieve greater efficiencies in rechargeability over the widespread lithium-ion model.

"You cannot solve these challenges by companies, government or universities acting alone. You need all of them."

Based at Brainport's Automotive Campus in Helmand, Lightyear is manufacturing cars that are powered entirely by solar energy, which will help address issues with the capacity and demand for EV charge points. Lightyear claims that the car's battery will not need recharging for two months in cloudy conditions, or seven months in sunny climates. Lightyear is now gearing up for commercial production.

Meanwhile, PhotonDelta is an organisation bringing together businesses and partners to advance innovation in photonic chips, which have the potential to revolutionise processing and data transfer by using light to transmit data instead of electronics.

Solving the myriad challenges facing society and the planet is going to take greater levels of cooperation to create the necessary technologies that will make a difference. And the culture in Brabant puts it at an advantage over other regions to find solutions for these challenges.

"You cannot solve these challenges by either just companies or just government or just knowledge institutes. You need all of them. And the fact that we have this cooperation in place, gives us an excellent position to come up with a solution for these challenges as a sort of living lab," explains Hendrikse.

Funding for the next generation in the Netherlands

Technological innovations are set to accelerate even further in the Netherlands over the next few years thanks to a significant injection of funding from the Dutch Government. Over 2021-25, the National Growth Fund will allocate approximately €20bn in projects categorised as either in R&D and innovation or developing knowledge in specialist areas.

In the second round in the first quarter of 2022, the National Growth Fund awarded €450m to the NXTGEN High Tech initiative. The sheer size of investment will make a significant difference in terms of project development, providing innovators with far great levels of support than is normally available.

"It's the size of the individual projects that can really accelerate development," says Eric Meulenkamp, DEMCON's new business development manager, who was involved in establishing the energy elements of NXTGEN High Tech. "[The investment] is very sizable, meaning we can create infrastructure. So, CAPEX that otherwise might be very difficult to realise. That in itself can have a big impact."

While there will be plenty of projects in development, the initiative has been created as a far-reaching program. The NXTGEN High-Tech initiative is aimed at sustainability and economic growth covering six main areas, which are:

- Renewable energy
- Lasers for improving data communications
- HealthTech
- Faster processing chips
- Lighter materials to make machines and vehicles more energy efficiency
- Robotics in agriculture

Many institutions and high-tech businesses based in Brabant will benefit from the funding. However, while a project may be running at a university in

"We see this as an opportunity to start something for a longer period of time into the future."

Brabant, there is a strong likelihood of partnering with other universities and businesses elsewhere in the Netherlands. The relatively small size of the Netherlands enables greater collaboration between different parts of the country.

The emphasis of the NXTGEN High Tech program is on innovation in the long term. The high-tech industry needs years of investment and patience, as new technologies are rarely invented and refined in short periods. The investment will cover the early stages of development when the technology may not be profitable. After all, ASML – now a billion-dollar company and world leader in machines to make chips – took several years to start turning a profit. What enabled the company to grow was consistent investments over years.

"You need that kind of investment mentality to benefit in 2022," says Willem Endhoven, managing director of High Tech NL, who was heavily involved in shaping the NXTGEN program. "We see this as an opportunity to start something for a longer period of time into the future.

"And that is one of the reasons why we call it the NXTGEN program. It is about earning capabilities of the Netherlands in the next generation of people. We're not doing something for the next five or ten years.

"We also want more high-tech engineers now. And if you can tell them that there is a long-standing opportunity for work that will certainly pull people into this kind of business."

To learn more about High Tech NL, click here.

What Brabant can offer investors

Brabant offers easy access to a population of 170 million European citizens within a 500km radius. The province's infrastructure, particularly in telecoms, is world-class for setting up a head office with all the necessary layers of support in areas such as R&D, manufacturing, marketing and sales.

When it comes to investors, Brabant Development Agency (BOM) can take care of all aspects of the process through its Foreign Investments & International Trade team. The BOM Foreign Investments team assists new and existing foreign companies in making optimal use of the opportunities in Brabant for businesses.

BOM offers support in finding sites for operations, building and environmental permits, labour market analysis, talent acquisition, assistance for logistics, employment regulations, bespoke research, and the relevant contacts within the regional private and public sectors.

In addition, the team also provides hands-on support for companies in Brabant seeking to grow businesses abroad.

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