

# Delivering Business Value with IoT enabled Infrastructure Management

## Introduction

IoT enabled Infrastructure Management is the art of knowing the condition of your asset infrastructure before you act on it. Knowing in such detail, that failure prediction and preventive action becomes a reliable and efficient infrastructure management strategy. This opposed to doing maintenance and replacement investments based on static decision rules like 'we always rebuild after 30 years', or waiting for a fatal breakdown to happen.

Knowledge based Infrastructure Management requires frequent collection of data not only of the infrastructure itself, but also of the corresponding throughput it facilitates and of external circumstances in which the infrastructure operates. The condition of the infrastructure and the way it changes or deteriorates over time must be compared with load, volume and variability data over time, and with external conditions like temperature, moisture, terrain conditions, etc. that may affect failure risks and the rate of degradation.

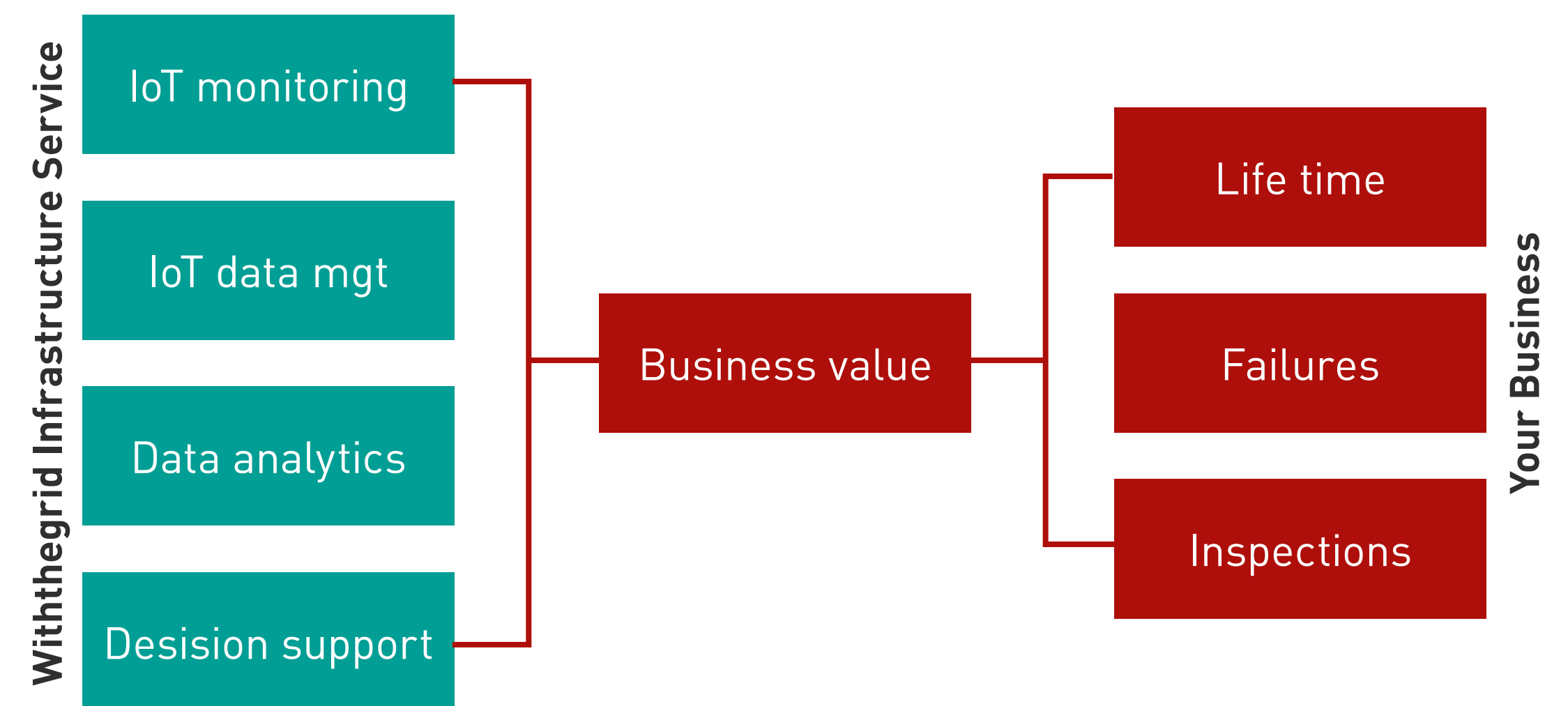
Analysing breakdown events or loss of performance by looking at the corresponding data prior to the event, statistical decision support models can be built, that tell you with a high degree of accuracy when to do maintenance or when to replace infrastructure components in order to prevent critical events. In this way you manage your operational risks at the lowest possible cost.

Thanks to recent advances in a number of IT technologies, like the development of Internet-of-Things (IoT) devices for infrastructure, cloud computing, machine learning, artificial intelligence, monitoring infrastructure with IoT devices

has become a highly cost effective approach to collect and deliver data and build decision support models for managing infrastructure businesses.

Here we will discuss what value this may bring to your infrastructure business. We have developed a simple [business value calculator](#) to make your own assessment.

## Delivering Business Value with Digital Asset Management for Infrastructure



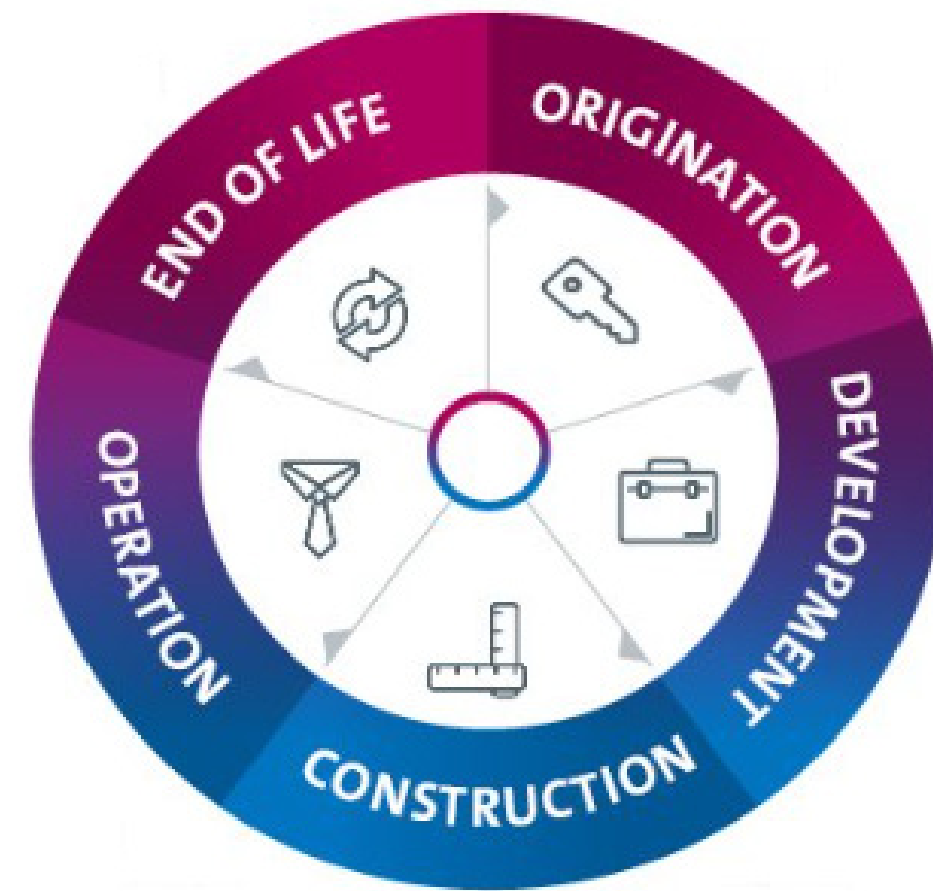
## Life cycle management

IoT enabled Infrastructure Management is especially valuable when assets reach the later stages in their life cycle. Lifetime extension and avoiding unnecessary investment is the first key business value driver of IoT enabled Infrastructure Management and the asset monitoring it delivers.

Infrastructures for electricity, gas, water, district heating, telecommunication, roads and bridges, railroads, etc. have been extensively (re)built after World War II and are being extended and replaced to this very day to support population growth, the growth of cities and economic activity, and to deliver new technologies to end users. But many grids are aging. When to replace them?

The technical lifetime of these infrastructures may vary between 30 and 100+ years. Usually the expected technical lifetime is more of an intelligent guess or derived from accountancy depreciation rules, than based on empirical data.

Empirical data are hard to obtain, first of all because the timelines are very long. Before you know whether a pipe that is said to last 60 years at the time of construction really lasts 60 years, you have to wait, well, 60 years. And after 60 years this information will be of little value, because technical innovation will have made this type of piping probably obsolete anyway.



Furthermore, 60 years will never be 60 years for every piece of pipe at the same moment in time. Therefore 60 years may be a 'save minimum' or it may be an average value. When it is an average value, the real value may be between 40 and 80+ years. But which is it for the particular grid in the area for which you happen to be accountable?

Replacing all infrastructure that has reached its 'save minimum' lifetime may be a good policy when the failure risk is extremely high, e.g. in a nuclear facility (by the way, even there lifetime extension is the name of the game). But for most everyday infrastructure this policy would cause a lot of premature investment and raise the infrastructure cost for its users significantly.

So there is a lot of social and business value attached to being able to execute a policy of 'save and smart' lifetime extension of infrastructure. IoT enabled monitoring with dedicated analytics delivers this value.

This value can be monetized by calculating the replacement value of the extra time you get out of your assets. This extra time is calculated by comparing the rate of degradation when infrastructure is unattended (run to failure), compared with the situation in which maximum protection, oversight and preventive maintenance is applied.

IoT will give you 24/7 surveillance, instead of periodic inspections of variable quality. Continuous surveillance will help your field force to prioritise their work and will prevent issues escalating to a point where replacement is the only option left.

## Sweat the assets but avoid failure!

When your intent as asset manager is to use infrastructure as long as realistically possible, and balance the cost of more frequent repairs and partial replacements against the cost of a total overhaul, it becomes very important to be able to predict emerging failures.

Real failures are usually to be avoided at all cost because of the societal and economic damage they inflict, and because they damage the regulatory compliance profile, and the image of the company and its bosses.

Being able to see early signs of trouble is therefore an important capability you need to build. It also requires building an 'expeditionary' capability in your organisation, being able to a swift response when required and having experienced personnel and enough equipment and supplies at hand to act accordingly.

Permanent monitoring of infrastructure, being able to analyse the data automatically (how often is available data overlooked because there are not enough data scientists to look at the data?), algorithms looking for signs of weakness, and having reporting systems that generate actionable alarms, without 'overreacting' to every anomaly that occurs, is what you will require from your monitoring solution provider.

Apart from the cost to society, which can be huge, infrastructure failures cause higher repair cost compared to regular maintenance, may cause revenue loss when service is interrupted (like with a toll bridge), may cause extensive compensation of damage to customers or, worse, victims of the failure, and will generate substantial regulatory cost for investigations, reports to regulators, legal advice and regulatory or even criminal charges and penalties.



The mother of infrastructure failure: Morandi bridge collapse in Genoa, Italy, 2018

Taking these cost into account, avoiding failures and limiting the impact of (emerging) failures is the second key business driver of IoT infrastructure surveillance.



## Avoid unproductive inspections

The third key business driver is reducing the number of visual infrastructure inspections by field engineers.

Field inspections will not be totally eliminated. They will still be necessary to assess the broader context in which the infrastructure operates and that may change over time. They are also needed to weed out 'false positives', alarms that are generated by the system, but when inspected in the field prove to be false. In this way the predictive model is validated and improved on.

Last but not least field inspections are necessary to follow-up on correct alarms on site and for designing and planning subsequent action.

But a large number of periodic inspections will be made redundant by IoT monitoring, making (scarce) technical personnel available for more productive tasks.

## Business Value Calculator

Based on these three key value drivers, lifetime extension, reduction in failure cost, and a reduced number of inspections, we have created a simple [business value calculator](#) that can be downloaded from our website. In a few steps you have a ballpark assessment of what value remote infrastructure monitoring with IoT devices might deliver to your infrastructure business.

## Withthegrid provides IoT solutions for Infrastructure Management

Withthegrid develops a growing range of end-to-end solutions and services for infrastructure management. We cover monitoring devices, data collection and management, data analytics, and decision support tools. Output is either directly available in our user interface, or exportable to your own asset management or field force planning systems.

Our end-to-end solutions cover e.g. [cathodic protection](#), [leak detection](#), [vacuum monitoring](#), or [legionella monitoring](#). Our data management platform is designed to support any device with any communication protocol, so we can always work with existing IoT devices in your network.

when you want to learn what Withthegrid  
can do for your business.