

## Decision Making Using Data

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### Some questions for you

- How does Machine Learning support Decision-Making?
- What are the differences between Descriptive, Diagnostic, Predictive, and Prescriptive Analytics?
- What is the business value of Machine Learning?

### How does Machine Learning support Decision-Making?

Data-Driven Decision Making is the process of making informed decisions and business strategies through deep analysis of available data. Essentially it involves data collection cleansing, mining historical data, data analytics to make better decisions in the future. However, with the development of data science and powerful business intelligence tools, this process has been made simpler.

Information technology, in general, is a huge driving force of productivity and organisational performance, providing the ability to easily collect and process information. Companies that invest in digital transformation are increasing their value in every area. Assuring that your decision-making process is time-efficient and well-structured can be performed by leveraging innovative technologies such as machine learning.

Until now, business decisions have been made according to the facts, extrapolating historical data trends to the future. As the era of information technology continues to move forward, there are increased opportunities for to leverage its power. Innovative technology, based on machine learning and artificial intelligence, goes beyond supporting the decision-making process to the point where most of the decision-making is autonomous and independent.



### What are the differences between Descriptive, Diagnostic, Predictive and Prescriptive Analytics?

Machine learning programs need substantial amounts of data and insights to function. They use this data to build their models. According to the amount and type of data you have, 4 types of analytics can be categorised offering several types of insights.

- **Descriptive analytics:** The simplest form of analytics that uses only past data to describe what happened and when. Descriptive analytics looks at past performance and understands that performance by mining historical data to look for the reasons behind past success or failure. It uses descriptive statistics of existing data to make it more understandable and finds patterns and meaning through the comparison of historical data.
- **Diagnostic analytics:** Explains why something happened by taking a deeper look at historical data. It helps you understand why and how certain factors affected the outcome. The most used training algorithms in this type of analytics are for classification and regression. Although it does not provide actionable insights, it provides a deeper understanding of causal relationships. Because diagnostic

analytics is used to identify the origin of business issues and find appropriate solutions to prevent them from happening in the future, it is also called “root cause analysis”.

- **Predictive analytics:** This type is used to forecast what might happen by calculating the probability of events occurring. Predictive analytics relies on machine learning algorithms and statistics to provide accurate predictions. In future industrial systems, the value of predictive analytics will be to predict and prevent potential issues to achieve near-zero break-down and further be integrated into prescriptive analytics for decision optimisation.
- **Prescriptive analytics:** This is the most advanced analytics because it recommends a course of action based on predictive analysis. It also works both ways - recommending specific action for a favourable outcome, and forecasting an outcome based on the action taken. Prescriptive analytics not only anticipates what will happen and when it will happen but also why it will happen. Further, prescriptive analytics suggests decision options on how to take advantage of a future opportunity or mitigate a future risk and shows the implication of each decision option. Prescriptive analytics can continually take in new data to re-predict and re-prescribe, thus automatically improving prediction accuracy and prescribing better decision options. Prescriptive analytics ingests hybrid data, a combination of structured (numbers, categories) and unstructured data (videos, images, sounds, texts), and business rules to predict what lies ahead and to prescribe how to take advantage of this predicted future without compromising other priorities.

## What is the business value of Machine Learning?

One key area where AI and machine learning can create value in companies today is the acceleration of the decision-making process. Today’s machine learning technologies can analyse vast data sets faster and more accurately thanks to a greater volume and variety of data, more affordable data storage solutions and greater computational processing power.

Due to the size and complexity of these data sets, machine learning can help unlock value from all this data in a way that humans cannot. As a result, machine learning is now able to guide better business decisions and more intelligent courses of action with minimal human intervention.

The use of machine learning algorithms has many benefits and systems that are based on this type of algorithms are more versatile and are capable of working in changing environments and adapting to them. One of the clear benefits that can be obtained from using these systems is the reduction rate of failure. They allow the detection of failures and their reduction, which has a direct impact on the quality of the process and its improvement. The mistakes that are made help improve the process. All this makes machine learning applications a great ally of Industry 4.0 when it comes to automating processes.

## What will ZDMP achieve?

Data analytics plays a significant role in the ZDMP architecture and the main purpose of machine learning in ZDMP is to detect and predict defects that can appear in the production process also minimising delay and inconsistency. The ZDMP platform allows the zApps developers to utilise Machine Learning technologies and AI to create models that are trained and tuned to make predictions using historical data.

One component that integrates machine learning and AI into ZDMP is AI Analytics Designer. The AI Analytics Designer uses AutoML for automating the machine learning workflow allowing the creation of highly predictive models that are deployed using AI Analytics Runtime component. The automated process trains and validates models using a set of different machine learning algorithms using stacked models optimised for model performance and production use.

The zApps developers can make use of other related components that are available on the ZDMP platform like Prediction and Optimisation Designer and Runtime, Application Builder, Data Harmonisation Designer, and Orchestration Run-time to design complex AI-based applications by leveraging the technology and tools provided by the platform.

## ZDMP Links

• <b>Architecture Component(s)</b>	Developer Tier
• <b>Work Package</b>	WP5
• <b>Tasks</b>	T5.6 AI Analytics Designer

## References/Acknowledgements

None

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