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Real Estate Predictions 2017

What changes lie ahead?

Introduction

Welcome to the 2017 edition of Deloitte's predictions for the Real Estate industry. What changes lie ahead? Discover the Real Estate trends for 2017 that will impact your business. Read about cyber, blockchain, smart mobility and more. Have an interesting read!

Topics

The Real Estate Predictions 2017 report contents the following topics:

# Rising cyber risk in real estate through the rise of smart buildings

Technology-driven innovation is the order of the day, and through this firms of all types seek to create competitive differentiation. We expect a rise in smart buildings, driven by new technology, sensors, the Internet of Things and by new workplace strategies of firms. Smart buildings are becoming critical to competitive advantage and can also open new revenue streams, energy efficiency and sustainability[1]. However, with the rise of smart buildings new risks emerge as well. One of the most important to consider is cyber risk.

Industries like retail, travel and hospitality, and the financial services industries have long been dealing with cyberattacks, and have not only matured their response capability but also positioned cybersecurity as a core element of their businesses. In contrast, the commercial real estate (CRE) sector considers itself to be relatively less at risk from a potential cyberattack. This is because CRE firms typically maintain relatively less consumer personally identifiable information (PII) and valuable intellectual property (IP) directly on their own technology systems. However, due to the rise of smart buildings where tenants have building management systems on their smart phones, new opportunities for cyberattacks will emerge within the sector. The interconnectedness of real estate owners' systems and tenant IT systems form a potential cyber risk for both parties. As a consequence to this heightened risk we predict IT and CRE will become more intertwined during the coming year to face these new cyber threats.

The rise of smart buildings
CRE firms must advance their use of new technologies such as cloud, mobile and social media to drive tenant engagement and operational efficiency. In addition, they must implement increasingly sophisticated technological solutions for building management systems (BMS). Some commonly used solutions of this type include systems to automatically control heating, ventilation, air conditioning, lighting and safety systems. The increased use of digital technologies also exposes information and data through multiple channels. At a corporate level, web-based transactions with tenants and vendors, use of cloud services, the growing use of smartphones and tablets under bring your own device (BYOD) policy, and social media presence create multiple access points for the PII data stored by CRE companies.

Cyber risk
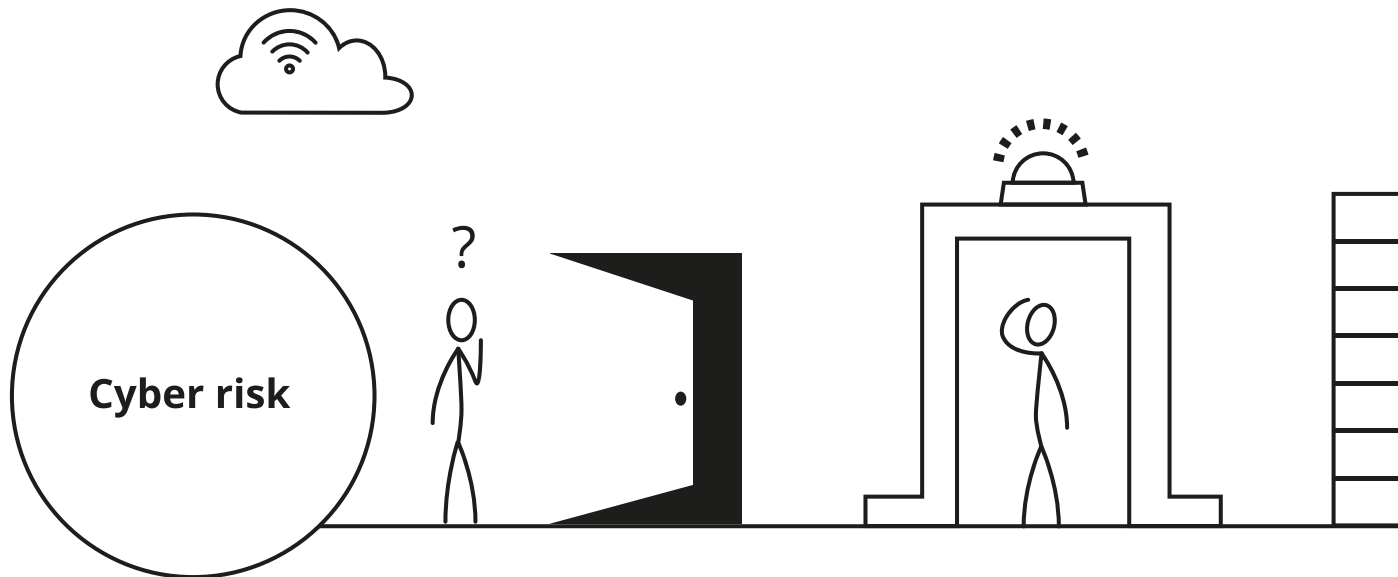
At an asset level, the interconnectedness through internet-based networks, industrial control systems HVAC[2] and open Wi-Fi networks increase data vulnerability. These asset-level cybersecurity risks do not only apply to CRE owners. Smart buildings tend to be interlinked with tenant systems, creating exposures to tenants whereby their systems and data can be accessed through the CRE owners' IT systems. Therefore, cybersecurity is a key consideration for modern day buildings.

**Smart buildings need more protection**
The data that is generated by a smart building can be considered as an asset and will lead to new business models and revenue streams.

However smart buildings also need more protection than the traditional security systems of a building. The cost of multiple million Euros on average per company.

According to analysis by the Deloitte Center for Financial Services, the most visible objective for cyberattacks on CRE companies has been the theft of PII and other sensitive information, as well as IP, such as strategic plans, engineering drawings, and tenant information. Furthermore, CRE companies may be uniquely vulnerable to treasury management cyber risk, given the significant amounts of cash maintained on the balance sheet as well as large Euro transactions related to acquisitions, dispositions, and financing of real estate properties.

Many CRE companies have expressed concern about potential cyber vulnerabilities in wire transfer processes associated with these large Euro transactions. Here, we believe that organized criminals and/or insiders could be the most significant potential threat actors.

When it comes to tenants, the interconnectedness of their IT systems with CRE owners' systems as described above, creates several vulnerabilities for them as well. Perpetrators can use the IT systems of the physical asset as an attack surface to cause physical destruction, reputational damage, financial, and/or productivity loss to the tenant.

[2]HVAC: Heating, Ventilation, Air Conditioning
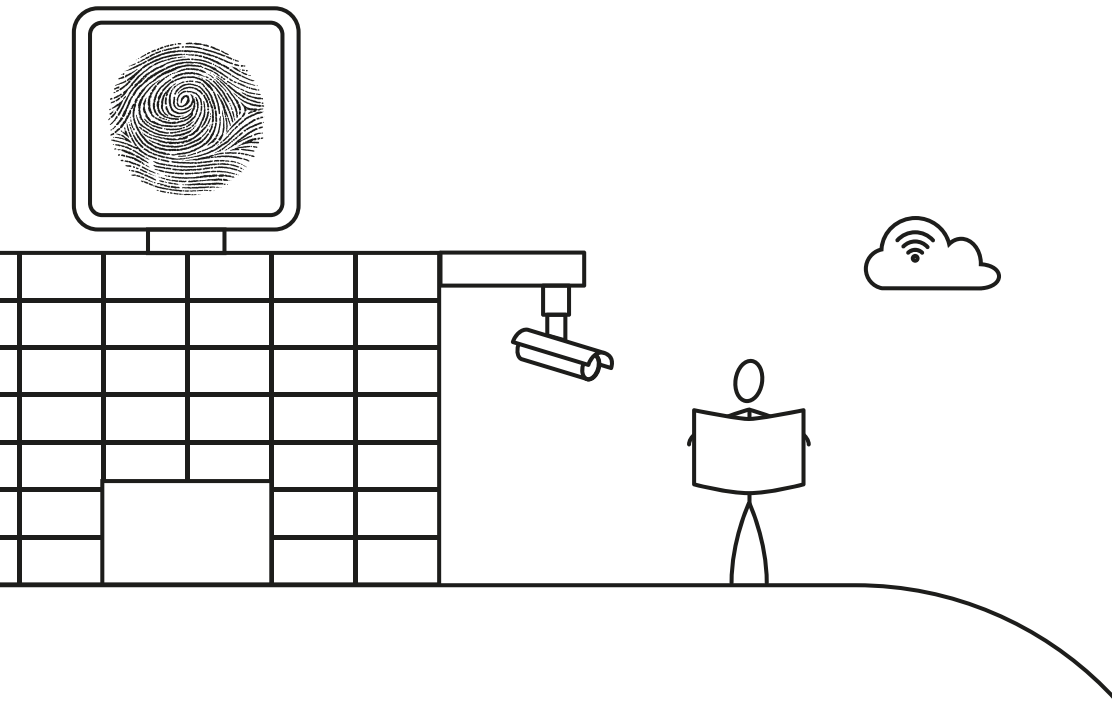
Organized criminals, nation states, hacktivists, or terrorists can destroy critical infrastructure by compromising BMS that can impact both safety of the environment and human life.

Top three risks
In summary, the analysis suggests that the top three risks that the CRE sector should be aware of and prepare for are:

1. Theft of PII data
2. An attack on tenants through building systems
3. Destruction of physical infrastructure

In 2017 the focus will be on properly addressing the associated cyber risks which allows CRE firms to keep innovating at a rapid pace, recognising that not just their own office infrastructure but even the buildings they develop are effectively now IT assets instead of only brick and mortar.

Getting in with the in crowd

What is crowdsourcing, and how is it transforming the real estate industry? To answer the first part is simple: Crowdsourcing involves harnessing the power of many individuals to solve problems in a decentralized way. The internet is the engine behind modern-day crowdsourcing, but the technique enjoys a rich history, with everything from scientific discoveries, world-class architecture, and online encyclopaedias benefiting from the approach.

Crowdsourcing can be used to tackle vast tasks, in which many responses are needed to come up with an answer or solution. Or, it can be used to home-in on a very specific response, using a competitions to come up with the best design for anything from a logo to an IT process.

**How can crowdsourcing impact real estate?**
Perhaps the most obvious channel relates to talent, and the way that people are employed. Firms that are able to draw upon the creative and competitive spirit of the crowd could have less need to employ specialists or experts on a full time basis. This can be an attractive proposition when budgets are under pressure, and businesses are expected to adapt ever more quickly to changing market dynamics.

However, it also means that firms may have to think differently about the sort of office space that they provide. Crowdsourcing elements of work traditionally performed in-house may free-up desk space as fewer permanent employees are required, but it may also necessitate a greater level of workplace flexibility to accommodate a more transient workforce.
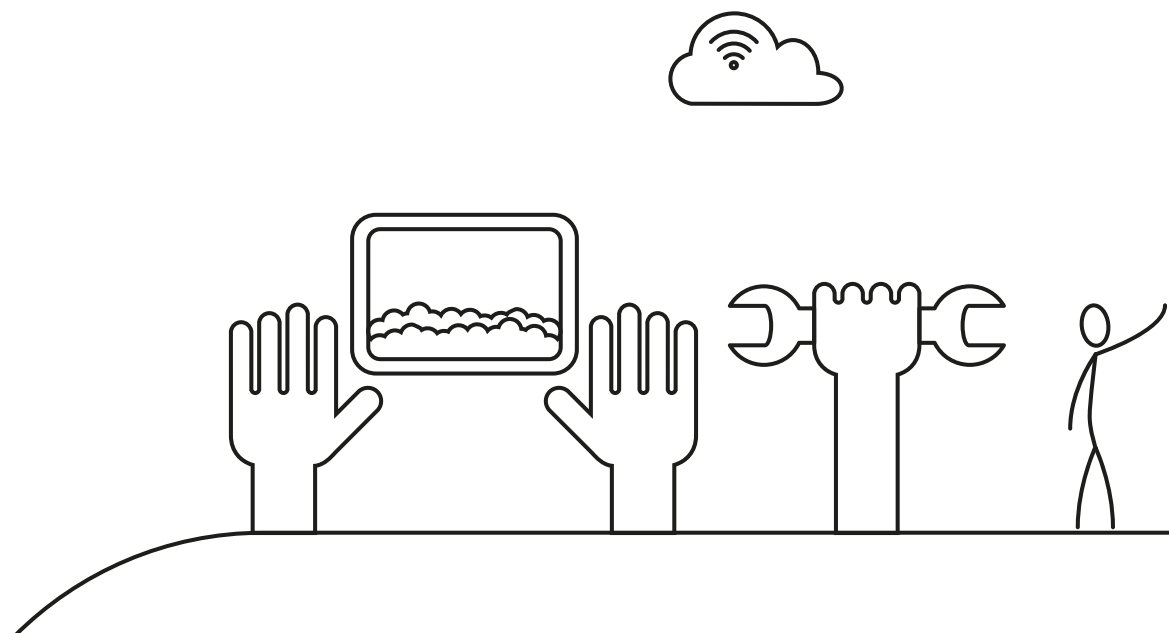
And if crowdsourcing is used to reduce the volume of tedious, repetitive tasks that staff undertake, then consideration should be given to the type of work they will be engaged with instead: if the balance shifts towards strategic, creative and interactive roles, then traditional banks of desks may need to be complemented by less regimented settings that allow for different types of collaboration.

Crowdsourcing isn't just about the way staff are employed, though: the approach can be used to seek the best product design, speed up the prototyping and modelling process, boost forecasting accuracy, potentially cutting cost at the same time. While the crowdsourcing eco-system is still relatively young, new success stories are emerging all the time - 2017 could be the year the impact starts to be felt in real estate.

Crowdsourcing
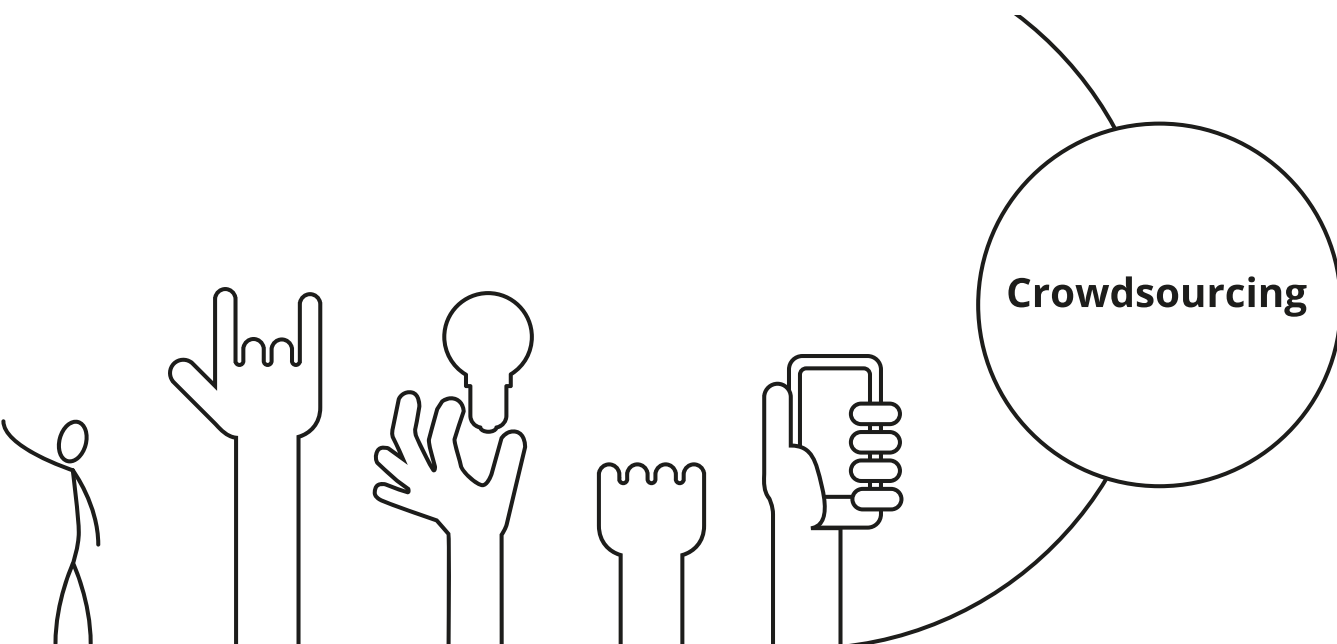
Shared and self-driving cars:
a game changer in real estate and area development?

Shared and self-driving cars have moved from fantasy to reality. Car-sharing initiatives from the likes of Uber, Lyft, Snappcar and Blablacar are rapidly changing the perception of car ownership and car usage. Combined with the application of autonomous vehicles, which are already operating in some places, this might well be the next game-changer in real estate and area development. We expect 2017 to be the year of large-scale pilot projects in Europe aimed at getting a better understanding of the related challenges and opportunities that lay ahead.

What can real estate developers, investors and government bodies expect from this potentially disruptive force and how can they prepare themselves? What do we already know and what can we expect in the short and longer term?

Transportation technology drives area development
Throughout history, the available modes of transportation have driven area development. In the colonial times cities clustered around ports as ships were the main means of delivering supplies and even residents. With the introduction of streetcars cities developed along radial streets that extended outward from the city-centre in a star-shaped layout. And when owning a car became the norm urban sprawl developments started to prevail.

Cities have thus been forced to adapt from a primarily pedestrian-oriented environment to an auto-centric lifestyle with a continuously growing demand for parking and road capacity. In order to provide for future-proofed real estate and area development both real estate developers and (government) urban planners have tried to predict these lifestyle changes resulting from progress in transportation technologies. Currently many of them point to the rapid expansion of shared and autonomous road vehicle initiatives as the new disruptive force. This raises the question: are we in the midst of a paradigm shift? In order to answer this question we have to look at how travel patterns have changed over the years.

Commuting time has remained approximately constant over time
Over the years people have gradually adjusted their lives to their living conditions, including the location of their homes relative to their workplace, such that the average commuting time stays approximately constant at one hour. This constant is known as Marchetti's constant and is important for policymakers as it casts doubts on the contention that investment in infrastructure saves travel time. Instead of actually saving travel time, people seem to invest this time in travelling longer distances. This partly explains why expanding highways only relieves congestion in the short term. As people adjust to the new situation by using the newly availably highway capacity to travel further and more often, a new equilibrium of road congestion will be reached in the longer run. But to what extent will Marchetti's constant also hold if travelers could be completely productive during their travels?

Shared and self-driving cars will increase the number of vehicle movements

Nowadays car users generally drive their own cars and as a result have little else that they can do during this time. But if autonomous vehicles would pick up passengers at home, without any waiting time, and enable them to fully focus on other things than driving, this would change. Depending on the comfort level of the vehicle, the car could then become a place to work or even to sleep. Arguably this would reduce the perceived travel time to almost zero.

The latter is likely to encourage current car users to travel longer distances and more often. As some of the vehicles will also run empty, for example to pick up passengers, the total number of vehicle movements by current car users will significantly increase.

Additionally, a large share of non-car users can be expected to switch to the use of shared and self-driving vehicles. This group consists of people that currently prefer other modes of transport and people unable to drive themselves, such as elderly, disabled, children as well as those who have consumed too much alcohol.

It remains to be seen if additional road capacity is needed

The expected increase of car usage could partly be offset by the application of new technologies that will make traffic flow much more smoothly. An example of such a technology is 'platooning'. This allows a group of vehicles to travel together (in a platoon) at high speed and with short distances between the vehicles. Each vehicle communicates with the other vehicles in the platoon.

There is a lead vehicle that controls the speed and direction, and all following vehicles (which have precisely matched braking and acceleration) respond to the lead vehicle's movement. As a result of platooning much less road capacity is needed to accommodate the same flow of vehicles. In addition, it also increases the safety resulting in fewer accidents, and thus, less congestion.

It is hard to predict to what extent such new technologies will offset the expected increase in car use. Therefore it remains to be seen if new road capacity will be required. However it is clear the layout of the road network will have to change. Developers and urban planners can already anticipate on the requirements of the future by looking at recent trends.

Car ownership will progressively decrease, especially in Western cities

After a period of suburbanization, particularly in the United States, we are currently in a phase of (re)urbanization, with virtually everywhere in the world people migrating to big cities. In addition, especially in Europe an increasing share of the inhabitants of these cities does not own a car. Instead, they rely more and more on public transport, cycling and ride-sharing. As ride-sharing companies are still rapidly gaining market share, this trend is likely to continue. Furthermore, several ride-sharing companies are already testing autonomous taxis, like Uber in Pittsburgh and nuTonomy in Singapore, and are likely to do so in Europe as well in the coming year. Due to the elimination of driver costs autonomous bus and taxi services could be offered much cheaper. The introduction of such services is therefore likely to further reduce the incentives to own a car, especially in big Western cities. It is therefore expected that car ownership will progressively decrease in the longer term.

**A different city layout and policy is required**

Decreasing car ownership and increasing reliance on shared and/or autonomous vehicles has large implications for the requirement of city street layouts. Access roads to residential building blocks and offices will need to be redesigned to accommodate high volume pick-ups and drop-offs. In addition, parking lots and garages may well become redundant over time. This uncertainty forces developers and governments to apply an agile long-term development strategy. Scenario-think and building in flexibility are the key words here. As expanding parking capacity is still required in many urban areas, at least in the short term, the trick is to design the garages in such a way that they can easily be transformed to suit new purposes, such as retail, in the long run.

Furthermore, the decreasing demand for parking has interesting policy implication as well. After all, municipalities generally require real estate developers to provide for a certain level of parking capacity, depending on the size of the building that is being developed.

This requirement can significantly diminish a developer's return on investment, especially when the parking capacity needs to be realized underground. As an increasing share of inhabitants of large cities relies on public transport, cycling and ride sharing, municipalities have started to rethink their policy.

Municipalities are experimenting with new policy instruments and pilot projects

Take parking permits for example. In many cities these have become valuable assets due to the waiting lists that municipalities have set up to regulate the demand for parking. As a result most permit owners are unwilling to give up their permit even though they hardly use it. The Municipality of Amsterdam therefore started to provide incentives for them to do so. In addition, it is also looking at reducing the parking requirements areas that are being (re) developed. For example, in the Sluisbuurt, a residential area in Amsterdam, it is considered acceptable to reduce the parking requirement to 0.25 parking space per apartment.

Smart mobility
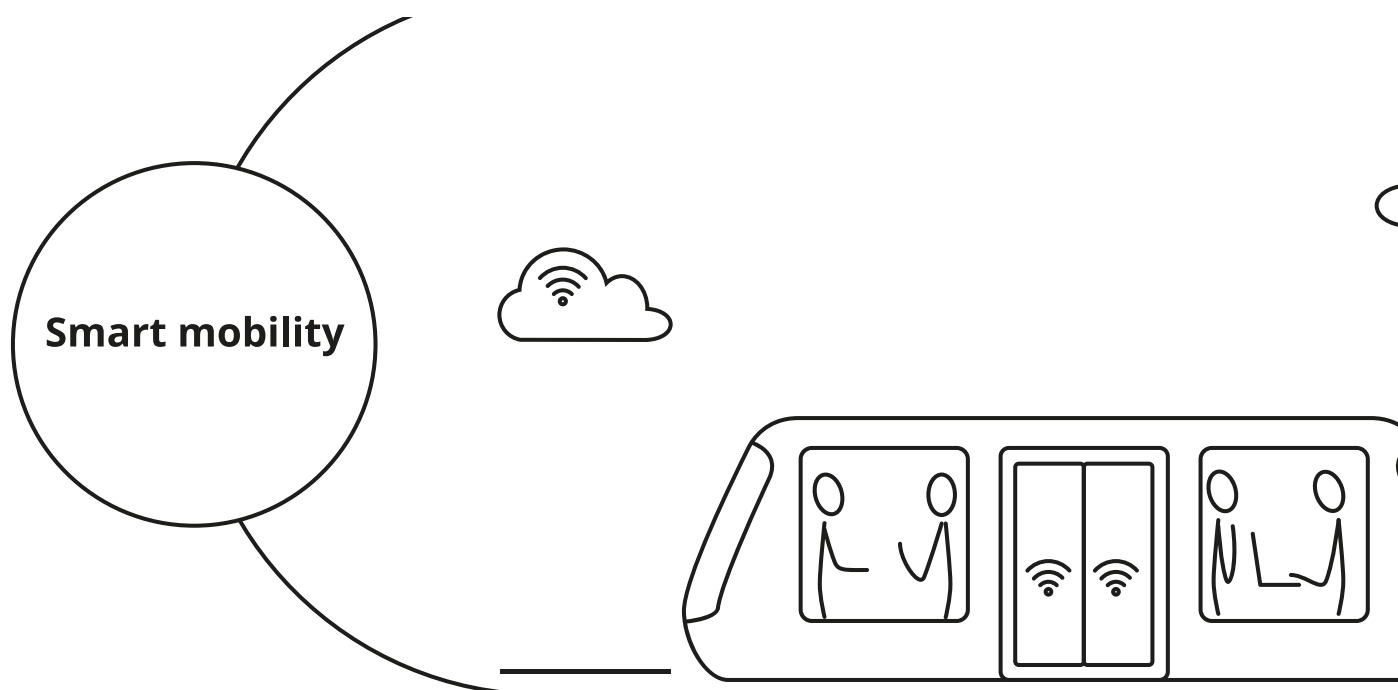
Although it is not easy to change these types of regulation in the short term, there is a clear need to assess whether 'old policy instruments' still make sense in today's rapidly changing environment. We therefore expect many local governments to start experimenting with regulation changes in 2017.

In addition, we expect many trials and pilot projects the coming year. In 2016 the Future Bus successfully ran between Schiphol and Haarlem, while other smaller autonomously driving vehicles have been tested elsewhere in the country. Continuation of these pilot projects have been announced. In the United Kingdom the first trials of driverless cars on the motorways will also take place in 2017, while London transport chiefs are said to initiate active discussions' with Google in an attempt to convince the company to trial its driverless cars in the city the coming year. These trials should provide insight on the potential impact of shared and autonomous vehicles and result in a next step towards the introduction of commercial services. This brings us to the last and perhaps most difficult and interesting question:

What are the implications for real estate prices and the importance of location?
According to the famous rule there are three main factors that determine real estate prices: location, location and location. Will this still be the case if perceived travel time is reduced due to increased use of shared and autonomous cars? Will many people opt for a larger and cheaper house outside the city in these cases, thus reducing price differences between urban and rural areas?

Perhaps, but let's not forget that experts have underestimated the role of location before. Only 15 years ago leading economists and urban planners predicted that the Internet would revolutionize area development and real estate prices. As the internet drastically reduced the cost of communicating over distance, many of them argued that the importance of location would practically disappear. 'The Dead of Distance' (Cairncross, 1997) and 'The World is Flat' (Friedman, 2005) are illustrations of these theories.

Current insights show that the opposite has in fact happened. The low prices of connecting over long distances accelerated globalization. But instead of reducing the need to travel, the importance of location has only grown bigger because decision-making and innovation still largely takes place via face-to-face communication. In "Triumph of the City", Glaeser (2011) it was concluded that 'the declining cost of connecting over long distances has only increased the returns to clustering close together'. This largely explains the high real estate prices in, for example, the City of London or Silicon Valley.

As autonomous cars, unlike the internet, would enable people to attend meetings in person, while largely reducing the perceived travel costs, a flattening effect on real estate prices should not be strike out. However it may be too early to see an impact on real estate prices, 2017 is set to be an exciting year for the development of the technology itself.
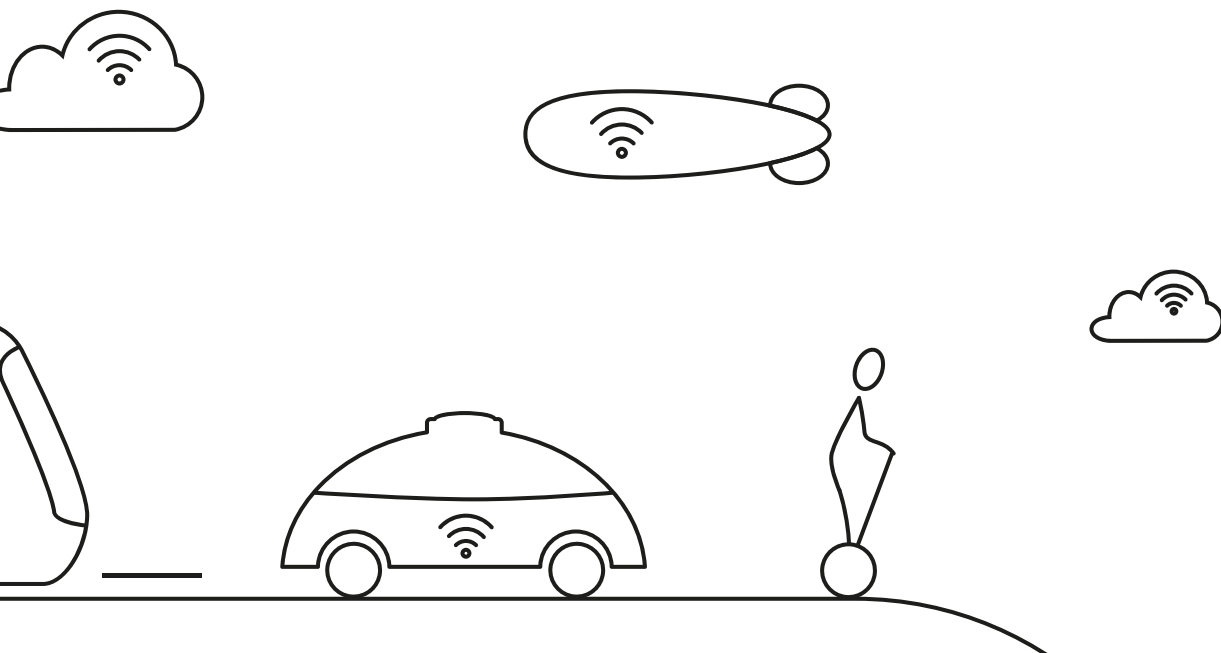
The world of work is being disrupted

Businesses are investing in automation capabilities which promise to reduce their reliance on people to perform routine tasks. At the same time, many are considering ways to outsource, or crowdsource, certain operations to increase flexibility and cut down on fixed costs. Whichever way you look at it, traditional roles are being fragmented.
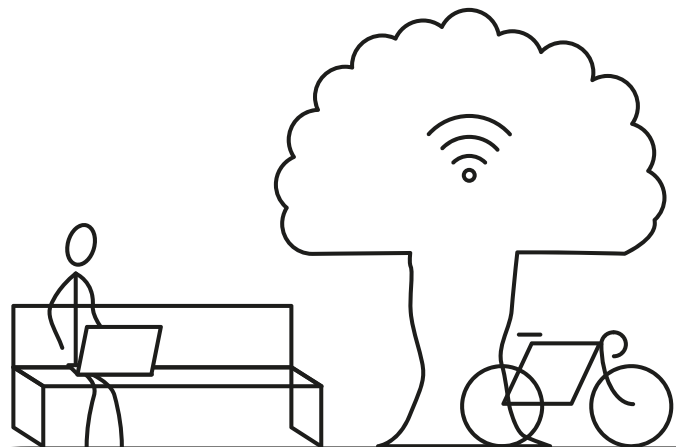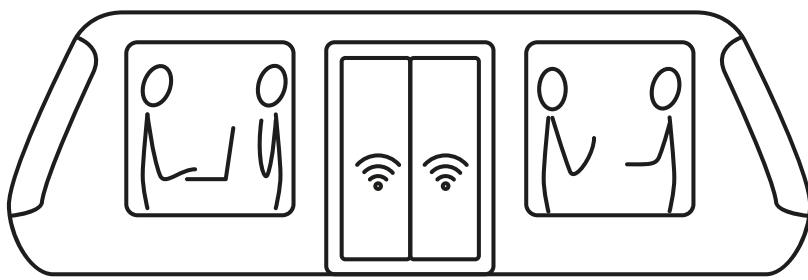
The future of work

The changing nature of jobs
But the changing nature of jobs is not being driven solely by organisations. Employees themselves have evolving expectations of what work should be like: Deloitte's millennial survey shows a big disparity between the high share of today's young workforce that would like better mobile connectivity and greater scope to work away from the office, and the much smaller share that feel they have the technology or opportunity to do so. Perhaps it is no coincidence that two thirds of this cohort expect to work for a different organisation by 2020.

A cohesive workplace strategy
In general, however, many of these changing expectations of work are shared by both organisations and their employees. Sometimes the challenge can be implementation of new practices, technologies and approaches. In that respect, it has become clear that the best chance of success lies in considering employees, workplace technology, and the working environment not as separate issues to be addressed individually, but as part of a cohesive workplace strategy.

Constantly in flux
Many forward-thinking organisations are already implementing changes to elements of the way they structure their operations and their employees work, so what makes 2017 a special year for the future of work? The reality is that the nature of work is constantly in flux, but with each new year we see an improvement in the myriad technologies that facilitate this change.
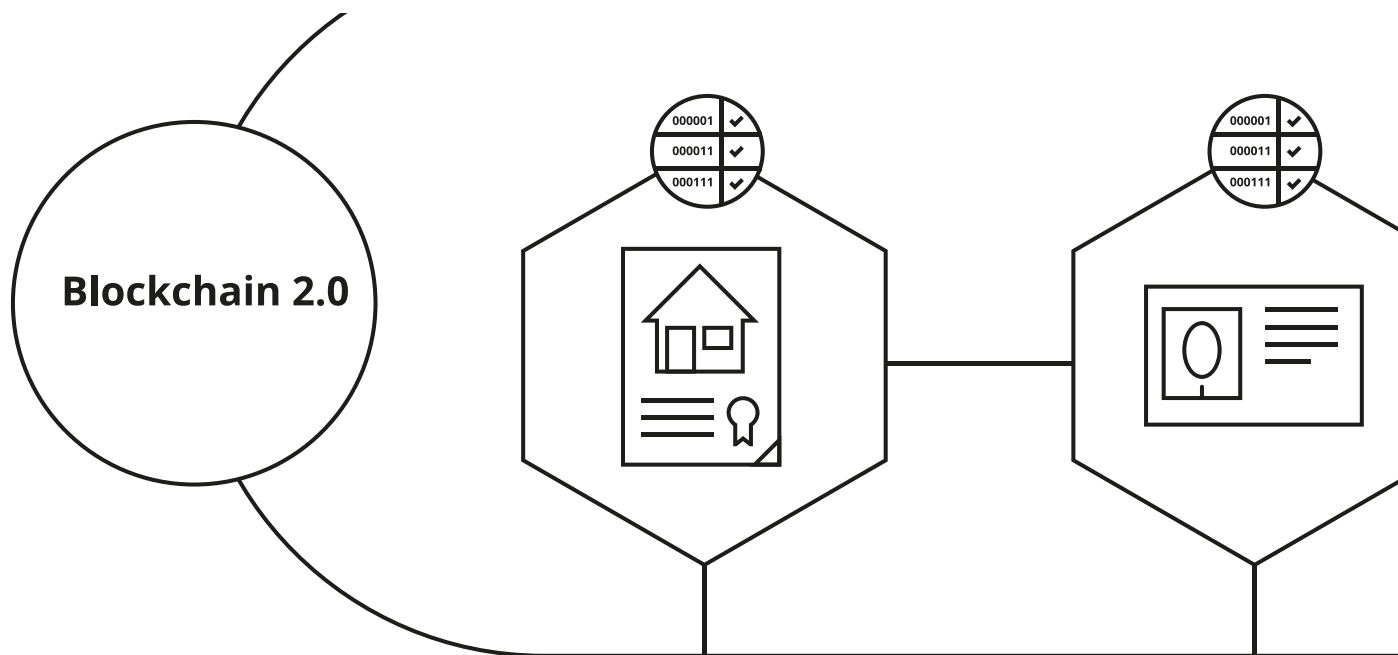
Blockchain 2.0

# Blockchain 2017: Done talking, start building

Blockchain is a digital, distributed transaction ledger with identical copies maintained on each of the network's members' computers. All parties can review previous entries and record new ones. Transactions are grouped in blocks, recorded one after the other in a chain of blocks (the 'blockchain'). The links between blocks and their content are protected by cryptography, so previous transactions cannot be destroyed or forged. This means that the ledger and the transaction network are trusted without a central authority – a 'middleman'.

A year ago we launched the blockchain prediction for 2016 'Blockchain: the next game changer in Real Estate', in which we highlighted the great potential of blockchain for the real estate market. Now one year later we believe in this potential even more.

In 2016 blockchain got a lot of attention in the real estate sector. We identify four phases of blockchain maturity:

1. I have heard of blockchain
2. I want to use blockchain
3. I understand blockchain
4. I apply blockchain

2016 was the year the real estate market 'heard of blockchain'.
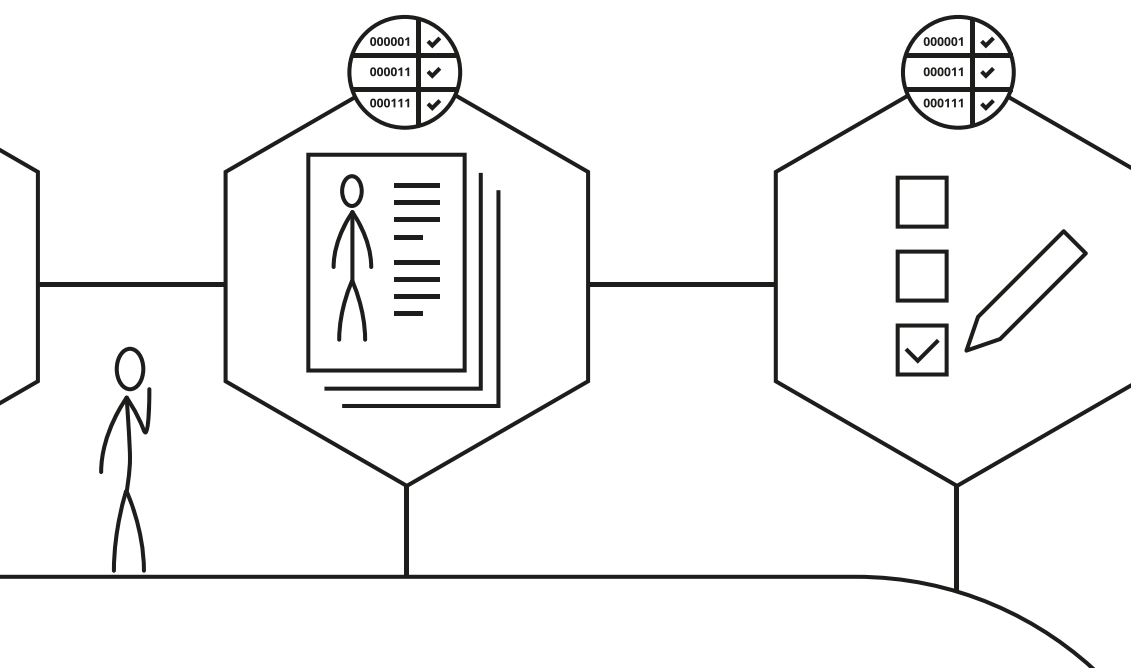
Interfirm collaboration

Many companies want to get familiar with blockchain and everyone who has heard about blockchain wants to know more about it. In 2016 several companies took the initiative to explore blockchain. In 2017 many more companies will take steps to accelerate their understanding. We expect that the ideation stage will continue and several proof of concepts will appear in 2017.

A proof of concept is a demonstration in principle with the aim of verifying that some concept is feasible. To make these proof of concepts a success, forming partnerships is essential. Organizations and networks are opening up, are sharing more and more data and giving more attention to the quality of data. Open innovation in collaboration with several parties is a key factor if you want to explore the potential of blockchain for the real estate sector. This requires a paradigm shift in the way businesses operate.

We see the enthusiastic participation of the Netherlands in the International Blockchain & Real Estate Association (IBREA) as a good example of the willingness of parties to collaborate with each other. This is a very promising development and is bringing blockchain technology and real estate expertise to the same table.

In 2017 the learning process of blockchain will be in the spotlights. Some believe that blockchain is a solution to every problem. That is not the case. If, when and under which conditions blockchain can be a success is something that has to be explored. Knowledge sharing is an essential part of the exploration.

Start-ups have developed the first real estate applications. But not only start-ups, also the established companies are engaged in Blockchain. Deloitte is building a proof of concept for real estate for lease contracts. This is a first step towards a more efficient and transparent management of real estate.

Although the potential of the blockchain is fully embraced, there are preconditions to make the technology more widely applicable. One of these preconditions is good quality of data.

Standardization as precondition

One way to improve the quality of data is to standardize. We believe that interoperability between different protocols can be the power of blockchain but to achieve this common industry standards and protocols will be essential. Companies first need access to standardized data to realizing the full benefits of the blockchain in terms of efficiency, reliability and cost savings.

In the property taxonomy there is a lot of development taking place with regard to standardization. We expect a standard for the property taxonomy will be developed. This standard will be the essential boost for the success of blockchain in real estate.

Standardization of real estate data:
the need for partnerships

In the last couple of years we have seen the development of International Valuation Standards (IVS) and European Valuation Standards (EVS). This introduced international accepted standards for the valuation of assets. However, valuations are still highly dependent on the accuracy of the data that is applied in the valuation. With that said we see that the accuracy of data may be more complicated than generally accepted.

Standardization in real estate data is the prior condition to effectively using the complete data chain. Financial institutions recognize the need for an industry standard and interoperability of real estate data to optimally guarantee quality, safety and consider data to be an asset.

Real estate taxonomy
The release of the Dutch Real Estate Taxonomy[3] is based on the Asset Quality Review guidelines of the European Central Bank (ECB). The Real Estate Taxonomy is launched by SBR Banken, this is a collaboration of Dutch banks and stakeholders to improve data standardization.

With SBR, which stands for Standard Business Reporting, accounts of companies are delivered digitally and standardized to the bank, the Tax Authorities, Chamber of Commerce and the Central Bureau for Statistics.

This system will be assessable through XBRL (eXtensible Business Reporting Language). The model choices are of highest importance since it will need to supply partners with information at the most detailed level for multiple industries within the Real Estate sector. We believe that the real estate taxonomy will give a boost for data driven real estate management and will lead to a faster, better and standardized process.

If banks use this standard in the real estate industry it will open the door for other parties to use this standard as well.

Nowadays gathering the proper information can be a time and thus money consuming activity. Standardization on the other hand can threaten the business model of valuers and due diligence firms because it is no longer necessary to discuss the definitions, data quality and availability of the data.

[3]https://sbrbanken.nl/vastgoedtaxonomie/

Data partnerships and open innovation
The availability of more standardized real estate data is valuable for the sector as a whole and will generate innovation. Besides the private sector, the public sector is busy with standardization as well. For example, the national government in the Netherlands is preparing the digitalization of environmental law. Part of the project is digitization of data that supports this environmental law[4]. In 2024, with one click on a map, all relevant information must be available. This involves information like zoning, permits, regional plans et cetera. This will represent a real cost and time saving for all target groups.

The digitization is a joint effort of national government, municipalities and provinces. They work together to agree on the method, use of uniform concepts and standards in order to create this unique way of sharing information. We expect that in future data partnerships in the real industry will start to evolve, both as private-private partnerships, as well as data partnerships between public and private parties. It is a form of partnership about the sharing and exchange of real estate data. It requires jointly formulated and shared interests and companies to see the mutual benefits of data sharing.

The added value of these partnerships can best be explored in a safe environment. Pilot projects, open innovation, experiments and a positive attitude towards the potential of these partnerships will contribute to the success.

If you want to go fast, go alone. If you want to go far, go together.
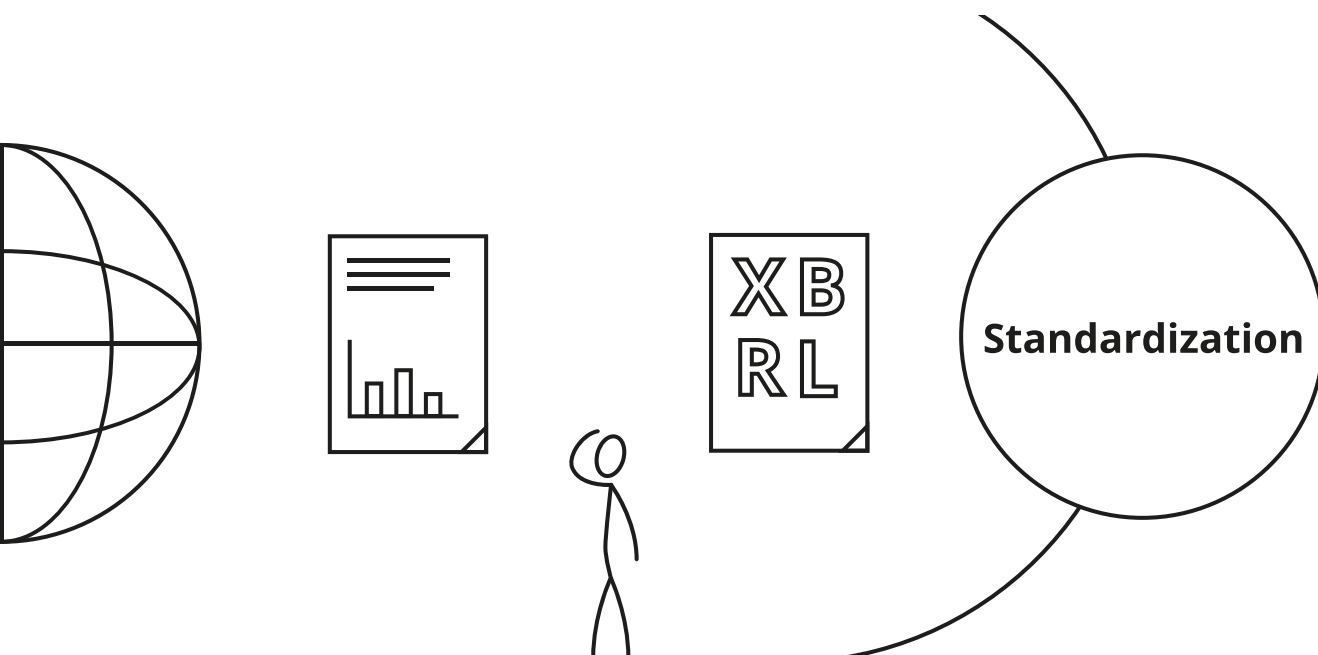
A changing port scape
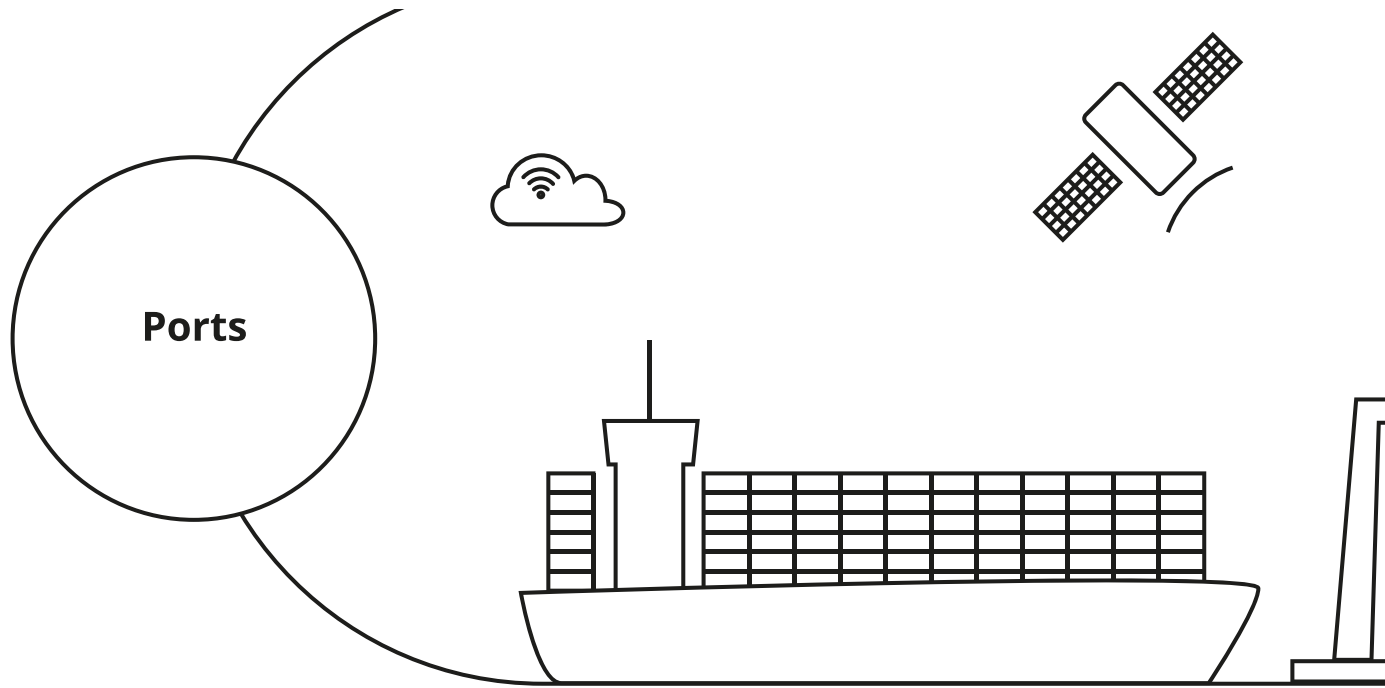
The wider maritime sector is going through a trying time. Low freight rates, bankruptcy in shipping lines and increased waves of consolidation are adding pressure to daily port operations and are forcing ports to reassess their strategies. Within this turbulent environment we expect three main topics to surface and become the center of attention in seaports the coming year.

Smart ports

Currently, a tidal wave of technological innovation & integration is pushing industries and businesses to transform themselves in an effort to become more data-, and insight-driven. In this regard, the port sector is no exception. Being part of both larger transport and logistics (T&L) supply chains and a cluster of companies and businesses active in the T&L sector, ports are in a unique position to fully grasp the potential generated by these new high tech developments.

Seaports are playing catch-up with the large T&L players when it comes to developing insight driven solutions and IoT applications. The current landscape offers some initial attempts at enhancing value propositions through technologies like automation but overall these projects remain isolated. At the moment, ports in Western Europe are leading the pack in these attempts.

We expect that the amount of digitally driven innovations like terminal automation (Rotterdam ETC), traffic management systems (Hamburg Traffic Flows) or Logistics Integration Packages (Antwerp NxtPort) will increase in seaports, adding to new business models, insight driven applications such as predictive repairs, infrastructure and traffic management or increased automation.
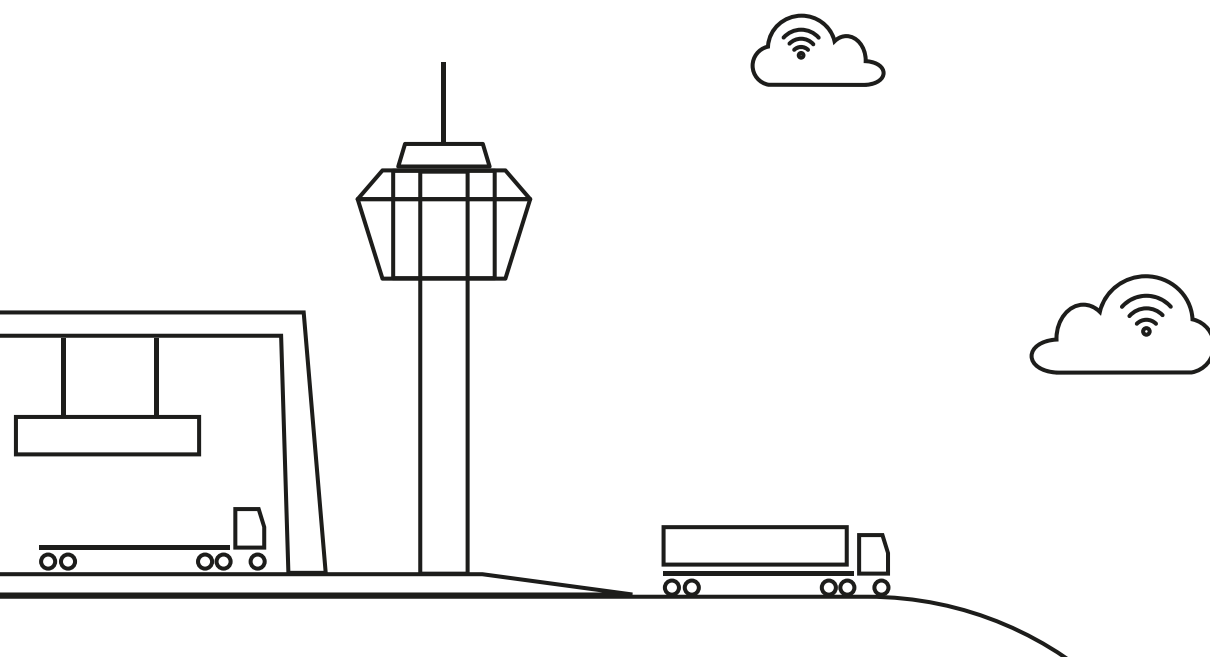
Increased cooperation

2017 could well be the year where we see more cooperation between seaports, especially in Western Europe. Ports have two very powerful clients, shipping firms and terminal operators. Today, due to the lower freight rates in shipping, we see increased consolidation happening in both these sectors. We expect, after one of the biggest consolidation waves in the shipping industry in 2016, by Q2 2017 three big alliances will dominate the business: 2M, Ocean Alliance and THE Alliance.

In order to cope with the increasing scale and power of the clients, we expect to see an increasing number of ports join forces and either cooperate or even merge in order to regain control in the value chain.

Building a niche

Today ports are often industrial clusters with strong ties to traditional fossil fuels like crude oil and coal. For some ports, dependencies on these cargo types account for over 50% of their total activities. In the long term we expect that the fossil fuel volumes will drop and that activities surrounding this cargo type will either disappear or relocate. This transition will free up a large amount of land and ports are actively seeking new activities that have potential to grow into new leading industrial clusters.

The type of activities pursued by ports varies greatly and is dependent on the direct environment of the port like distance from urban center or availability of chemical infrastructure.

Game changers could include specialized bio based initiatives like waste to chemicals, the attraction of maritime service activities like financing, brokerage and trading, increased metropolitan logistics, or high tech industries like 3d printing.

We expect to see an increase in the number of 'game changing initiatives' within the port sector over the coming year. Even though these initiatives are often more complex and risky than their traditional counterparts, ports must embrace them in order to adapt to the new environment and remain competitive as industrial regions.

Smart cities and the vital role of the government

Urbanization, climate change, employment, digitization, mobility and resource depletion are transforming societies. More than ever there is a need for high-quality digital infrastructure for better accessibility and urban air quality, energy-efficient homes and buildings, and a healthy environment. This makes the development of smart cities increasingly relevant.[5]

[5]www.platform31.nl and https://gsc3.city/smart-city-strategie/
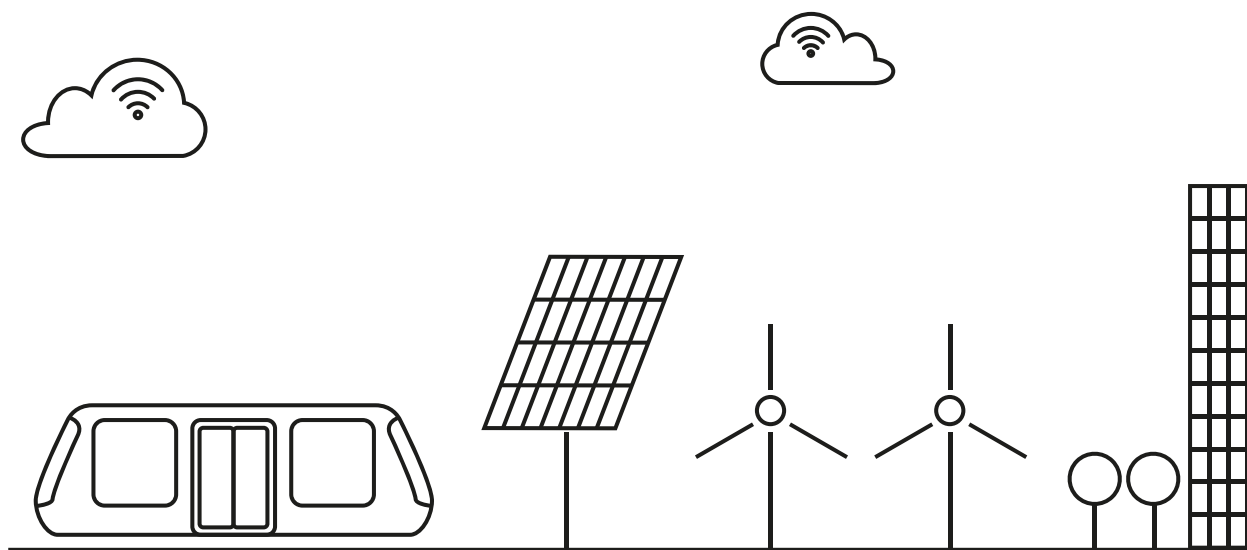
Technology has been incorporated by cities for many years. However, the pace at which this adoption takes place is increasing rapidly as disruptive digital technologies have the potential to solve major metropolitan challenges. As a consequence, urban areas transform into 'smart cities'.

A city is smart when investments in (i) human and social capital, (ii) traditional infrastructure and (iii) disruptive technologies fuel sustainable economic growth and a high quality of life, combined with thoughtful management of natural resources, through participatory governance.

In the transformation to become a smart city, disruptive technology is only one of the drivers. The second ingredient of smart cities is data, the lifeblood of smart solutions. The challenge is to use the power of data to create smart solutions that address real needs of city users and are perceived as meaningful by them. Their intuitive design causes them to be adopted naturally, resulting in changes of behavior that are lasting.

In the end, smart solutions are all about human behavior. Finally, the third cornerstone of smart cities is smart people. Focus on employability and winning the 'war for talent' is vital for sustainable economic growth.

The mix of roles
A smart city is the result of the efforts of many stakeholders, working together in partnerships of different shape and form. Smart cities require a government that is able to combine several vital roles. To be most effective, city government must make deliberate choices on the mix of roles through which it engages city challenges in the most effective way. Each role must be developed at a mature level.

· **Strategist & Advocate:** Sets out a clear direction for the city: what is our vision and ambition as smart city and how do we want to realize this? Furthermore: be an active advocate of the city as innovative hub for new business.

· **Director & Regulator:** Create or change laws and regulations to allow new business models and disruptive entries, and simultaneously protect the interests of citizens and users of the city.

· **Connector & Protector:** Secure modern transportation infrastructures, energy grids and digital networks. Set standards and take measures to make these vital infrastructures resilient and safe.

· **Innovator & Investor:** Apply the principles of innovation in the internal organization and processes. Stimulate innovative solution by acting as launching customer.

· **Steward:** Create an environment in which new businesses and smart solutions can emerge and grow. For example by providing 'open data' and by facilitating startups.

· **Solution enabler:** Build ecosystems by gathering parties that normally do not work together to deliver creative new solutions that neither of the parties could have realized on its own.
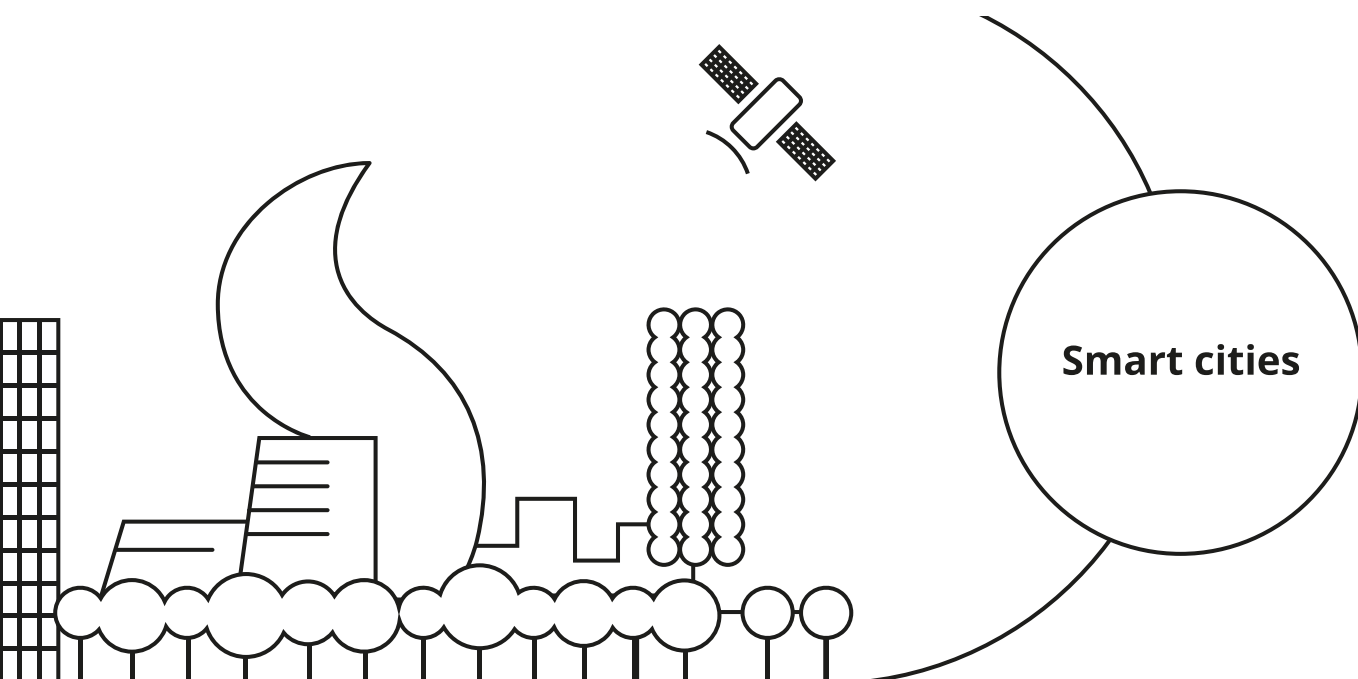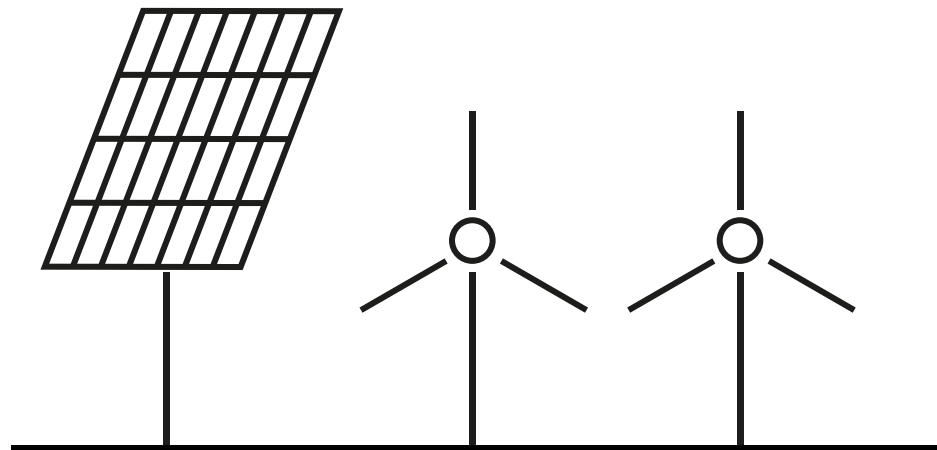
Examples of smart city technology

An example of smart city technology applies to land use planning, which is a critical function of all cities. Because the data used from smart city technologies is much more real time and accurate, land use planning is about to become much smarter. Data sets from transportation, engineering and planning departments could be combined into a wide platform, which would drastically improve land use planning as all decision makers would have equal access to the same data. An example of this is set by Uber. Uber recently launched Uber Movement, a website that uses Uber's data to help urban planners make informed decisions about our cities.[6] This is an example of the use of data in city planning in a new way.
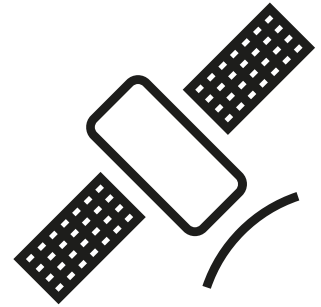
Another example of smart city technology can be spotted in Rotterdam. The municipality of Rotterdam is developing a 3D-model, which should help? transform the city into a smart city. The model will be used for simulation purposes, city planning, design, city management, city marketing, and analysis. The 3D-model provides smart solutions. Users are urban designers, licensing authorities and the managers of all municipal infrastructure such as lampposts and cables and pipes. Questions like 'how far do roots of trees reach', 'to what depth are the underground containers exactly positioned', 'how does sound move through the city of Rotterdam', are answered by this model. Possible implications with new construction plans could easily be visualized by using a simulation. Rotterdam is aiming to have an even more advanced model ready by 2020, which would also provide real time information on traffic, current water levels, and the filling degree of garbage containers. The 3D-model does also give citizens insight into planned projects and the consequences for their particular district, in order to add up to their comprehension of the choices that are made by the municipality. The vision for the future of Rotterdam is a digital city with similar dynamics as the physical city.[7]

[6]https://movement.uber.com/cities
[7]http://www.binnenlandsbestuur.nl/digitaal/nieuws/rotterdam-bouwt-geavanceerd-3d-model-van-de-stad.9557616.lynkx

Cities don't become smart on their own.

Cities need to cooperate and learn from each other. As said by the global smart city community and coalition:

"Cities are continuously subject to transformation. Now, with the need for cities to become more sustainable and the opportunities provided by digitalization, cities have a lot of work to do. Each city is developing new services and integrating new solutions, while continuous trying to connect to the needs and activities of its residents. As cities all over the world are facing this transformation, there is a need for collaboration. Cities need to make their solutions interoperable, scalable and replicable so that other cities can use them as well.

This will accelerate the development and implementation of the solutions, while lowering the costs and preventing lock-in.[8] "

The need for partnerships was stressed during the EU seminar 'Investing in Europe: building a coalition of smart cities & regions towards a Third Industrial Revolution'.

"If the EU is to meet its climate change commitments, end energy poverty and drive sustainable growth, regions and cities must become smarter by strengthening cooperation and better exploit new technologies."

Shaping the future

The first examples of smart city technology use have been realized the last few years. But this is only the beginning. We expect an enormous growth of initiatives within the ecosystem. Due to partnerships, ecosystems and a lot of experimentation cities will become much smarter in the upcoming years. Governments are setting up strategies and partnerships to shape the future of becoming a smart city. Smart cities are here to stay and the government plays a vital role in this process. Awareness and the next level of maturity of initiatives is one of the big steps in 2017.
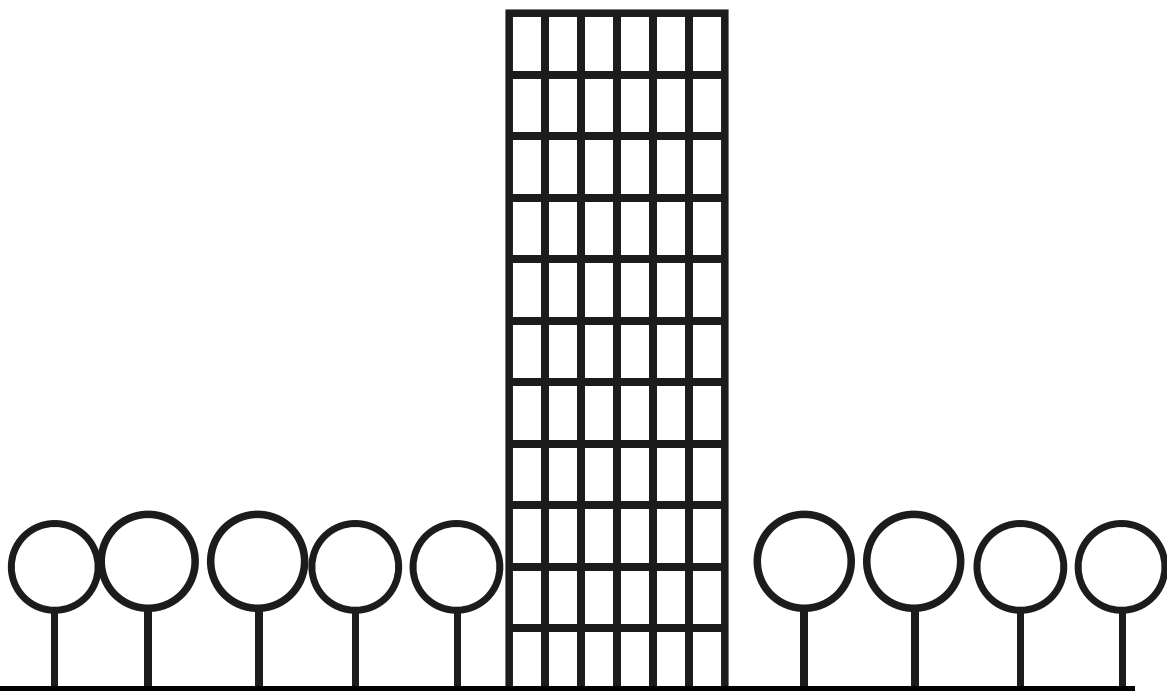
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