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STAGES TO DIGITALIZE YOUR MANUFACTURING COMPANY

How to improve your production processes thanks to data monitoring, IIoT and AI

WIZATA

Introduction

Companies live in environments where digital technologies have an increasingly outstanding role. That implies that organizations need to adapt and implement new technologies to keep their competitive advantage.

Manufacturing industries must face up digital transformation with new approaches, systems, and strategies in order to exploit the vast number of opportunities these technologies provide and improve efficiency and productivity.

In this context, Wizata makes companies' industrial operations smarter by using real-time data and collecting all the information needed to make better decisions.

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What is industry 4.0? IIoT? And Data Science?

Industry 4.0 is currently redefining the way we understand manufacturing and affects the future of production. The Fourth Industrial Revolution, as it is also called, involves integrating more technology in the production process aiming to optimize production, reduce costs and increase revenue.

Industrial Internet of Things (IIoT), robotics, artificial intelligence (AI), and cloud computing are just some of the latest advanced technologies manufacturing companies start using within the industry 4.0 context.

IIoT is capable of fully integrating and connecting devices (of every size and shape) and processes to the Internet with the goal to make information globally available for leveraging its value.

Given the large amount of data that circulates on the network, finding a way to analyze this information, extract meaningful insights and discover patterns is needed for decision-making. Data Science is the field of study responsible for that.

Manufacturing companies who wish to remain competitive in the age of big data need to efficiently develop and implement Data Science.

Why is IIoT trending? →

DEVICE CONNECTIVITY
Connect devices, assets and processes to digital networks

DATA AVAILABILITY
Capture, process and manage a massive amount of data

PROCESS AUTOMATION
Gather and share real-time data autonomously

VALUE CREATION
Data monitoring and analysis to generate valuable insights
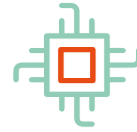
PRODUCT QUALITY
Reduces bottlenecks, scrap and improves efficiency

ROI GENERATION
It is a combination of costs-savings with revenue increase

Understanding digital transformation

Digital transformation through data →

> **"Digital transformation has the potential to increase an organization's revenue by up to 22 percent and EBIT by up to 19 percent"**
>
> – according to Deloitte's research

Under this assumption, what are the barriers preventing companies and executives from implementing digital transformation?

Although many managers are aware that they need to move towards digital transformation, few know that most of their problems are due to the stagnation on outdated and little effective models of data analysis and processing.

The challenge of managers, but also data engineers and scientists, is how to use initial data that comes from reality and add value to it. The more we enrich data with context and meaning, the more useful insights and knowledge it is possible to get out of it, and as a result, we can take better and data-based decisions.

How can you scale data up the knowledge pyramid?

Reflect

Connect

Procces

1. WISDOM

2. KNOWLEDGE

3. INFORMATION

4. RAW DATA

Aplication

Feedback

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1. RAW DATA

Data comes from diverse sources: from conventional databases, IoT devices, machines used in the production processes, etc.
When processing, organizing, and interpreting the raw data, it is possible to extract useful information.

2. INFORMATION

Information is a collection of data that is stored and ordered in a consistent way.

Through traditional data methods, companies can extract raw data, and even in some cases, transform data into information. Nevertheless, companies that have information, do not consider the context associated with this information.

High experience and knowledge of experts are key aspects to transform raw data into actionable information, also including information that would increase the performance of subsequent machine learning development efforts.

3. KNOWLEDGE

Machine learning (ML) allows extracting knowledge from all the information gathered.

ML, which is a subset of Artificial Intelligence (AI), finds context in information by recognizing patterns and classifying all the information. More and more companies are implementing machine learning models to achieve the best outcomes

4. WISDOM

Wisdom is possible when people gain experience and knowledge and allows to opt for the best decision path to design the best strategy and reach successful results.

Ways to acquire experience:

- Gain intelligence from people who are facing the same problems.
- Develop insights thanks to deep analysis of data and information in a certain context.
- Develop an understanding of problem-solving methods.

How to improve decision-making through AI and data monitoring?

"McKinsey predicts that 70 % of businesses will use at least one type of AI technology by 2030 "
– McKinsey study

Often raw data needs to be transformed and reengineered to unhide the information it contains.

Big Data   **AI**   **Business decisions**

Even though you have large amounts of data, you need a solution where to orchestrate, filter, and analyze all this data. AI solutions use data collection to find out meaningful patterns, make more accurate predictions, and as a result, improve decision-making.

Thanks to Advanced analytics it is possible to make faster, more accurate, and consistent decisions.

Benefits of data-driven approach in decision-making

MAKE BETTTER DECISIONS
It allows making decisions with solid evidence and facilitates decision-making across different departments and teams

STRUCTURE AND USE COMPLEX DATA
It can process large amounts of data and give measurable results to businesses

IDENTIFY PRODUCTION BOTTLENECKS
Detect work stages or processes that cause interruptions on the workflow, delays across the production process or an increase in costs

INCREASE EFFICIENCY AND GENERATE ROI
Make it possible to avoid downtime and industrial processes can become more accurate and efficient, generating an improvement of the ROI.

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How to control data flowing effectively? →

Data is the fuel for any artificial intelligence solution in order to get accurate insights and learn from data to improve decision-making.

In the context of massive amount of data flowing through all production lines, solid data management is crucial:

- Boost data quality at the source

- Optimize automated data entry

- Guarantee a constant flow of a large amount of data

- Do not replicate or double record data

- Gather historical data to develop a predictive model

- Improve data reporting

**It looks like a long and complex process, right?**

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Managing data properly will help you to train your ML model. Eventually, it is about optimizing the learning process of your machines in order to provide more accurate results.

The adoption of ML makes machines able to learn without being explicitly programmed and extract valuable patterns from data.

That is the unique way your AI model is able to make predictions, give recommendations, follow trends, and improve its operations on all levels.

Having tight control of your data tracking, flow and analysis help to improve the quality of this data and be a step closer of creating a well-running AI solution.
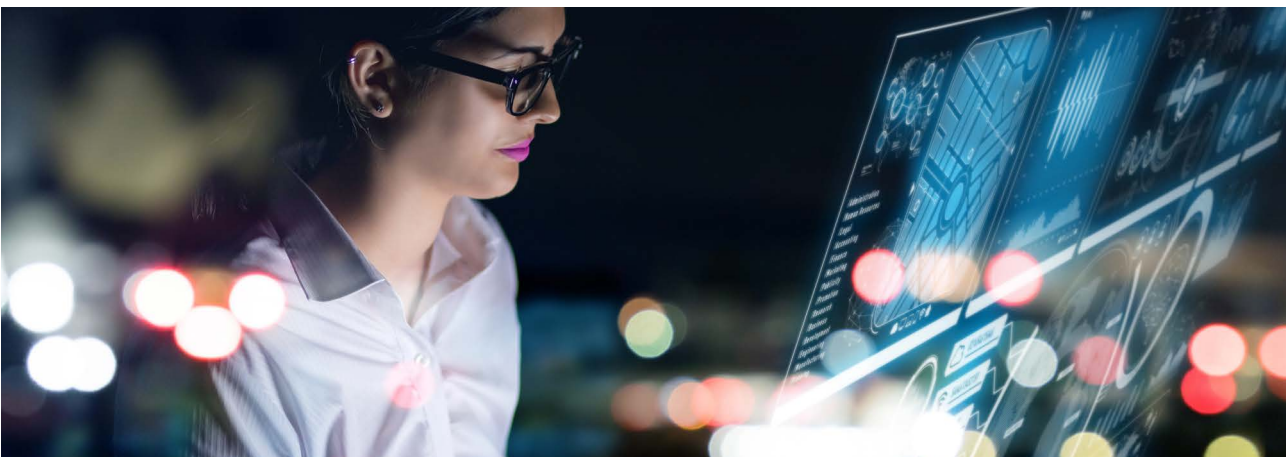
DATA STORAGE AND CONNECTIVITY

41 % of organization workloads will be run on a public cloud platform in front of 22 % which will use a hybrid approach by the end of the year. The study also predicts a reduction in the use of on-premise solutions of 10%, thus going from 37% to 27%.

– According to a Microsoft 2020 survey,

Another aspect companies consider in connection with data, is where to store their business' information. Is it better on-premises, in the cloud or a hybrid option?

CLOUD-BASED

Cloud environments are able to store extensive data and, integrating with AI, they can learn from the data they collect. In this case, your data is hosted by a service provider who maintains the entire infrastructure.

ON-PREMISE

In on-premise approach, the company's server is hosted on the organization's infrastructure. Thus, the server is controlled and managed by the company and IT team. All data and information are shared through the local network.

HYBRID

It is a mixed strategy: model deployment and output into the local edge (on-premise) to ensure data control and extract knowledge from it and, at the same time, rely on the cloud for better performance and scalability.

Digitalization journey
5 Stages to digitalize your company

A
B
C

> **According to a survey launched by McKinsey & Company in 2020, most manufacturing companies remain stuck in a "pilot trap" when it comes to industry 4.0 implementation. In late 2020, 74 % of companies surveyed indicated they are facing industry 4.0 implementation challenges.**
>
> **– McKinsey & Company**

Many companies do not know how to start digitalization and how to improve their production processes through data monitoring, IIoT and AI.

In what stage of digitalization are you and how to move forward through digitalization in order to transform your production process into a competitive advantage?

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Stage	Next stage	Benefits & ROI
STAGE 0 - 0% Inexistant data layer	Digitalize	Access your data remotely
STAGE 1 - 25% Monitoring	Monitoring	Centralize data Data-driven decisions
STAGE 2 - 50% Smart monitoring	Smart Monitoring	Advanced data-driven decisions
STAGE 3 - 75% AI for decision-making	Data-driven automation	Efficient interaction humans-machines
STAGE 4 - 100% Data-driven automation	Scale across plants-geographies	Optimize production Replicate solutions

Actors needed to succeed with your digital transformation

In order to move forward through digitalization, a bottom-line objective is to ensure communication among all stakeholders and to keep them informed.

MANAGEMENT DEPARTMENT
Set up the strategy and measure KPIs

DATA ENGINEERS
Ensure connectivity between Information Technology (IT) and Operational Technology (OT) in order to guarantee data flowing

PRODUCTION PROCESS EXPERTS
Process engineers, automation engineers, operators, etc. All of them are essential in the process development and in extracting insights and knowledge

DATA SCIENTISTS
Translate the business knowledge into data flow useful for AI systems

STAGE 0: Inexistant data layer →

Most of these companies know how crucial digitalization is for keeping their competitive advantage, but they still did not set up any data initiative.

Building a solid foundation for a long-term digitalization strategy starts by understanding and defining your architecture data flow, which you surprisingly might find is the main bottlenecks when starting your digital journey.

STAGE CHARACTERISTICS

- Processes not automated
- All information tracked on paper
- Optimization relying on state-of-the-art practices and experience
- Data collected and stored on machine but not used

GET TO NEXT STAGE: DIGITALIZE

- Automate and collect data
- Centralize data access
- Onboard process/business with useful reporting and monitoring tools

BENEFITS AND ROI

- Consolidate your data governance
- Access your data remotely

Requeriments

Process your data and your configuration and seek quality

ESSENTIALS FOR CONNECTIVITY

It is crucial to connect and integrate machines to the IoT software in order to start leveraging data and solutions

1. All machines involved in any production process have sensors capable to generate data.

2. Sensors generate tens of thousands of data. In order to use this data to monitor and/or optimize the process, machines use protocols that need to be read and understood by what is known as IoT gateways. Data needs to be connected to the cloud and eventually to the solution.

3. So, all the data moving to the cloud goes through the gateway, which can be hosted on either a hardware device or a virtual machine on local servers.

4. One of the main roles of gateways is 'to translate' the language of the machine, into a language that is understandable by the IoT software we want to connect to. In this case, the gateway acts as a universal translator for networks or equipment which operate based on different protocols. That means that the gateway guarantees communication between different environments and architectures.

5. Besides helping to connect devices and translate protocols, gateways provide additional security for the IoT network and the data it carries.

In short, gateways establish communication between multiple environments. Moreover, they allow, in a context with large amounts of data, to mediate the connection between the sensors and the database avoiding the unnecessary amount of data processing and sending to the cloud only the most relevant information.

TYPOLOGY OF SOURCES

There are many sources, sometimes not easily accessible, where data can be stored and that need to be connected and harmonized through a single tool, such as a platform.

- PLC
- Databases
- Flat files
- Web services
- Other sources such as RSS feeds.
- Historians

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STAGE 1: Basic data layer: Monitoring →

Companies have basic tools to collect data and get some insights, usually some threshold-based alerting, but they face many challenges when processing and analyzing data.

STAGE CHARACTERISTICS

- Process automated
- Centralized interaction with processes
- Digital Twin*
- Data visible on control screens
- Alarms

GET TO NEXT STAGE: SMART MONITORING

- Train users to derive more from connected data
- Log and explore issues through connected data
- Set up KPIs follow-up and identify use-cases to improve

BENEFITS AND ROI

- Centralize your data
- Less time to consult and access data
- Data-driven decision

What is a digital twin? ✳

Digital twin is a virtual replication of all the components of your production process, where all ingested data is understood together with contextual information to have a clear view of processes and the impact of some actions and events on these processes.

Requeriments

Data training and data-driven problem-solving.

STAGE 2: Intermediate data layer: Smart monitoring →

Manufacturers are able to collect many insights from data and use them to drive value to their business.

In this stage, companies have the ability to manipulate data to extract actionable information and make efficient decisions.

STAGE CHARACTERISTICS

- Humans can solve simple use cases with data analytics tools
- New calculated data derived from connected data to support operations
- Advanced KPIs computation and forecasting

GET TO NEXT STAGE: DATA-DRIVEN SYSTEM

- Use KPIs tools to identify areas to be improved
- Identify use-cases not resolvable with basic data analytics
- Move from manual exploration and human-encoded knowledge to AI and ML to tackle use-cases

BENEFITS AND ROI

- Advanced data-driven decision
- More asset availability
- Plan efficiently

Requeriments

Add data tools to engineering for problem-solving, identify use cases with clear ROI, and basic training for ML and AI.

STAGE 3: Advanced data layer: AI for decision-making →

Companies see data as an integral part of their business strategy. They are already using AI and ML to get meaningful insights that are not possible to get from human engineering.

At that stage, complex multivariate interactions can be captured and are transformed in recommendations to better operate production processes and maximize assets uptime and performance.

STAGE CHARACTERISTICS

- Operations indirectly impacted by data-driven systems
- Human validation and intervention
- Rules executions
- Machine learning & AI algorithms

GET TO NEXT STAGE: AUTOMATION

- Evaluate impact of existing solution on KPIs
- Make systems evolve to safely interact directly with process and machines

BENEFITS AND ROI

- Efficient interaction between human and machines
- Data-driven decision
- More asset availability
- Plan efficiently

Requeriments

- Onboarding of OT (Operational Technology) and enabling direct communication with machines.
- Risk assessment.

STAGE 4: Advanced data layer: Data-driven automation →

As in stage 3, manufacturing companies exploit rich data and AI for problem-solving and decision-making in order to optimize their entire production process. But to push the limits of efficiency even further, the actionable recommendations are automatically applied to target processes for continuous, non-biased and direct improvement of processes and assets performances.

From that stage, the operational health of processes increases exponentially, together with the increasing number of processes on which the optimization solutions are replicated and applied.

STAGE CHARACTERISTICS

- Process directly impacted by data-driven systems
- No human intervention required

GET TO NEXT STAGE: SCALE ACROSS PLANTS-GEOGRAPHIES

- Identify all assets for replication
- Standardize existing solutions
- Replicate solutions to other assets
- Replicate over all group assets

BENEFITS AND ROI

- Optimize through data the full production cycle
- Replicate solutions
- Save human resources time
- More asset availability
- Plan efficiently

Requeriments

- Ability to train your model for similar assets.
- Ability to transpose solution build to other types of assets.

Shall I rely on an external partner? What skills are needed? →

Implementing AI in any business can have a significant value for organizations: extract valuable insights from data collection, optimize assets management, prevent downtime, and increase production capacity.

Nevertheless, most organizations lack the AI expertise needed to develop data-driven systems based on AI.

In order to find the best AI solution, choosing the right provider with the necessary experience, reliability and customized service is crucial.

Skills an AI partner should have:

AI SOFTWARE
A scalable, portable and flexible platform where you can consume data and easily deploy and replicate the solution. Look for a partner who provides open-architecture software to use data and keep control on IP.

VIABILITY
Look for relatively mature companies, with trajectory and in constant growth.

TEAM
Pick a partner with a strong and experienced team focused on satisfying your specific needs.

FULL AI DEVELOPMENT
Consider an AI vendor who understands and supports all the stages of an AI project development.

DATA ENGINEERING KNOWLEDGE
For ML development is key to find a partner capable to process and transform all the raw data generated for any system.

NICHE MARKET
Work with a partner that is specialized on 2-3 key manufacturing areas and has established experience and references.

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Success story

Downtime Decrease through Data Analysis on Metal Manufacturing

Challenge

A worldwide leader in metal manufacturing decided to start its digital transformation with a project in predictive maintenance. The primary aim of the client was to use their data to decrease downtime and stoppages in the continuous casting section.

The specific project has been selected based on the expected ROI, data availability and opportunity to scale up the solution across plants.

Objective

The aim of the project was to develop and integrate a data-driven solution to predict anomalies in the continuous casting section of the line to alert operators to take immediate actions and avoid any unexpected stoppage and downtime to increase OEE.

Solution

The real-time connectivity to the cloud and Wizata Platform is provided through OPC UA protocol. Data coming from different machines and sensors is collected in an historian. Subsequently, data is fetched directly from there and through OPC UA connected to the cloud and ingested to the Wizata Platform for smart monitoring and to integrate advanced technology such as ML.

In conclusion, Wizata and the local team work side by side to develop 16 customized models that are deployed in real-time and integrated in operations, providing operators the means to be alerted if deviations and expected failures are occurring. In this way, end users have the time to take adequate actions and plan maintenance efficiently without causing urgency and stoppages.

The solution that has been generated between Wizata and the local team is ready to be replicated on similar technologies in other plants, generating exponentially ROI for the group.

If you want to know more about this and other cases:

Follow this

Conclusion and what to look for in 2022

The value of digitalization and AI in manufacturing has been widely proven. This trend started different years ago and, according to McKenzie reports, this will continue to accelerate in 2022.

However, a large number of companies still seems to struggle with the implementation in operations and fall into the so-called 'pilot trap'.

Through digitalization, companies can:

- Optimize their processes, such as automize furnaces, become more sustainable, extend life cycle of critical equipment, to mention a few

- Improve connectivity between devices and business, facilitating the access to the right data for the right resources (operators, engineers, business experts, management)

- Increase efficiency and productivity

- Replicate solutions and generate ROI to stay competitive

- Empower resources in daily operations and enrich mindset

- Raise awareness and skills towards digital solutions

If you are thinking about starting your digitalization path in 2022, in order to succeed in this journey is indispensable to rely on competent resources, whether this to be internal dedicated team or external partner. In most of the cases, it is a co-joint effort: on one side the manufacturer who has the business and process knowledge and on the other side, a partner that can provide a global IoT solution with AI capabilities, data scientists, cloud specialists...

In this context, Wizata helps organizations to easily connect, access, manage and analyse all their assets and the dispersed data they already have, in a single data-driven solution.

The Wizata platform provides companies to optimize their entire production process: increase the performance of operations, boost the overall equipment effectiveness (OEE) and anticipate unexpected downtimes. On top of that, Wizata allows companies to develop a scalable solution able to be replicated across their many plants and geographies

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Expresso 4.0
by Wizata

Espresso 4.0 is an exciting initiative to bring value to the #I40 community and help fellow manufactures navigate real digital challenges.

Join us every Wednesday at 3pm (CET)
To ask, connect, and level up on all topics Industry 4.0.

Bring your coffee
And your questions

Espresso 4.0
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