Help architects and Leaseholders understand, with the use of data and sensors, how their office spaces are being used in order to increase employee well-being.
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This report addresses the following strategic design question for 3XN/GXN:

**How might we use IoT, sensors, and data to create new feedback loops in architecture?**

Since the appearance of Facebook in 2004, the use of data has changed the way companies organize their products and services, making every strategy targeted and customer-centered. In today’s global economy, a majority of industries have integrated IoT, data and sensors into their business model. This report analyzes the current use of IoT, data and sensors in the architecture industry and offers a solution for architecture firms to create customized office spaces for leaseholders.

After a thorough market analysis through desktop research and interviews, the original strategic design question is narrowed to the following concept:

**Help architects design office spaces for Leaseholders that increase employee well-being, with the use of data and sensors.**
Help architects design office spaces for Leaseholders with the use of data and sensors that increase employee well-being.
The above model represents the traditional relationship between the three main stakeholder groups in the office building industry. The architects and building owners have a one-time payment relationship. Typically the building owners (developer) pay the architects to design the building and possibly facilitate construction management. In the traditional relationship, the architect does not usually have any contact with the building leaseholders.

The proposed feedback loop creates a direct connection and possible collaboration between the architects and leaseholders.

Using sensors and IoT, architects would collect data on the leaseholder’s use of the office space, analyze the data - and in collaboration with the leaseholder, create an optimized design. The political model showcased here above demonstrates 3XN/GXN's extended relationships by adopting the proposed feedback loop. The offering of a new type of service to the end customer - in this case, the leaseholders - would be an opportunity for 3XN/GXN to elevate their positioning in the market. By attracting an additional customer segment, 3XN/GXN would increase their current client portfolio, their range of services, as well as their ability to keep control over their buildings.
Background
Behavioral design represents the future of the modern workplace

3XN/GXN has a large focus on Office Buildings

Information/insights is the most valuable asset nowadays

The currently evolving use of offices requires adaptive spaces

Data is essential in the optimization of people-centered architecture

3XN/GXN
IoT Sensors and Data

IoT (Internet of Things), Big Data and Sensors will be discussed throughout the report. For every reader to align with the definition of these terms, here is how they are referred to in this context. IoT or the Internet of Things is the myriad of physical tools connected to the internet that collect and share data on a daily basis. Big Data is a large set of structured and unstructured information, also called data, that grows at an exponential rate. Finally, sensors are devices that measure physical inputs from the surrounding environment and output data and insights.

The use of IoT, data and sensors has grown exponentially in architecture. With increasing technological improvements in the 21st century, access to data generated in today’s built environment has developed accordingly. 2.5 quintillion bytes of data are created every day through almost everything humans do (Forbes, 2018). This data has been progressively used by city governments to help plan and manage their urban spaces, often to develop “Smart Cities”. The increasing access to data has changed the way architects work and has helped them improve their designs, make them safer and increase their efficiency.

So far, Big Data, IoT and sensors have proven their effectiveness by:

Helping designers meet user needs; improve experimentation and modeling accuracy; improve local and national policy-making and implementation; enhance transparency to speed up development processes; accelerate and improve design processes.

The advanced accuracy of data has enabled architects to obtain a deeper understanding of people and places, but also to speed up and inform design processes.
Where is it collected?

There are a wide variety of sources in buildings that collect data. Including but not restricted to the following:

- Design and construction (BIM modeling)
- Post occupancy evaluation
- Utilities, building services, meters, building management systems, etc.
- Infrastructure and transport systems
- Enterprise systems (performance reporting and work scheduling)
- Maintenance and replacement systems
- Operational cost monitoring
- Information and communications technology systems and equipment
- Sensors

How is it used?

When focusing solely on offices and company environments, data can be used in different ways and for different ends. Insights created through office generated data can help management evaluate several aspects of company performance. Through large gatherings of data it is now possible to understand employee behavior more effectively; assess individual- and team performances; improve a company’s market competitiveness; allocate resources more effectively; adapt to the development of the workplace, and to effectively use space. All in all, well managed internal data insights can provide an important competitive advantage for companies.
Well-being in Office Spaces

Well-being is an experience of health, happiness and contentment. This state of being usually comes with a low level of distress, overall good physical and mental health and a good ability to handle stress (American Psychological Association, 2020).

Well-being is getting more and more attention from employers as they realize that a high salary isn’t enough to keep and attract new employees. High levels of well-being also have a value for the image of the company, as people will be more likely to recommend working at the company. According to numerous workplace studies, there are many benefits of focusing on well-being.
The Centre for Economic Performance, a high level of well-being can increase employee performance by 12%. Employee performance refers to work effectiveness, quality and efficiency at the task level.

Spending an average of 1/3 of their day in the office, employees also have a great interest in well-being in office buildings. According to a Capital One survey on the work environment from 2019, 87% of employees think that it is essential that employers create a space that promotes well-being.

87% of employees think it’s important that leaseholders create a space that promotes well-being.

Cite: Capital One - Work Environment Survey 2019

Our definition of Well-being

In the context of this project, well-being is perceived as a state of mental, social and physical comfort. When such a level is adequate, workers can enjoy a sense of fulfillment that allows them to feel satisfied on a personal and professional level. Indoor climate can have a direct impact on workers’ health, while social interactions may give a sense of community and mental well-being can be associated with feelings of internal peace and wholeness. An employee who feels good may feel joy when coming to work, motivation when interacting with colleagues and accomplishment when leaving the office.
Covid-19 impact

The COVID-19 pandemic has shown us that we don’t necessarily need to come to the office in order to get our work done. For us to want to go to the office, the office needs to give us something – this something is the social collaboration and interaction with colleagues.

Because of Covid-19 we might see staff start working in an A- and B- team structure. This means that employers need a new focus on managing the teams, where people are at what time, when they have to be together and when they can be apart.

‘Research by Global Workplace Analytics’

“A rich network of face-to-face relationships that creates a biological force field against disease”


The ethical aspect of the transparency toolbox

The Ethical Architectural Data Machine (EADM) is, as its name implies, a way of using data ethically in a built environment. The Transparency Toolbox within the EADM is a framework to communicate between stakeholders.

Sensors can often be perceived as invasive due to their use in the collection of ofteneralized data. The EADM puts a high emphasis on making the Transparency Toolbox as ethical and privacy-friendly as possible. First, the types of sensors, which have been selected to measure the different aspects of well-being, have been specifically chosen to avoid any intrusion into people’s private sphere. In other words, the data which is collected from the different types of quantifiers is anonymized. For example, when tracking movement within the office, Bluetooth tracking data is used instead of facial recognition monitoring. Secondly, the toolbox is specially designed for all involved stakeholders to enjoy increased value. It provides architects with additional insights to improve their work. It offers employees an increased feeling of comfort in their work environment, thus enhancing their creativity and efficiency. Last but not least, it allows a deeper collaboration between the architect firm and the leaseholder company to make the new space a success.
Data to Well-being
Due to the many stakeholders involved, and the sensitive nature of collecting data with sensors and IoT, the path from raw data to increased well-being in office buildings requires several steps. The Ethical Architectural Data Machine (EADM) identifies these steps as Value, Transparency, Accessibility and Insights. These steps are necessary to ensure understanding and accountability for all stakeholders.

**Value** consists of demonstrating the benefits of using sensors and IoT to inform design for well-being to each stakeholder. It aims to demonstrate the benefits specific to each stakeholder through the stakeholder model presented earlier in this report, and through the value proposition in the Business Model section.

**Transparency** details why and how the data is collected. This is manifested by the Transparency Toolbox – a set of Well-being quantifiers each about a different aspect of well-being, and three services implementing the quantifiers; Evaluation, Adaption and Transformation. The Transparency Toolbox provides a communication basis for the stakeholders by giving them a common language to discuss sensors and IoT for well-being.

**Accessibility**, the visual manifestation of the data, could be done in a myriad of ways. Due to the diverse stakeholder profiles, the data could be visualized and presented differently for each stakeholder. For example, for architects, a BIM plug-in enabling data visualization during the design process could offer actionable insights, while for leaseholders a real-time app offering them day-to-day insights might be more suitable.

The **Insights** step is where the Ethical of the EADM is demonstrated. Instead of making direct changes to the office design like an integrated AI would do, the EADM provides stakeholders with insights from the analyzed data, leaving the choice of how to change the office building up to the appropriate stakeholder.
Help architects and Leaseholders understand, with the use of data and sensors, how their office spaces are being used in order to increase employee well-being.
Well-being Quantifiers

To measure the well-being of employees in an office building, the Transparency Toolbox uses nine Well-being Quantifiers. Each Well-being Quantifier relates to a different design influenced aspect that affects well-being. The Well-being Quantifiers cross-reference data streams from IoT and Sensors with individual feedback surveys and data from Building Information Modeling (BIM) to identify design optimizations to improve well-being.

The following pages will explain each Well-being Quantifier, their effect on well-being and design, as well as how they are quantified through data streams.
# How

## Data from

$$\begin{array}{c}
\text{Sensors and IoT} + \text{BIM} + \\
\text{Data Library} + \text{Surveys} = \text{Well-being Insights}
\end{array}$$

### Data streams

<table>
<thead>
<tr>
<th>Data streams</th>
<th>Data</th>
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<tbody>
<tr>
<td>Sensors and IoT</td>
<td>Data collected through sensors and IoT installed in the building</td>
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<tr>
<td>BIM</td>
<td>Data provided by the Building Information Modeling (BIM)</td>
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<tbody>
<tr>
<td>Air_Temperature</td>
<td>Neighborhoods_Type</td>
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<tr>
<td>Air_Humidity</td>
<td>Neighborhoods_Location</td>
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<tr>
<td>Air_Ventilation</td>
<td>Spatial_Dimensions</td>
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<tr>
<td>Air_Radiation</td>
<td>Spatial_Features</td>
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<tr>
<td>Air_Pollen particles</td>
<td>Object_Location</td>
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<tr>
<td>People_Location</td>
<td>Object_Type</td>
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<tr>
<td>People_Time</td>
<td>Object_Intention</td>
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<tr>
<td>People_Type</td>
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<td>People_Department</td>
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<td>People_Movement</td>
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<td>Video_Body language</td>
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<td>Video_Facial expressions</td>
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<td>Sound_Intonation</td>
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<td>Sound_Key words</td>
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<td>Light_Type</td>
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<td>Light_Location</td>
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<tr>
<td>Data from previous collections from Sensors and IoT</td>
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<tr>
<td>Specific leaseholder</td>
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### Survey

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<tr>
<td>Industry average</td>
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<tr>
<td>Collection of data from a different industries such as, Finance, Design, Tech, etc.</td>
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<tr>
<td>Employee satisfaction</td>
<td></td>
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<tr>
<td>Specific leaseholder</td>
<td></td>
</tr>
<tr>
<td>Data from a specific leaseholder. Data would be collected over a period of time to make the unique leaseholder profile.</td>
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### Employee satisfaction

A general survey to determine employees' general satisfaction of the office space.

### Organizational culture

The information included would touch on: who is the leaseholder and what are their values and needs, in what way does the leaseholder view collaborations and social interactions among their employees. How does their company work - hierarchy, work hours, teams, scaling, market type.
**Interior Climate**

**What**
Indoor climate consists of many variable factors that determine the physical comfort of people in the space. These factors are temperature, air humidity, carbon dioxide level, C02 and ventilation.

**Effect on well-being**
The physical comfort of an individual is crucial to their well-being. Ensuring that spaces are adequately ventilated according to their function and occupancy rate is also very important for general health.

**Effect on design**
Spaces with higher occupancy rates or particular functions should be placed in areas of high natural Indoor Comfort to cut down on energy consumption. Leaseholders may have specific needs, such as extra ventilation for computer servers.

---

**How**

- **Sensors and IoT**
  - People_Location
  - People_Time
  - Air_Temperature
  - Air_Humidity
  - Air_Ventilation
  - Air_Radiation
  - Air_Pollen particles

- **BIM**
  - Neighborhoods_Type
  - Neighborhoods_Location
  - Spatial_Square meters
  - Spatial_Dimensions
  - Spatial_Features
  - Spatial_Mechanical
  - Location_Sun path
  - Location_Weather

- **Data Library**
  - Industry average
  - Specific leaseholder

- **Employee satisfaction**

**Insights**
- Location of areas of high natural Indoor Comfort
- Ideal Indoor Comfort levels for Neighborhood types
- Particular needs for industry/leaseholder types
- Identification of mechanical Indoor Comfort needs

**Design**
- Change location of neighborhoods
Visual Comfort

What
Visual Comfort takes into account the natural and artificial lighting qualities of a space, as well as certain aesthetic qualities such as colors, materials and the presence of biophilia.

Effect on well-being
Lighting quality, in particular, the presence of natural light, has a direct connection to well-being. The integration of biophilia and specific colors and materials has also proved to improve employee satisfaction.

Effect on design
Neighborhood placement can be optimized to the natural and artificial lighting qualities of the space along with an assessment of the biophilia coverage and leaseholder’s preferred materials.
Acoustic Comfort

What
Acoustic comfort assesses noise levels in each space and identifies potential conflicts between Neighborhood functions.

Effect on well-being
Achieving occupant acoustic satisfaction requires both speech privacy and comfortable sound levels, calling for a balance between background noise loud enough to cover conversations but low enough to not cause disturbance.

Effect on design
The placement of Neighborhoods can be optimized depending on the amount of noise generally generated according to their function. Also, acoustic blocking elements or materials can be added.
Landscape

What
Landscape assesses the amount of usage of different neighborhood typologies or spaces, along with the type of person using it.

Effect on well-being
A diverse set of neighborhood typologies allows employees to choose the spatial setting best suited to their tasks and preferences. Ensuring that a diverse group of employees allowing employees to extend their social circles and collaborate.

Effect on design
Optimize the design to use a strategic variety and number of Neighborhoods for a specific Industry or Leaseholder. As well as changing the Neighborhood placements to encourage cross-company usage and interaction.
Activity Relationship

What
Activity Relationship assesses the activities performed in each Neighborhood or space, along with the type of person performing the activities, to optimize the Neighborhood functions to meet intentions and Industry or Leaseholder preferences.

Effect on well-being
Employees need spaces where they can perform both formal and informal activities. Social interactions in a relaxed setting permit employees to create bonds and better work relationships leading to collaboration while improving their well-being.

Effect on design
Change the quantity or placement of Neighborhoods to ensure spaces for both formal and informal interactions. Optimize the balance between flexible and fixed elements within a Neighborhood to match its intended function.
Connectivity

What
Connectivity identifies how people move through the building and spaces – which paths are preferred, how they are used, who uses them and at what time they are used.

Effect on well-being
Direct and effective movement through the building on an ‘A’ path can give people a sense of belonging and comfort, as well as more detouring and spontaneous movement on a ‘B’ path, can bring innovation and intrigue.

Effect on design
Change the location of spatial elements (stairs, atriums, hallways, etc.) and Neighborhoods to ensure the direct and effective ‘A’ path and detouring and spontaneous ‘B’ path. Effective Connectivity should also provide a division between public and private spaces.
Collaborative Behaviour

What
Collaborative Behaviour identifies communication, group work, team forming, information exchange, cross-company exchange.

Effect on well-being
Collaborations and social interactions at work create a positive social climate and organizational culture. Cross-company interaction is important, strong ties within small units can undermine cooperation and communication of the whole.

Effect on design
Collaborative behaviour may occur more often in particular Neighborhoods or spatial configuration depending on the Industry type or Leaseholder profile; the design can be optimized to promote these instances.
Spatial Generator

What
Spatial Generators are elements or spaces that draw people to meet and therefore interact. Identify objects or areas that mainly attract people to them and where interactions between people occur.

Effect on well-being
Particularly ‘awe-inspiring’ spatial objects or experiences can inspire innovation and creativity. These elements and spaces can also draw people to them instigating social interactions and increased collaboration among employees.

Effect on design
Understanding the usage of these elements (staircase, double-height space, overlook, interior garden, etc) by a particular Industry or Leaseholder to use them correctly and effectively.

How

- Sensors and IoT
  - People_Location
  - People_Time
  - People_Type
  - People_Department
  - People_Movement
  - Sound_Level
  - Sound_Intonation
  - Sound_Key_words
  - Video_Body_language
  - Video_Facial_expressions

- BIM
  - Neighborhoods_Type
  - Neighborhoods_Location

- Data Library
  - Industry_average
  - Specific_leaseholder

- Data streams Survey
  - Employee_satisfaction
  - Organizational_culture

Insights
- Who uses the Spatial Generators
- For how long people use the Spatial Generators
- How they use the Spatial Generators
- Ideal types of Spatial Generators

Design
- Add/Remove Spatial Generators
- Change location of Spatial Generators
- Add/Remove elements within Spatial Generators
Custom

What
The Custom Quantifier allows architects or leaseholders to draw on the raw data collected through the data streams to inform a customized test for their specific profile.

Effect on well-being
Certain leaseholders may have an interest in customized tests specific to their ways of working. For example, a tech company might want to know how much time their employees spend on screens.

Effect on design
The effect on the design would depend on the insights drawn from the customized test. For the tech company example, the design could introduce more non-fixed seating areas to encourage employees to move around to take breaks from their screens more often.
Services

The Transparency Toolbox analyzes different aspects of employee's behavior within office spaces. In order for companies to understand the necessity of these sensors within their office spaces, the service that 3XN/GXN provides needs to be customized. There are three services, each addressing a different leaseholder situation:

**Evaluation:** Corporations who wish to move into a custom-designed office space based on data collected in their old office space.

**Adaptation:** Companies who would like to benefit from continuous data-driven insights into their office space occupancy to make regular design improvements.

**Transformation:** Small and mid-sized companies who would like to improve their office space by installing sensors and renovating the space on the gathered data.

**Evaluation**

Leaseholders who are moving from their old office space into 3XN/GXN new office spaces and would like their new office space to fit their company culture.

1. Installation of sensors in old office space
2. Data-based well-being insight report
3. Creation of customized new office space based on previously collected insights

**Adaptation**

Leaseholders who are starting a new business within a 3XN/GXN office space and would like to continuously optimize the office design to improve employee’s well-being and company productivity.

1. Installation of sensors in new or 3XN/GXN office space
2. Periodic data-based well-being insight report
3. Regular office interior design adaptation

**Transformation**

Leaseholders in a non-3XN/GXN office space and would like to optimize the office design to improve employee’s well-being and company productivity.

1. Installation of sensors in office space
2. Data-based well-being insight report
3. Transform existing office interior design
Business Model

**Key Activities**
- Installation of Sensors
- Data Collection, Gathering and Visualization
- Identification of Key Insights
- Office Space Design & Continuous Improvement

**Key Resources**
- Database of Insights
- Skilled Architects & Behavior Experts

**Value Proposition**
- Improved Employee Well-being and Productivity
- Custom Office Space Design
- Smart and Efficient Space
- Tailored Actionable Insights for Improving Building Efficiency

**Segments**
- Leaseholders
- Chief Executive Officer
- Chief People Officer
- Building Owners
- Landlords
- Companies

**Revenue Stream**
- **Subscription fee:** ADAPTATION works on a subscription basis for continuous service
- **Service:** All services come with a one-time implementation fee
- **Licensing fee:** giving access to exclusive insights on building occupancy and positioning among comparable companies

**Customer Relationships**
- Consulting Services with Personal Assistance
- Co-creation on Business Requirements, Plans & Objectives

**Cost structure**
- **Value driven:** Human capital is the main cost engaged, including internal and external (high variable costs)
- Acquisition of sensors and Data Analysis capabilities

**Key Partners**
- Sensor Provider
- Data Analysis Company
- Business Intelligence

**Channels**
- 3XN/GXN Website
- Developer & Network

**Channels**
- 3XN/GXN Website
- Developer & Network
Value Proposition

Many stakeholders would benefit from the use of the Transparency Toolbox; from sensor manufacturers to interface developers and data analysts, to schools, local municipalities, cities, industries, architects, building owners and leaseholders. The EADM focuses on well-being for people within office spaces, therefore the target stakeholders for the project are a group of three; building owners, architects and leaseholders.

Adding IoT, sensors and data to a company’s everyday life certainly raises a lot of benefits, but also limitations and new responsibilities. For all three stakeholders, the use of IoT, sensors and data, increases accountability in terms of data security, data storage and protection, as well as legal and ethical concerns. Data security and protection is critical, as the data can contain sensitive information about employees. The employees need to feel safe letting the company collect, store, analyze and use data about them. Having the data secured and stored is an extra cost for the stakeholders. Buying the sensors, having the system set up, analyzing the data it collects, also costs money.

On the other hand, the three stakeholders would undoubtedly benefit from the use of IoT, sensors and data. For the building owner, it would provide a competitive edge in the market, by being better positioned to understand their leaseholders’ needs. Also, facility management would be improved. The sensors would inform tasks such as monitoring of the HVAC system (heating, ventilation and air conditioning), making it easier to predict breakdowns.

The leaseholders also benefit a great deal from implementing data and IoT into their office space. By using data analysis to understand their employees’ habits and needs better, they can enhance the workplace experience. It can also make the leaseholders’ usage of the building more energy-efficient, and by that save money.

For architects, the use of IoT, sensors and data allows for automated post evaluations of their buildings to see whether the intentions of the design are in line with the actual usage. This data analysis also enables architects to ensure clarity and well-being for the users of the buildings and office designs, along with designing adaptive and more flexible architecture. It also creates new business opportunities, as knowledge from previous projects can be used in the development of new projects.
**Role of AI and digital work streams**

**Gain knowledge for future projects**
- Leases holders
- Architects
- Building owners

**More efficient operation of buildings**
- Improve air quality
- Security
- Reduce noise
- Enhance workplace experience
- Increase Employee Happiness

**Improved maintenance**
- Predict and improve maintenance
- More efficient operation of buildings

**Energy Efficiency**
- Increase business productivity
- Adapt facilities to employee preferences
- Increase Employee Happiness
- Reduce noise
- Enhance workplace experience
- Better understanding of employee habits and needs

**More Effective Facility Management**
- Automated Post Evaluation
- New Business Opportunities
- New business as consultants through life of buildings

**Better understanding of leaseholders’ needs**
- Increased responsibility
- Held accountable for meeting leaseholders’ needs

**Update access framework**
- Need framework for data ownership and accessibility

**Cost**
- Cost of physical sensors
- Cost of data gathering and analysis
- Cost of changes suggested by data analytics

**Need to pay for architects’ extra work**
- Increased responsibility
- Held accountable for creating efficient building

**Improved maintenance framework and facilitation**
- Building management
- More work, long term
- Subscription framework

**Increased responsibility**
- Held accountable for meeting leaseholders’ needs
- New fields of knowledge
- More work, need more people

**Access to Data**
- Need framework for data ownership and accessibility

**New Business Opportunities**
- Better understand design decisions
- Create more energy-efficient spaces
- The role of AI and digital work streams

**Relative costs**
- Cost of physical sensors
- Cost of data gathering and analysis
- Cost of changes suggested by data analytics

**Need to pay for architects’ extra work**
- Increased responsibility
- Held accountable for creating an efficient building

**Real-time analytics**
- Future of business
- Market demands

**Gain knowledge for future projects**
- Leases holders
- Architects
- Building owners

**Improve air quality**
- Security
- Reduce noise
- Enhance workplace experience
- Increase Employee Happiness

**Better understanding of leaseholders’ needs**
- Increased responsibility
- Held accountable for meeting leaseholders’ needs

**Accuracy of business decisions**
- Automated Post Evaluation
- New Business Opportunities
- New business as consultants through life of buildings

**Market demands**
- Competitive Edge
- Real-time analytics
- Future of business

**Improved maintenance framework and facilitation**
- Building management
- More work, long term
- Subscription framework

**Increased responsibility**
- Held accountable for meeting leaseholders’ needs
- New fields of knowledge
- More work, need more people

**Access to Data**
- Need framework for data ownership and accessibility

**Data analysis on employees**
- More work, long term
- Subscription framework

**Stakeholders benefits and limitations**
- Data security
- Industrial espionage
- Privacy concerns
- Ownership ambiguity
Segments

Building owners may consist of landlords who will rent out the office space to a company, or a company itself who is moving into a building that was built for them. Landlords who initiate the project with the goal of renting out the office space are concerned with creating as much value as possible for their potential tenants. Profitability (charging a higher rent) and reputation (satisfied customers) are the main drivers of their decision. A company developing a new office space for themselves may be concerned with long-term efficiency, adaptability and organizational culture improvement.

Leaseholders may consist of companies who are renting out a space or moving into a newly built space that was not built for them. In both cases, the stakeholder initiating the project will generally be the CEO or CPO. While the CEO may be mostly concerned about value-creation and cost-efficiency, the CPO will generally be interested in employee satisfaction and employer branding. Naturally, these areas of interest may largely overlap.

Channels

These various personas call for different distribution channels. Namely, building owners may become aware of the availability of these products via their developer network. It is thus essential that 3XN/GXN leverage any existing relationship with developers, or actively seek to build business relationships based on reciprocal recommendation. Leaseholders are more likely to do some browsing on how to improve their office space. In this case, it is crucial to have a strong online presence, strengthened via SEO and paid advertisement.

To help potential clients evaluate 3XN/GXN's value proposition, it is suggested that a well-being audit is freely made available. It is suggested that 3XN/GXN provide companies with a simple way of surveying their employees via a pre-made well-being assessment survey. After all employees of the organization have completed the survey, 3XN/GXN would provide a short report summarizing some of the insights from the well-being audit as a way to tease the newly created services. The report may consist of a quick overview of the results, along with a comparison to other companies who have used the service. As part of the report, it is recommended that 3XN/GXN provides suggestions as to which service is the most suited to the prospect's situation.

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3XN and GXN distinguish themselves by a vertical approach to data-driven architecture. Solely focused on office spaces, with the entire process from research, to ongoing office space adaptations, including sensor installation, data collection, insight generation and customized office space interior design, 3XN/GXN benefit from an industry expertise that no competitor can compare with. Most competitors rely on a horizontal approach to data-driven design, applying skills, methods and knowledge to various spaces and offering a broad range of services across multiple fields and industries. By choosing to work with you, your clients choose to work with someone who knows exactly what their pains, needs and wants are.
Willow is a digital technology company that deploys digital twins for the built world to collect, organize, and analyze data.

**Focus**: Tech - Engineering - Architecture

**Product**: Software platform, WillowTwin.

**Services**: WillowDigital (to accelerate digital adoption)

Willow Delos EdgeVanti

Willow provides science-driven solutions to improve health and well-being through design and technology.

**Focus**: Tech - Engineering - Architecture-Well-being

**Offering**: Scientific Research: impact of indoor environment on well-being and health

Scientific Evaluation: identify risk factors in the specific project

Scientific Solution: provide solutions to improve health and well-being through design and technology.

Delos provides science-driven solutions to improve health and well-being through design and technology.

**Focus**: Tech - Engineering - Architecture-Well-being

**Offering**: Scientific Research: impact of indoor environment on well-being and health

Scientific Evaluation: identify risk factors in the specific project

Scientific Solution: provide solutions to improve health and well-being through design and technology.

Vanti is a technology company that specializes in the built environment, making buildings and spaces better for the people who use and occupy them.

**Focus**: Engineering, Design, Technology

**Offering**: design and deliver fully integrated spaces that will not be limited by the restrictions a completed construction can experience.

Mobilize quickly to bridge the worlds of technology and construction.

Enlisting Vanti as Master Systems Integrator for your retrofit project will result in a space that is vastly improved in terms of both user experience and operating costs.

Edge develops their buildings holistically, leaving the necessary room for creativity and innovation.

**Focus**: Well-being, Design and Tech.

**Platform**: Sensors, IP backbone, digital ceilings, smart building app and dashboards.

**Offering**: Workspace design: flexibility, neuroscience, office management (consists of everything from making sure there's great coffee available at the entrance, to running the gyms, to collecting the data from the technology infrastructure and optimizing buildings).
A peek into the future

5-10 years from now, 3XN and GXN will have a database collected from various leaseholders and company industries. This database will give access to valuable insights that can inform the design of new buildings and the redesign of existing ones. Access to these insights may be licensed to other architecture firms to generate additional revenue. While GXN does not need to undertake the manufacture of sensors, the company might work with a sensor supplier and inform the development of new sensor technology by providing insight into needs and wants from architects. Additionally, while it is expected that 3XN and GXN will need to partner with a tech company to gather and analyse the data in the short term, there is room for developing their own data analysis capabilities, eliminating the need for this middleman.

Ultimately, 3XN may position itself as a leading data-driven architecture firm, and GXN’s brand could take the direction of an occupancy analysis expert, showing leadership in data-driven behavioural research.