

Institute of Technology Management



University of St.Gallen



Industry Study 2016

# Manufacturing Data Analytics

*Personalized Report for*

**General Report**

*“From insight  
to impact”* 

# Key Facts

## Executive Summary



**100 participants**

**42** Companies make use of descriptive analytics

**39** Companies make use of diagnostic analytics

**15** Companies make use of predictive analytics

**4** Companies make use of prescriptive analytics



**11 countries**

are represented in the sample, nevertheless the majority of participating companies is located in the DACH-Area



**52.0%**

of all participants have been working for more than 3 years on Data Analytics in manufacturing



**89.4%**

of advanced analytics companies think that Data Analytics will change the manufacturing landscape extensively



**5.5%**

of the available manufacturing data base is exploited for decision support

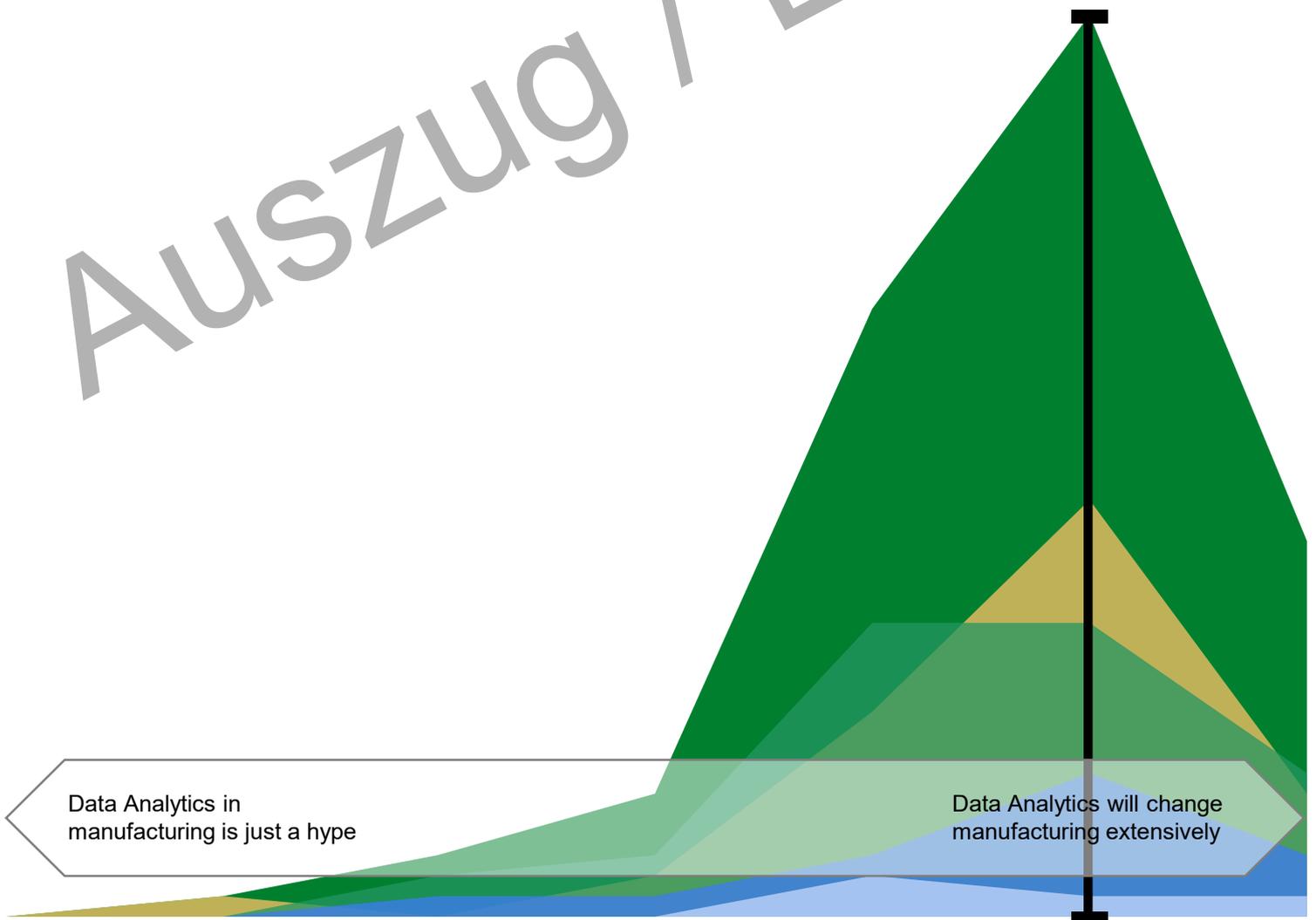
*“Data Analytics will be pivotal to fully understand the physical processes in manufacturing (e.g. metal forming) and to reach new quality levels as a result.”*

Robert Cisek

General Manager Production Press Lines  
BMW AG

Asking companies how they perceive the overall impact potential of Data Analytics in manufacturing, a large proportion sees a significant chance that Data Analytics will change manufacturing extensively. More than 90% of the respondents estimate this potential as more than five on a seven-point Likert scale.

FIGURE 0.1  
IMPACT  
POTENTIAL OF  
DATA ANALYTICS  
IN  
MANUFACTURING  
n= 42

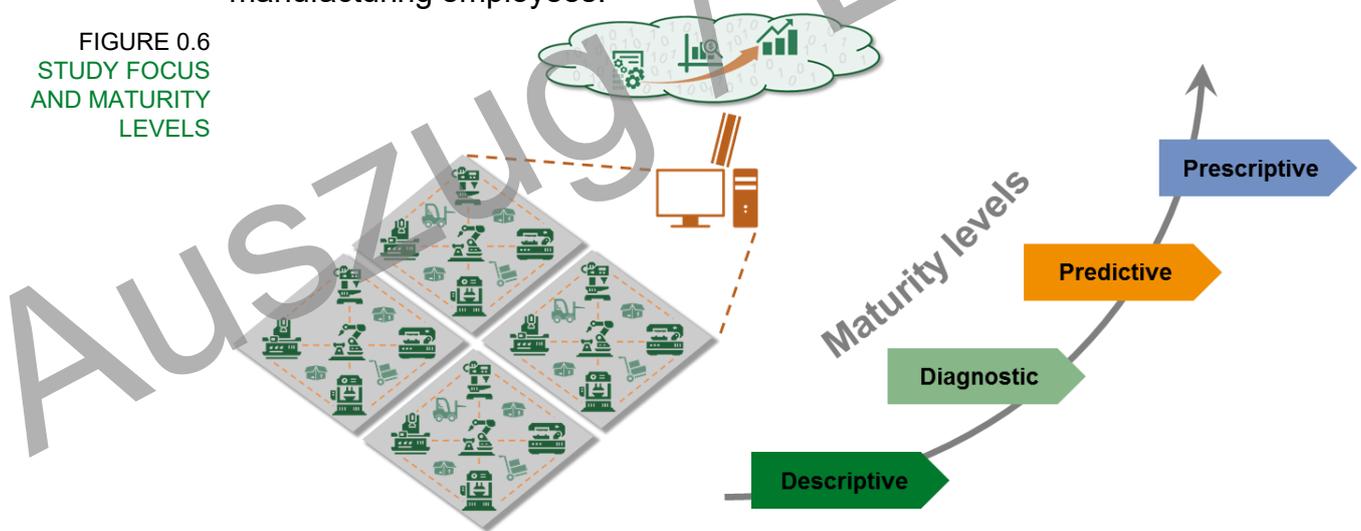


# Introduction

Data Analytics describes the process of turning data into information and finally into new insights and knowledge to support better business decisions. In this study, strategic and organizational aspects are examined as well as operational aspects. Therefore, the Data Analytics process is subdivided into four steps – data acquisition, data storage, data processing and finally data exploitation. In some industries, advanced data analytics methods are already the “state-of-the art”, e.g. targeted advertising and online marketing. Despite optimized analytics methods and a successively increasing data base, manufacturing companies still struggle to unleash the full potential of their data and to impact their business performance.

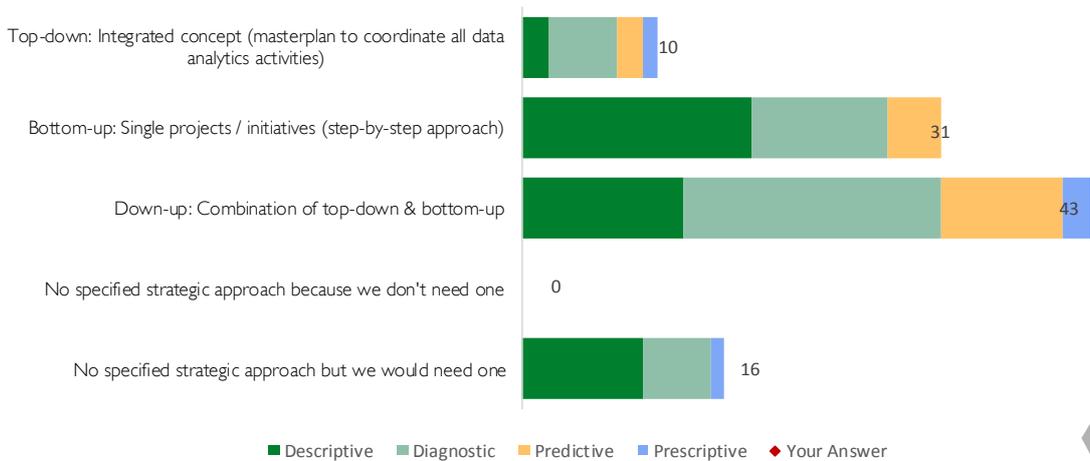
This study examines the current status in Manufacturing Data Analytics and focuses on shop floor data – meaning data which arises within manufacturing processes. These data comprise process data in e.g. manufacturing, transportation and storage as well as inspection data or tracking and tracing data. It could be collected through embedded sensors or even manually by manufacturing employees.

FIGURE 0.6  
STUDY FOCUS  
AND MATURITY  
LEVELS



According to the existing literature, Data Analytics approaches and application scenarios can be categorized into four different maturity levels – descriptive, diagnostic, predictive and prescriptive analytics. Descriptive analytics uses data to answer the question “What happened?”, while diagnostic analytics aims to find causes and effects answering the question “Why did it happen?”. Predictive and prescriptive analytics go one step further, while trying to forecast future scenarios. Predictive analytics gives an answer on “What is likely to happen?”. Prescriptive analytics aims to give decision support for predicted scenarios (“What should be done?”). Due to its huge reputation, these maturity levels are tools to categorize the participating manufacturing companies. In this study advanced analytics companies already implement predictive and prescriptive analytics in different application scenarios.

**FIGURE II.2**  
**DATA ANALYTICS**  
**STRATEGY**  
 n=100



When it comes to the applied strategic approaches, a strong differentiation between companies can be observed. However, it has to be acknowledged that 84% of all participants claim to have a strategy for data analytics in place and even the 16% that do not, are aware that this is essential for the future. The majority of companies decided on a down-up strategy as a combination of top-down and bottom-up strategy. Usually, first pilot projects are initiated on a shop floor level. Successful pilot projects are then scaled-up in the organization. Different on-going activities are aligned top-down to avoid the duplication of activities.

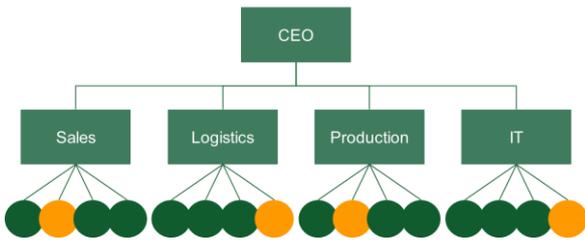
**FIGURE II.3**  
**ORGANIZATIONAL**  
**INTEGRATION**  
 n=100



The majority has integrated manufacturing data analytics into one of their functional strategies. Nevertheless, many companies have also integrated manufacturing data analytics in higher level strategies such as business unit or corporate strategy. Again advanced analytics companies are evenly distributed and cannot be associated with only one distinct level of strategy, even though they represent a major fraction in the companies who anchored their data analytics activities in corporate strategy.

FIGURE II.4  
 INSTITUTIONALIZA-  
 TION OF SHOP-  
 FLOOR DATA  
 ANALYTICS  
 n=100

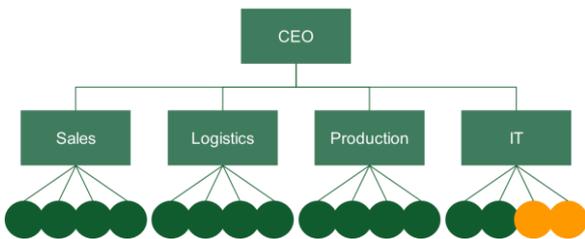
Decentralized



Integrated in functional units (analysts are scattered over different departments and do the analyses necessary for their department)

56%

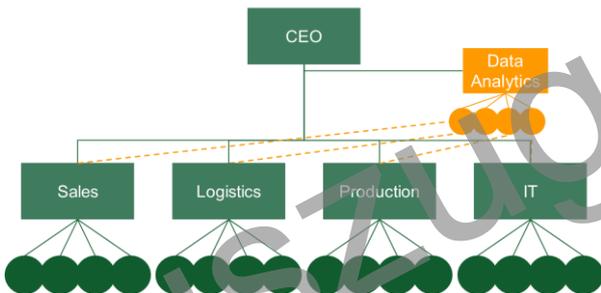
Functional



Integrated in a single functional unit (analysts are part of one functional area which is performing all analyses)

11%

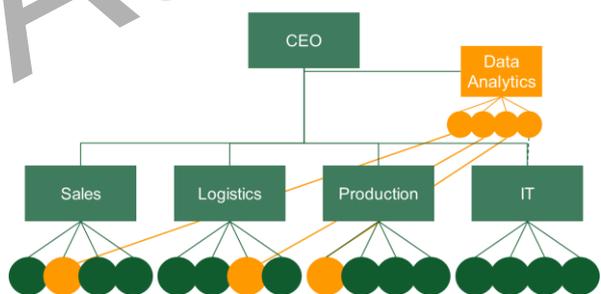
Shared Services



Organized as a shared service center (a team of specialists that can be approached as required and performs the analyses)

6%

Centre of Excellence



Organized as a center of excellence (analysts are allocated to functional units and their activities are centrally coordinated)

12%

Not Institutionalized



Data Analytics is not institutionalized within the organization

15%

● Data Analytics Specialist

# III Data, Systems & Capabilities

*"[...] in parts of our production we already generate significant amounts of process and product data, which should enable us to get in part a digital shadow of our products."*

Dr. Schwartze  
Vice President Production Consumer, Operations Strategy & Projects  
WMF Group GmbH

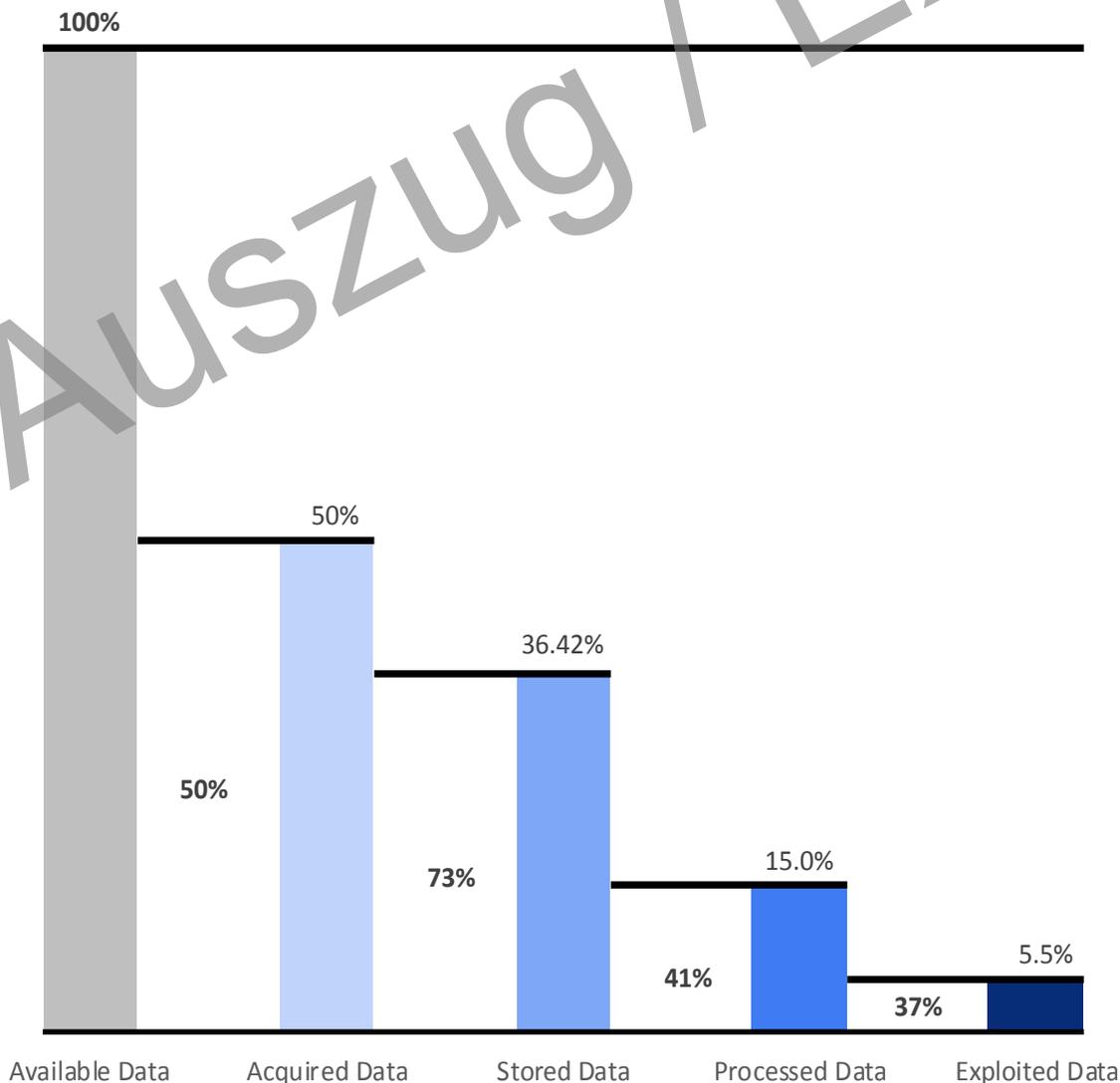


FIGURE III.0.1  
AMOUNT OF DATA  
ACQUIRED,  
STORED,  
PROCESSED,  
EXPLOITED  
n=100

There are two main storage options when storing data. One being the traditional way of storing data internally so that no data is transferred via the internet. This option needs own hardware infrastructures and maintenance services within the company. On the other side, there is a growing market for Cloud Services with Microsoft, Google and Amazon as the biggest players. This option allows companies to completely outsource the hardware and IT infrastructure services to specialized companies and to focus on their core competencies. Together with successively decreasing costs for these services, this seems to be a good option for manufacturing companies with low IT competencies. Nevertheless, there are still some obstacles in the manufacturing industry, as only 12% already use cloud services. The most important issue in this context is data security and the risks involved.

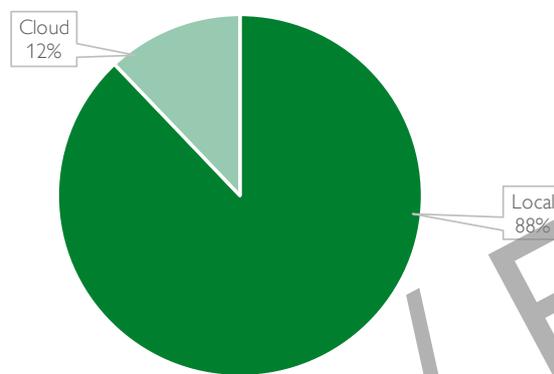


FIGURE III.3.4  
CLOUD VS. LOCAL STORAGE  
n=100

Data storing concepts strongly influence the accessibility of data within the company. Thus, a lack of accessibility is affecting the following steps in data analytics. In general, this study shows that in manufacturing companies the data access is very restrictive.

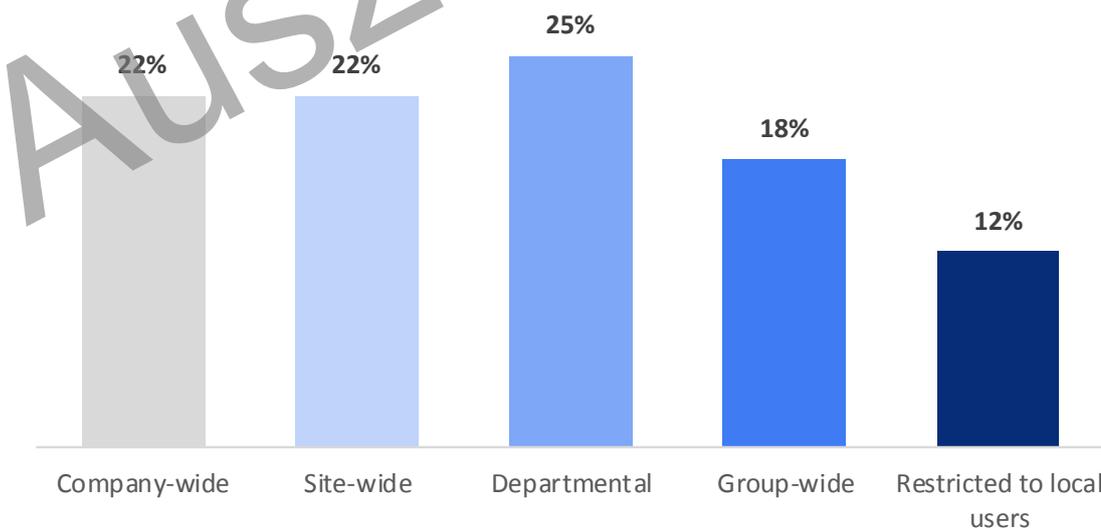
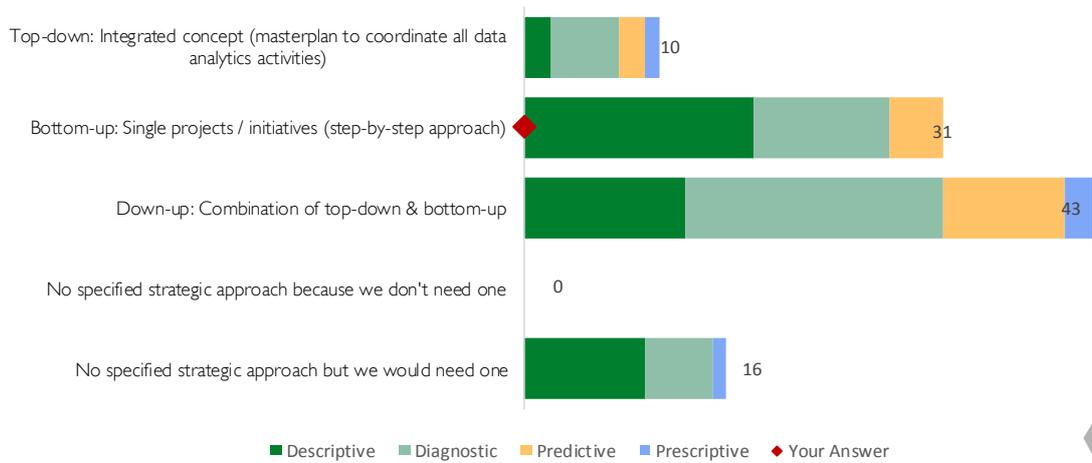


FIGURE III.3.5  
DATA ACCESSIBILITY WITHIN MANUFACTURING COMPANIES  
n=100

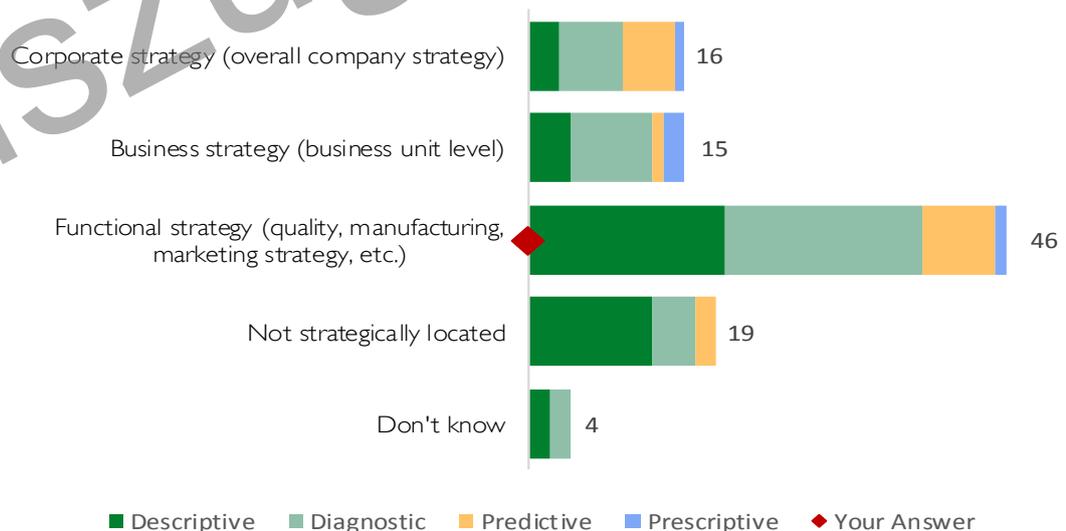
Besides the low percentage in cloud services usage, a low rate of integration of the different data processing systems and their databases is also still an obstacle in data analytics. While it is important that sensitive data is only accessible for authorized users, restrictions in manufacturing data access, e.g. due to a lack in IT-infrastructure, is a barrier that hinders new potentials in manufacturing companies.

**FIGURE II.2**  
**DATA ANALYTICS**  
**STRATEGY**  
 n=100



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The majority has integrated manufacturing data analytics into one of their functional strategies. Nevertheless, many companies have also integrated manufacturing data analytics in higher level strategies such as business unit or corporate strategy. Again advanced analytics companies are evenly distributed and cannot be associated with only one distinct level of strategy, even though they represent a major fraction in the companies who anchored their data analytics activities in corporate strategy.

# III.5 Data Exploitation

The last step of the data analytics process is the exploitation, which means using the new insights for decision support in manufacturing. This step is essential to transform the effort of data analytics applications into improvements, e.g. increasing cost efficiency or providing higher quality levels. Nevertheless, this study shows that only 37% of already processed data is actually exploited. Combined with the previous losses of data, this results in an overall low degree of efficiency and missing economic which is impacted by practicing data analytics in manufacturing.

The low quota of exploited data shows the difficulty of developing new application scenarios beforehand. This is necessary in order to acquire and process the right, problem-specific data. In all process steps of Manufacturing Data Analytics, the awareness of use cases and application scenarios is one major barrier. Nevertheless, the graphic below summarizes the broad range of different use case scenarios for Manufacturing Data Analytics, according to mentioning of participants.

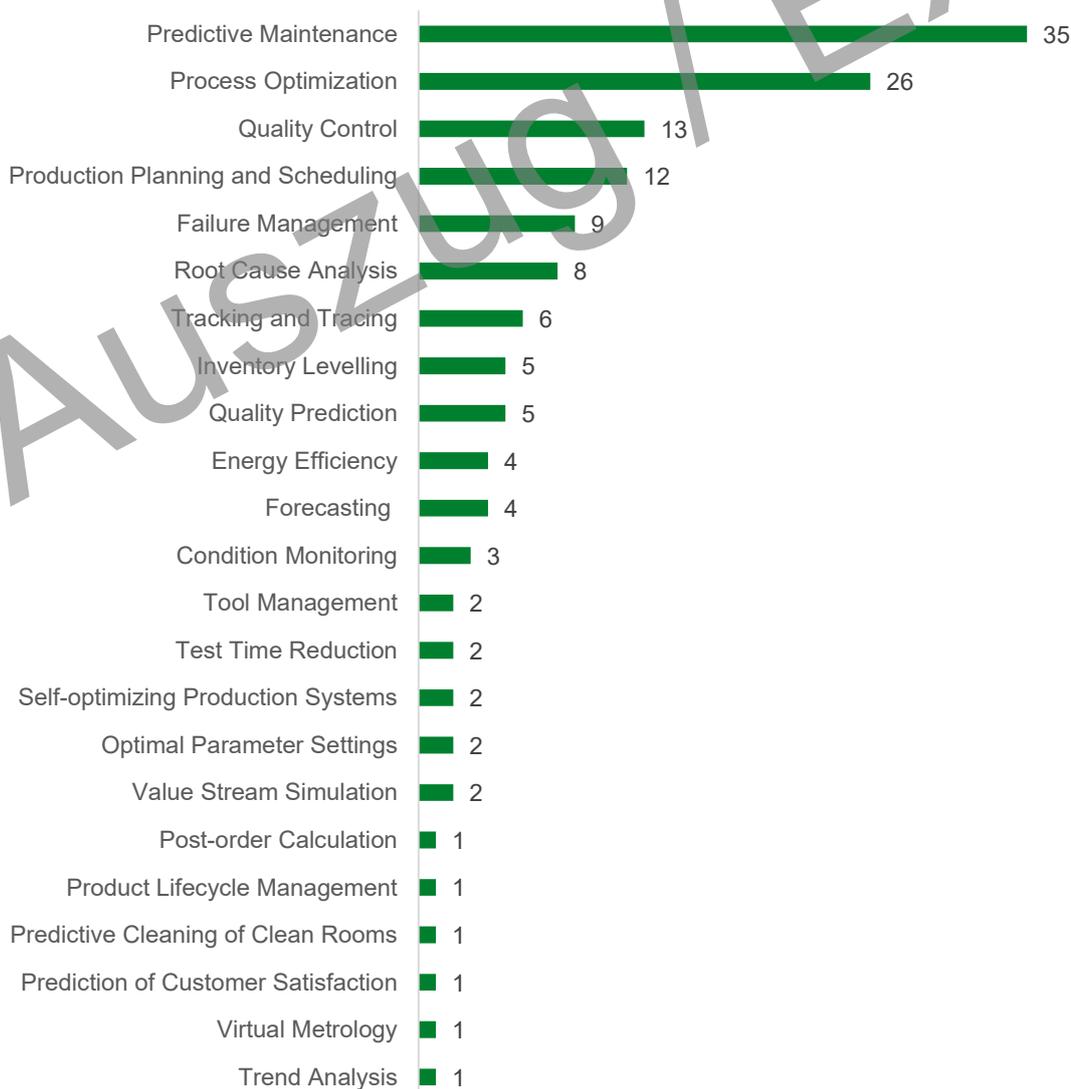


FIGURE III.5.1  
USE CASE SCENARIOS  
FOR DATA ANALYTICS

# V CONCLUSION & OUTLOOK

As the preceding chapters have shown, a successful application of Data Analytics in production and the exploitation of its full potential is still a challenging task. While acquiring and storing data is manageable for most companies, processing the acquired data (41 mentions) and using it to support decision-making (42 mentions) remains difficult.

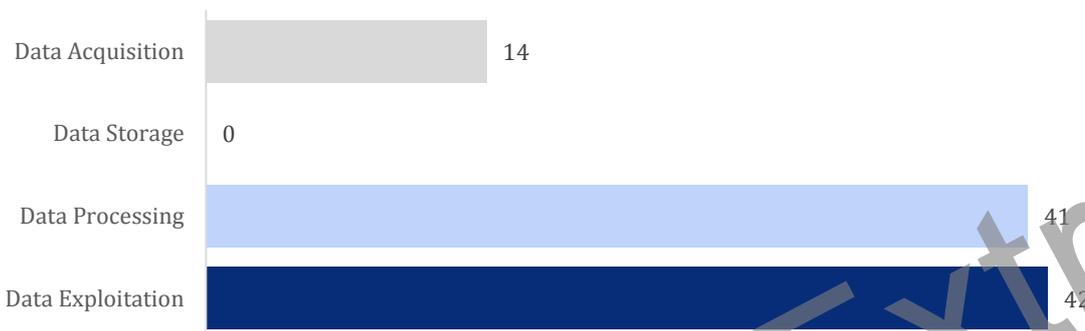


FIGURE V.1  
CRITICAL STEPS IN THE  
DATA ANALYTICS  
PROCESS

n=81

There are multiple possibilities for companies in order to successfully expand in data analytics. Investing in either internal development, external acquisition or IT infrastructure were the most common choices made in order to enhance profit from data analytics in production. While most companies decided to train and educate their current staff, integrating the existing IT infrastructure is a priority for 64%. Only 33% will hire additional specialists to strengthen Data Analytics in manufacturing, whereas contracting external consultants and collaborating with customers and suppliers are popular options as well. Among the other choices that were made, introducing MES was the most popular although only 6% stated that they planned activities in fields that were not listed above.

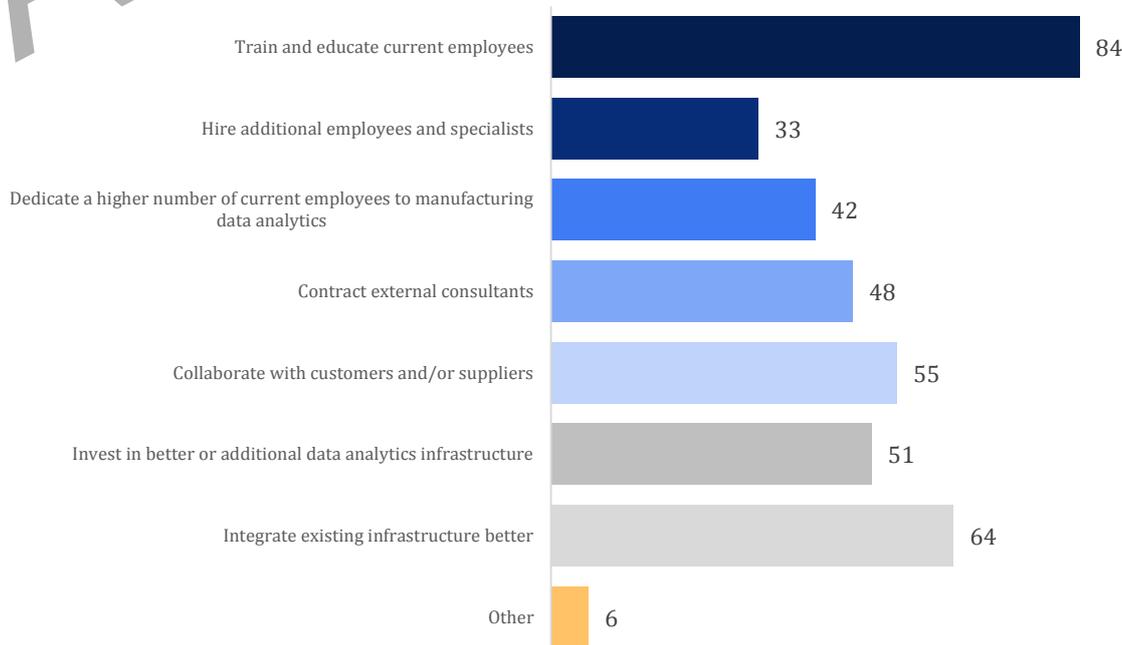
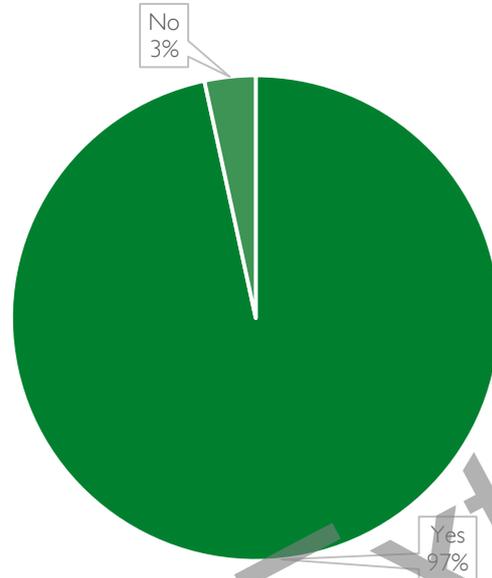


FIGURE V.2  
IMPROVEMENT OF  
COMPETITIVE  
PRIORITIES BY USE OF  
DATA ANALYTICS

n=100

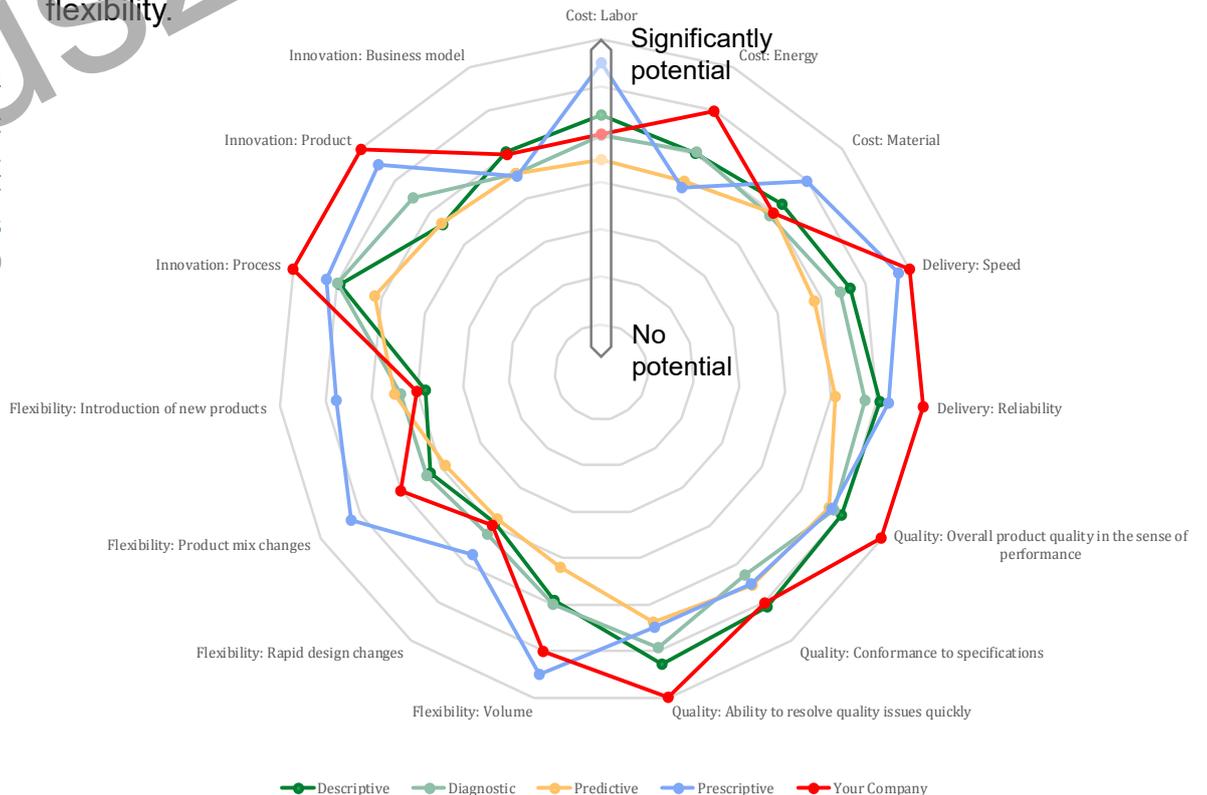
Although current efforts in the field of data analytics are not reflected in business performance improvements, manufacturing companies see big potentials for the future concerning Manufacturing Data Analytics. 97% stated that they will increase related activities in the future.

FIGURE V.3  
EXPANDING ACTIVITIES  
IN MANUFACTURING  
DATA ANALYTICS IN THE  
FUTURE  
n=89



In contrast to the rather small impacts of Data Analytics, companies are confident that if they made better use of their data, the potential improvement in all categories would be much higher than it currently is. Especially in terms of quality and innovation process there is a lot of confidence that once data analytics in manufacturing is highly developed these categories will profit the most. The category that is believed to profit the least is flexibility. The prescriptive maturity stage has the most confidence in the potential of Data Analytics, especially in labour cost, delivery speed and flexibility.

FIGURE V.4  
POTENTIAL  
IMPROVEMENT OF  
COMPETITIVE  
PRIORITIES BY USE OF  
DATA ANALYTICS  
n=89





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