From unstructured data to business value for manufacturing.

**WHITEPAPER** 

## How do you do it?







### Introduction

During the 'Battle of Britain' in World War II, fierce fighting took place between German and British airplanes. Both sides sent their planes to bomb enemy cities and important infrastructure. Many returned badly damaged or didn't return at all. For the British it was vital to understand the weak spots in their airplanes, so they assigned a British engineer to investigate all bullet holes in order to discover where the planes could be strengthened.

After counting an endless amount of bullet holes the engineer met a fellow engineer to whom he explained his assignment. His colleague looked at the airplanes, saw the bullet holes and directly noted something important. "You're counting the wrong bullet holes," he warned. "All these airplanes actually returned, which means these shots weren't vital. To really find the weak spots, you have to know the bullet holes from the shot down planes."



### **Benefits and risks**

Using data for predictive maintenance or quality checking is getting more popular by the day. Properly executed, it can provide you with valuable insights that can expand the lifespan of your machines, make your work environment safer and increase the quality of your products.

On the other side data can easily be corrupted, like in this example with the bullet holes. Using your data in such a way that it stands to its promises requires the data team to be 'a bit like Einstein'. Previous experience and extensive knowledge of the matter are super important for a proper execution.

### The real experience

In this whitepaper we will go further than just explaining the big benefits of using data for manufacturing. We will also look into a few mistakes and red flags we have learned the hard way.

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### Two 'tastes' of data value for manufacturing

Within manufacturing data is mainly used in two ways: predictive maintenance and quality inspection.

#### Predictive maintenance

Predictive maintenance is used to expand the lifespan of valuable machines for production and to reduce the costs and efforts for their maintenance. The easy way to do this is by using already installed basic (IOT) sensors to measure important things like temperature and humidity. However, it doesn't stop there. The real challenge is to use your data to get new insights.

### Data plus data is new data

This can be done by analyzing all data in a data warehouse where specific tooling can be used to enrich your data. For example, the combination of both humidity and temperature into a new indication of machine overload. Many things are possible, varying from using photos to track corrosion in an early stage to infrared cameras to look underneath specific parts.

### **Quality inspection**

The other 'taste' of data in manufacturing is quality inspection. Most factories have a specific department which solely task is to make sure the produced fries, metal plates, wooden fences and whatever more fall within their quality boundaries. More and more of these quality inspection processes are automated and carried out by machines. By using machine learning they can be taught to discover damaged or unfunctional items, enabling you to use scarce and expensive manpower more efficient.

Both for preventive maintenance and for quality inspection the quality of the data is extremely important. We will look further into this in the next part.

> "Machine learning enables you to use scarce and expensive manpower more efficient."

Quality Score 9.38

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A company was tasked to make millions of pictures of factory assets. The goal was to use these to feed an algorithm that could detect broken or malfunctional assets that should be repaired.

Ten million pictures later the company got to work. The made a division between 'good' and 'bad' assets and set the algorithm to work. The results were out of the scale. In major cases the algorithm predicted no damage. For those cases with damage there was a lot of false alarms. What happened?

### Literally polluted data

Looking at many of the token pictures the data team discovered they fed the algorithm with more than just assets. Out of these 10 million pictures only a tiny percentage showed visible damage the algorithm could use to learn from. From these pictures many were literally polluted. By bird droppings or rotten leaves for example.

This literally polluted the outcome of the algorithm. After removing all 'polluted' photo's there were only a few pictures which consisted 'clean' damaged factory assets.

### Separate the wheat from the chaff

The art of data processing is the term used by data experts for the process of determining which data can be used and which should be thrown away. It is arguably the most important step when implementing machine learning in your factory.

Even a small difference can already lead to different outcomes. A factory lately installed a high-tech videosystem that used cameras to keep an eye on their production lines. However, when the algorithm was put into practice the results were off the map. It took the data team three weeks of talking, searching and investigating to find out what happened. According to the machine operators nothing changed to the machines. Only after a long time the operator mentioned the lights were changed. It took only an hour to solve the problem.

### **Be like Einstein**

To do the art of data processing right sometimes you have to be a bit like Einstein. There are many, many factors that can affect the outcome of an algorithm.

The underlying reason is that machine learning works very differently compared to normal programming. Normal programming follows a logical pattern. If this happens, do this, then do this and finally do this. Machine learning works more like: explore this and find patterns.

### Garbage in, garbage out

To avoid tons of mistakes you need to have a data team with a good amount of experience and knowledge carrying out these kinds of processes. Often, we see factories who are trying themselves but are not getting the desired outcomes. Often corrupted data is the reason. Garbage in, garbage out, is true in this field.

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### How do you do it?

Maybe, after reading the previous chapter, you got a bit scared to start using data. However, this is unnecessary. Yes, working with data is difficult and can be fragile, but this doesn't mean you shouldn't do it. The amount of (business) value preventive maintenance and quality inspection can generate is worth the costs and efforts. Especially when carried out the right way.

### **Building IT together**

At LINKIT we use the slogan 'building IT together'. We often take this literally. As an IT knowledge-partner we don't move in, build something and move out again. We collaborate instead, working together with your own businesspeople and IT-department to empower them were possible and to strengthen them with our own experts when necessary. This approach limits costs and secondly teaches your personnel to understand and use the technologies used, so they can often maintain it themselves. Having our own 'ecosystem' of over 1000 IT-specialists, expertise is always available.

### Data is not a goal on its own

Before implementing predictive maintenance and/or quality inspection you have to answer one important

question: does this really solve my problem? Both are means and implementing them shouldn't be a goal on its own.

### Finding the best solution

Next to this you must find a balance between costs and quality. With data the sky is the limit, but often that's not necessary. Instead of using complex and expensive IoT sensors, state of the art models and unnecessary tools, you may also get the results you need with a relatively simple solution.

### **Maturity assessment**

In order to get the necessary answers, we always start by carrying out an assessment. This generally takes a week in which we, together with your businesspeople and IT-department, try to gather as much information as possible. We want to know what kind of technologies are already in use, how data is currently stored and how people are using it culture). Finally we will come up with a concept solution.

### "With data the sky is the limit, but often that's not necessary."

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### **Proof of Concept**

BWhen agreed this is carried out into a PoC (Proof of Concept). Depending on the scale of the solution this takes between two to four weeks (one or two sprints). The main objective of the PoC is to validate if the proposed solution will actually deliver as expected. A PoC will either be delivered or fail. In both cases you will be glad you've done it.

#### MVP

Only in the third stage we, together with your own staff, will start building the MVP (Minimal Viable Product). Just like the PoC this will be done in twoweek sprints. The development team can consist of just your own people, with LINKIT giving guidance in the background, a mixed team, or a team of just LINKIT experts. From the client part there always has to be a product owner who can 'steer' the development team where necessary.

### Adoption

When the MVP is ready the real work starts. When the data solution gets into production, of course your personnel has to start using it. Otherwise it doesn't generate any value. It really helps if stakeholders have been involved in the implementation. Next to this there will be an adoption before and after the start.

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Often the MVP is not the end of the job. Depending on the needs of the business there can be other phases to implement new features.



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### **Conclusion + starting your journey** to data maturity

Data is a valuable substance. Used in the right way it can prolong the life of machines and increase the quality of your goods. However, data is also difficult to handle and requires a lot of experience and wisdom to process. At LINKIT we believe to have found a valuable concept by combining a huge pool of experts with a pragmatic work approach. As mentioned, before it all starts by carrying out a maturity assessment to determine the current state of your data infrastructure and to get an idea of improvements necessary to reach your business goals.

### Do you have questions?

Or would you like to talk to an expert from LINKIT? Feel free to call our expert. Check the contact details on the right.



### LINKIT BUILDING IT TOGETHER



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