IOT IN THE FINNISH REAL ESTATE AND CONSTRUCTION SECTOR

MARKET ANALYSIS

CONTENTS

What does IoT mean to us?

We have just completed Granlund's innovation strategy for the period 2017–2021. In our vision, the future is a place where the user and the building communicate with each other, creating well-being for both the property and the user.

It is our belief that the future will make it possible to achieve an even better understanding of property use, create reliable data for even more secure decision-making and improve the customer experience. All kinds of stakeholder interaction in properties will also become more productive and efficient.

IoT and related technologies, such as platforms, will be among the most significant facilitators of this development. Another purpose of this market analysis was to better understand in which phase of the development we currently find ourselves.

We also wanted to discuss and think about what we will need to make both current and future IoT solutions a part of everyday life.

The market analysis confirms that the IoT market has one foot firmly on the first step of its development while the other is reaching towards the next one. We are on a journey towards platforms that serve property users. Platforms will at first enable a reporting property, then a predictive property, a learning property and, finally, a thinking property. One thing that is certain is that our industry is changing, but it is not yet completely sure what it is changing into.

This review has been prepared in cooperation with Delft University of Technology and Aalto University. Thanks to all the IoT service producers, start-ups and user representatives as well as industry experts for being part of the review by giving interviews and participating in workshops.

We hope that with this review we will inspire the readers of this market analysis to envision a bold future and discuss different opportunities.

Wishes for a smart future,

–
Pekka Metsi,
CEO
Granlund

–
Miia Anttila
CEO
Granlund Consulting

Market analysis summary:
Moving towards a developed ecosystem

The goal of this market analysis of IoT in the property sector is to describe the IoT market situation in Finland as it currently exists. The review will also identify the factors that are essential in order to develop IoT solutions to their full potential.

According to the survey, IoT services and products are primarily focused on optimising an individual issue, not on process development as a whole or creating new customer value or business. Development work is primarily focused on technologies as we are only starting to understand the full range of user-focused solutions.

Currently, 90% of IoT suppliers are in the first development phase, with the remaining 10% in the second phase (Image 1). Disruption takes place in the third and fourth phases, but of the Finnish IoT services in the real estate and construction sector studied, none has progressed to these later phases.

A precondition for the development and implementation of IoT is an understanding of and ability to respond to the needs of property users.
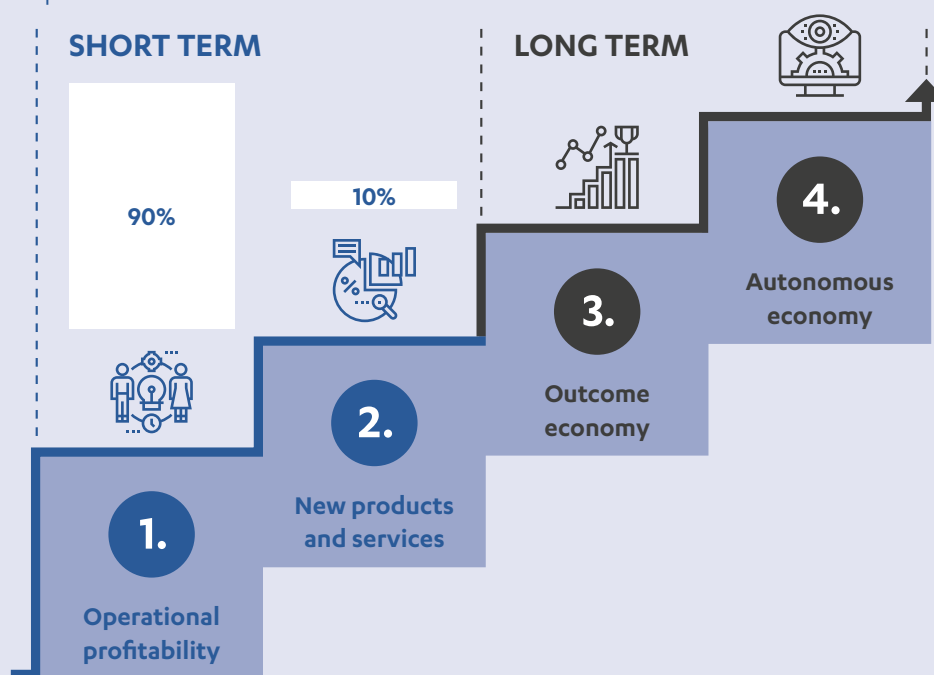
Users are looking for solutions that make everyday life easier both in the workplace and outside of it. However, users remain sceptical about how the data collected from them is used. This could become a challenge in the implementation of IoT systems.

In addition, cooperation with suppliers is needed when creating different kinds of ecosystems. Towards the end of the review, we present some great examples of solutions in the next phases in which ecosystem thinking and understanding the user have moved into a key position.

When the different IoT products and solutions related to properties create a developed ecosystem, they can provide an entirely new kind of value for the whole property sector chain, from users and owners to suppliers.

Image 1:
The IoT solutions of real estate and construction industry companies are still focused on solutions in the first and second phases.

SHORT TERM

LONG TERM

90%

10%

4.

Autonomous economy

3.

Outcome economy

2.

New products and services

1.

Operational profitability

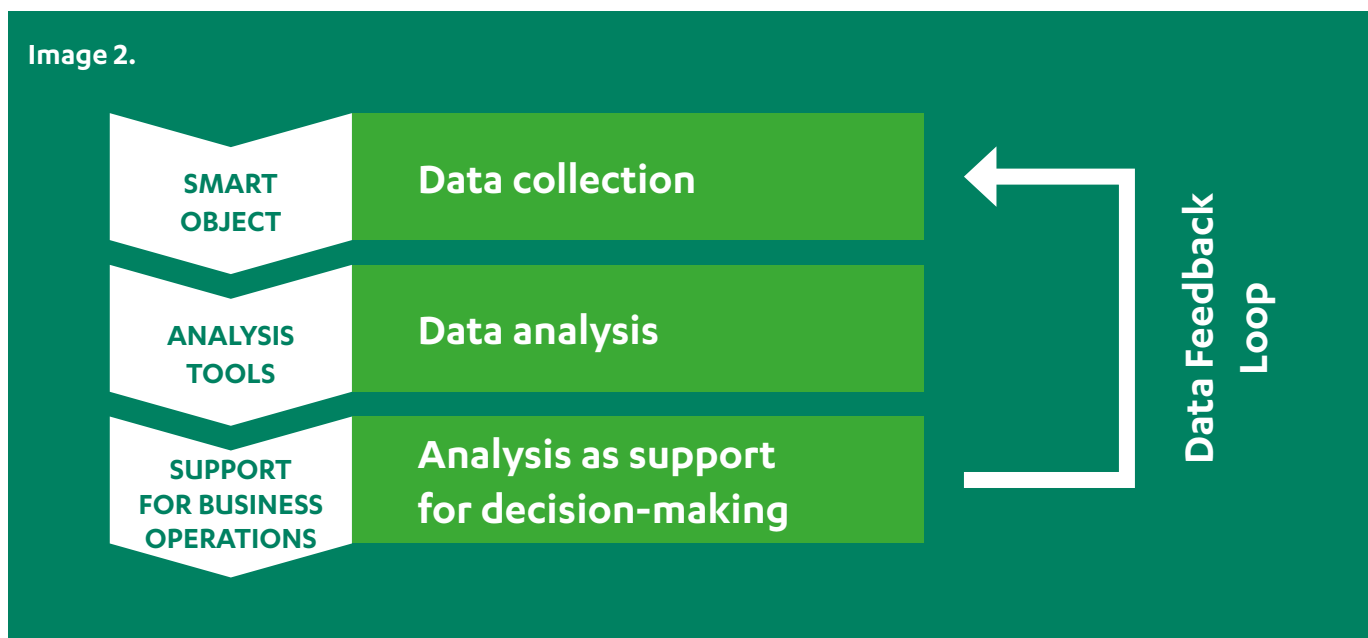**IoT development path, see pages 8–9 for more details.**

What is IoT?

> **The core concept is that everyday objects can be equipped with identifying, sensing, networking and processing capabilities that will allow them to communicate with one another and with another devices and services over the Internet to achieve some useful objective[1]".**

IoT operations can be divided into three categories (Image 2). The first two are essential for the usability of IoT, but they create costs and take up resources. It is only when the collected and analysed data is used to support decision-making and business operations that IoT can create additional value and provide benefits to the company.

Image 2.

SMART OBJECT — Data collection

ANALYSIS TOOLS — Data analysis

SUPPORT FOR BUSINESS OPERATIONS — Analysis as support for decision-making

Data Feedback Loop

The added value, benefit or above-mentioned need for communication created by IoT can be found in two different perspectives:

1. **To increase efficiency by, for instance, improving internal processes**

2. **To increase turnover by improving quality or by introducing new products or services**

At best, the data gathered through IoT helps to achieve both goals.

One of the greatest challenges in using IoT—and also at the same time one of the biggest criticisms—is about making use of IoT data. Material and data are collected from sensors that are detached from one another, but the data isn't necessarily analysed or used sufficiently on a larger scale.

Making use of the data and data management requires the development of clear key figures and user-friendly tools.

Data produced by IoT is not valuable in itself, the data must serve the requirements of the business operations.

> **"** **The customer is not interested in knowing how many measurement points there are or how much data has been collected. They want to know if it helps them. We must collect data and then add a level of smartness so that it is actually useful."**
>
> – Tarja Teppo, co-founder and CFO, Cleantech Invest

> **"** **I don't think we should do it just because the technology exists."**
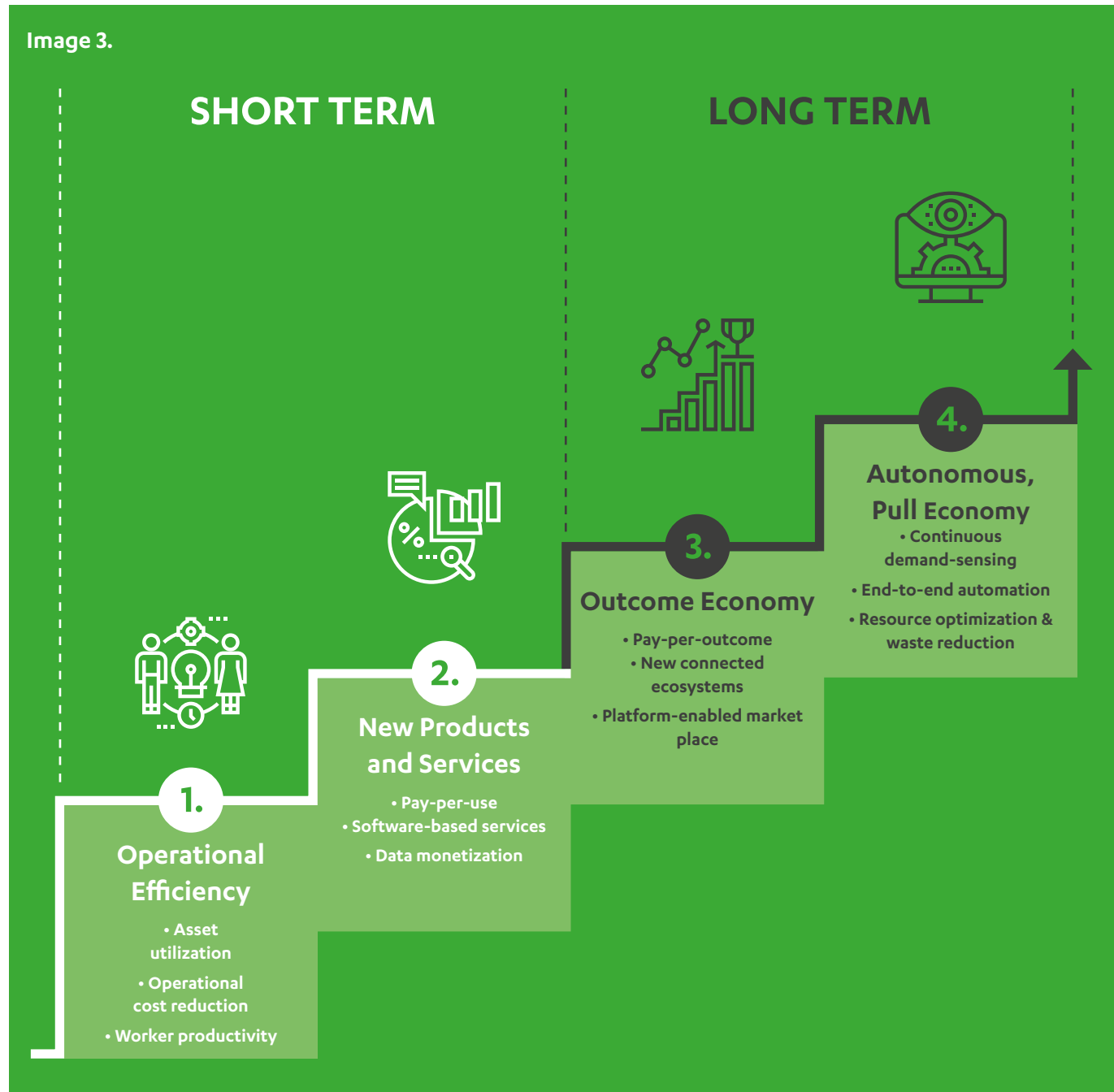>
> – Erik Ubels, CTO, OVG Real Estate

The IoT development path

The real estate and construction industry considers IoT to be one of the most important development directions and investment targets in the near future. A majority of the companies in the industry consider IoT as strategically important for business development.

According to the World Economic Forum[2], the development of IoT will take place in four phases (Image 3). According to the report, the factors that have acted as the drivers of IoT development so far in the first and second phases are operational efficiency and new services or products. In the future, the outcome economy and the autonomous economy will be the drivers.

Image 3.

SHORT TERM

LONG TERM

1.

Operational Efficiency
• Asset utilization
• Operational cost reduction
• Worker productivity

2.

New Products and Services
• Pay-per-use
• Software-based services
• Data monetization

3.

Outcome Economy
• Pay-per-outcome
• New connected ecosystems
• Platform-enabled market place

4.

Autonomous, Pull Economy
• Continuous demand-sensing
• End-to-end automation
• Resource optimization & waste reduction

IoT suppliers

IoT services can roughly be divided into three groups: services that are based on **(1)** optimisation, **(2)** business model development and **(3)** disruption. We studied the service offering of 29 real estate and construction companies offering IoT services based on public marketing materials and customer promises (Image 4). According to this market analysis, it can be said that:

1. A company or service in the optimisation group focuses on one problem at a time, such as a service related to lighting or ventilation. The purpose is primarily to create cost savings by making the current process more efficient. Based on the market analysis, 90% of property IoT services fall into this category.

2. The services that focus on business model development can produce other value adding factors through integration with other IoT systems as well as the optimisation discussed above. In addition, using these services can recommend a change in the company's daily operation or make a large part of the company's operations more efficient. These services were included in 10% of the featured property sector IoT suppliers.

3. Disruptive services significantly change the existing structures and create new business. Examples include Netflix or the iPhone[3]. According to the World Economic Forum Report (2015), disruption takes place in the third and fourth development phases, as shown previously in Image 3. Our market analysis suggests that the Finnish real estate and construction industry does not offer these IoT services.

In addition, we studied the statements of earnings of 11 suppliers and their financial results. On the basis of the review, we found that

▶ A majority of the companies are growing when estimated by turnover.

▶ Only two companies had made a profit.

Image 4.

NUMBER OF COMPANIES

Optimisation   Business model development   Disruption
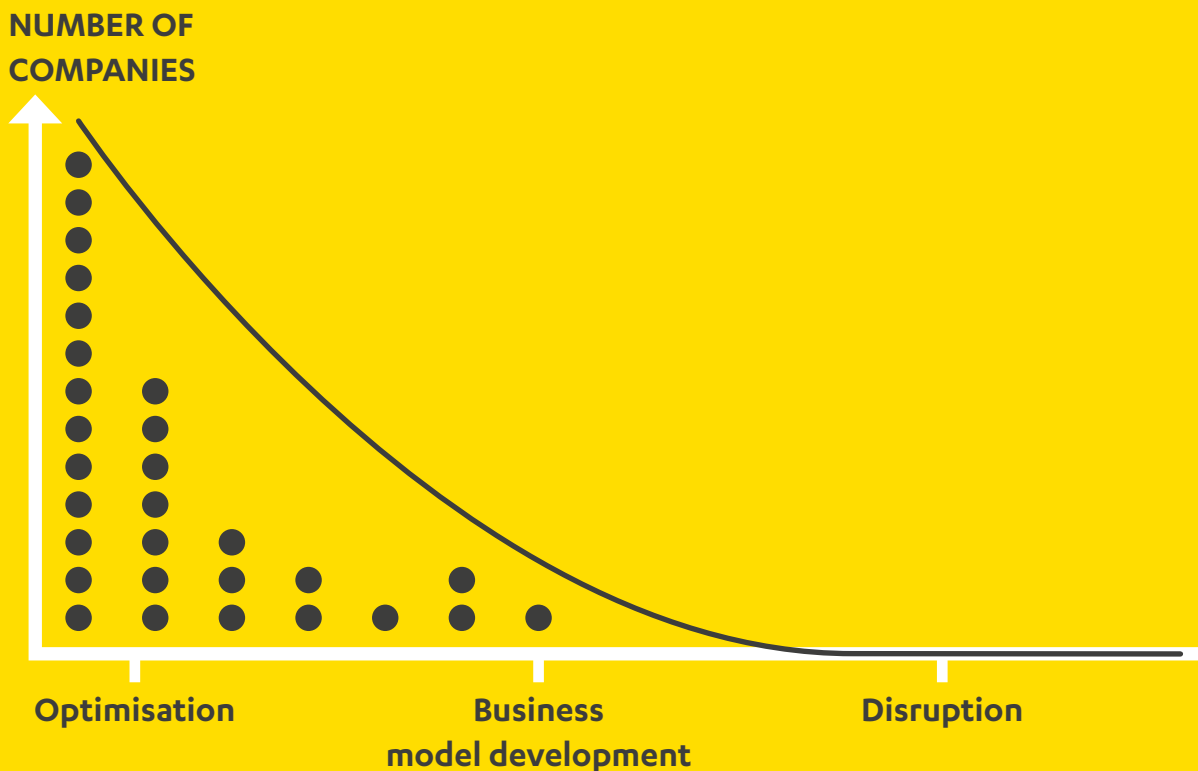
Disruption takes place in phases 3–4 (World Economic Forum)

The use and implementation of IoT primarily takes place in the real estate and construction industry in the early phases of the trajectory presented by the World Economic Forum (2015). Central to current IoT services are operational efficiency improvements, which lead to reductions in costs and resource consumption. However, there are signs of more diverse use of IoT.

The preconditions for the third phase include new kinds of business models, different partners and networked ecosystems (World Economic Forum 2015). Real estate professionals also see this as the next step.

SHORT TERM

LONG TERM

1. 2. 3. 4.
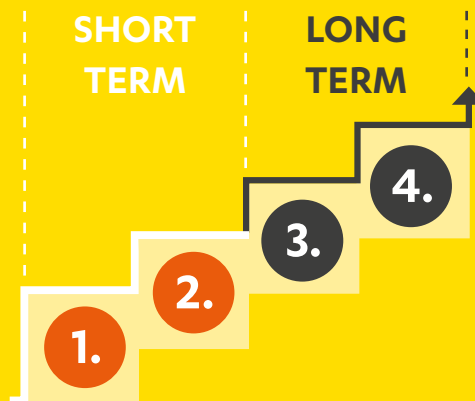
" **The next step will see small companies starting to work together."**

– Antti Ropponen, CTO, Houm

" **The great revolution will take place when the entire property is connected to a smart platform that tells us what is physically happening there, what people are doing, how they are moving about, and what kinds of activities are taking place—this will mean we can guide and forecast things."**

– Ville Tolvanen, Digitalist, Rome Advisors Oy

" **Platform suppliers will be the winners."**

– Markku Makkonen, CEO, Co-founder, Fourdeg

" **If a company really wants to do a digital transformation, the business model needs to be changed, too."**

– Erik Ubels, CTO, OVG Real Estate

IoT and property users

IoT solutions must support users' everyday needs so that they will actually adopt the solutions. Barriers to adopting new technologies often include different fears, preconceptions or attitudes. This also seems to be true for IoT.

A smart working day
It appears that users seem to value smooth everyday routines the most. It should be noticed that a smart working day at the office (or a working day anywhere else) is not limited to regular office hours between 9 a.m. and 5 p.m. (Image 5), as the solutions are far reaching.

The user's fundamental requirement is that during the working day he/she can focus on expert work and be stressed less about the small details of everyday life. These include, for example: worrying if they have their keys or charger with them; where is the right conference room; when is the best time to have lunch, where and with whom; or will they make it to the daycare centre to pick up the kids.

Solutions that make these everyday challenges smoother are what people want and, at its best, these are what IoT could provide. Different solutions help create a diversity of value related to time, money, health, safety, energy, as well as taking the environment into account.

A smart working day lasts all day, not just during office hours

Image 5.

| At: | 07:00 a.m. | 08:00 a.m. | 09:00 a.m. | 10:00 a.m. | 11:00 a.m. | 12:00 noon | 01:00 p.m. | 02:00 p.m. | 03:00 p.m. | 04:00 p.m. | 05:00 p.m. | 06:00 p.m. | 07:00 p.m. |

🕐 **TIME**   💶 **MONEY**   ♡ **HEALTH**   🔒 **SAFETY**   ⚡ **ENERGY**   ◊ **ENVIRONMENT**

Examples of solutions to improving everyday life include:

• Automatic door opening

• Automatic reception and admittance of guests

• Real-time booking system that helps you find a free workstation

• Smart alarm system that combines calendar information and location data and tells you when to leave for a meeting

• Switching lights on or off by smart phone or by voice

• Sensors and artificial intelligence that forecast energy consumption and adjust energy consuming systems accordingly

• System that shows free parking spaces in real-time

Attitudes as a barrier to adoption
Adoption may also be prevented by different fears or insecurities related to IoT services. These may include fears concerning the reliability of the IoT solution and its ability to work as promised, security concerns related to installing the devices, breaching privacy protection, and ease of use (does the user know how to use the device). One factor contributing to such fears is the thought that the IoT solution will replace a person's job.

One way of getting past these challenges is to offer the freedom to choose whether or not to use the device or offering personalised solutions. IoT will be more readily adopted and accepted if it seen to facilitate the daily life of the end users.

"A building is not smart if it does not make people work smarter."

– Erik Ubels, CTO, OVG Real Estate

"The energy saving is given, you cannot sell any platform that wouldn't deliver or help you in achieving those savings but you need to be able to stand out and you need to be able to deliver much more."

– Tarja Teppo, co-founder and CFO, Cleantech Invest

"All the unnecessary surrounding administration will be removed and this will make people feel better as they can focus on their primary tasks. This will expedite growth and well-being."

– Tomi Teikko, Director, Tieto Intelligent Building

"It has lot to do with customisation, personalisation and the end user controlling what is happening."

– Erik Ubels, CTO, OVG Real Estate

Ecosystems

The key precondition for the next development phases is to understand the potential of fully developed ecosystems. It is only when separate IoT systems are integrated that they can produce great change. In addition, when ecosystems are not limited to one property, we can acquire a mass of data that is significantly larger than what a single owner or user could ever be able to collect.

As well as the end user, it's obvious that digitalisation presents opportunities for creating significant value for the entire property industry chain, from users and owners to suppliers. Each stakeholder group should receive the information that is most relevant to them and it explained in way that matches their technical competence.

IoT will not only change users' processes but also suppliers' service processes related to properties. For the supplier, the first step is to make work more efficient and service timely, which will mean that properties are managed in a cost-efficient manner and when needed. IoT can, for instance, communicate the need for cleaning when a conference room has been used or alert when there are no paper towels in a WC. Suppliers will need different technologies.

There is no technology or service that should be a priority for smart building designers, the real value (benefit) comes from the cumulative effect of the 20 or 50 or 100 different solutions that are integrated into the smart system that is the building."

– Ken Dooley, Senior Specialist – Digitalisation, Granlund Oy

The true leap from individual solutions is constructed in a smart environment where the information from the real estate, user data and services meet."

– Ville Tolvanen, Digitalist, Rome Advisors Oy

We are combining data into one platform. We are learning from the learnings of our suppliers across different domains and across multiple buildings. I think that this is going to make a huge difference. We can optimise the next building based on the learnings from the buildings before."

– Erik Ubels, CTO, OVG Real Estate

Engineers selling to engineers

At the moment, IoT solutions are not sufficiently taking the user, user experience or user needs into account. Technology provides a great platform and it is essential for IoT solutions, but the end user should be more strongly included in the property sector's value network.

When we focus on property users, it enables many new business models and new perspectives. At its simplest, IoT can increase information about the users and reveal their movement patterns around the building. These, in turn, can be used to make decisions about locations, marketing or energy consumption, for instance. IoT also enables better communication between consumers and real estate owners without any middlemen. At its best, IoT will help produce great service for users and create more net sales for property owners.

Why do we so often talk about properties like they don't have people in them at all?"

– Tarja Teppo, co-founder and CFO, Cleantech Invest

The current services are good technical realisations but very few of them actually solve customers' issues. The starting point too often is technology, not value."

– Tomi Teikko, Director, Tieto Intelligent Building

The greatest challenges in making use of and implementing IoT are understanding the bigger picture and identifying benefits."

– Ville Tolvanen, Digitalist, Rome Advisors Oy

One or more interfaces?

Experts agree that the preconditions for the next development phase are producing different cooperation models and ecosystems.

These experts cannot yet agree on whether the ecosystem is one interface decided upon by the market or if, in the future, there will be several equal interfaces.

> **We need great actors who will combine IoT into one user experience, and we need one interface for that."**
>
> – Tomi Teikko, Director, Tieto Intelligent Building

> **In the future, we won't see only one system that controls the properties, but rather several systems and devices that communicate with one another through open interfaces over the Internet."**
>
> – Antti Ropponen, CTO, Houm

> **At the Edge, we found 21 companies and related technologies that we would like to work with. None of them used the same technology. We needed to create a holistic view on the needed services and combine and integrate them into one. Now, the 21 technologies are used via a smartphone."**
>
> – Erik Ubels, CTO, OVG Real Estate

Disney: Optimisation of resources and identifying needs

Disney has constructed an IoT solution that is an excellent example of how IoT can both make operations more efficient and also improve the customer experience and increase sales. It focuses on the ease, safety and experience of the customer journey, and simultaneously guides customers' behavior and decreases loss and waste in the processes. Disney's solution, the Magic Band wristband translates into better service for the customer as it makes paying in the amusement park easier, works as a key card, makes queueing easier and also helps if your child gets lost. At the same time, the solution takes into account the customer's entire path and adds a touch of magic to the experience. It also collects information and data about users, which will again help in creating an even better customer experience and help to decrease waste and loss—for instance, in improved work shift planning.

SHORT TERM **LONG TERM**

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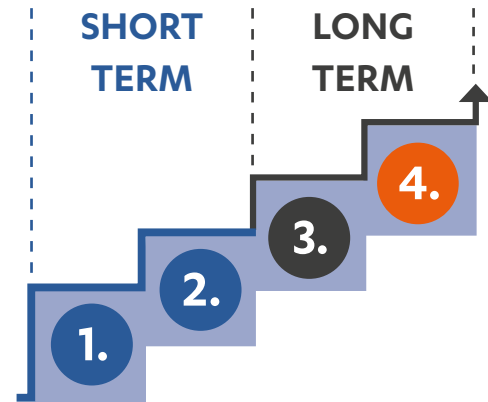
# SnapSkan: Safety, not just technology

There are good examples that manage to make the customer value more visible:

One example of digitalisation in the tyre industry is SnapSkan technology in Nokian Tyres and Vianor. It tells the driver the depth of tyre treads and when it's time to change the tyres. The technical solution was realised in cooperation with Futurice, Affecto and Sigmavision.

The service is focused on understanding customer needs, and communication to customer focuses on values, not technologies. The solutions highlight freedom of choice and cost-efficiency, the service is free-of-charge to the customer, and no additional devices have to be installed in the vehicle.

SHORT TERM   **LONG TERM**

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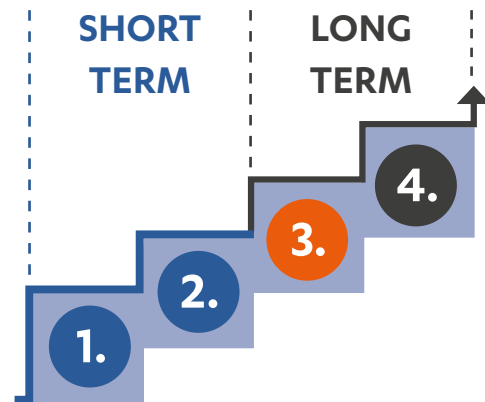
SnapSkan – sometimes, a few millimetres can make a difference to the well-being of your loved ones.
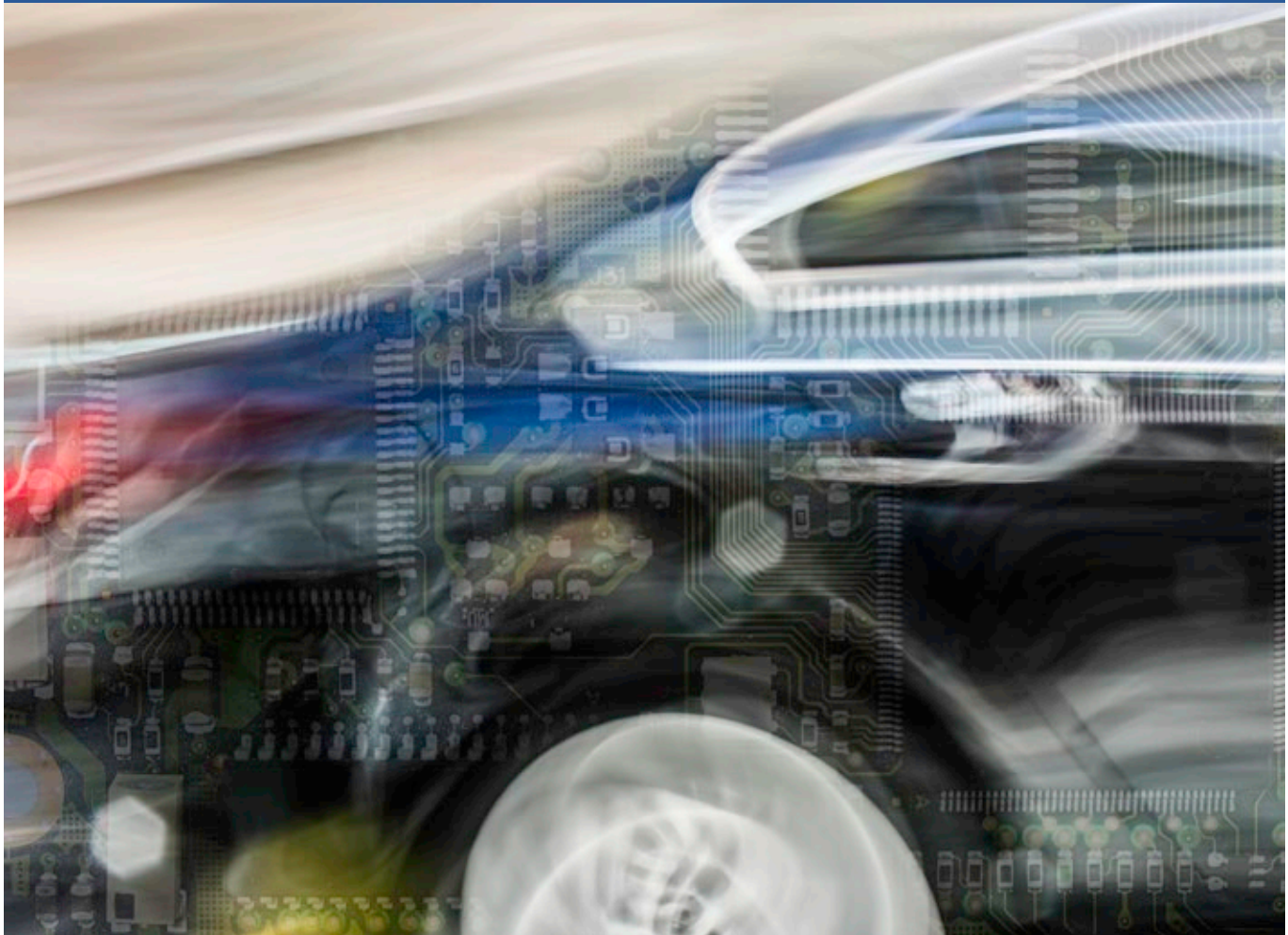
# WeWork: Implementing IoT data in the design of space solutions

The American company WeWork offers working spaces in 12 countries and in more than 100 offices. This mass of properties offers an enormous amount of data on the use of the spaces and which solutions are preferred by users. This data can be used in the design and planning of spatial solutions.

WeWork uses user surveys, observation, indoor location and indoor condition sensors as sources of information. The data helps create more comfortable spaces and make the use of premises more efficient, such as changing the allocation of space for different functions, such as focusing, interaction and negotiations. All this data collected from practical experience can be used when planning WeWork's new and renovated buildings.

SHORT TERM

LONG TERM

1.

2.

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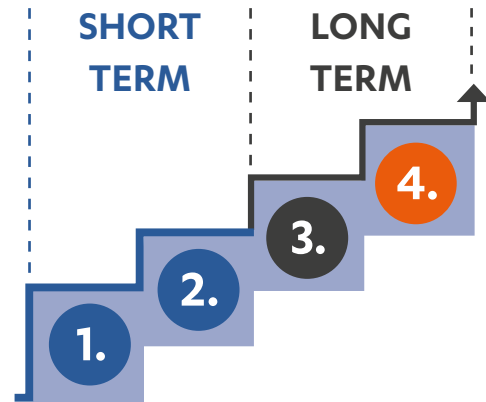
The Edge: The smartest building in the world?

Deloitte's Amsterdam office, The Edge, has been dubbed the smartest building in the world. The property features numerous technologies and more than 28,000 sensors with the objective of creating smart and healthy working spaces while still being environmentally responsible. The building not only collects property data but also data on users with the objective of making their everyday life easier. The most important feature about The Edge is that the users can choose which functionalities they want to use. There are many applications on offer that make everyday life easier, ranging from finding a free parking space to monitoring lighting, temperature and schedules. The challenge in The Edge has been to get users to extensively make use of the potential provided by the ecosystem. In this report, The Edge has been used as an example and we have interviewed Erik Ubels, who acted as the client during the design phase of the building.

SHORT TERM   **LONG TERM**

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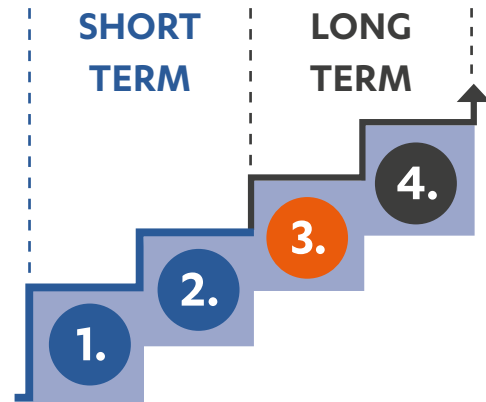
East Side Tower: Coworking hub of the future focuses on the user

The idea of user experience is also the basis for OVG and FREO's East Side Tower in Berlin, which is currently being planned. The building will become an innovative example of how different technologies can be used to improve the user experience and create a new kind of service concept.

The objective is to create a new kind of a coworking space that exploits, for instance, infrared light in identifying users and allows the use of the company's properties around the world without key cards or codes. The building's starting point is to use the latest and most developed technology but also take the user into account in terms of ease of the use and creating customer value.

The building will be completed in 2020 and it already demonstrates the need for certain types of solutions that real estate stakeholders will require in the future.

IoT enables the hospital of the future

In health care, the pressure to make operations more efficient, cut costs and produce better service is intense. This provides a good target for different IoT technologies and the creation of ecosystems.

Several systems for the hospital world already exist for measuring indoor air, optimising nurse call response times, monitoring the booking situation of hospital beds and operating theatres, forecasting the maintenance of different hospital equipment and for the remote monitoring of patients. Running these systems separately is challenging and thus cooperation between the systems and the integration are indispensable in order to control and make use of the massive amount of information and different devices.

In Finland, the New Children's Hospital is a leader and pioneer in digitalisation. At the same time, it's a perfect example of taking the user into account; the perspective of children and families has been listened to in the spatial design as well as in the way it will exploit existing and emerging technology.

What does the future offer for smart properties?

We anticipate five development directions in the real estate business of the future.

1. Properties will enhance the quality of life

In properties, the well-being of users will become more significant, and, as a result, the properties of the future must enhance the quality of life. Users will be more critical towards the properties in which they spend their time. This may also affect public properties. For instance, parents can choose the school for their children based on how healthy it is. Then they can monitor the indoor air quality in real-time to ensure that it is continuously good. Or they can choose a nursing home for their loved ones that offers the best well-being experience.

2. The market will be more competitive

Competition is becoming even tighter as users' alternatives to traditional offices have increased, because of new alternative places and ways of working in society. Properties will even have to defend their status as locations for work, and property owners and operators must revaluate the kind of competitive market they are participating in and who they are competing against.

Improving employee well-being with IoT solutions will be one of the competitive advantages in achieving the best workforce.

3. Location will be less important

In the future, not being tied down to a specific location will increasingly be a factor that guides the choices made by users, and this will create new kinds of service offerings in the property industry.

For instance, this could mean that office providers will be able to offer the user a desk in a premium-level property regardless of where they are. This flexibility will be enhanced by IoT solutions that provide access to the space exactly when they need it and without reservations or key cards.

Such solutions may even be integrated to autonomous vehicles, which will mean that the office will travel with the user wherever he/she goes. It can take the employee to the seaside or forest, according to his or her wishes.

It could also be a virtual work community that can be accessed anywhere by simply putting on VR goggles. An individual property must offer something unique to attract users. These things may include the ease of use, connection to other services required that day or an exceptionally great indoor environment. However, these all are services that are related to a great customer experience.

4. The purpose of real estate is to support the core business

At its best, a smart property both decreases costs for the owners and increases the yield for the owners. The increase in the yield will be tied to how well the space supports the user's core business. In an office, this means, for instance, supporting the well-being and satisfaction of the personnel, giving up unnecessary floor space, improving the end user's customer experience and increasing attractiveness.

5. There will be a productivity leap in the real estate and construction sector

The digitalisation of the real estate and construction industry will facilitate new working methods that will help produce a long-awaited productivity boost.

IoT will widen the skillsets needed and, as a result, new stakeholders will participate in the market. The end result will probably be something old and something new, as has been the case in past iterations of the industry.

> **Should the property industry move from the technology-oriented "Internet of Things" thinking towards an "Internet of Experience" model focused on customer value?**

> **It has nothing to do with technology. It's all about customer experience."**
>
> – Erik Ubels, CTO, OVG Real Estate

Background to the market analysis and the authors

The following areas were part of the review:

• Literature review

• Market analysis. Studied companies:
  - RF sensit, Nest, 720degrees, Nuuka, Libelium, Simap, IoLiving, eGain, Wirepass, Ouman, Lewel Group, Cozidy, Houm, Tosibox, Fidelix, Flexim (Abloy), Rollock smart locks, Helvar, Orego, Verisure, LoxOne, Berker, Eke, Fourdeg, Indoor Ninja (Kone), Remion, Walkbase, Enevo, Smart Washroom concept

• User workshop: 6 property users

• Expert workshop: Center for People and Buildings

• Start-up interviews

• Expert interviews

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The Governing Body of Suomenlinna/Arttu Kokkonen

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Granlund
Less energy gives more

Granlund group specializes in design, consultancy and software services. The core of our expertise is energy efficiency and well-being.

Company was established in 1960. Today we have 800 employees and 20 offices in Finland and also offices in Dubai, Shanghai and Malmö.

We focus on innovation and information technology and have clear vision and a strong drive to promote development. A clear continuum can be seen in Granlund's over 50-year history. Our foundation has always been:

- leading expertise

- focus on development and information technology

TUDelft

A? Aalto University