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THE UTOPIAN SMART CITY

IF A SMART CITY WAS COMMON, WE WOULD NOT CONSTANTLY DISCUSS ABOUT IT. SO WHAT IS A UTOPIAN SMART CITY?

Unlimited cities and unlimited definitions. Let's deconstruct the meaning of a smart city – it is in fact a city, that together with citizens, organisations and think-tanks tackles multiple challenges ranging from sustainability to mobility, safety, health and more using technology. The fact that this approach of a city attracts investors, boosts the job market and helps economy surge, is a bonus.

While this is the utopian dream, the reality is that currently a 'smart city' is mainly the subject of endless pilots and projects by self-motivated people at municipalities across the Netherlands. In the beginning of 2017, the Dutch Prime

Minister received a smart city strategy from a coalition of large municipalities, organisations, and science and technology institutions.

If you research for the said strategy, the search engine will throw up a list of links that are all mutations of just one press release. Given the enormous social and economic impacts of a smart environment, you would expect the government to set up a mesh of guidelines and conditions for digital infrastructure that forms the backbone to the smart city strategy.

However, the 'digital infrastructure' in question is bit of a blind spot in



the Hague (the political seat in the Netherlands). Take the roll out of 5G – the next generation mobile network that is vital to smart cities. The 3.5 GHz band is the global standard for 5G, but in the Netherlands this frequently is used mainly by the ministry of Defence for espionage purposes and the Ministry of Economic Affairs and Climate – responsible for the management and assignment of radio frequencies – is not planning to free up any bandwidth to be used in the digital infrastructure development of cities.

Municipal administrators have practical objections as well. A mayor, who was told how attractive his city centre would be for

residents and visitors if it would become car-free thanks to smart technology, exclaimed desperately: "We have just built a parking garage in the centre and we have to pay for another 30 years. We do not want less cars: we want more cars!"

I fear, for the time being, we still live in an environment with limited intelligence. ■



Peter Lievense

Editor-in-chief,
iBestuur

Guest column: Peter Lievense has over 20 years of experience as a journalist with focus on the government in the Netherlands.

A SMART CITY LEARNS FROM ITS CITIZENS

A COLLABORATION BETWEEN CITIZENS AND GOVERNMENT TO IMPROVE QUALITY OF LIFE. IS THIS THE FUTURE?

LIVEABILITY

As citizens, we are responsible for not just ourselves, but to our living environment and hence to the municipality we live in. The quality of life in our environment is important to us. Every four years, municipal elections are held in the Netherlands.

In March 2018, we as the citizens had the opportunity to vote and choose the direction of decision making in our municipality by electing a new council. Multiple themes are to be considered during municipal elections, ranging from employment to energy transition (going from 'grey' to 'green'), mobility, climate change and more. These themes have a direct impact on the quality of life.

However, to influence quality of life, we must first understand the relevant processes. We tend to extract insights from data (current and from the past).

With advancements in technology such as sensors, the Internet of Things, platforms and open data, it is simple, quick and affordable to collect huge amounts of data. There is so much data and information available, that decision making has become rather complex. So how can we ensure that we do not lose sight of our goals?

THE SELF-LEARNING CITY

Fortunately, there are solutions to help process and filter big data quickly and efficiently. Beyond big data processing, arise the challenges of sharing timely information that is easy to comprehend. Translation of information into knowledge and insights is perhaps the biggest challenge faced today by information users. Once goals are

Read the article 'Almere Municipality Monitors Polling Station Data'. P. 11

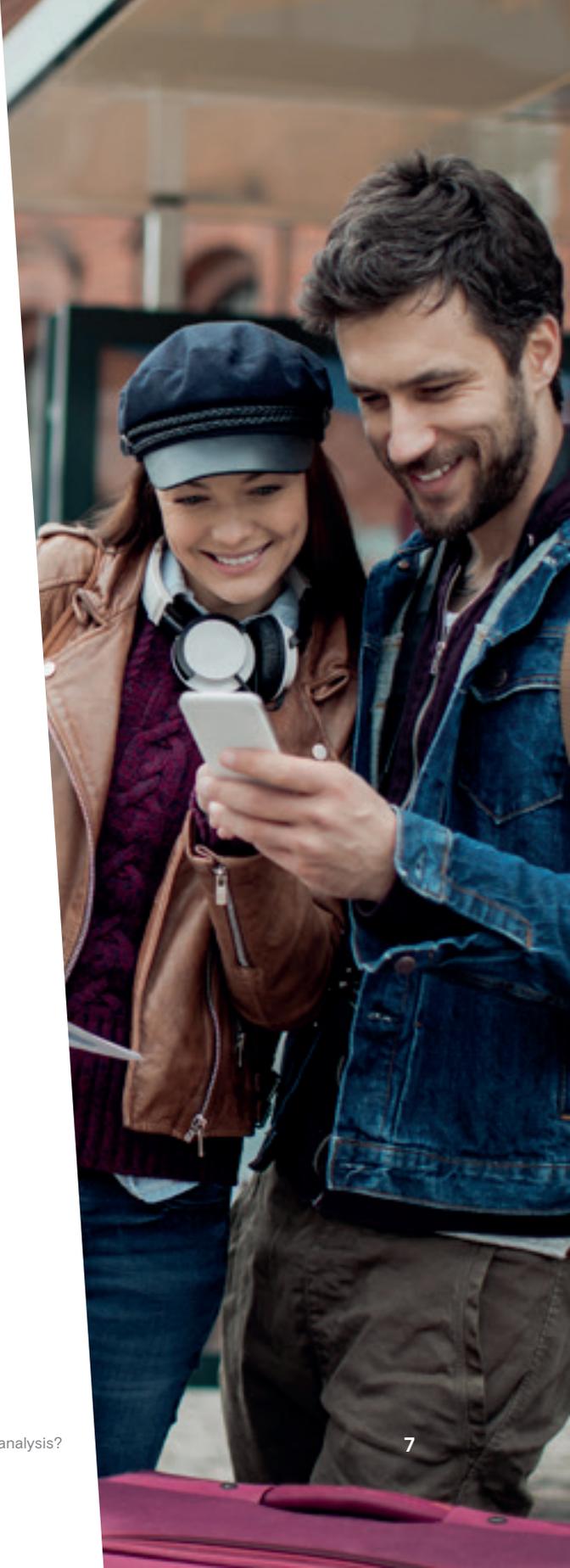
51%

of a work week is spent by data professionals on the collection, integration and preparation of data.¹

accomplished, and questions answered though insights, new questions arise, especially about the future. This results into a vicious cycle of constantly seeking answers to make decisions. Wouldn't it be more convenient to be able to predict the impact of our choices or decisions? With the development of self-learning algorithms such as 'machine learning', considerable advancements are being made that would impact the progress of smart cities.

Artificial Intelligence and robotization are fast-developing technology trends that help automate repetitive processes and predict information, ultimately improving quality of life. Robotization is everywhere.

¹Source: TMMData – Are data analysts actually doing any analysis?



It underlies so many processes in our daily lives, most of which we might not even be aware of. The downside though is that it replaces jobs and forces the community to upskill more often than previously. Everyone uses some form of AI and robotization in daily lives as they're easy to adapt to. For municipalities though upgrading technology and adapting newer advancements is much more complex. If we want to make cities smarter, isn't it an idea to learn from the approach of citizens?

COMMON GROUND AND CITIZEN PARTICIPATION

Technology is increasingly being used in the process of learning. This certainly helps us move ahead, but while technology only offers resources, the desired solutions are often tailor-made large-scale projects. The Dutch government has become cautious in implementing large-scale innovative solutions after years of less than desired results from budget-guzzling IT-projects. To tackle this very concern, the 'common ground' concept was approved by the

Association of Dutch Municipalities (VNG) in September 2017. The concept aims to build new 'digital cities' from the ground up, so that innovation is not restricted by the limitations of the complex existing systems. While the government recognises the need for custom applications, the infrastructure, services and platforms must be open and standardised - a hybrid approach. This approach will enable reuse of solutions between municipalities to a considerable extent.

For citizens, projects are often small-scale. A city is nothing but a collection of citizens who form communities. They collaborate in groups and kickstart initiatives together. While some of the initiatives are successful, others are not.

But the more knowledge and experience is applied, the higher is the success rate. Now how about applying the same idea to governments? What if the municipalities could apply a small-scale approach to their goals of being smart cities? What if they could freely share and reuse solutions amongst themselves?

Read the article 'Building a Smart City One Step at a Time'. P. 20

REVOLUTION IN COOPERATION

Each form of cooperation has pros and cons. In case of smart cities – where citizens and government must work together – wouldn't we benefit from the small-scale approach of citizens in combination with the common-ground principle for technological innovation within the municipalities?



The **Municipality of Nijmegen**, together with citizens, universities and businesses, successfully implemented the participation project that allows both city administrators and citizens to view air pollution and noise levels on a dynamic and interactive dashboard.



Now imagine that there is a form of cooperation, in which citizens and the government can collaborate on a small-scale to improve the quality of life. A modern and open technology platform is used, where useful applications can be shared with others. The knowledge of the solutions is stored here and can be shared, free of charge, with other municipalities: a 'sharing economy' or community model for municipalities and citizens. This would revolutionise and accelerate smart city projects.

The 'common-ground' principle from VNG, combined with the small-scale approach of citizens, gaining insights and learning together. A new participation model is born, where tax money is spent once to create solutions that can be reused multiple times. This would enable municipalities to collaborate and accelerate liveability of our cities; and create smart cities of the future. ■



Wouter Brokx
President, IMAGEM





ALMERE MUNICIPALITY MONITORS POLLING STATION DATA

MUNICIPAL ELECTIONS ARE HELD IN THE NETHERLANDS EVERY FOUR YEARS, THE MOST RECENT HELD ON 21 MARCH 2018. THE MUNICIPALITY OF ALMERE MONITORED AND VISUALISED DATA FROM POLLING STATIONS USING A DYNAMIC DASHBOARD TO TRACK LIVE VOTE COUNTING.

The city of Almere is home to more than two hundred thousand citizens who voted to eventually elect a new municipal council through 98 polling stations.

45%

of citizens turned out on
Election Day to cast their votes
at 98 polling stations in Almere.

On Election Day, the town hall was the 'place-to-be' for members of the

municipality, participating political parties and media, as mayor Franc Weerwind announced the progress of election results once the vote-counting began.

While this is the usual scene at many municipalities, the geo-data team at Almere Municipality took polling-analysis to a different level altogether. Through interactive dashboards projected on multiple screens across the town hall, they facilitated for all attendees to experience the power of statistics, business- and location-intelligence fused together in a powerful tool - the Election Monitor.



Emil Otte analyses the Election Monitor dashboard on an interactive screen.

“On Election Day, every party member is at the city hall, and they want to see the results. That’s why we created dashboards, which are a map presentation of voting progress on the same evening. Besides that, you can do your own analysis.” – Emil Otte, Consultant – team Geo-data at Municipality of Almere.

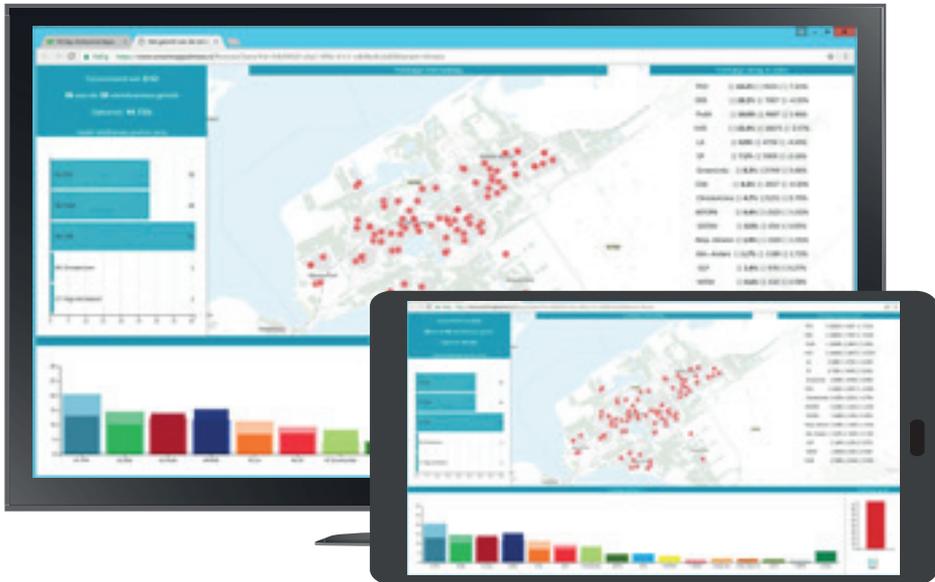
The dashboard – based on Smart M.App® technology – helped combine multi-source data projected on a unified cloud-based platform.

The polling stations and their results were

represented on an interactive and dynamic map.

With every vote-counting cycle, voting results were updated on the dashboard connected directly to the polling stations. The interim results were announced by the mayor at the end of each cycle.

“Results were coming in every half hour so, and in between members of political parties could use the map – the Smart M.App – to analyse data on several touchscreens that were in the Town Hall.” – Emil Otte.



Screenshots of the Election Monitor dashboard the geo-data team at Almere Municipality.

The Geo-Data department succeeded in providing a simple-to-use, dynamic and interactive platform that displayed live information and helped in visualising polling results. Everyone, from the mayor to the city employees, were able to use the dashboards to create custom-views based on their individual requirements. The dashboard could be used by a broad spectrum of 'information users' – policy makers, politicians, political party members, city workers, as well as the media. It becomes easier to create a dashboard if all the required data readily available. Various dashboards can be created

depending on the needs of the user. Emil says, "When i was asked to help create a 'map' of the polling stations on Election Day, we could create it quickly. Integrating multi-source data with the polling map made the solution even more intelligent as it ensured that the dashboard had live and accurate information available on it."

Non-technical people were able to use the dashboard effectively proving that the dynamic dashboards used by our department has users beyond just the information makers." ■

WHAT OUR CUSTOMERS AND PARTNERS ARE SAYING



I'm a politician, and I have to defend our plans in the council. And now I can show the council in one blink of an eye where we need the money for. The Smart Roads dashboard provides real-time insight, it's actual, up-to-date, and that's how we operate.

Theun Wijbenga, Alderman, Municipality of Tynaarlo



Citizens of Nijmegen can get in conversation with the local government with the Smart Emission dashboard. So when they experience a problem or experience something else they can just talk to each other and make a solution together. With an application like the Smart M.Apps you can see that you actually make a difference in society.

Bas de Greef, Business Developer, Intemo



IMAGEM helps us with data visualisation solutions to understand the information and perceive patterns and connections that matter.

Alous Spaanderman, Data Coordinator, Delfland Waterboard



“ Smart M.Apps can help cities become smarter as it integrates all kinds of data on a real-time platform to even make a small village like Tynaarlo even smarter.

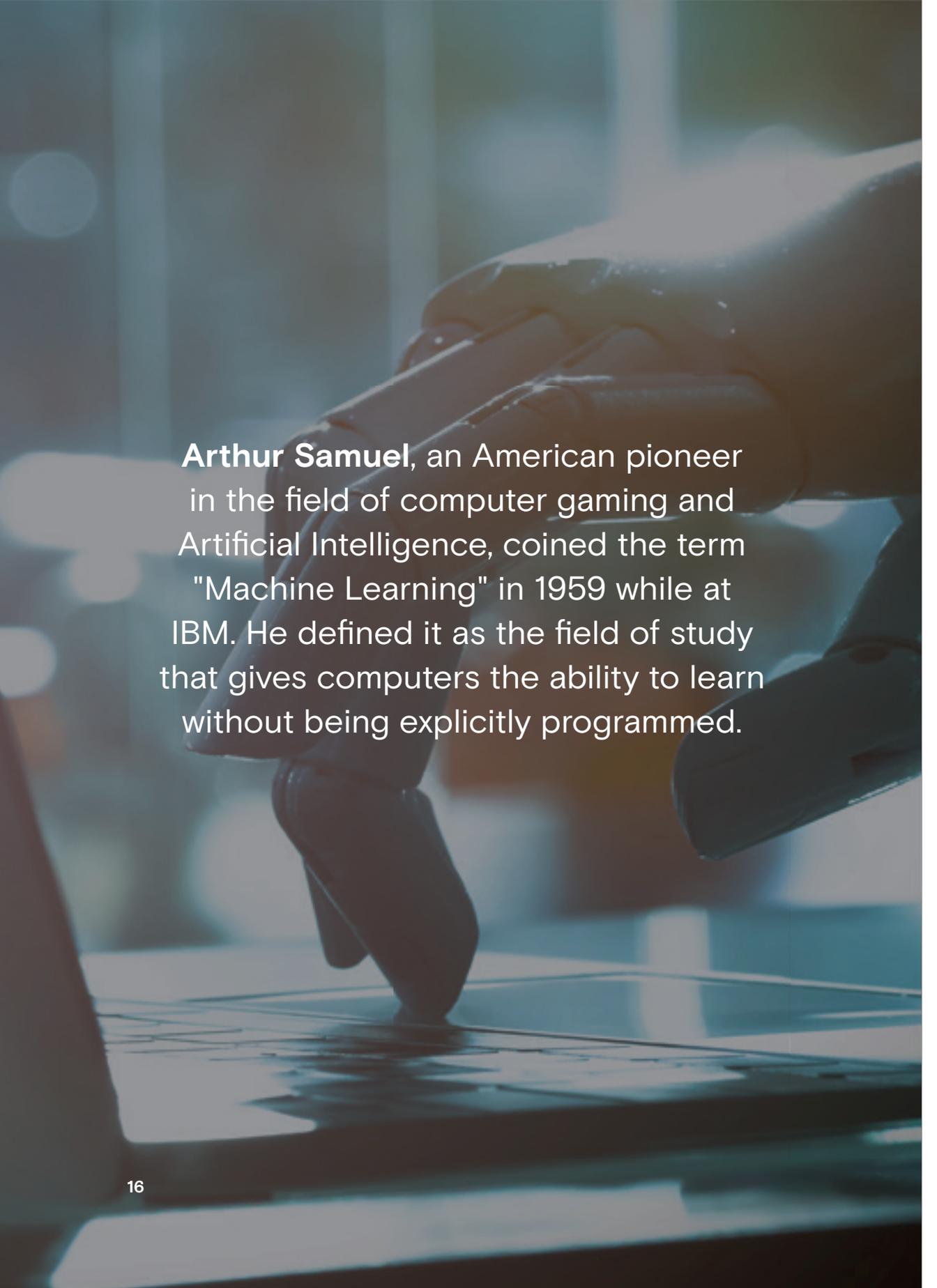
**Harmen Tjeerdsma, Manager
Innovation & ICT, Antea Group**

“ We choose the most appealing form to visualise data, like an Interactive dashboard with ‘live’ data.

**Gerhard Dekker, Research & Statistics Manager,
Municipality of Almere**

“ Using more efficient and effective data visualisation combined with real information results in enormous amounts of benefits. Time between observation and action is shortened, and it is then possible to cut costs, improve living quality and create new opportunities for daily policy decisions.

**Emil Otte, Geo-Data Consultant,
Municipality of Almere**



Arthur Samuel, an American pioneer in the field of computer gaming and Artificial Intelligence, coined the term "Machine Learning" in 1959 while at IBM. He defined it as the field of study that gives computers the ability to learn without being explicitly programmed.

MACHINE LEARNING IN LOCATION INTELLIGENCE TECHNOLOGY

DID YOU KNOW THAT ALMOST EVERYONE TODAY USES SOME FORM OF MACHINE LEARNING UNINTENTIONALLY?

Several algorithms support the search features of Google, Facebook, or LinkedIn. The same goes for selecting assets on Netflix, Spotify or YouTube. Even when you use your phone for Siri, Okay Google or Amazon Alexa, the voice recognition and search commands are supported by machine learning.

Facebook stopped an "Artificial Intelligence Engine" after the developers discovered that the AI had created its own unique language that they could not understand. Researchers from the 'Facebook AI Research Lab' (FAIR) found that the chatbots had deviated from the script and communicated in a new language without human input.

Regardless of the perils, this incident clearly reflects the potential of Machine Learning if harnessed with precaution.

Beyond these platforms, 'Machine Learning' is a buzzword increasingly used in the location-intelligence domain.

However, the first ever algorithms were used over 50 years ago. You may ask what makes machine learning important and relevant now? The answer simply is 'data'.

We live in a dynamically changing world feeding a constant stream of structured and unstructured data to unlimited volumes of data storage. If you combine this to computer power and expertise required from people and organisations, the need for machine learning is inevitable.

2.7

Zettabytes* of data exists in the digital universe today.²

The concept of machine learning involves using statistics or mathematical techniques that enable computers to learn without being explicitly programmed.

² Source: MarTech – Big Data Brings Marketing Big Numbers
* 1 Zettabyte = 1,000,000,000 Terabytes

20%–35%

of operating revenue can be lost by businesses due to poor data.³

Hexagon Geospatial, the leading provider of geospatial technology, has been dabbling with machine learning.

Their aim is to make this concept available in practice for any geospatial professional.

While various Machine Learning libraries can be found on the internet, most of these have no commotion to the geospatial domain.

Beyond the in-depth knowledge on the subject, one must know scripting or programming languages to apply machine learning to geographic datasets.

The Hexagon Geospatial 2018 product release harnesses machine learning

and deep learning analysis possible for geographical data.

Now available in the ‘Spatial Modeler’, within ERDAS IMAGINE® or GeoMedia®, machine learning enables data to perform multi-class predictions.

It would be interesting to see how users adapt to this technology and the effect it has on the output. ■



Wim Bozelie

Technology Director,
IMAGEM

A hand pointing at a robotic hand against a futuristic digital background with a world map and data charts.

While **machine learning** is a powerful technology, it is important to know it is not a panacea that solves all problems within seconds. This technology is at its adolescence and it continues to develop and improve.



BUILDING A SMART CITY ONE STEP AT A TIME

SMART CITIES, BIG DATA, INTERNET OF THINGS, AND BLOCKCHAIN ARE JUST A FEW CONCEPTS THAT MUNICIPALITIES IN THE NETHERLANDS FREQUENTLY LAUNCH PILOTS ON.

These pilots are certainly innovative, that is, if the approach is to demonstrate the capabilities of technology. However, this should not be the end goal. What often is missing, is the connection with a deeper question. Innovation should not take the possibilities of technology as a starting point; technology is simply a means to an end. The goals are development and improvement of municipal processes and therefore their services.

Based on social trends, there are certain themes and issues related to care, economy, environment, sustainability, safety, participation and spending of tax money that a municipality must deal with. Only when correlating these themes with each other and combining them with innovation, can a municipality become 'smart'.

Such an integral approach is not easy. It requires long-term vision encompassing all municipal domains. In addition,

several parties are involved, sometimes with opposing interests. But when municipalities want to evolve and enable their citizens to benefit optimally from technological developments, they have to act as a unified organisation.

What do you want, and what do you have to do as a holistic municipal organisation? That is the first and basic question that should be asked. A municipality with a clear vision of their aim, can truly be innovative and implement pilots to test technology and innovations that best suit them. This process should however not be done the other way around.

27.7

billion euros will be
spent on global smart
cities by 2020.⁴



START SMALL

The 'start small' approach does not exist in today's world, but not everything needs to start large and cumbersome that takes months to launch. A feasible approach is to 'think big, start small, but just start'. Innovation and improvement start with asking the right questions and building teams with the right people. Connecting and communicating are the key to the process. Municipalities must prepare for rapid change and be flexible to adapt changes quickly. Optimal collaboration is a crucial factor when you want to ensure seamless connections and communication between people as well as information management.

DATA-DRIVEN COMMUNICATION

The essence of this argument is that no major changes in workflows or ICT-processes are needed to work smarter. For example, do you want to work with sensors? Experiment and experience first

72%

of European Union populations lives in urban areas.⁵

with 25 sensors instead of a large ICT-project with multiple types of sensors. This will minimise the risks of multiple new technologies inducted all at one. During the collection of sensor data too you have enough time to determine the value and relevance of gathered information.

What is seen within Dutch municipalities is that they make data-driven and evidence-based decisions. They want to introduce data-driven policies which invariably leads to setting up of complicated projects. Again, the philosophy of 'start small' is applicable here. Just start somewhere.

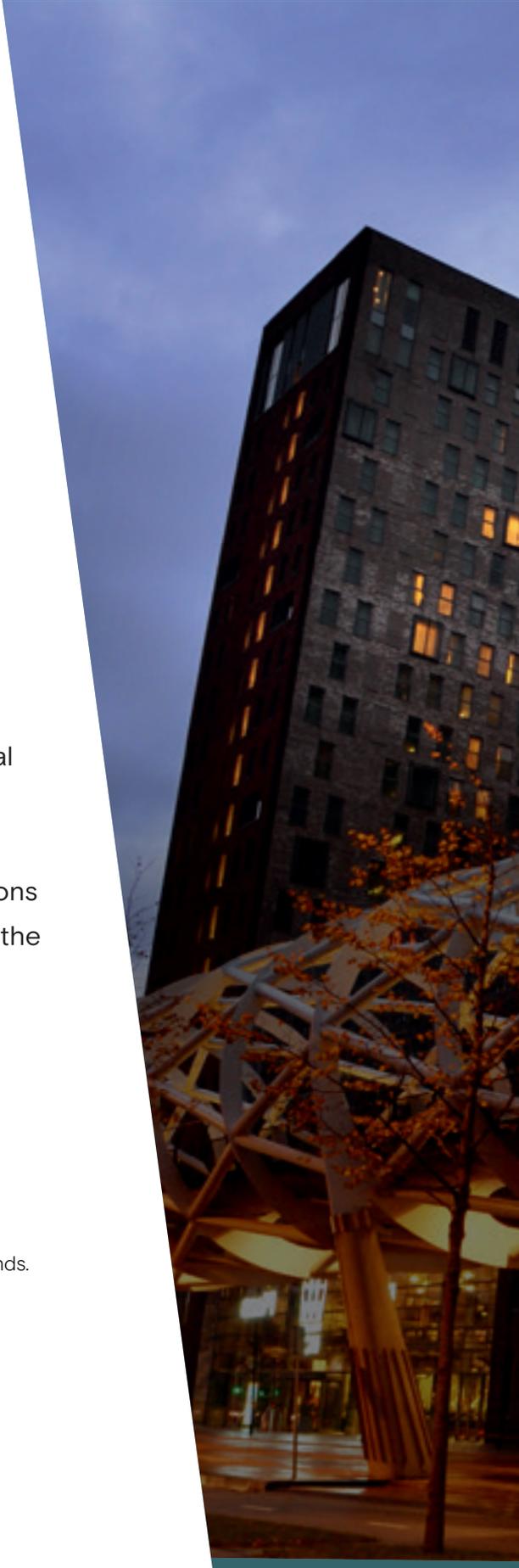
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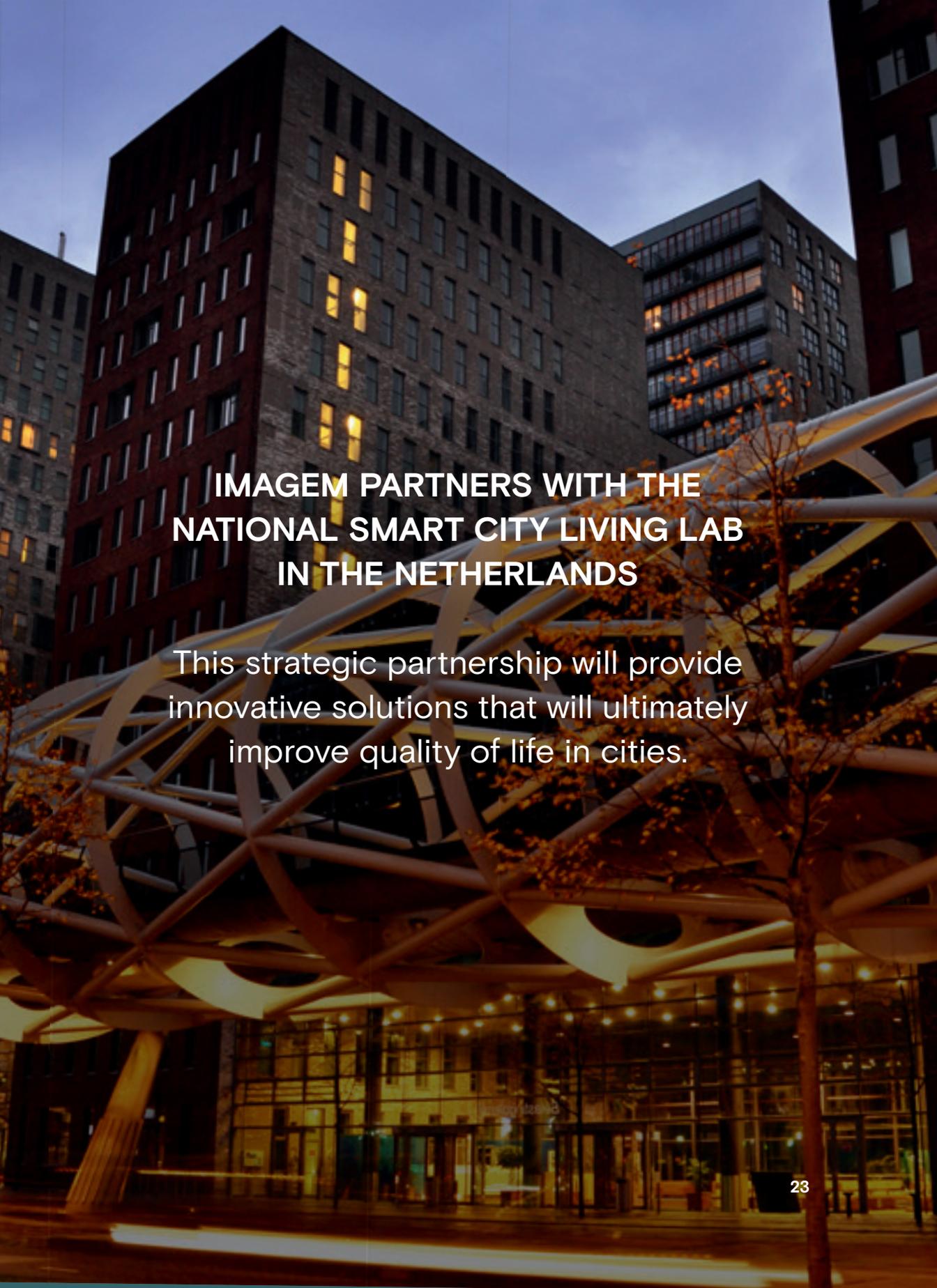
⁵ Source: www.smartcityhub.com



Almost everything has a location. It is hence logical to link geospatial technology to data sources that indicate the status of smart cities. Collaborating with IMAGEM solutions in the living lab, helps us visualise the complexity of the smart cities.

Hans Nouwens, Program Director at the National Smart City Living Lab in the Netherlands.





**IMAGEM PARTNERS WITH THE
NATIONAL SMART CITY LIVING LAB
IN THE NETHERLANDS**

This strategic partnership will provide innovative solutions that will ultimately improve quality of life in cities.



40%

of local and regional governments
in Europe will use IoT to turn
infrastructure like roads, streetlights,
and traffic signals into assets
instead of liabilities by 2019.⁶

continued from P. 21

Select a goal or theme, determine the information required to, locate the data (could be from multiple sources) and experiment until the gathered information is satisfactory. The path to approach communication, decision making, monitoring and expansion is then paved. This process immediately guarantees the continuity for providing data-driven information.

TOGETHER IN THE LAB

IMAGEM is part of the National Smart City Living Lab in the Netherlands. The strategic partnership has been formed to provide innovative solutions that will ultimately improve quality of life in cities. There are seven municipalities from the Netherlands that participate in this program as well - Breda, Dordrecht, Helmond, Leidschendam-Voorburg, Rijswijk, Veldhoven, and Zoetermeer.

In the pilot projects launched under this collaboration, location-intelligence technology is used to create information. The participants gain experience on the added value - a simple realisation of business information - in which location-intelligence provides the context. The participants can choose specific themes, search and combine relevant data (multi-source) and create data-driven

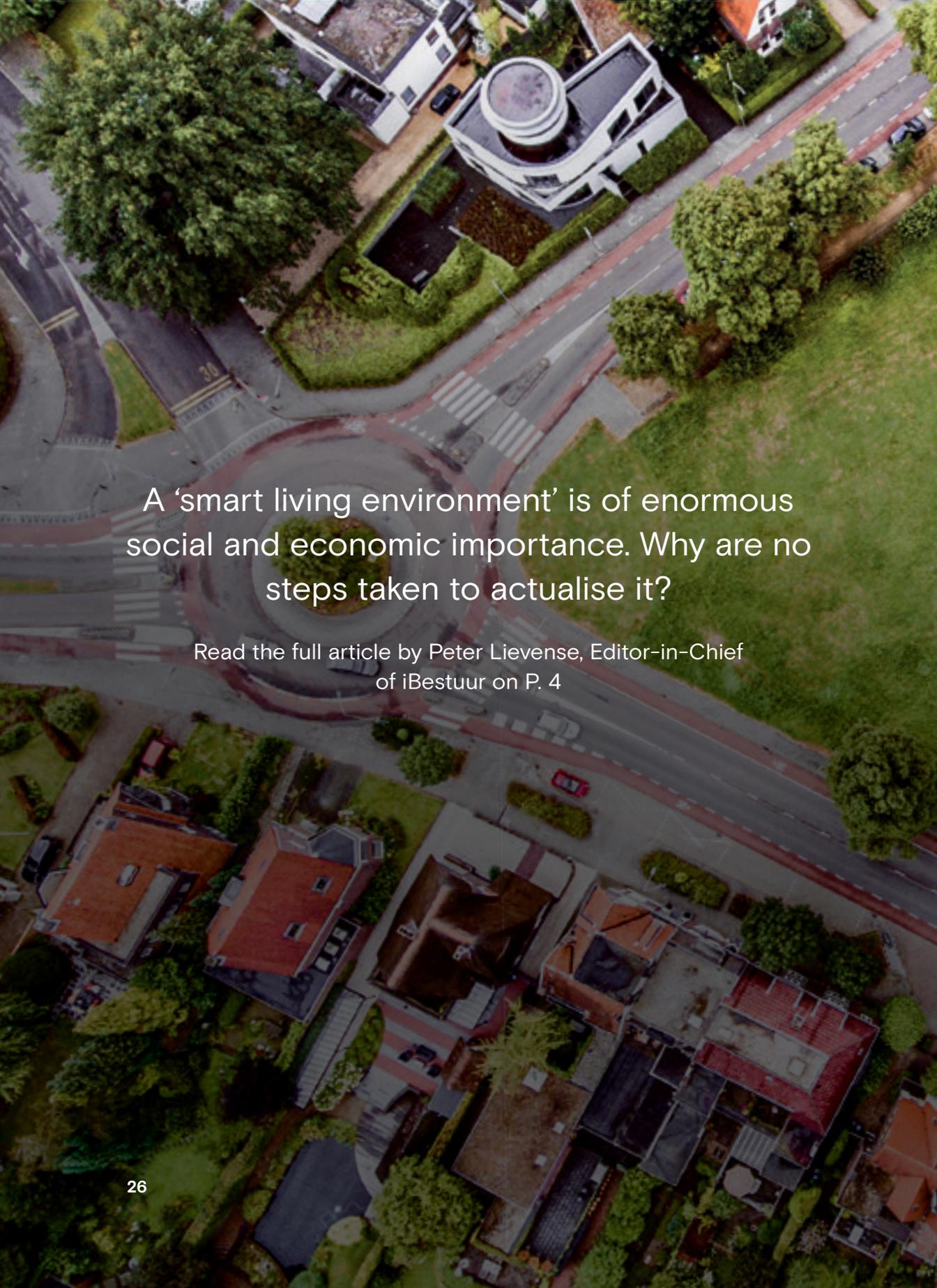
information. While gathering sensor data to capture information for policy and governance, we find that it works best to collaborate (public-private-partnership) and gain experience. The earliest findings from the National Living Lab Program are to 'just start'. Keep it small and simple and take small steps towards your goal. The participants in the program can experience 'first-hand' that geospatial information provides added value in the information gathering process process. Location-intelligence offers policy makers, managers and administrators with visual answers to their questions.

A SOLUTION FOR YOUR MUNICIPALITY?

Municipalities across the world often have similar issues. If you find yourself wondering if a certain approach also works in your municipality (where projects might already be underway)? The truth is that it doesn't matter which project phase you are in; every municipality can start small. In other words, start by gaining insights into the social trends and issues of your own municipality. ■

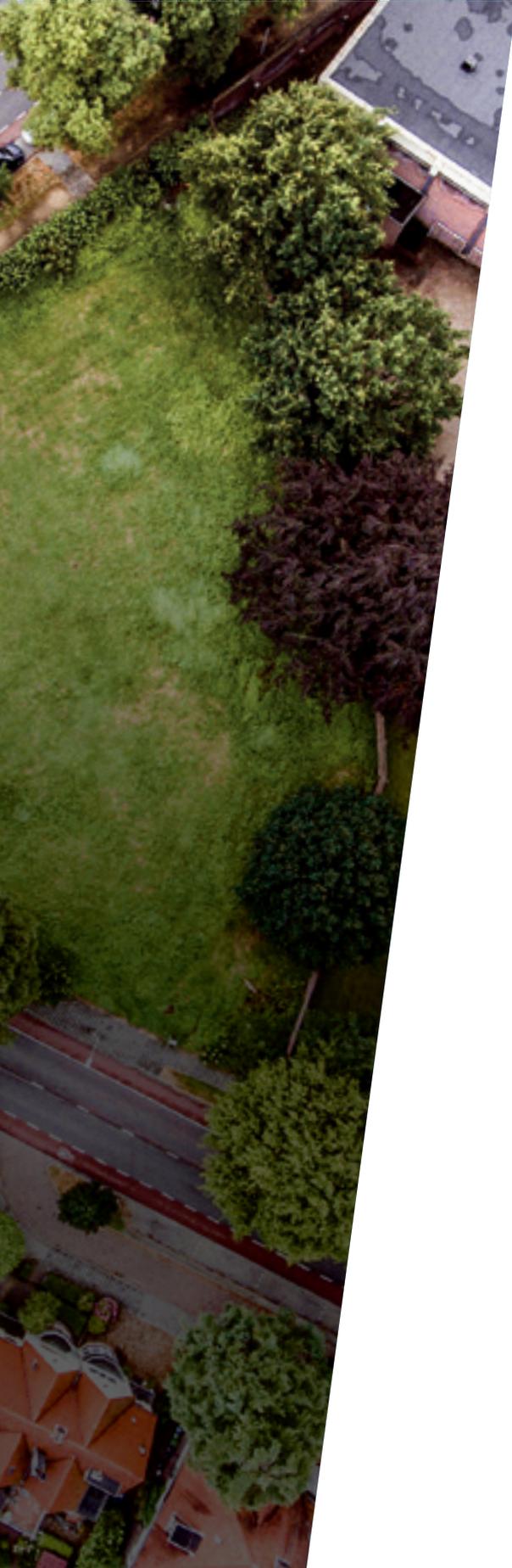


Niels van de Graaf
Segment Manager -
Government, IMAGEM

An aerial photograph of a city intersection. In the center is a roundabout with a green island. To the top, a modern white building with a circular rooftop terrace is visible. The surrounding area includes residential houses with red roofs, green trees, and paved roads with crosswalks. The overall scene depicts a well-developed urban environment.

A 'smart living environment' is of enormous social and economic importance. Why are no steps taken to actualise it?

Read the full article by Peter Lievense, Editor-in-Chief of iBestuur on P. 4



WE ARE IMAGEM

We are translators and location intelligence is our domain. We translate data from the changing environment around us to enable data-driven decision making. Our platform uses hybrid software technology to turn real-time data into useful information; through which self-learning algorithms can be used to deliver ever improving predictions.

The map of the future is a smart app, that translates the complex world into dynamic information and interactive infographics. The resulting insight can be used to respond adequately to changes in the world around us. This is how IMAGEM gives meaning to the things that matter. We help you gain control over your future.

Read more: www.imagemnl.com





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