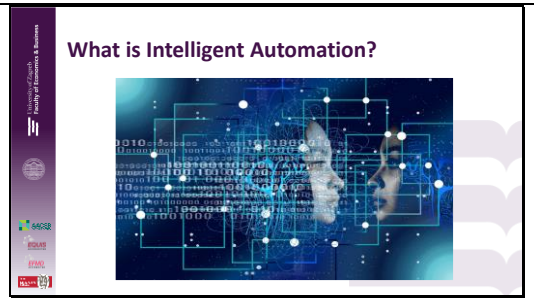
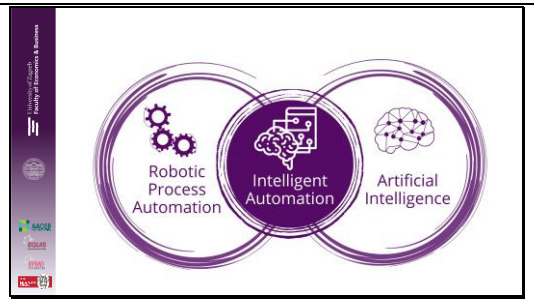
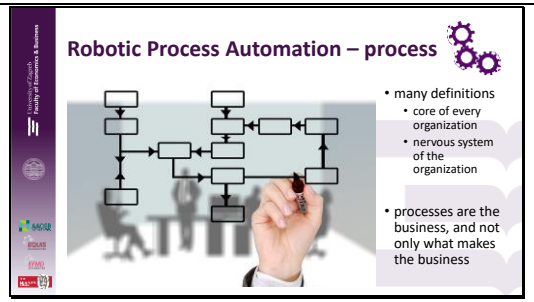
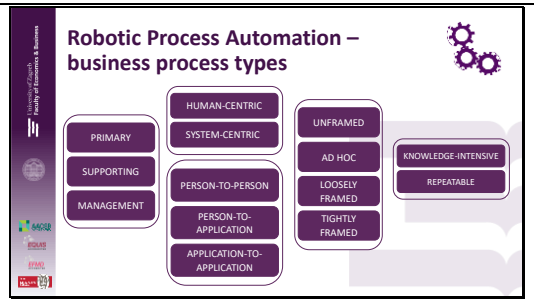
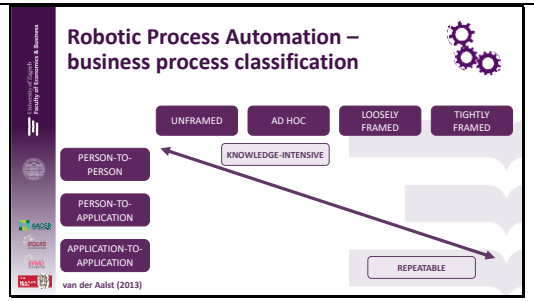
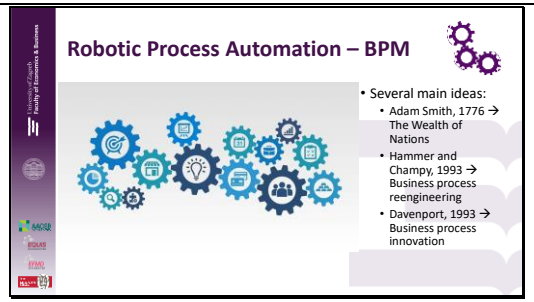
INTELLIGENT AUTOMATION – EXTENDED PRESENTATION NOTES WITH SOURCES		
Slide 1		
Slide 2		The answer to the question What is Intelligent Automation is not so simple and it cannot be answered in a few sentences.
Slide 3		Simply, Intelligent Automation is the combination or the overlap of two big areas: Robotic process automation, and Artificial intelligence.

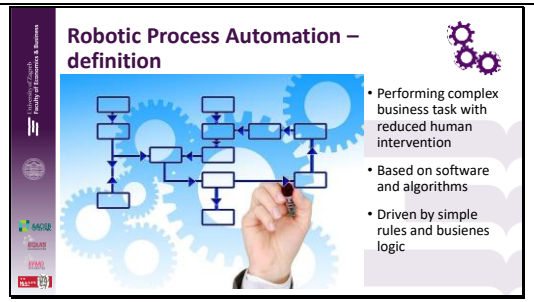
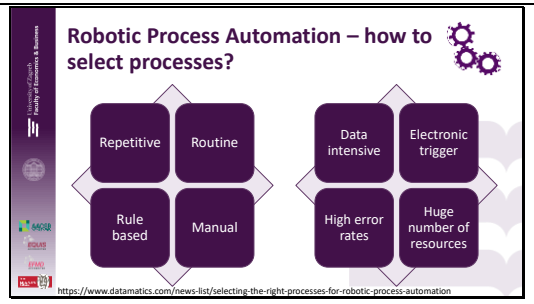
Slide 4		Business processes are a very important part of the organization. They are the core of every organization. Regardless of the size of the organization and the activity the organization is engaged in, every organization functions following certain business processes. However, not all organizations are aware of their business processes to the same extent and therefore some organizations do not have formally defined business processes at all, while on the other hand, there are many organizations that have carefully elaborated, formally defined and designed business processes. Some authors like Khan argue that business processes represent the nervous system of the organization, which is why it is extremely important to manage them adequately. In more formal way, some dictionaires define the process as the flow, path and manner in which something is or becomes, development or the procedure. An even clearer definition of process is that given in the Cambridge dictionary, according to which a process is a series of actions or events carried out to achieve something or achieve a certain result. If processes are viewed in a business context, a business process can be defined as a series of related actions that need to be performed in order to achieve a specific business result. However, there is no single and widely accepted definition of a business process, but there are rules that can reduce confusion associated with the definition, and those rules are determined by the consensus of business process management experts, whereby the definition does not contain a description of the minimum number steps, actions, rules or paths in work tasks. Still, a large number of authors provide different definitions of business processes, most of which are usually short and concise, for example *a business process is a set of internal activities that are performed to serve the customer or client* or *the specificity of organizing functions performed in a company* or *an activity or a set of activities that fulfills a specific organizational goal*. On the other hand, there are also longer definitions of business processes which include resources, values and goals. For example, business process is *a set of activities that use one or more types of inputs and create outputs that have value for customers* or *a complete set of connected dynamic business organizational activities that are scientifically designed to meet customer expectations or to meet business goals and objectives that are defined at the business strategic level* or *a series of logically connected activities that use the company's resources, and whose ultimate goal is to satisfy customer needs for products or services of appropriate quality and price, in an adequate time frame, with the simultaneous realization of some value* or *a special type of process that is defined as a series of tasks or actions that are performed in a certain order by employees or other resources in charge of it based on input data in order to produce the necessary output data to fulfill business goals*. However, by mixing and matching different available definitions of a process, putting it in a business context and taking into consideration process characteristics, busienes process can be defined as a series of logically connected activities that have an owner, duration and required input resources, which must be performed in order to achieve a certain business result of the organization. Nevertheless, it's important to remember that the processes are the business, and not only what makes the business, as Davis and Brabander state.
Slide 5		The most common classification of business processes lists three main types of business processes which are 1. primary business processes 2. supporting business processes 3. management business processes **Primary business processes**, which are also called core or operational ones, refer to the basic processes by which a company delivers a final product or service to its customers or clients, and each step that includes primary processes adds value to those products or services. They are crucial for business considering that they deal with core values and run parallel to the vision and mission of the business, and include the following processes: • *sales* - which refer to independent processes on which the entire company actually depends, given that such business processes generate income, and the company is unable to function, survive and develop without income;

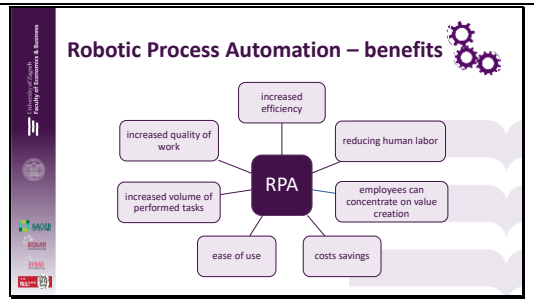
		• *customer service* - which refer to processes that can retain existing customers or bring back lost ones, considering that such processes provide customer support services, i.e. management of situations in which customers need help, • *financial department* - which refer to the processes that manage incoming and outgoing finances, that is, income and expenses and investments; • *operational* - which refer to supply chain management processes and also represent the basis of business without which the company cannot survive; and • *production* – which refer to the processes associated with the production of products (from the production plant to packaging and shipping) or the provision of services (standardized flow of services) that can be sold to customers. **Supporting business processes** are processes that do not add direct value to the final product or service, but they do support the day-to-day business operations of a company by creating an environment in which primary processes can run efficiently and smoothly. The improvement of supporting business processes strengthens the planning of the business strategy, while they enable the smooth functioning of the company. Supporting business processes are: • *processes of accounting procedures* - which are responsible for the smooth and efficient functioning of the financial department, and refer to processes related to the company's cash flow, and the authenticity of transactions; • *management processes* - which refer to middle management processes, that is, to those processes that deal with company expansion; and • *processes of the human resources department* - which are responsible for the smooth functioning of employees, i.e. resolving conflicts and disputes, strengthening communication between employees, encouraging values and achieving career goals, and smooth replacement of older employees who leave the company with younger staff. **Management business processes** include monitoring, analysis and control of other business processes of the company, i.e. daily business activities. They are used for business management through strategic, tactical and operational planning, and are responsible for corporate and strategic management and the management of company operations in terms of setting goals and standards that lead to the efficient and effective operation of primary and supporting processes and for harmonizing and managing risk. They also do not add direct value to the final product or service of the company, but they do help to create and maintain the brand and ensure prominence in the market, thereby adding value to customers in the context of intangible values . Furthermore, there are two classifications that are simmilar. The first one classifies business processes into two large groups: • human-centric and • system-centric. The other one is simmilar, but deeper, where business processes are specifyed **according to the nature of the process participants**, so there are: 1. Person-to-Person process (P2P), 2. Person-to-Application (P2A) processes, and 3. Application-to-Application (A2A) processes. **Person-to-person (P2P)** processes are processes whose participants are to the greatest extent people, that is, which to the greatest extent imply human involvement in the course of the process and the execution of tasks, and are supported by job

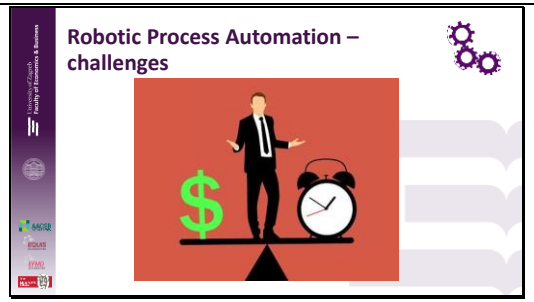
		monitoring tools, project management and group software, which do not involve fully automated tasks but require human intervention. **Person-to-application (P2A)** processes are processes that include both tasks that require a human to perform and those performed by applications without human intervention (Dumas et al., 2005). In other words, such processes involve both people and applications, where people are most often involved in the information system in the context of decision-making. **Application-to-application (A2A)** processes are processes that include only tasks performed by applications, i.e. software systems, are typical of the field of distributed computing and are supported by transaction processing systems, Internet integration servers, and enterprise application integration platforms. Next, there is the classification that takes into account the **predictability of the business process**, according to which there are four types of business processes: • **unframed or unstructured business processes** – where there is no explicit process model, which is most often the case with collaborative processes supported by group software systems, which do not offer the possibility of defining a process model; • **ad hoc business processes** - where the process model is defined a priori, but is executed only once or a small number of times before changing or discarding, which is most often the case in the environments of project management and scientific computing; • **loosely framed or loosely structured business processes** - in which the process model is defined a priori and there is a set of constraints so that the predefined model describes the normal state, while allowing the actual performance of the process to differ from the model with certain constraints, which is most often a case in a case-handling environment; and • **tightly framed or tightly structured business processes** - in which an a priori defined process model is constantly followed, which is the case with traditional workflow management systems. The boundaries between the last two classifications (nature of the participants and predictibility) are not clear, and that there is a whole range of tools and techniques from manual (P2P) to automated and application-driven (A2A) processes. There is also a large number of possibilities between loosely structured and tightly structured business processes. Lastly, there are knowledge-intensive business processes and repeatable business processes.
Slide 6		Van der Aalst (2013) presents a framework for the classification of business processes, according to which most business processes can be found on the diagonal of the framework. On the left of the framework there the classification **according to the nature of the process participants,** while on the top there is a classification **according to the predictability of the business process**. Van der Aalst says that most business processes can be found on the **diagonal** of this framework. The more the process is people-oriented and less structured the more it is **knowledge-intensive,** while **repeatable** business processes are automated and tightly structured, which is important for robotic process automation.

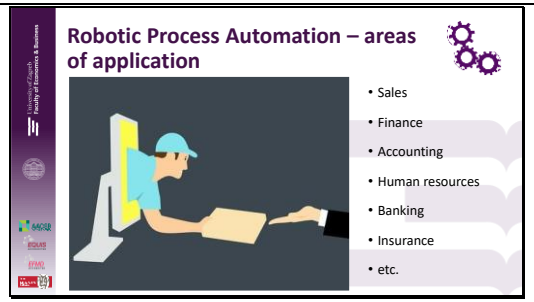
Slide 7		In today's business world, there is a large number of organizations that have introduced the concept of business process management into their operations, while, on the other hand, there are also organizations for which business process management is not the focus of their daily operations. However, it is evident that business process management in today's business world could be considered one of the most important aspects of successful and sustainable business. The importance of business process management as a discipline is recognized both by the scientific community and by business practice, as evidenced by the large number of available systems for business process management and the large number and range of conferences related to topics that concern the management of business processes. Robotic process automation cannot be done without the business process management because it is important to know business processes and know how to manage them in order to be able to automatize them and to select the ones that are suitable for automatization. The concept of business process management rests on several main ideas, there are top three on the slide. The very beginnings of developing the idea of managing business processes can be found already in the description of the division of labor given by Adam Smith back in 1776 in his famous work "The Wealth of Nations". Smith describes the division of labor on the example of making pins, arguing that the said work can be divided into several branches, that is, into approximately eighteen individual operations where each worker will perform one or more operations. In this way, Smith actually describes the pin making business process where each operation represents an activity in the process that is repeated in each new pin making process. As a separate discipline, business process management began to develop only in the mid-nineties of the twentieth century. Its development is based on the ideas of Hammer and Champy (1993) on the one hand, and Davenport (1993) on the other. Hammer and Champy (1993) talk about business process reengineering as an organizational concept that focuses on the radical restructuring of the company's business system using business process modeling with the support of information technology, with the aim of improving the company's performance in terms of meeting the needs of customers related to the provision of products and services of appropriate quality and price, while at the same time reducing delivery time and increasing profits. They emphasize that reengineering business processes does not mean "patching holes", i.e. fixing defects in existing business processes and organizational structure, nor making incremental changes that will leave the basic structures of business and processes untouched, but "start again". The definition of business process reengineering says that reengineering is "the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, modern performance measures such as cost, quality, service and speed. Hammer and Champy emphasize four key words: (i) fundamental, (ii) radical, (iii) dramatic, and (iv) process. In this sense, in order to reengineer business processes, the company must change its business organization from a traditional and functional organization to a process organization. Also emphasizing the importance of changing the focus when organizing business from traditional and functional to process-based, Davenport (1993) brings the idea of business process innovation, emphasizing that a revolutionary approach to improving business performance must include not only the way in which business is viewed and structured, but also the way in which they can be improved and how business needs to be viewed in terms of key processes, and not in terms of functions, divisions or products. Business process innovation combines the adoption of a process view of business with the application of innovation to key processes. It differs from business process reengineering, given that innovation includes

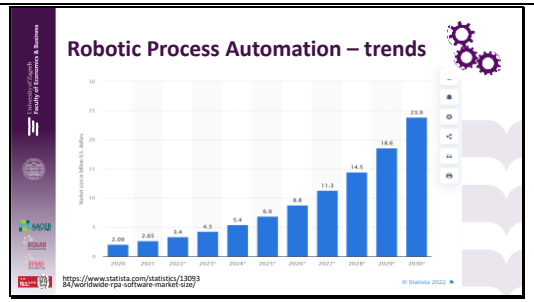
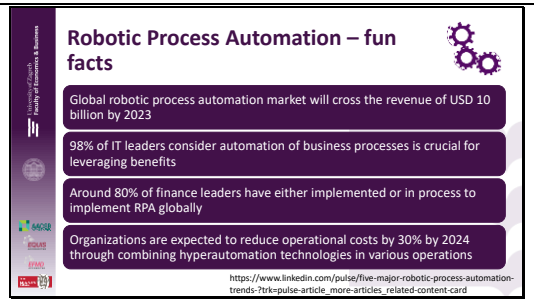
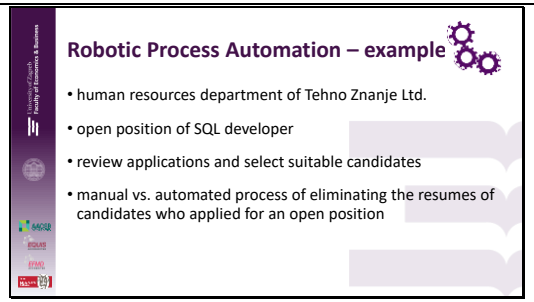
		the prediction of new business strategies and activities of designing real processes, as well as the implementation of changes in the technological, human and organizational dimensions of business processes, while reengineering is only part of what is needed to radically change processes. Business process management is the development and control of processes used in a company, department, project, etc. to ensure their effectiveness. Harmon as one of the most known business process management experts describes it as a management discipline focused on to improve corporate performance by managing the company's business processes. It is also a business approach to change management due to the improvement of business processes, whereby changes encompass the entire life cycle of the process: from analysis and design to implementation, automation and process execution. Business process management is a discipline that combines information technology and management and applies knowledge of those two to business processes. *In addition, Dumas et al. (2018) define business process management as the art and science of monitoring work in an organization to ensure consistent outcomes and take advantage of improvement opportunities, while Venkatakumar and Schmidt (2019) define it as a robust concept for identifying, monitoring, analyzing, operating, controlling, modeling , documenting, improving and automating real-world business processes involving human and other resources and computer systems.* Business process management is a multidimensional approach aiming to achieve better business performance through continuous process improvement, optimization and digital transformation. It is a holistic discipline and should take into consideration all aspects of doing business, not just IT but also culture, social aspects, environment and simmilar.
Slide 8		There are many changes in the global economy which have been driven by the development of new technologies. Such changes require businesses to become more agile and to quickly response to the needs, wishes and demands from their customers. In that sense, it is greatly important for the organizations to be able to direct their efforts towards new technologies which could provide support for quicker responses to the changes on the market. Automation is the answer to the frequently asked question of how it is possible to do a job more efficiently, flexibly, faster and more productively. In order to achieve this, it is necessary to carry out digitization, which will modernize existing business processes by introducing new technologies and enable the necessary change. Digitization has become unstoppable, it changes work processes in all business sectors, and it is impossible for it to affect only one process, and the most advantages can be seen precisely in tasks that take a lot of time due to the need to do them manually, such as paperwork, maintaining Excel tables or e-mail correspondence. This is exactly why robotic systems are an attractive solution because they offer automation of repetitive tasks.

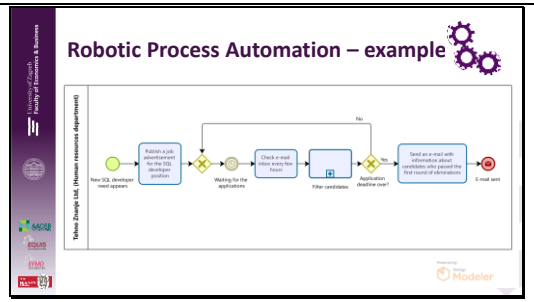
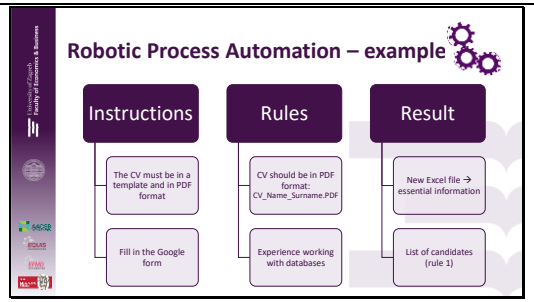
Slide 9		Business process automation is defined as workflow automation or process automation because it represents the way in which technology and automation are used to perform complex business tasks with reduced human intervention and of course effort. The fundamental determinants when introducing automation are defining the scope, or where is the beginning and where is the end of that process, and the actions that will take place between those two points. Automation of business processes is especially important for systems that interact with other systems. In order for such systems to evolve, it is necessary to introduce robotic systems into business processes that use a lot of unstructured data and where business tasks are repeated. Those are software robots which deal with discreet, repetitive tasks and execute processes as a human would. RPA refers to tools that provide the possibility of connecting internal processes with external ones and are of vital importance for business operations, and their main feature is the elimination of complex coding and manual processes that become automated. RPA can replace employees on a repetitive tasks and automate them, and therefore, enable employees to be involve in more complicated tasks which can bring organization more value. According to the reports of consulting companies RPA is recognized as an emerging and disruptive technology that is already delivering value. RPA is defined as the application of specific technology and methodologies which is based on software and algorithms aiming to automate repetitive human tasks. It is mostly driven by simple rules and business logic while interacts with multiple information systems through existing graphic user interfaces. Its functionalities comprise the automation of repeatable and rule-based activities by the use of non-invasive software robot, called "bot", as I said, not the actual phisical steel robots. RPA is a software solution configured to interact with existing applications and systems the way like human would do. Most of the definitions define traditional RPA as an emerging technology which automates repetitive human tasks, both digital and physical. Those tasks are usually error prone and therefore are suitable for automation. Recently, RPA definition is extended towards its conjunction with artificial intelligence, cognitive computing, process mining, and data analytics. The introduction of the advanced digital technologies allows RPA to be reallocated from performing repetitive and error-prone routines in business processes towards more complex knowledge-intensive and value-adding tasks. The RPA vendors' partnership with the main leading artificial intelligence providers enabled the extension of traditional RPA functionalities with the new, emerging technologies such as self-learning from process discovery, training robots, AI-screen recognition, natural language generation and automated processes documentation generation.
Slide 10		When selecting the processes for RPA, they should be repetitive and routine and that's one of the most important characteristics in selection. Datamatics says that businesses can safely select processes, which involve any of the following criteria, for the business-transformation: **Repetitive in Nature:** Manual and repetitive tasks are the right processes. **Rules-driven:** Processes that are rules-based and consistent are good candidates. **Manual Calculations:** Laborious tasks involving manual calculation of results, where one error leads to another. **Data Intensive:** Tasks that involve systematic churning of voluminous data. **Electronic Trigger:** Processes that commence on receiving electronic data files. **High error rates:** Tasks that involve paper-based data entry or are interdependent. **Huge number of resources:** Tasks involving many resources and multi-step processes. They could also be: **Out-of-Hours jobs**: Seasonal work overloads, round the clock tasks, which involve resolving complaints, orders, etc. **Electronic Start/End points:** Processes involving digital inputs/outputs with intermittent manual steps. **High Compliance:** Processes which require audit proofs for regulatory compliance's. **Validations:** Tasks involving multiple systems where validations are required at each synapse.

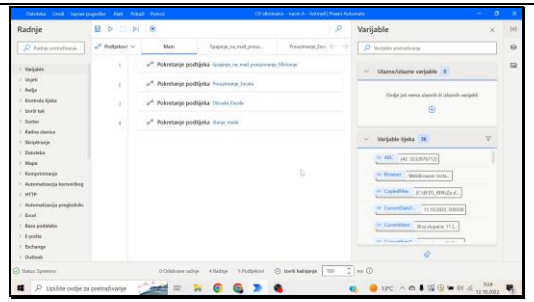
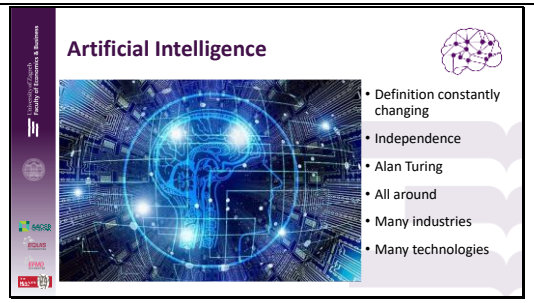
		Selecting the right process, which falls under the above defined criteria, automatically translates into quick Return on Investment. The process could be small but the savings achieved at the end of the year are significant. Simple processes reach breakeven in 2 - 4 months, medium complexity processes in 6 months, while highly complex processes reap ROI anywhere between 6 - 24 months. It is interesting to note that enterprise roll-outs and centralization of operations using RPA bring in efficiencies of scale. From a business perspective, RPA is mainly used to "capture and interpret existing applications for processing a transaction, manipulating data, triggering responses and communicating with other digital systems". Thus, it is considered "suitable for high volume, repetitive, monotonous, well-structured and standardized tasks, where there is no need for subjective judgment, creativity or interpretation skills". RPA solutions are minimally invasive, easy to use, inexpensive and quite simple to implement since RPA sits on the top of existing information systems, does not store any transactional data and does not require a database. Source: https://www.datamatics.com/news-list/selecting-the-right-processes-for-robotic-process-automation
Slide 11		Benefits of the RPA implementation in business practice include: increased efficiency; reducing human labor, i.e. reducing workforce; employees can concentrate on value creation; costs savings; ease of use; increased volume of performed tasks, and increased quality of work, i.e. tasks are performed accurately, correctly and consistently. Moreover, automation can be extended from a task level to a business level, by also automating the handover of work between tasks. This will increase the overall process performance and generate great cost savings. Also, RPA improves data quality and makes data manipulation tasks more comprehensive. The perceived value of RPA is mainly related to organizational performance enhancement and costs reduction by reducing human labor in routine business processes, and also by increasing the quality of the work On the other hand, the outcomes that cannot be directly measured financially are also comprised, such as competence, market position, innovation, knowledge discovery, research and development When implementing RPA, no underlying systems programming logic needs to be changed as systems are accessed through the presentation layer. RPA do not require expensive systems integration. Many RPA products are also relatively easy to learn and can therefore be implemented by business professionals rather than IT professionals. RPA software with its graphical interface is designed for non-programmers and advanced IT skills are not needed in robotizing processes. This enable business users to create quick solutions themselves and allow for agility in changing business processes. RPA is a relatively cost-effective method of process automation. With RPA, automation can be implemented in a short timeframe (usually from couple of weeks to maximum of few months), allowing for a fast return on investment. For example, Willcocks and Lacity reported an ROI of between 650% and 800% over three years for process automation at O2, a U.K. mobile telecoms operator. RPA enables automation of processes, which have been previously considered too costly to automate. Typically, the costs of a software robot are between 10%-19% of an in-house full-time equivalent (FTE) and between 33%-50% of an offshore FTE.

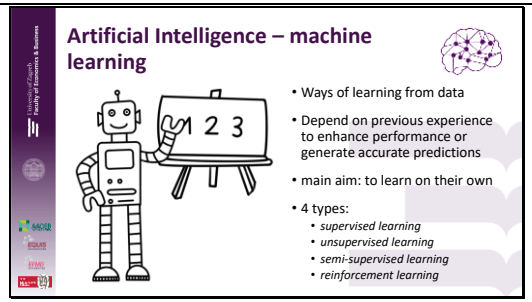
Slide 12		Implementing RPA represents a challenge and organizations must learn to manage RPA adoption to achieve maximum results. Since sometimes the costs of RPA development and maintenance can exceed the obtained savings business processes must be carefully analyzed in order to evaluate their suitability for RPA. Replicating a complex process with many variants using RPA is typically tedious and requires significant investment which is why the cost of maintaining and servicing the robots could outweigh their acquired savings. One of the key challenges for RPA is to effectively identify processes and tasks that are suitable for automation. It is therefore crucial to understand the maturity of business processes and decide which processes are standardized enough to benefit from RPA and which processes would benefit from harmonization and standardization prior to starting an RPA initiative. Some authors claim that RPA has the potential to make mistakes faster and with higher certainty because there is often no human check before executing an action. Also, there are still risks and challenges in RPA utilization itself. If the process has errors when performed manually and the same process is automated without correcting the mistakes in the process, the RPA technology will continue generating the mistakes. Furthermore, the flaws may be even more significant, as RPA performs everything more efficiently. Therefore, the workflow process must be built correctly to avoid mistakes in the automated process. As RPA is very scalable, the mistakes are also very scalable. Therefore it is crucial that the automation process is built in cooperation with those who know the process properly. Utilization of RPA also requires capabilities within the organization, not only in IT functions, but also dedicated business users. As RPA is a software-based solution, the inputs must be digital and the process must be rule-based. RPA is technology independent, and robots can use any applications and sources from the mainframe to Excel and from CRM (customer relationship management) or ERP (enterprise resource planning) to web applications. This, however, assumes existing infrastructure built on heavyweight IT tools. Other lightweight solutions, like macros and scripting, have existed already for decades. However, RPA can be seen as an evolution from these basic tools, as enterprise RPA platforms allow defining a lot richer logic and support more complex processes. Compared to these solutions, the most notable potential of RPA lies in automating processes that are deeper in the traditional domain of knowledge workers. Nevertheless, it is important to emphasize that RPA tools are unable to make decisions or adapt to the changing environment. Therefore, RPA is most valuable in strictly defined, low cognitive, high-volume tasks RPA raises interesting academic research questions such as how to design and program robots and to integrate them with BPM systems, how to leverage RPA as a vehicle to support AI-enhanced processes, and how to use artificial intelligence techniques to program RPA solutions based on goals.

Slide 13		Several business functions are recognized by business practitioners as good candidates for RPA implementation, among which the most often mentioned are sales, finance and accounting, and human resources management. A majority of early RPA adopters automated their back-office tasks and internal support processes, like accounting, billing, travel expenses, master data management, keeping employee records and claims processing, but recently several researchers documented a number of RPA applications aiming to automate core business processes and shared service operations. Also, it is essential that the tools of robotic automation systems can be applied to both web and mobile environments. Robotic automation systems are of particular interest to industries that traditionally adopt new technologies quickly, especially process-aware information systems such as banking and insurance. They can also be applied in many industries, and are mostly implemented in the following: • retail, • construction, • telecommunications, • oil industry, • pharmaceutical industry, • automotive, • fashion industry, • logistics, • food industry. In **retail**, robotic systems can be used for tasks that include automatic price and inventory adjustments, obtaining data from customer opinions and complaints. Such data is later used by several departments in the company from marketing, sales, development and production. In the **pharmaceutical industry** RPA enables the automation of tasks related to receiving shipments, demand forecasting and planning, supplier relationship management, inventory control, and production testing. **The fashion industry** relies heavily on speed and accuracy, so robotic systems are the perfect solution for performing automated jobs in logistics, online advertising and digital product creation.Robotic automation in **logistics** and supply chains improves company efficiency as long-term processes in the area of inventory management, supply and demand planning, and freight management improve business efficiency and profitability after automation. Companies in the **food industry** can benefit from robotic process automation tools to help them organize and update production records, audit food safety, health and safety documents, validate data for risk assessment, internal and supplied by suppliers The processes that are most often automated are (DataLab, 2021): ➢ e-mail and notifications, ➢ calculations and invoicing, ➢ support, ➢ conclusion of the year in business books, ➢ customer support, ➢ production services, ➢ storage and use of large amounts of data, ➢ making backup copies of data, ➢ employee requests for annual vacations, leave from work, tracking working hours and arrivals and departures from work, and ➢ processes related to the operation of call centers, and processes related to sales.

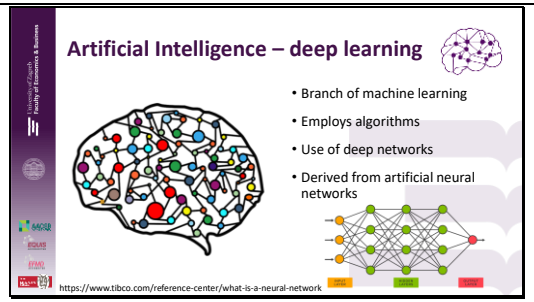
Slide 14		Spending on robotic process automation (RPA) software worldwide from 2020 to 2030 *(in billion U.S. dollars)*
Slide 15		
Slide 16		The example shows the human resources department of Tehno Znanje Ltd. The mentioned company is a company that deals with information technology (IT). According to the adopted employment strategy, it is necessary to announce a competition for the position of SQL developer. After all interested candidates have applied for the announced competition, it is necessary to review their applications and select suitable candidates for the further procedure.

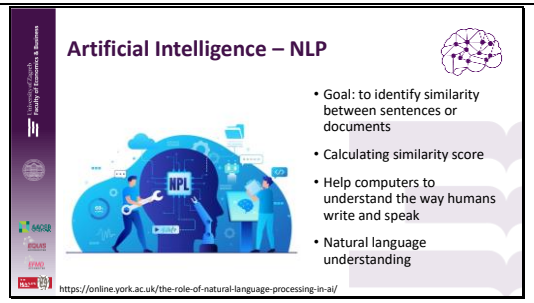
Slide 17		This model is made in Bizagi modeler using BPMN 2.0 notation, which is the grapical representation of the processes, activities, events and gateways as main symbols. IT company Tehno Znanje Ltd. posts a job ad for the position of SQL developer on its website. The advertisement contains information about the position, a description, instructions and an e-mail address to which the data of the candidate applying for the advertisement should be sent. In the instructions, it is stated that with the e-mail it is necessary to attach the candidate's CV and a description of the experience that the candidate or potential employee has in the requested field. After that, an employee in the human resources department checks e-mails every few hours and filters good candidates or possible new employees from others. In the mentioned process, there is a possibility of various problems, such as different formats of CVs, applications of people without experience, applications of candidates for the wrong ad, applications with wrong information and the like. At the end of the process, the employee of the human resources department should send an e-mail containing information about the candidates who passed the first round of elimination and will be further considered for the possibility of employment.
Slide 18		The previously described process of eliminating candidate resumes that do not fit the company Tehno Znanje Ltd. it is possible to automate. In this way, human resources employees can save their valuable time that was spent manually checking emails every few hours and selecting those candidates who fit the needs of the job opening. In the automated process, job candidates still send their resumes or CVs via e-mail, however, in order to automate the previously shown process with the help of a software robot, in addition to the SQL developer job advertisement published on the website of the company Tehno Znanje Ltd. two instructions are attached: • INSTRUCTION 1: The CV must be in a certain form and in PDF format, the template can be downloaded from the advertisement, and INSTRUCTION 2: it is necessary to fill in the Google form, which is also in the ad. The task of the software robot is to log into the e-mail account, filter all incoming e-mails and select all those e-mails that contain an application for a job vacancy. After that, the software robot will extract data from the candidate's CV and the database based on the completed Google form and will check whether the candidate meets the default rules according to which it is determined whether the candidate passes to the second round of consideration for the possibility of employment. As previously stated, there are two rules for determining whether a candidate passes the second round of consideration for the possibility of employment, namely: • RULE 1: the document containing the candidate's CV should be in PDF format, and its name should be formatted as "CV_Name_Surname.PDF", and RULE2: the candidate must have experience working in databases. If the registered candidate meets both rules, he goes to the second round of consideration for the possibility of employment for the position of SQL developer in the company Tehno Znanje Ltd. After processing and extracting the candidate's data and checking the conditions, it is necessary to compile an Excel file that will contain essential information about the candidates that will facilitate the company's process of selecting an adequate candidate for the position. This is information that is predetermined by the responsible persons in the company, and includes the candidate's ID, first name, last name, e-mail address, contact number, age, experience and a description of the experience. In addition to the mentioned Excel file, it is also necessary to compile a list of candidates that will be sent by email to the responsible persons as an attachment to the previously mentioned Excel file. The list of candidates should contain those candidates who have met rule 1, while those who do not meet rule 1 must not be on that list. If the candidate meets rule 2, the note "YES" and his ID should appear next to his first and last name on the list, and if the candidate does not meet rule 2, then the note "NO" should appear next to his name on the list. In addition, it is necessary to attach a file for assigning IDs to candidates.

Slide 19		Microsoft Power Automate is a software solution for automating business processes owned by Microsoft. Power Automate is available as a cloud solution, while the Power Automate Desktop version can be downloaded, installed and used on computers. Before solving the task, it is necessary to create the EFZG_RPA folder on the C: drive. The C: drive is chosen as the folder storage location to obtain a file path that exists on any computer, which enables the process to be started from any computer. All files that will be used in the process will be saved in the specified folder. After creating the folder, it is necessary to start the Power Automate Desktop program and create a new process. For the purpose of this task, the process will be called CV eliminator. In order to create a software robot, it is necessary to first create four additional subflows, in addition to the preset Main subflow, named: (1) Connection_to_mail_retrieval_filtering, (2) Download_Excel, (3) Processing_Excel i (4) Sending_mail.
Slide 20		The definition of Artificial intelligence is constantly changing as certain topics cease to be classified in the field of artificial intelligence and new topics emerge. An old ("geek") joke defines artificial intelligence as "exceptional things that computers can't do". The irony is that according to this definition, artificial intelligence can never advance: as soon as we find a way to do something extraordinary with computers, it ceases to be considered an artificial intelligence problem. However, there is some truth in that definition. For example, fifty years ago automatic methods of search and planning were considered to belong to the field of artificial intelligence. Today, every computer science student learns about these methods. Similarly, so much is already known about certain methods of processing uncertain information that they will probably move very quickly from the field of artificial intelligence to the field of statistics or probability. Artificial intelligence does not have only one dimension or axis, so it is not easy to define. Artificial intelligence is a simulation of human intelligence reproduced by machines (Boban, 2022). In this way, an attempt is made to create a system that will be able to copy most human actions, at least as far as those related to business interaction and work tasks are concerned. A bit more complicated definition by European Parliament says that AI is the ability of a device to imitate human activities such as reasoning, learning, planning, performing given tasks and solving problems. Artificial intelligence can be defined as any non-living system that exhibits intelligence, and these are usually computer systems (Encyclopedia, n.d.). Artificial intelligence is defined as the ability of an inanimate system to be able to navigate new situations independently and without the help of humans using a system of thinking and logical reasoning (ARZ!, n.d.). Also, artificial intelligence is defined as a set of concepts, problems and methods for solving these problems (Elements of AI, n.d.) which greatly distinguishes it from robotic systems as explained later in the paper in chapter 4.1. Given that artificial intelligence is also defined as a part of computer science (informatics) that deals with the development of the ability of computers to perform tasks that require some form of intelligence, i.e. to be able to navigate new situations and learn new concepts, draw conclusions, understand natural language, recognize scenes, etc. (Croatian encyclopedia, n.d.). Artificial intelligence is a program that has the ability to work on all possible devices that have the ability to interact with their environment (Paschek

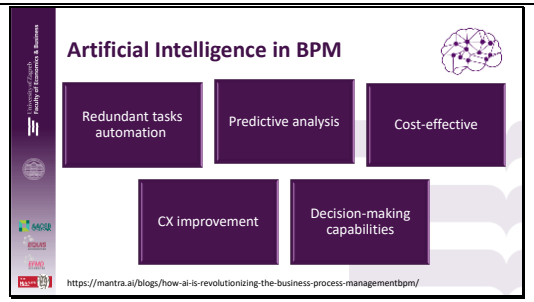
		et al., 2017). The properties attributed to artificial intelligence are: independence because it has the ability to perform tasks without constant guidance from the user and adaptability because it has the ability to learn from experience (ElementsofAI, n.d.). The father of artificial intelligence is considered to be **Alan Turing**, who developed a computer in 1936 and made it possible for non-living things to become intelligent. To show how machines can think, he created a test, called the Turing test, where questions are asked to a computer and a human, and if the person conducting the test fails to distinguish between their answers, the computer is considered to be an intelligent machine. Today, artificial intelligence is integrated into people's everyday lives, often without even realizing it. Various services that people use, such as: online shopping and advertising, internet search, machine translation, digital personal assistants, smart cities and homes, autonomous cars and many others such as Facebook and Google algorithms, facial recognition in photos and the like, are examples of the application of artificial intelligence in everyday life. (European Parliament, 2020). Artificial intelligence is also used in many industries, such as manufacturing industries, mining, military, transportation, medicine, engineering, biotechnology, traffic, video surveillance, and the like. It is also used in the household, although there is limited artificial intelligence in the devices to perform the required functions in washing machines, dishes, TVs or irons. Considering the prevalence of artificial intelligence in our lives, the question arises, how long will it take for artificial intelligence to perform work independently without human assistance? There are many AI technologies such as: Natural Language Processing Speech Recognition. Machine Learning. Virtual Agents. Expert Systems. Decision Management. Deep Learning. Some of them are very important for Intelligent Automation.
Slide 21		Machine learning is a branch of artificial intelligence that studies the ways in which machines and humans can learn from data. In the 1950s and 1960s, the science of discovering knowledge from databases attempted to simulate on computers the ways in which humans learn, and subsequent research has focused on developing algorithms and methods that can learn well and perform certain tasks (Miller, 2010). Goodfellow et al. (2016, p. 96) describe machine learning as “a form of applied statistics with increased emphasis on the use of computers to statistically estimate complicated functions and a decreased emphasis on proving confidence intervals around these functions”. As explained by Mohri et al. (2018), machine learning is a wide phrase that refers to computational techniques that depend on previous experience to enhance performance or generate accurate predictions. That experience refers to the learner's prior knowledge, which is normally in the context of electronic evidence gathered and granted access for study, and such knowledge could be, for example, digitized human-labelled training sets or other forms of data collected from interaction with the environment. Machine learning, according to Experts.ai (2020), is an application of artificial intelligence that enables computers, i.e. machines, to learn and grow on their own without having to be explicitly programmed in the process. To put it in other words, it is concerned with the creation of computer programs that can access data and learn on their own from the material they are presented with (Experts.ai, 2020). Consequently, the main aim is for machines to learn on their own, without the need for human intervention, and to change their behaviour as a result of their learning (Experts.ai, 2020). While Goodfellow et al. (2016), explain two major categories of machine learning algorithms, being: (i) supervised learning, and (ii) unsupervised

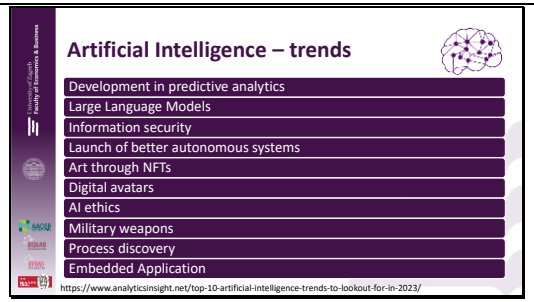
		learning, Ayodele (2010), Fumo (2017), Dutta et al. (2018) and Mohri et al. (2018) offer a list of four kinds of machine learning, which are as follows: *supervised learning* – in this instance, human specialists act as instructors, providing the machine with training data including input/predictor data and showing correct responses (output) in order for the computer to understand patterns from the data; supervised learning algorithms try to model connections and dependencies between the goal prediction result and the input characteristics in order to anticipate the output values for new data using the relationships learned from prior data sets; however, this is not always successful. Among the most popular algorithms are closest neighbour, naive Bayes, decision trees, linear regression, support vector machines (SVM), and neural networks, among others; *unsupervised learning* – when unlabelled data is used for machine training, there is no teacher, and after learning patterns in data, the machine is able to show new things, which is especially useful when the human specialist is unsure of what to look for in the data; it is commonly used in pattern recognition and descriptive modelling; examples of common algorithms include k-means clustering and association rules; *semi-supervised learning* – this case can be classified as a hybrid of supervised and unsupervised learning techniques because semi-supervised learning techniques take advantage of the fact that unlabelled data contains valuable knowledge about group criteria, even when the group memberships are unknown; in certain realistic cases, the cost of labelling is prohibitively expensive and necessitates the use of professional human experts, which results in the use of supervised learning techniques in the absence of supervised learning techniques; and *reinforcement learning* – this approach aims to use insights gathered from environmental interactions to take actions to optimize the rewards and minimize risk; an agent for strengthening learning algorithm is also called and it learns from the context in an iterative way about the interactions of its environment before exploring the maximum spectrum of potential conditions. Besides previously described four types of machine learning, Mohri et al. (2018) add the following: *transductive inference* – the learner gets a labelled testing sample as well as a collection of unlabelled evaluation points, much like in the semi-supervised case; the main aim of transductive inference is to predict labels only for these specific test points and it tends to be a simpler task that corresponds to the situation used in many modern applications, but the conditions under which improved results can be obtained in this setting are still open research questions; *on-line learning* – multiple rounds are used in the online scenario, and the preparation and assessment stages are combined together; the learner receives an unlabelled training point in each round, makes a guess, receives the true mark, and loses, aiming to minimize the total loss for all rounds; on-line learning does not make any distributional assumptions, instances and their labels could be selected in a competitive manner; and *active learning* – the learner gathers training samples in an adaptive or immersive manner, usually by querying an oracle for new point marks, aiming to reach a level of success similar to that of supervised learning, but with less labelled instances.

Slide 22		Growing popularity of machine learning and the development of the computing capacity of computers enabled the emergence of one of the branches of machine learning in 2011 called deep learning (biSmart, 2021). Deep learning, according to the Cambridge Dictionary (2021), is a kind of artificial intelligence that employs algorithms, i.e. sets of mathematical instructions or rules based on how the human brain works. On the other hand, according to Dong and Wang (2016, p. 581), deep learning is defined as "the use of deep networks that are linked to calculate algorithms that in turn use several layers to produce an output", while Munappy et al. (2019, p. 140) describe it as "one of the most exciting and fast-growing techniques in Artificial Intelligence" and stress out that deep learning makes significant progress in tackling issues that are currently being addressed by other techniques. Deep learning is derived from **artificial neural networks**, which refer to systems that are based on biological neural networks, such as those found in the brain (Sayad, 2021). Through the learning process, artificial neural networks use nonlinear mathematical equations to establish meaningful connections between input and output variables (Yeh & Lien, 2009). According to Cios et al. (2007), interest in artificial neural networks comes from the understanding that the human brain is the greatest instrument for identifying and modelling data. Using computers, artificial neural networks try to replicate the rebuilding of biological brain networks, resulting in artificial neural networks being made up of a network of artificial neurons called nodes that are linked, with the strengths of their interconnections given a value depending on their strength: inhibition (maximum -1, 0) or excitement (maximum +1, 0). (Sayad, 2021). To put it in other words, a neural network, according to Zhang et al. (2021), is made up of a collection of neurons (or nodes) that receive and process signals from other neurons. Each neuron may change its internal state (activation) in response to the signal received throughout the learning process, enabling activation weights and functions to be learned and modified (Zhang et al., 2021). A transmission function is incorporated into the architecture of each node, and according to Sayad (2021), there are three kinds of neurons in artificial neural networks: (i) input nodes, (ii) hidden nodes, and (iii) output nodes, as presented by the Figure on the slide at the bottom right. A neural network is completely connected, which means that each node in one layer is linked to every node in the next layer but not to any other nodes in the same layer (Larose, 2005). The input layer merely passes data set inputs, such as attribute values, to the hidden layer without additional processing, implying that nodes in the input layer do not share the complex node structure shared by hidden layer nodes and output layer nodes (Larose, 2005). The activation value is then transferred from node to node depending on the binding power or weight, inhibition or excitement, and the transfer function received by the input layer (Sayad, 2021). Larose (2005) shows that many hidden layers may exist, despite the fact that most neural networks only have one, which is adequate in most instances. Once the activation of information, which travels through the network, that is, via its hidden levels, reaches the output layer nodes, they reflect the input information back into the outside world, thus giving it a meaningful context (Sayad, 2021). Naumov et al. (2019) claim that the development of deep learning has been responsible for a significant amount of recent machine learning success, particularly the multilayer perceptron (MLP) model, which is considered to be the most basic model of deep learning. Multilayer perceptron is used by factorization machines, according to Zhang et al. (2021), to assist in the development of features. Deep learning is a notion that is very similar to machine learning, but it employs methods that are distinct – while machine learning use algorithms such as regression or decision trees, deep learning employs neural networks that operate in a manner that is very comparable to the organic neural connections in human brain (biSmart, 2021). Deep learning, unlike conventional machine learning, does not need the study, development, and application of new features to enhance the performance of machine learning algorithms - the neural network does the job itself by learning how to pick the most important characteristics (Paradzhanyan, 2020). Furthermore, Paradzhanyan (2020) argues that deep learning can achieve

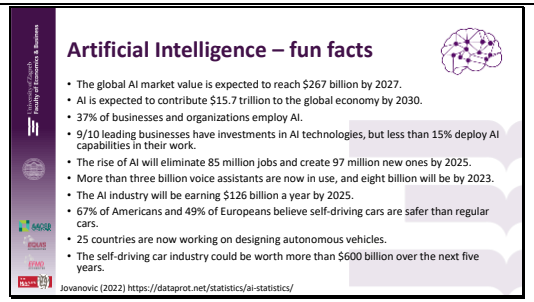
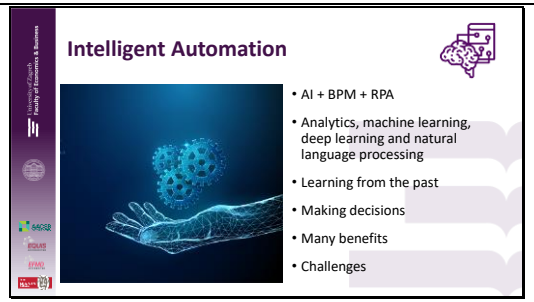
		near-human performance, if not outperform it, unlike machine learning which requires the supervision and reinforcement learning of a data scientist, who must manually discover and generate new characteristics. Source: https://www.tibco.com/reference-center/what-is-a-neural-network
Slide 23		Ma (2018) explains how in natural language processing, the goal is to identify similarity between sentences or documents which can be done by calculating a similarity score, since text is not like number and coordination and the differences between, for example, “Apple” and “Orange” cannot be compared. In that sense, there are three basic distance measurements which are used in text mining, being: (i) Euclidean distance, (ii) Cosine similarity and (iii) Jaccard similarity (Ma, 2018). Natural language processing (NLP) is a branch of artificial intelligence within computer science that focuses on helping computers to understand the way that humans write and speak. This is a difficult task because it involves a lot of unstructured data. The style in which people talk and write (sometimes referred to as ‘tone of voice’) is unique to individuals, and constantly evolving to reflect popular usage. Understanding context is also an issue – something that requires semantic analysis for machine learning to get a handle on it. Natural language understanding (NLU) is a sub-branch of NLP and deals with these nuances via machine reading comprehension rather than simply understanding literal meanings. The aim of NLP and NLU is to help computers understand human language well enough that they can converse in a natural way. **How does natural language processing work?** Natural language processing can be structured in many different ways using different machine learning methods according to what is being analysed. It could be something simple like frequency of use or sentiment attached, or something more complex. Whatever the use case, an algorithm will need to be formulated. The Natural Language Toolkit (NLTK) is a suite of libraries and programs that can be used for symbolic and statistical natural language processing in English, written in Python. It can help with all kinds of NLP tasks like tokenising (also known as word segmentation), part-of-speech tagging, creating text classification datasets, and much more. These initial tasks in word level analysis are used for sorting, helping refine the problem and the coding that’s needed to solve it. Syntax analysis or parsing is the process that follows to draw out exact meaning based on the structure of the sentence using the rules of formal grammar. Semantic analysis would help the computer learn about less literal meanings that go beyond the standard lexicon. This is often linked to sentiment analysis. Sentiment analysis is a way of measuring tone and intent in social media comments or reviews. It is often used on text data by businesses so that they can monitor their customers’ feelings towards them and better understand customer needs. In 2005 when blogging was really becoming part of the fabric of everyday life, a computer scientist called Jonathan Harris started tracking how people were saying they felt. The result was We Feel Fine, part infographic, part work of art, part data science. This kind of experiment was a precursor to how valuable deep learning and big data would become when used by search engines and large organisations to gauge public opinion. Simple emotion detection systems use lexicons – lists of words and the emotions they convey from positive to negative. More advanced systems use complex machine learning algorithms for accuracy. This is because lexicons may class a word like “killing” as negative and so wouldn’t recognise the positive connotations from a phrase like, “you guys are killing it”. Word sense disambiguation (WSD) is used in computational linguistics to ascertain which sense of a word is being used in a sentence.

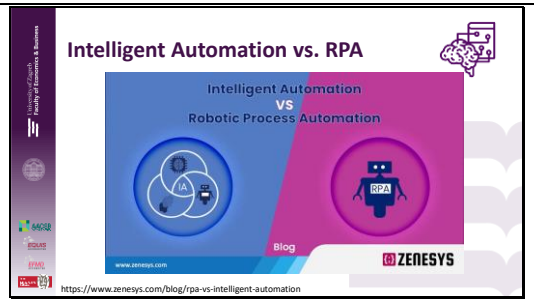
		Other algorithms that help with understanding of words are lemmatisation and stemming. These are text normalisation techniques often used by search engines and chatbots. Stemming algorithms work by using the end or the beginning of a word (a stem of the word) to identify the common root form of the word. This technique is very fast but can lack accuracy. For example, the stem of "caring" would be "car" rather than the correct base form of "care". Lemmatisation uses the context in which the word is being used and refers back to the base form according to the dictionary. So, a lemmatisation algorithm would understand that the word "better" has "good" as its lemma. Summarisation is an NLP task that is often used in journalism and on the many newspaper sites that need to summarise news stories. Named entity recognition (NER) is also used on these sites to help with tagging and displaying related stories in a hierarchical order on the web page. Real-world applications and use cases of NLP include: **Voice-controlled assistants** like Siri and Alexa. **Natural language generation** for question answering by customer service chatbots. **Streamlining the recruiting process** on sites like LinkedIn by scanning through people's listed skills and experience. **Tools like Grammarly** which use NLP to help correct errors and make suggestions for simplifying complex writing. **Language models like autocomplete** which are trained to predict the next words in a text, based on what has already been typed. All these functions improve the more that we write, speak, and converse with computers: they are learning all the time. A good example of this iterative learning is a function like Google Translate which uses a system called Google Neural Machine Translation (GNMT). GNMT is a system that operates using a large artificial neural network to increase fluency and accuracy across languages. Rather than translating one piece of text at a time, GNMT attempts to translate whole sentences. Because it scours millions of examples, GNMT uses broader context to deduce the most relevant translation. It also finds commonality between many languages rather than creating its own universal interlingua. Unlike the original Google Translate which used the lengthy process of translating from the source language into English before translating into the target language, GNMT uses "zero-shot translate" – translating directly from source to target. Google Translate may not be good enough yet for medical instructions, but NLP is widely used in healthcare. It is particularly useful in aggregating information from electronic health record systems, which is full of unstructured data. Not only is it unstructured, but because of the challenges of using sometimes clunky platforms, doctors' case notes may be inconsistent and will naturally use lots of different keywords. NLP can help discover previously missed or improperly coded conditions. **How does AI relate to natural language processing?** Natural language processing – understanding humans – is key to AI being able to justify its claim to intelligence. New deep learning models are constantly improving AI's performance in Turing tests. Google's Director of Engineering Ray Kurzweil predicts that AIs will "achieve human levels of intelligence" by 2029. What humans say is sometimes very different to what humans do though, and understanding human nature is not so easy. More intelligent AIs raise the prospect of artificial consciousness, which has created a new field of philosophical and applied research. Source: https://online.york.ac.uk/the-role-of-natural-language-processing-in-ai/

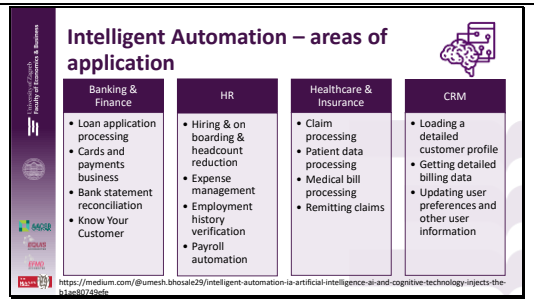
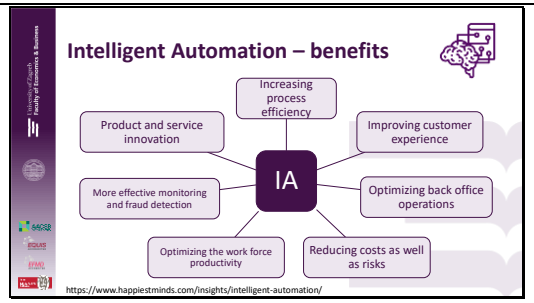
Slide 24		The use of artificial intelligence in the management of business processes leads to the so-called data-driven processes that enable proactive behavior, and in addition, artificial intelligence continuously evaluates data for the purpose of better assessment and providing better forecasting indicators so that decisions can be made that would lead to better corporate performance and awareness of the environment. Mantra Artificial intelligence: Here are the various ways in which Artificial intelligence is improving the business process management: **1. Redundant tasks automation**: Automation of the repeated tasks is one of the most common applications of Artificial intelligence. Robotic process automation is a software that is empowered with machine learning and Artificial intelligence helps to handle a large volume of redundant processes that otherwise needed a dedicated human workforce. **2. Predictive analysis**: The one unique quality of Artificial intelligence is that it can be used to learn, observe, and analyze data sets that are collected from various channels. Businesses use these details to determine their plan of action. Artificial intelligence is capable of identifying patterns that the human eye cannot interpret. For example, analysis of the data patterns for any fraudulent activities related to online transactions or segmenting prospects based on their buying behavior for marketing purposes. **3. Cost-effective**: Business process management implementation is an intensive process that requires significant financial investment as well as time. Robotic process automation, on the other hand, is profitable and make use of the available resources. Thus, business process management ideas can be implemented with robotic process automation techniques in a budget. **4. CX improvement**: There was a time when the primary driver for the adoption of Artificial intelligence in business process management was the cost, but now the focus has shifted towards improving the customer experience. AI-based BPM helps to get accurate insights into customer's behavior and based on these inputs one can find the future consumption trends. Implementation of chatbots and other similar techniques are the most common example of AI backed customer service. It improves the customer experience and help to create a transparent platform of communication. **5. Decision-making capabilities**: The advancement in AI has introduced sophisticated machine learning algorithms such as the decision trees and neural networks. These algorithms help the managers, business owners to solve problems that they face when they are describing properties for specific datasets for getting the expected output. Also, Artificial intelligence-based decision-theoretic models can assist the managers to make decisions within a business process. For example, these models can help to decide whether a customer should be sent a product recommendation or needs a follow-up call. Artificial intelligence-embedded business process management solutions are assisting businesses to overcome performance blockades and improve their work efficiency and quality. Artificial intelligence is no more a technology that was intimidating and felt hard to adopt. Small as well as large enterprises are gradually understanding the power of Artificial intelligence embedded business process management software for optimizing their business processes. With the passage of time, one can expect widespread adoption of Artificial intelligence for business process automation and will become even more accessible for all the businesses. Source: https://mantra.ai/blogs/how-ai-is-revolutionizing-the-business-process-managementbpm/

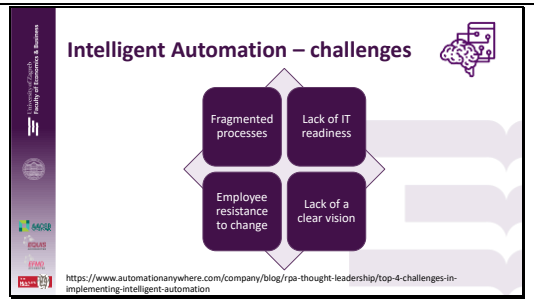
Slide 25		Analitycs Insight presents top ten artificial intelligence trends in 2023: **1. Development in predictive analytics** One of the top artificial intelligence trends is the development of predictive analytics for better research. It is based on the use of data, statistical algorithms, and machine learning techniques to identify, relying on historical data, the likelihood of future outcomes. The goal is to utilize the knowledge of the past to provide the best assessment of what will happen in the future. It is not that predictive analytics has emerged recently but when one traces its development one finds that with the advent of up-ending interactive and user-friendly technology in particular, it has come out of the shell of mathematics and statistics and has captured the imagination of business analysts and market experts. **2. Large Language Models (LLM)** Large Language Models are founded on the principles of machine learning wherein algorithms recognize, predict, and generate human languages based on very large text-based data sets. The models include Statistical Language Models, Neural Language Models, Speech Recognition, Machine Translation, Sentiment Analysis, and Text Suggestions. These models are to transform science and society in league with AI. This AI prediction claimed that future AI models won't merely reflect the data, they will reflect our chosen values. **3. Information security (InfoSec)** Information security covers the tools and processes adopted by organizations to protect information. It includes policy settings basically installed to prevent the practice of preventing unauthorized access, use, disclosure, disruption, modification, inspection, recording, or destruction of information. The AI prediction says that it is a growing and evolving field, especially with AI models that cover a wide range of fields, from network and infrastructure security to testing and auditing. Information Security programs are built around three core objectives which are known as the CIA – Confidentiality, Integrity, and Availability to protect confidential data from potential cyberattacks. **4. Launch of better autonomous systems** One of the leading artificial intelligence trends is the launch of better-automated systems. The next generation of autonomous systems through AI models is concerned with the progress in the fields of drone research, autonomous exploration, and bio-inspired systems. Researchers focus on technologies ranging from prosthetic legs that use machine learning to automatically adjust to a wearer's gait to a flying, self-driven ambulance. The goal is to teach autonomous systems to think independently and react accordingly, preparing them for the rigors of the world outside of the lab. **5. Art through NFTs (non-fungible tokens)** NFT artworks are digital art that allows you to prove ownership of a store of value. In technical terms – "Non-fungible" means that it is completely unique. " Token" means that it can be transferred on a blockchain. Essentially, NFTs are assets that carry a unique digital identity NFT art is claimed to be providing greater power to artists. It is rapidly changing the way artists are paid and revolutionizing how NFT artists can work, create new projects, and take ownership of their art. Having the power to decentralize and democratize wealth and offer access to new revenue streams, the integration of NFT and AI models can facilitate to a great extent the foundation of art schools. The claim is that because of the ability to register digital art and files as unique artists are finally finding themselves in control of their own success by way of art through NFTs. **6. Digital avatars** A digital avatar is one of the current and potentially artificial intelligence trends as a visual form or an image that is constructed to represent a person in the virtual world. The AI prediction speculates that advanced technologies such as artificial intelligence and augmented reality ensure that avatar bodies are developed to match human beings, which are then mind-linked to these avatars for remote control operation. Driven primarily by AI models, an avatar can be described

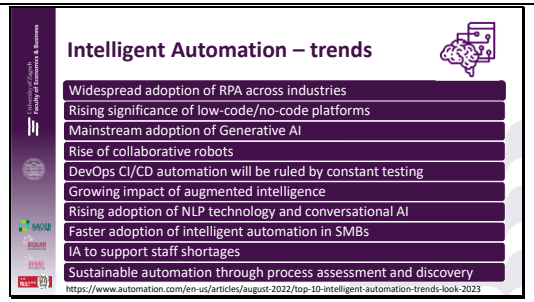
		as a digital representation of a person with intelligence, which offers human-like interaction by simulating the way our brain handles conversation. **7. AI ethics** There is no unanimously accepted definition as yet but broadly put, AI Ethics, also called AI value platform, refers to a broad collection of considerations for responsible AI, which makes a combination of three crucial factors: safety, security, human concerns, and environmental considerations in AI models. AI ethics is a system of moral principles and techniques that are intended to develop the responsible use of AI. Its core components include avoiding AI bias, AI and privacy, avoiding AI mistakes, and managing AI environmental impact. **8. Military weapons** Military weapons are meant to cause physical damage — death or serious bodily injury — to adversaries in warfare. The weapons can be both animate and inanimate objects. The list of such weapons includes guns, mortars, rockets, machine guns, grenades, and armor. Leveraging AI is increasing at an increasing rate in the militaries for smart and remote functionalities and protecting soldiers from death and major injuries. This is becoming one of the top artificial intelligence trends in 2023 due to an increase in political turmoils. **9. Process discovery** It can be described as an assortment of technologies and techniques, with extensive use of AI and machine learning, to identify the performance of those involved in the business process. It goes deeper than the earlier version of process mining to determine what happens when people indulge in various ways with various things to create business process events. The ways and AI models have a wide range — from mouse clicks for specific purposes to opening files, documents, web pages, and so forth — and all this involves numerous modes of information transformation. The automated process through AI models is meant to enhance efficiency in business processes. **10. Embedded Application (EA)** It is a software application that is permanently positioned, specifically in flash memory or a ROM in an industrial or consumer device. The fundamental attributes of EA are real-time, fault-tolerance, portability, reliability, and flexibility. The software is designed to have a special role for particular hardware with a specific purpose that must meet time, size, energy, and memory constraints. Some embedded applications, such as the one we have on our mobile phone, are designed to run for months or years in a row without being turned off or receiving a reset command. Other examples of AI prediction include image processing systems found in medical imaging equipment, fly-by-wire control systems found in aircraft, motion detection systems in security cameras, and traffic control systems found in traffic lights. Source: https://www.analyticsinsight.net/top-10-artificial-intelligence-trends-to-lookout-for-in-2023/

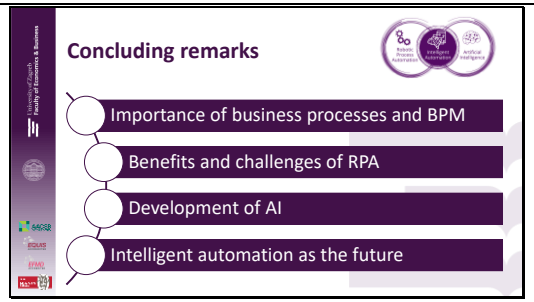
Slide 26		The global artificial intelligence market value is expected to reach $267 billion by 2027. The global artificial intelligence market size was estimated at USD 93.5 billion in 2021. Artificial intelligence is expected to contribute $15.7 trillion to the global economy by 2030. 37% of businesses and organizations employ artificial intelligence. Nine out of ten leading businesses have investments in artificial intelligence technologies, but less than 15% deploy artificial intelligence capabilities in their work. The rise of artificial intelligence will eliminate 85 million jobs and create 97 million new ones by 2025. Artificial intelligence will threaten some unskilled jobs through automation, but it will also potentially create different kinds of jobs that require new skill sets that will be developed through training. Artificial intelligence will take over jobs that require copying, pasting, transcribing, and typing. In areas such as medical diagnosis, speech translation, and accounting, artificial intelligence has outperformed humans in every way. But artificial intelligence will not be able to replace human judgment. Artificial intelligence has accelerated demand for positions like machine learning engineers, robotics engineers, and data scientists. More than three billion voice assistants are now in use, and eight billion will be by 2023 (Google Assistant with 92.9%, Siri with 83.1%, and Alexa with 79.8% accuracy of all the questions) The artificial intelligence industry will be earning $126 billion a year by 2025. 67% of Americans and 49% of Europeans believe self-driving cars are safer than regular cars. 25 countries are now working on designing autonomous vehicles (USA, China, Japan, South Korea, Germany, Canada, Australia, Rusia, France, Spain, etc.) The self-driving car industry could be worth more than $600 billion over the next five years. Source: Jovanovic (2022) https://dataprot.net/statistics/ai-statistics/
Slide 27		Robotic process automation cooperate very well with artificial intelligence and in such a synergy offer a more innovative and intelligent approach to work processes. In this way, companies are given the opportunity to fully automate business processes through the introduction of intelligent automation. Automation.com defines Intelligent automation as a combination of next-gen technologies like artificial intelligence, business process management, and robotic process automation. Besides these, intelligent automation also leverages technologies like analytics, machine learning, deep learning and natural language processing. Combining these technologies together has enabled intelligent automation to deliver some of the most advanced solutions that modern business leaders are using. Intelligent automation is quite different from other forms of automation, but the growing technology is making big waves and has definitely the potential to make the most significant impact on the organizations' growth and development cycle. By combining robotic systems and artificial intelligence, smart solutions are created that can make business easier for workers, given that in such a combination they add new value to the systems, and thus provide companies with a competitive advantage. The use of robotic systems in combination with artificial intelligence enables easier production of different products because in such a synergy they are able to analyze large amounts of data in real time collected from different sources (Ribeiro et al., 2021). When robotic systems are used in synergy with artificial intelligence, such systems enable the automation of business processes from start to finish throughout the enterprise as they make better, intelligent decisions by learning from the past and making decisions that humans cannot. There are many advantages of using intelligent automation in business processes, and precisely because of them, they cause great interest and desire for integration into business. Increased productivity, improved customer and employee experience, growth and increased efficiency, reduced risk of errors, speeding up processes, ensuring visibility of the entire

		business process and the ability to spot obstacles that may appear on the way as well as a work process that combines humans and robots are just some of the advantages. As with any innovation, so with intelligent automation there are challenges and shortcomings, among which are safety, insufficient professional staff and the inability to train employees, but the advantages it brings far outweigh the disadvantages, which will become less and less with time and the development of technology and could be solved precisely through such systems (Boban, 2022). Robotic process automation is the collaboration of robots and systems with humans providing structured input, while for artificial intelligence the entire approach is based on knowledge that is integrated into the system (Bhosale, 2019).
Slide 28		With robotic process automation, robots are used to carry out simple automated processes, systematic, repetitive jobs and rule-based tasks are automated that are routinely performed following instructions. Robotic process automation performs simple automation using bots, while intelligent automation automates non-routine tasks and user-centric proceses that require thoughtful consideration in order to draw conclusions and deliver meaningful and intelligent solutions and uses natural language recognition and processing in doing so. Robotic process automation systems use instructions to automate tasks they must perform based on rules, while Intelligent automation adapts to new environments and learns from previous experiences, improving, developing and progressing over time. Robotic process automation system is software that enables work to be done with less human effort, Intelligent automation is used with solutions that completely remove human work from the process, and we can say that technology and science meet here. Robotic process automation replaces the need for physical work, while Intelligent automation will contribute to the performance of intelligent and logical tasks. Robotic process automation is trained for performing routine tasks by following instructions with more efficiency and less error rate, while Intelligent automation relies on unstructured data and processes revolving around text, voice, language, pattern etc and involves a certain amount of probability, meaning it is not 100% accurate. Many categorise robotic process automation as the brawn and intelligent automation as the brain of the business operation. Robotic process automation is the workhouse and the stepping stone that gets businesses to enter the automation phase to reduce or eliminate the number of manual efforts. Tasks once done by humans can now be done by software and save a lot of time and efforts, which can then be used to carry out more meaningful tasks. Intelligent automation is the one that works intelligently. Intelligent Process Automation mimics human work and learns while observing. Such bots also referred to as cognitive agents, will streamline your work process and can even deliver better results at a much faster pace. Intelligent Automation holds a better work scope than robotic process automation or even other technologies at the moment. Source: https://www.zenesys.com/blog/rpa-vs-intelligent-automation

Slide 29		The application of intelligent automation is diverse, so it can be implemented in various sectors such as banking and financial institutions, human resources, healthcare and insurance, and customer relationship management systems. Intelligent Automation can be used in retail and corporate banking, cards and payments business, and wealth management to detect insider threats and payment anomalies, improve financial forecasts and optimize customer response time, but also its accuracy and intimacy. In manufacturing, it can increase sales and customer engagement and predictive maintenance operations, improve supply planning and seamlessly connect consumers and devices. In retail, companies using IA use bots that are capable of thinking on their own. These bots help in improving the efficiency of an organization by fulfilling the orders received from the customers. While in the supply chain, these bots can also travel around the warehouses without colliding with other traffic. Thanks to the Artificial intelligence-derived intelligence and sensors present in it. In banking, intelligent automation helps in processing of incoming and outgoing transactions. This also helps in investigating the payment issues while reducing the dependency on employees. Also, Intelligent Automation can create reports and helps the companies in drawing conclusions and that too, without any human intervention. Risk management is also key in Intelligent Automation. It helps the companies in identifying the potential risks involved within a transaction. Source: https://medium.com/@umesh.bhosale29/intelligent-automation-ia-artificial-intelligence-ai-and-cognitive-technology-injects-the-b1ae80749efe
Slide 30		Intelligent automation empowers humans with advanced smart technologies and agile processes for faster, more intelligent decisions. The key benefits of Intelligent Automation in business include: • Increasing process efficiency • Improving customer experience • Optimizing back office operations • Reducing costs as well as risks • Optimizing the work force productivity • More effective monitoring and fraud detection • Product and service innovation Source: https://www.happiestminds.com/insights/intelligent-automation/

Slide 31		AutomationAnywhere: With the majority of business leaders acknowledging the critical importance of intelligent automation, why is it taking them so long to go further? There are the four top challenges to a successful intelligent automation deployment: **#1 Fragmented processes-**Deploying intelligent automation is much more than simply attempting to automate what is already being done. Today's companies have hundreds of different processes, most of them fragmented into silos by functional departments or divisions. Yet, many important business processes transcend organizational boundaries. Human resources hiring and onboarding processes affect payroll, finance, and IT. Yet, all too often, these processes are disconnected as documents or data are thrown over the proverbial wall to the person in the next department. Intelligent automation can play a major role in re-engineering these siloed processes by enabling lean and cost-efficient operations at substantially higher speeds and 100% accuracy in comparison to traditional approaches. Those workers who struggle with multiple systems to complete a single task can be freed of repetitive (and error-prone) manual keyboarding or button-pushing to focus on higher-value work. But before this can happen, the employees who do the work need to be involved. Process re-engineering professionals and consultants are useful, but also engage the people who know the processes intimately. And make sure to listen to them—their input will be invaluable. **#2 Lack of IT readiness-**Intelligent automation requires significant support from IT. Unlike traditional robotic process automation, which can be implemented by business units with little—if any—IT support, intelligent automation requires much more compute and storage and other infrastructure resources—and not just on-premises resources. Intelligent automation, by definition, should, in most cases, be based in the cloud for scalability and capacity reasons. And this will almost certainly require cooperation from, if not collaboration with, a fully prepared IT team that is familiar with—if not already operating in—the cloud. **#3 Employee resistance to change-**Technology is just one aspect of intelligent automation. The human factor is also essential. From the beginning, businesses need to carefully consider how coming changes to roles, processes, tasks, and ways of working will affect employees. Even at the organizations surveyed by Deloitte that was in the process of scaling intelligent automation, 58% had not yet performed this kind of assessment. This view of intelligent automation—leaving the human out of the picture—is myopic and will not pay off in the long term. A holistic approach is needed that promotes resiliency and adaptivity by focusing first and foremost on the employees. More than half of enterprises surveyed by Deloitte (59%) are retraining employees on process skills like active listening and critical thinking, and an equal number are providing retraining in cognitive abilities such as creativity and problem-solving. **#4 Lack of a clear vision-**Getting it right means integrating vision and strategy. Many companies are implementing intelligent automation in a piecemeal fashion, led by either IT or business units, but without an overall strategy. According to Deloitte, only 26% of companies that are piloting automation—and 38% of those implementing and scaling—have an enterprisewide intelligent automation strategy**.**What's needed in such cases: involvement and sponsorship from the C-Suite as well as a federated model of intelligent automation governance that involves a centralized Center of Excellence (CoE) that sets standards and provides guidance to business units that are engaged in the actual initiatives. Source: https://www.automationanywhere.com/company/blog/rpa-thought-leadership/top-4-challenges-in-implementing-intelligent-automation

Slide 32		Sanyal has enlisted the top 10 intelligent automation trends for 2023 for Automation.com. **Widespread adoption of RPA across industries** RPA has recently gained dramatic popularity as it enabled software bots to replicate human actions and perform tasks more effectively. The rising adoption of RPA across industries like insurance, banking, finance and healthcare has triggered enhanced operational efficiency, reduced time-to-market, and ensured high security. Hence, the usage of RPA is one of the most significant components of intelligent automation that is expected to rise in 2023. **Rising significance of low-code/no-code platforms** The low-code and no-code automation has been gaining traction in recent years. These platforms are basically software programs that require little to no coding experience, so the rising importance of coding, both in tech and non-tech businesses will eventually lead them to the increased popularity of low and no-code platforms. **Mainstream adoption of Generative AI** Generative AI is basically based on AI algorithms and machine learning methods that learn from existing data such as text, audio files, and images, and create completely new and original content. Generative AI can be used for various purposes such as making software codes, processing images, facilitating drug development, and speeding up organizational growth and development. **Rise of collaborative robots** Collaborative robots are also known as cohorts that are directed to interact with humans in a shared professional environment. Starting from lifting heavy weights in warehouses to intelligently removing assembly lines, these bots are efficiently handling all small and large-sized companies. In 2023, it is expected that the adoption rate of these robots will significantly increase across industries. **DevOps CI/CD automation will be ruled by constant testing** Almost every other business needs to adopt DevOps since it enabled continuous integration and delivery of high-quality software to customers. Testing is extremely important for DevOps CI/CD, and the continuous automated testing of the software at each stage of development will be done through IA tools. Continuous automated testing basically enhances the quality of the developed software and fixes all problems before its immediate release. *CI/CD (*continuous integration/continuous delivery) *is defined as a set of development practices that enable the rapid and reliable delivery of code changes. DevOps is defined as a collection of ideas, practices, processes, and technologies that allow development and operations teams to work together to streamline product development. While the two concepts are related, they are different in many ways.* **Growing impact of augmented intelligence** Augmented intelligence is expected to rise in the coming months. It basically involves robots and humans working together to improve cognitive performance. Platforms that utilize augmented intelligence can efficiently collect all sorts of data, both structured and unstructured. **Rising adoption of NLP technology and conversational AI** Intelligent automation focuses on a plethora of technologies with robotic process automation being the center. Intelligent automation leaders are speculated to widen their horizon of IA utility and include NLP and conversational AI tools. The benefits of NLP and conversational AI are opening up a wide array of opportunities. **Faster adoption of intelligent automation in SMBs small and midsize business** An increasing number of SMBs are getting interested in adopting digital technologies, with the most prominent use case being process optimization. With more affordable automation options available in the market, SMBs can now avail these options to reduce costs, improve customer service and improve competitiveness.

		IA to support staff shortages Trends like the 'Great Resignation' has become incredibly popular in the corporate sector. Hence, large, medium, and small businesses have used the opportunity to launch or scale their automation programs, reducing hiring costs, and improving process efficiencies. And with hybrid working environments in place, automated workplace tools might be the best way to accelerate organizational growth and development. **Sustainable automation through process assessment and discovery** Companies are adopting and scaling IA to efficiently handle employees and processes. Process discovery and assessment frameworks offer actional insights to make informed decisions, prioritize processes and create an automated production pipeline. Now adopting automation in a sustainable manner will eventually help promote increased efficiency and advancement. Source: https://www.automation.com/en-us/articles/august-2022/top-10-intelligent-automation-trends-look-2023
Slide 33		
Slide 34