

AUTOMATION OF NON-MANUFACTURING PROCESSES

Handouts for lecturers

Introductory instructions for lecturers

We have prepared materials for lecturers to follow. They include

- Introduction
- The complete texts as read by the machine voice. The lecturer can choose what to say, for example by highlighting certain sentences or concepts.
- Recommendations on where to turn the sound on or off

The presentation can run in two modes

- With audio on
- Without audio on

Presentation with audio on

- In this mode, a machine voice is heard explaining the displayed texts, diagrams and animations.
- This mode is suitable for self-learning.
- The lecturer is not recommended to go through the entire content in this way. The trainee's attention may be lost, and the trainee may not focus on what is most important in the content.
- We recommend using this mode no more than 2 times during the presentation.

Presentation with audio off

- If the presenter turns off the sound, they can give the participants an abbreviated version of what the machine voice is saying in the background.
- They can also highlight what is most important about the content being shown.
- The lecturer needs to go through the course several times.
- This is because the background machine voice is running all the time, and until the narration is finished, the lecturer has no opportunity to move on to the next step in the presentation.

The lecturer can either

- do the content switching and scrolling on their own (recommended for online webinars)
- **or** their partner can do it, but it has to be well coordinated with them (recommended for larger audiences)

Link to the course

<https://paitool.eu/courses/paitool-course/lessons/automation-of-non-manufacturing-processes/>

Educational objectives

Each presenter must understand their educational objectives. In the case of AI, participants should gain the following knowledge:

- Understand artificial intelligence as an information system that is capable of learning,
- Know how to identify those processes where it makes sense to use artificial intelligence or machine learning,
- Know the prerequisites for deploying AI in the conditions of a specific company, such as the need for data, the personnel required, etc.,
- Recognize the benefits of implementing AI and the risks associated with implementing the project.

Course of training

Introduction

Hello. Let's take a look together at intelligent automation of non-manufacturing processes in industry using artificial intelligence. Our journey will take us into the world of process automation that can revolutionize the way we manage and solve technical problems in industrial enterprises. The presentation, which we'll get to shortly, focuses on how artificial intelligence can transform traditional problem solving in mainstream businesses, and how we can avoid repeating mistakes and improve performance.

I'm now going to play a presentation, the voice of which belongs to artificial intelligence, as a demonstration of one of its capabilities.

🕒 *START THE PRESENTATION*

Slide 1 - Introduction

Slide 2 - Introductory example

Slide 3 - Common problems of a typical factory

This is a regular factory, containing many different, relatively complex machines. The machines have failures. Whether something needs to be tightened, lubricated, or a spare part replaced, we need to have experienced technicians on hand who know what to do when something goes wrong. Disorders occur at different times in different places. The larger the factory, the more machines, and the more problems there can be. Then it is necessary to have more technicians.

There will be a problem that the first technician will solve from time to time. Another similar device will have a similar situation on the opposite side of the factory in a few days, which a second technician will solve. Problems arise constantly. Sometimes the solution is evident and straightforward; other times, the technicians spend hours researching what went wrong. If they find a solution, they may share their experiences with colleagues and maybe not. If they leave the job, their knowledge and expertise will disappear.

Slide 4 - Common problems of a typical factory

Large companies often have a problem sharing knowledge. The same problems and mistakes are then repeated over and over again.

1. The same mistakes are often repeated.
2. The effectiveness of knowledge transfer between employees is questionable.
3. The company's knowledge base is based on the experience of individual employees.

🔊 *STOP THE SOUND OF THE PRESENTATION*

Question to the audience:

Can artificial intelligence help solve these problems? Let's take a look.

🔊 *START THE PRESENTATION SOUND*

Slide 5 - Example of a service intervention

When a problem occurs, it will be reported either by the operator or automatically based on an alarm from IoT sensors.

Reporting a problem

The operator registers it. The system evaluates what they write in real-time and tries to understand the text.

Problem classification

As a result, it can help classify the problem. It is based on a standardized failure code list.

Equipment identification, selection of the most similar failures

Based on these inputs, the system identifies the device on which the fault occurred and selects a list of the most similar defects.

Correct failures identification

The operator selects the corresponding fault type and instructs the maintenance worker to start the repair, together with the necessary instructions.

Repair of the equipment

After the repair, the maintenance worker checks the device's functionality and informs the operator, who confirms it in the system, if everything is in order.

Functionality check

Gradual streamlining of maintenance

This way, the equipment maintenance process becomes significantly more efficient, impacting the company's overall profitability.

🔊 STOP THE SOUND OF THE PRESENTATION

The text will be retold by the speaker in his/her own words:

Slide 6 - How it all works in the background

Now let's talk briefly about how it all works in the background and about the order of the individual activities.

Entry of textual information about the failure into the AI model and their analysis

The artificial intelligence machine processes the texts about failures and tries to understand them.

Placing text in n-dimensional space

Placement of fault texts in N-dimensional space in the form of clusters. This space has interesting mathematical properties. Among other things, it is possible to do computations with the meanings of words. For example, if we take the concept of the word son, revoke the concept of the word man, and add the concept of the word woman, we get the word daughter. Similarly, if we take the concept of Germany from the word Berlin and add Slovakia, we get Bratislava.

Reading text in sections

In practice, artificial intelligence reads the text in parts, much like a human.

Comprehension of the text, selection of the most similar malfunctions

After reading, the AI will create a kind of understanding of the text. This understanding is interpreted by an N-dimensional matrix that captures "what is written there." AI also searches the database for a group of failures with the most similar symptoms. If we wanted the workers to go through the whole history in each case, it would take them hours, if not days - the machine can do it in a few seconds.

⏸ STOP THE PRESENTATION

End of presentation - option 1

- *The lecturer can end the presentation at this stage.*
- *This applies especially if the following parts of the lecture have not been covered in other courses.*
- *If the audience has received training in computer science for business and understands the concepts covered in the next part, the explanation can be continued.*
- *This is primarily a basic understanding of manufacturing and non-manufacturing processes in businesses and an understanding of basic concepts in data processing, computing and communications infrastructure, and information systems used in business practice.*
- *It is desirable for the lecturer to check immediately after the lecture that the audience understands the lecture.*
- *It is also important that the lecturer allows the audience to ask and answer questions, or to explain the context that goes beyond the completed explanation.*

🔊 START THE PRESENTATION

🔊 START THE PRESENTATION SOUND

Slide 7 - Presumptions

Slide 8 - Process

Intelligent process automation is also referred to in the technical environment as RPA - Robotic Process Automation. It is beginning to be widely used in many administrative activities, such as processing invoices, orders, travel orders, and other processes with a high share of routine activities.

Our example is about service intervention management.

The individual process steps must always be clearly defined. Even though artificial intelligence allows a looser description of decision-making conditions, the individual actions within the process must be defined relatively precisely. Freely defined operations can be automated only after their standardization.

🔊 STOP THE SOUND OF THE PRESENTATION - the text "In the event of an electrical fault, contact the chief electrician" appears

The text will be retold by the speaker in their own words:

"In the case of a power outage, contact the chief electrician."

An example would be contacting a chief electrician in the event of an electrical fault. The decision condition "it is a power outage" can be freely defined, as artificial intelligence can be used to identify that it is this category. However, the subsequent "contact an electrician" action must be precisely defined. For example, to send an email to a specific address.

🔊 START THE PRESENTATION SOUND

Slide 9 - Data

It is necessary to have several examples for automatic classification and decision-making, so-called data samples.

Data samples

In applications in which artificial intelligence makes decisions, it is necessary to have or generate a certain number of examples with the right decision.

Examples of the right decision

In case we do not have enough data, a semi-automatic mode is recommended at the beginning, in which workers check and correct the decisions made by the model. This data will then be used for additional AI training.

Slide 10 - Information systems

Process automation is usually not built on a so-called green field; it often integrates with existing information systems.

It is a question of a specific project whether it will be more appropriate to initiate the integration to existing applications or replace some applications.

Some of the frequently used information systems:

CRM - Customer relationship management

CRM is a system that captures all information about customers and their interactions.

ERP - Enterprise resource management

ERP is an enterprise resource planning system that is used to manage and control all resources, workplaces, and business functions with the support of shared data.

Help desk

The help desk is an information system or portal that records all demands and problems of users and how they were solved.

Slide 11 - Technical infrastructure

High-performance computing is usually needed to create a machine learning model. The infrastructure required for subsequent operation is not fundamentally different from the infrastructure for a standard IT system.

It is possible to run the resulting solution in the cloud, but it is often possible to deploy it on-site. Using a virtual server in the cloud is sufficient in a minimal variant.

However, with larger volumes of processed data, the demands on performance increase - similarly to any other information system.

Usual infrastructure requirements

Deployment options:

- Cloud
- On-site

STOP THE SOUND OF THE PRESENTATION

The text will be retold by the speaker in their own words:

End of presentation - option 2

- *For more advanced listeners, the lecturer has got this far and can end the presentation at this stage.*
- *This applies especially if the following parts of the lecture have not yet been covered in other courses.*
- *If the audience has received training in business management and understands the concepts covered in the next section, the explanation can be continued.*
- *It is also important that the listeners know the basic concepts in project management or that the lecturer explains the basic concepts and principles to them.*
- *It is desirable that the lecturer checks the understanding of the audience immediately after the lecture.*
- *It is also important that the lecturer allows the audience to ask and answer questions, or explains the context that goes beyond the completed explanation.*

Slide 12 – People 1

Competent people, whether on the **client's side** or the supplier's side, are crucial for the project's success.

A Sponsor, the owner of the process, the person who has the resources to finance the project and enough power to push for change

- The top position on the customer side is the project sponsor, who is responsible for its financing and, at the same time, ensures the necessary cooperation or eliminates resistance to change in the involved teams.

An Expert on process, provides data samples, examples with the right decision, and other inputs necessary to set up automation

- From a technical point of view, an expert in the process of automation plays a key role. They provide all the detailed information necessary to implement automation.

Support team, supervision of automation functionality, control of artificial intelligence training

- Equally important is the support team that oversees the proper functioning of automation and artificial intelligence training.

An IT specialist ensures the operation of the infrastructure

- If the automation applications are operated on the client's infrastructure, it is necessary to have an IT specialist in the team who provides operational tasks.

 **START THE PRESENTATION SOUND**

Slide 13 - People 2

It is essential on the **supplier's side** to have:

An Architect, designing the necessary infrastructure depending on the operation model (cloud / on-site)

- Architect, providing the design of the necessary infrastructure, whether it is the infrastructure on the customer's premises or a cloud solution.

A Consultant, automation setup expert

- A vital role on the supplier's side is the consultant, who actively communicates with the client's process expert and configures the automation process or the artificial intelligence learning process.

A Computer programmer, creation of algorithms necessary for setting up automation

- In the case of more complex automation requiring the creation of automation algorithms, the programmer is also a member of the supplier's team.

Slide 14 - Organization

Practical cooperation of the professional teams of the supplier and the contracting authority is essential for the success of the project. Fundamental factors, in this case, are a project plan with appropriately set milestones, a communication model defining the system of project meetings, but mainly sufficient allocation of professional teams, and a flexible process model supporting the proactive definition of requirements and timely response to suggestions of the implementation team.

Project plan

- appropriately set milestones and sub-objectives of the project

Communication model

- interaction of professional teams
- regular meetings
- formulation of requirements
- responding to suggestions from the implementation team

Human capacity

- sufficient allocation of the experts
- flexible process model

🔊 *STOP THE SOUND OF THE PRESENTATION*

The text will be retold by the speaker in his/her own words:

Slide 15 - Benefits and risks

The primary benefits of process automation are:

Significant reduction in the duration of automated processes (tens of percent)

- Shortening the duration of the processes, up to tens of percent. There are cases where automation has reduced the time from recording to resolving the issue from an average of 30 days to 2 working days.

Significant financial savings

- Significant financial savings are also directly related to reducing time.

Improving the quality of processing, eliminating human errors

- A significant benefit of automation is eliminating the human factor and related errors due to inattention or weariness of the staff providing routine tasks.

The ability to use the saved human capacity for more sophisticated tasks

- After the automation project is put into operation, several client employees relieve themselves of their routine activities. Their potential can be used for more sophisticated work with higher added value.

🔊 *START THE PRESENTATION SOUND*

Slide 17 - What we should be careful about

For more information, click on the number buttons one by one.

1. Differences between the functionality of the automated process on paper and in reality

We often find that the process works in a certain way on paper, but it works through so-called backchannels in practice, and essential information is communicated orally or by e-mail.

2. Poor data inputs (mainly examples with the correct decision)

If the system is to work correctly, it must have complete information. For example, records such as "The problem from yesterday" or the failure ticket with the text "Failure" cannot be processed correctly. Ensuring that all the necessary information is entered into the system is

essential. A colleague who works in another city and who we cannot contact him by phone should also be able to solve the given problem, only using the information in the system.

3. Resistance to change, fear of job loss

Any change will naturally be accompanied by resistance. Workers often feel threatened in these cases. Therefore, it is essential to work with employees and explain to them the benefits of this solution, especially what will be their future engagement.

II STOP THE PRESENTATION

End of presentation - option 3

- *For the most advanced listeners, the lecturer has made it this far. This is where the end of the lecture occurs.*
- *It is desirable for the lecturer to check the audience's understanding of the presentation immediately after the lecture.*
- *It is also important that the lecturer allows the audience to ask and answer questions, or to explain the context that goes beyond the interpretation that has been completed.*
- *The lecturer should encourage the audience to view the presentation on www.paitool.eu as part of their self-study.*
- *The lecturer should point out to the audience that the digital educational content is on the site in English and Slovak.*
- *It is up to the instructor's discretion whether to revisit the content in a future lesson as a review of the knowledge gained.*
- *Tests and exam questions are not part of www.paitool.eu or this material.*

⌚ START THE PRESENTATION

Slide 17 - This course was created in collaboration

II STOP THE PRESENTATION

Conclusion:

Artificial intelligence has great potential to change the way we solve technical problems in industry. It is helping us to reduce process times, eliminate errors and improve the quality of workmanship. We should also not forget the risks that come with this transformation. It's important to remember that change is not always easy and can be met with resistance from employees. With competent people, quality data and an efficient organisation, we can achieve success.

Finally, I would like to thank all the participants for their attention and openness in listening. I hope you were inspired by our presentation and if you have any questions or need more information, we are here to help.