The Foundations of our Digital Economy

Structure study on the infrastructure behind our data economy
Publication details

This report is a joint publication by the Dutch Hosting Provider Association (DHPA), Dutch Datacenter Association (DDA) and ISPConnect, sector organisations for data centers, and Dutch cloud and hosting companies, the digital foundations of the Netherlands.

Authors
Ruud Alaerds
*DHPA Dutch Hosting Provider Association*

Stijn Grove
*Dutch Datacenter Association*

Simon Besteman
*ISPConnect*

Pim Bilderbeek
*The METISfiles*

Editors
Wouter Pegtel
*Splend*

Marketing & Artwork
Michiel Cazemier, Gaby Dam (Splend)

Issue
Structure Study 2017 (Year: 1, Issue: 1)

Format
This publication was created in PDF-format.

Availability
This publication can be downloaded free of charge from:
www.dhpa.nl
www.dutchdatacenters.nl
www.ispconnect.nl
www.theMETISfiles.nl

© 2017
# Table of Contents

1. Foreword ................................................................. 4  
2. Management Summary ................................................. 6  
3. Transformation and transition ....................................... 8  
   a. Digitisation .................................................. 8  
   b. Data: the new raw material ................................ 9  
   c. A new digital basis ......................................... 9  
4. What is the digital economy? ......................................... 10  
   Digital transformation ........................................ 11  
   Digital economy model ..................................... 12  
5. At the end of the day ................................................ 15  

Appendix  
Facts and Figures: the Dutch digital economy ....................... 16  
About the Dutch Hosting Provider Association ..................... 19  
About the Dutch Datacenter Association .......................... 20  
About ISPConnect .................................................. 21  
About The METISfiles .............................................. 22  
Participants Dutch Hosting Provider Association ................. 23  
Participants Dutch Datacenter Association ........................ 24  
Participants ISPConnect ........................................... 25
Our digital infrastructure is a crucial aspect of all online activity and development, and consists of data connections, internet exchanges, data centers, cloud and hosting businesses, as well as the supporting ecosystem. It is a major asset that remains hidden or unfamiliar to many of us, even those of us who work in the world of IT. This is a pity, because we in the Netherlands are sitting on a goldmine.

The above applies specifically to the Netherlands’ digital data hub, one component of our digital infrastructure. It is one of the most important hubs of its type in the world: just like the Port of Rotterdam and Schiphol Airport, it forms a gateway to Europe. Companies from around the world use the Netherlands as their data distribution node, and as a key location for their data centers, cloud applications or headquarters.

Because of the data hub, nearly 20% of all foreign investments in the Netherlands are now data center-, cloud- or online related. The ‘online’ sector is already the largest by far when it comes to foreign investments throughout the Netherlands – unprecedented given its young age, and making it one of the key sectors in ensuring a healthy future for the Netherlands.
Since ‘out of sight’ means ‘out of mind,’ the digital sector has taken the initiative to provide some clarity on how the Dutch digital economy is structured. To that end, this study provides an outline of the entire digital economy and its supporting infrastructure. The Dutch Hosting Provider Association (DHPA) launched the project in conjunction with research partner The METISfiles, after which the Dutch Datacenter Association and ISPConnect joined the ranks.

The study has a dual purpose. Firstly, as representatives and advocates, we wish to show the Netherlands what digital infrastructure is, and why it is so important to our society and economy. It is also for this reason that we are all joint founders and members of the Digital Infrastructure Netherlands Foundation (Stichting Digitale Infrastructuur Nederland, DINL). Secondly, it is important for our colleagues active in the world of internet to have a good understanding of how our sector is structured, and to be able to interpret the developments that take place within it. This study and initiative will begin with this initial document, and over the period ahead will be supplemented with relevant information on the ecosystem and market mechanisms.

We hope that this document will help you to better understand the online world, and to explore the importance of our digital infrastructure both in and for the Netherlands.
The role of the digital economy within the Dutch economy as a whole is gaining importance. The cogs that turn and make the digital economy possible are mostly hidden from view, however, resulting in a lack of knowledge regarding the fabric of the underlying infrastructure, and what it means for our economy and society. For the first time, this report provides a comprehensive and thorough insight into the complexity of digital infrastructure and the digital economy by describing them both in detail. An extensive, all-encompassing model is used to show how the various elements fit together. Without solid, reliable infrastructure, the digital economy cannot exist.

Based on the model below, readers of this report will learn how data has come to play a key role in our lives, and about the role that data centers and cloud and hosting providers play in enabling digital services. It presents an in-depth discussion of the interplay between the interconnected elements presented in the model, and the infrastructure that makes them possible. The many concrete examples give readers an understanding of how digital infrastructure serves as a prerequisite for Dutch industry. These range from ensuring the operation of IT systems for energy providers, to laying the basis for online stores that are open for business 24 hours a day, 365 days a year.
These and other reasons are why data centers, cloud and hosting providers (and the broader digital infrastructure) are indispensable for the ever-growing role played by the digital economy in the prosperity of the Netherlands. One quarter of the Netherlands’ Gross Domestic Product (GDP) is dependent on data centers and cloud and hosting providers. The appeal of these sectors is what brings many international businesses to the Netherlands along with significant investments, making the Netherlands one of the major operators in the global digital economy. To inform our international colleagues, this study offers detailed insight into the structure of our digital economy.
Transformation and transition

We are living in turbulent times: the advent of the internet and smartphones has changed the pace of life. The internet is a part of nearly everything we do.

a Digitisation

Consider even simple matters, such as ordering a pizza, buying a television, sharing photos with friends, submitting a tax return or running an election campaign. In all aspects of our society and economy, we see the influence of extensive digitisation.

At the same time, it has become apparent that the economy of the second half of the twentieth century – that was fuelled by oil, natural gas and other fossil fuels – is entering its final stage. There is now an urgent need to switch energy sources, as we know that global warming is progressing more rapidly than anticipated, and is already causing noticeable changes to our climate. With a potential global crisis on the horizon, we are in search of a sustainable economic model.

The momentum brought by internet technology and the energy transition together constitute an industrial revolution, a change that is constantly accelerating due to exponential growth in technological possibilities and innovations.
### Data: the new raw material

Far-reaching digitisation is making documentation and analysis easier and easier. Analysing and combining data produces information: information that enables greater control of business processes, better service and improved strategic planning.

We are generating and accumulating data on a massive scale. At the individual level, this data relates to where we are, and what we do. The ‘Internet of Things’ also means that more and more devices are connected to the internet and generate even more data. The number of sensors sending real-time data is increasing day by day. To organisations, government authorities and institutes, the enormous quantities of big data are an essential ingredient in their success, now and in the future.

The internet is also dependent on data: tailored advertising based on customer data is the reason why online applications appear to be offered for free, and is the driving force behind nearly all online businesses which would not exist without this data-based advertising.

Data is therefore the new ‘raw material’ for all organisations in the digital age.

### A new digital basis

As a new raw material, data marks the start of an entirely new supply chain: the digital supply chain, which – although elusive to many people – nonetheless has many similarities with other well-known supply chains, among which coal or iron. Because although data may be intangible, it must still be transported, stored, and processed in order to be of value.

Much of this process is not visible to us. Data is transported by wireless networks and sub-sea or underground cables that emerge in faceless buildings we call ‘data centers’, which in turn contain row upon row of computers and network equipment owned by hosting providers (among others), where the data is processed and stored. Immense cooling and power systems ensure that this process can continue 24 hours a day, seven days a week. However, this digital infrastructure is not on everybody’s radar as the essential element that facilitates digital progress.

The enormous vested interest in this infrastructure is also underestimated and without it our economy and society would quite simply grind to a halt. The sector has now also grown into an entire industry of great economic significance.
What makes the model so different, so disruptive? AirBnB has turned the hotel industry upside-down with its online platform, where millions of times per year, private individuals rent out a room or their home to tourists via a service that is safe, transparent and affordable. Uber has revolutionised transport in a similar way. Instead of ‘calling a taxi’, we now tell Uber where it is we need to go. Uber estimates the cost in advance and, if you agree, takes care of the rest: they organise a car, a driver, plan the route, and payment is cashless and automatic. The ease and security of this service have made it a household name within a couple of years, and changed the taxi industry forever. Without data and digital technology, these innovations would not have been possible.

There are more examples: Dropbox allows documents to be stored on a cloud server and shared with others, providing access at any time and eliminating the need to turn up with USB sticks or send enormous files back and forth. The low visibility of such services does not make them any less palatable: we book our airline tickets online, make online payments using a banking app, while another app reports on whether there is a traffic jam on the way to work. These are cloud services used by everybody. The common element in all such services, which have been shaped by today’s society, is that they are cloud-based. Instead of on users’ computers, they run on powerful servers in a secure environment that users connect to via the internet, using their PC, tablet or smartphone. The ways these server-based applications run and how the stored data is processed, form the basis of the various models of the digital economy.

All of these (and other) services employ a digital infrastructure that remains hidden from most people: the servers run in high-security data centers, the data is transported by fibre-optic networks and managed by professional hosting companies.

One way the above-mentioned digital businesses facilitate their rapid growth is by using services such as co-location, hosting, cloud computing and Software-as-a-Service (SaaS). Use of cloud computing in particular (the on-demand availability of digital
infrastructure via a network, comparable to electricity via the mains) has grown quickly in recent years. This model means that users no longer need to own – or be responsible for maintaining – the infrastructure or services in question, as opposed to on-premises infrastructure. Figure 1 above roughly outlines how the various layers in the digital-infrastructure stack can be scaled and supplied on-demand.

**Digital transformation**

Digital transformation is also bringing the digital and traditional economies closer together. According to McKinsey (from 'Finding your digital sweet spot'), companies use digital technologies to generate added value in four areas:

- Faster and improved decision-making processes using big data and advanced analysis techniques;
- Automation of manual tasks and eliminating labour through technology; and
- Innovation in products, services and business models.

Digital transformation therefore gives rise to new businesses, digital business models and sectors, and adds a digital component to existing sector/business activities. Unfortunately, the current classification system for economic activities used by both Eurostat (the statistics agency of the European Union) and Statistics Netherlands (CBS) – the NACE code – is (as yet) unable to incorporate this digital component into the economic statistics.

To try to relate the traditional business classification to the digital economy anyway, research and consulting firm The METISfiles has created a taxonomy/model that brings both together.
Digital economy model

This model takes the form of a layered chain or cycle, and draws a distinction between sectors and components that a) deliver digital infrastructure, b) create digital services, and c) consume digital services/infrastructure (see Figure 2).

Digital infrastructure (digital delivery) consists of data as the raw material, the network sector, the data center sector, and the cloud & hosting sector. Digital services are created by software and digital companies (digital creation). Digital data, infrastructure and services are purchased by businesses, consumers and the government (digital consumption), facilitated among other ways by linking on-premises IT infrastructure and devices such as smartphones, tablets.
and sensors to cloud computing and SaaS providers.

The effective functioning of the digital delivery, creation and consumption supply chain is of vital importance to the smooth running of the digital economy, and depends not only on the sectors themselves, but also on environmental factors such as innovation, research, education, promotion, sustainability, policy, laws & regulation, trust, security and finance. Digital transformation also means that these enablers must adapt to the new reality, and is necessitating change among all social and economic stakeholders and institutes.

A more detailed version of this model is presented in Figure 3, which shows how the various supply-chain layers in the digital economy support each other, and how digital transformation of the traditional economy is supported by digital infrastructure.

Figure 3 The digital economy model

The model is made up of the following interrelated and mutually-dependent layers:

**The data layer**
- **Digital data** – in the form of bits and bytes – is the raw material of the digital economy. A distinction can be drawn between structured data (e.g. a CRM or digital financial transaction database) and unstructured data (such as a random collection of videos, images and text).

**Infrastructure and infrastructure services layer**
- **Networks transport data.** Networks can be divided into fixed and mobile networks, or core/metro/access networks. This layer also includes internet exchanges that facilitate traffic between various networks, such as the Amsterdam Internet Exchange (AMS-IX).
- **A data center** is a secure building fitted with redundant power sources (emergency generators) and containing servers that must be constantly in operation. It is the
place where computing power, connectivity and storage are combined. Besides housing, data centers also provide redundant data communication links, and various security facilities. They can be divided into single-tenant, multi-tenant and hyperscale data centers.

- Among other things, data centers house the infrastructure for hosting and cloud providers. Hosting providers supply web hosting, application hosting and/or infrastructure hosting and related services. Cloud providers deliver public, private and hybrid IaaS and PaaS as defined in the NIST model (National Institute of Standards and Technology).

Software and software services layer
- Companies that provide services using the digital infrastructure layer are included in the software and software services layer. Software-as-a-Service (SaaS, as defined by NIST) is one common variety, however in principle a multitude of services can be offered online (Everything-as-a-Service). Companies such as those mentioned above (AirBnB, Spotify, Dropbox, Netflix and Uber) belong in this layer.

Consumption layer
- ‘Things’. Digital services are delivered to companies, the government and consumers via smartphones, tablets, and – increasingly – online devices such as smart meters, sensors, etc. (IoT).
- On-premises IT. Companies on-premises IT is increasingly co-located with data centers, and is connected to cloud, hosting and software services via hybrid and multi-cloud architectures.
- Roles. Digitisation is changing roles. Consumers are becoming digital consumers (online banking, online media and entertainment); marketing specialists are going digital (marketing automation, social marketing); Sales is using SaaS (SalesForce); HR uses eHRM (YouForce); Finance uses online accounting, and Production is changing due to 3D printing.

- Industries. More and more industries are changing due to digitisation. In the primary sectors (agriculture, forestry, fisheries and mining) the importance of sensors and the IoT is increasing. Secondary sectors (industry, utilities and construction) are employing digital technologies such as Industry 4.0, the IoT, Smart Grid and BIM. The tertiary sector (trade, transport, information and communication, finance, rental, commercial services) is primarily focused on the rise of e-Commerce, social media and Fintech. The quaternary sector (public administration, education, healthcare) is transforming traditional services into online services such as e-Government, e-Learning and e-Health.

Enablers
The effective performance of the digital delivery, creation and consumption supply chain is of vital importance to the smooth running of the digital economy, and depends not only on the sectors themselves, but also on environmental factors such as:
- programmable interfaces (APIs) that unite the data, infrastructure, software and consumption layers;
- digital partner ecosystems, that offer new inlets to the market; and
- innovation, research, education, promotion, sustainability, policy, laws & regulation, trust, security and finance.
Digital infrastructure is an enabler for various processes that define our strong evolving digital economy. But it is also a best kept secret. By describing the digital economy and the role of the digital infrastructure within, we not only provide a view on one of our fastest growing industries, but also show how this infrastructure and the players in it enable many online services we use on a daily basis.

This document provides a number of schematic figures to explain developments that take place now. And clearly shows the rapid pace in which not only digital infrastructure is evolving but also the way we run our business. Most important, the model visualizes the digital economy and the ‘layers’ that make it work.

It demonstrates that digital infrastructure is indispensable for the ever-growing role played by the digital economy. This holds true for the Netherlands and for any other country or region for that matter. The appeal of these sectors is what brings many international businesses along with significant investments to our country, making the Netherlands one of the major operators in the global digital economy.

This document will be the starting point for more documents describing various topics & trends in the world of internet and cloud. Thank you for taking the time to read this. We trust it will help you gain a better understanding of our sector and role in the online ecosystem.
Appendix

Facts and Figures: the Dutch digital economy

Figure 4 Single tenants data centers’ growth expectations for the next 12 months, May 2016 (N=100)


Figure 5 Amsterdam commercial data center market size

Figure 6  Server rack locations, dutch end-user (organizations with 5+ racks, may 2016 (N=100)

<table>
<thead>
<tr>
<th>Year</th>
<th>Onsite</th>
<th>Colocation</th>
<th>Hosting/Cloud</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>72%</td>
<td>13%</td>
<td>15%</td>
</tr>
<tr>
<td>2021</td>
<td>50%</td>
<td>22%</td>
<td>28%</td>
</tr>
</tbody>
</table>


Figure 7  A hybrid, multi-cloud world

Source: The METISfiles
**Figure 8** What is Driving Market Growth

Graph showing the driving forces of market growth:
- Web hosting: Digitalisation of products & Services
- Infrastructure hosting: IT Infrastructure Outsourcing
- Application hosting: Everything-as-a-service

**Source:** The METISfiles

**Figure 9** Cloudscape Netherlands

- 58% of SaaS providers have an IaaS partner, 42% have their own infrastructure.
- 69% of SaaS providers that have an IaaS partner are located in a Dutch data centre, 16% are in another European country, 15% are in the US.
- 45% of SaaS providers that have an IaaS partner provide online ordering and onboarding compared to 21% of those that have their own infrastructure.

**Source:** The METISfiles

**Figure 10** Dutch SaaS providers by category

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online workspace</td>
<td>19%</td>
</tr>
<tr>
<td>Communications</td>
<td>13%</td>
</tr>
<tr>
<td>Finance/ERP</td>
<td>12%</td>
</tr>
<tr>
<td>HRM</td>
<td>9%</td>
</tr>
<tr>
<td>Digital marketing</td>
<td>6%</td>
</tr>
<tr>
<td>CRM</td>
<td>5%</td>
</tr>
<tr>
<td>Collaboration</td>
<td>4%</td>
</tr>
<tr>
<td>Education</td>
<td>4%</td>
</tr>
<tr>
<td>Time management</td>
<td>3%</td>
</tr>
<tr>
<td>Document management</td>
<td>3%</td>
</tr>
<tr>
<td>Healthcare</td>
<td>3%</td>
</tr>
<tr>
<td>Other</td>
<td>19%</td>
</tr>
</tbody>
</table>

**Source:** The METISfiles
About the Dutch Hosting Provider Association

With more than 30 market leading participants and over 20 A-brand vendors of technology and services, the DHPA represents the top tier of the Dutch cloud and hosting industry. DHPA participants are providers with an excellent track record in professionalism, quality and information security. DHPA participants represent a large part of the revenues of the hosting- and cloud provider sector in the Netherlands. See www.dhpa.nl/ for an overview of DHPA partners and participants.

The DHPA is the leading point of contact of the Dutch cloud and hosting industry for suppliers, media, education, Government and politics, and is a founder and an active participant in the umbrella organisation DINL (www.dinl.nl, Digital Infrastructure Netherlands).

DHPA board and management frequently publish sector-related articles and reports, participates in panels, speaks at events and express themselves in the media about relevant and current themes. The DHPA is very well represented in consultative bodies and platforms of industry and Government, where they convey the interests and views of the sector. The DHPA approaches themes such as education, our economic importance, trust and information security and is combating cyber crime with a positive tone of voice. We prefer to present solutions based on our expertise, rather than offering resistance and voicing criticism.

DHPA’s activities include promotion of the sector, initiating market research, the promotion of quality education, the development of standards, guidelines and procedures for information security and service quality, combat against cybercrime, and facilitating connections between the market and participants. See www.dhpa.nl for a detailed overview of activities.

Dutch Hosting Provider Association
Contact: Ruud Alaerds, Director
Tel.: +31 634 861 667
Email: r.alaerds@dhpa.nl
Website: www.dhpa.nl
The Dutch Datacenter Association (DDA) is the trade organisation of data centers in the Netherlands, the bedrock of the Dutch economy. The DDA unites leading data centers in the Netherlands in a common mission: the strengthening of economic growth and the profiling of the data center sector to government, media and society.

The DDA expresses industry views on regulatory and policy issues. It demonstrates leadership by facilitating and encouraging members to implement operational improvements in the form of best practices. The DDA promotes education and contributes to technical standards, which enables the data center industry in the Netherlands and abroad to further distinguish itself.

The DDA is one of the founders of the umbrella foundation Digitale Infrastructuur Nederland (DINL). DINL unites organisations that facilitate the digital infrastructure within the Netherlands. The DDA closely collaborates with Digital Gateway to Europe, which promotes the Netherlands as international data hub. The DDA also actively collaborates with market operators, the government and other interested parties.

Dutch Datacenter Association
Contact: Stijn Grove, Managing Director
Tel.: +31 650 439 288
Email: sgrove@dutchdatacenters.nl
Website: www.dutchdatacenters.nl
ISPConnect is the trade association of Internet Service Providers in the Netherlands. Our main purpose is to represent the collective interests of our members and of the internet industry. ISPConnect achieves this aim by working on the subjects of privacy, security, image of the industry and education.

As a not for profit association ISPConnect has a broad membership of almost 100 members. This extended base gives us the legitimacy we need to represent the industry towards the various stakeholders we engage with on the topics of our agenda.

We offer a range of hands-on services to our members (such as terms and conditions, SLA’s, legal and fiscal advice, an arbitration committee and advice with mergers and acquisitions). Our “Young ISPConnect” programme is a forum in which the young staff of our community get to develop their network, exchange experiences and receive advice from industry veterans.

ISPConnect represents the internet community in a large selection of fora in which we represent the point of view of our members on topics that are important for our industry in discussions with government and other stakeholders on issues such as net-abuse, DDOSS, botnets, regulation and privacy.

We manage various programmes, independently and within the umbrella coalition DINL to improve the quality of education, to promote diversity in the sector and stimulate young people to choose for careers in the industry.

Finally, ISPConnect organizes a dozen events every year: conferences, seminars, information days and knowledge events, but also networking and fun events where the entire Dutch internet community comes together.

ISPConnect
Contact: Simon Besteman, Director
Tel: +31 624 665 055
Email: simon@ispconnect.nl
Website: www.ispconnect.nl
About The METISfiles

The METISfiles is a market research & consulting firm dedicated to solving strategic issues for executives in the digital economy and digital infrastructure industry.

The METISfiles
Contact: Pim Bilderbeek, Partner and Principal Analyst
Tel: +31 653 902 852
Email: pim@themetisfiles.com
Website: www.themetisfiles.com
Participants of the Dutch Hosting Provider Association
Participants of the Dutch Datacenter Association
Participants of ISPConnect