# TEXNOLOGIK JARAYONLARNI AVTOMATLASHTIRISH

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***Annotatsiya:*** *Maqolada texnologik jarayonlarni avtomatlashtirishning dolzarb masalalari ko‘rib chiqiladi, avtomatlashtirilgan jarayonni loyihalashda rioya qilish tamoyillari tavsiflanadi, ishlab chiqarish jarayonida avtomatlashtirishning afzalliklari va kamchiliklari ko‘rib chiqiladi, ijobiy tomonlari yoritilgan va korxonalar tomonidan qo‘llaniladigan bir qator muammolar ochib berilgan.*

***Kalit so‘zlar:*** *avtomatlashtirish, ishlab chiqarish, texnologik jarayonlar, innovatsion texnologiyalar.*

# АВТОМАТИЗАЦИЯ ТЕХНОЛОГИЧЕСКИХ ПРОЦЕССОВ

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***Аннотация:*** *В статье рассматриваются актуальные вопросы автоматизации технологических процессов, описываются принципы соблюдения при проектировании автоматизированного процесса, рассматриваются преимущества и недостатки автоматизации в производственном процессе, выделяются положительные стороны, а также раскрывается ряд вопросов, с которыми сталкиваются предприятия при внедрении автоматизации в производственный процесс.*

***Ключевые слова:*** *автоматизация, производство, технологические процессы, инновационные технологии.*

# AUTOMATION OF TECHNOLOGICAL PROCESSES

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***Abstract:*** *The article examines current issues in technological process automation, describes the principles of compliance in the design of an automated process, discusses the benefits and drawbacks of automation in the manufacturing process, highlights the positive aspects, and reveals a number of issues that businesses face when implementing automation in the manufacturing process.*

***Keywords:*** *automation, production, technological processes, innovative technologies.*

**Introduction.** Automation of technical processes has recently emerged as a hotly debated scientific topic. This is owing to the advancement of novel technologies, software in different sectors of manufacturing and industry, and the use of technology to aid human work.

The ability to highlight such areas of process automation as the possibilities of employing electronics, electronic equipment for control and monitoring, sensors, technology with work automation, and the development of robotic mechanisms may all be found in the materials of scientific articles. Today's technological advancements necessitate the highest levels of automation.

So, N.F. Voinovay noted that improving quality through the introduction of process automation will increase the efficiency of modern production, increase productivity, improve product quality, and minimize waste in production [1].

**Literature review.** McKinsey & Company used Process automation as new process of century [2]. *Process automation* uses technology to automate complex business processes. It typically has three functions: automating processes, centralizing information, reducing the requirement for input from people. It is designed to remove bottlenecks, reduce errors and loss of data, all while increasing transparency, communication across departments,speed ofprocessing.

Looking at the Numbers:

Let's take a look at some eye-catching facts about how the market is gradually changing toward business automation strategies.

Takeaways:

1. Efforts to automate are steadily rising across all industries.
2. Accounting automation saves a significant amount of money while improving service.
3. Remote work is proving to be more productive, and the potential for it is linked to task automation.
4. Companies all across the world are using process automation to reallocate time from manual chores to strategic objectives (salesforce).

5. Automation of processes helps to focus attention on more valuable human abilities, and it should be welcomed.Automation is acknowledged as a scientific and technological trend that manifests itself in the employment of self-regulating technical means, procedures, and control systems that totally remove a person from production processes or information.

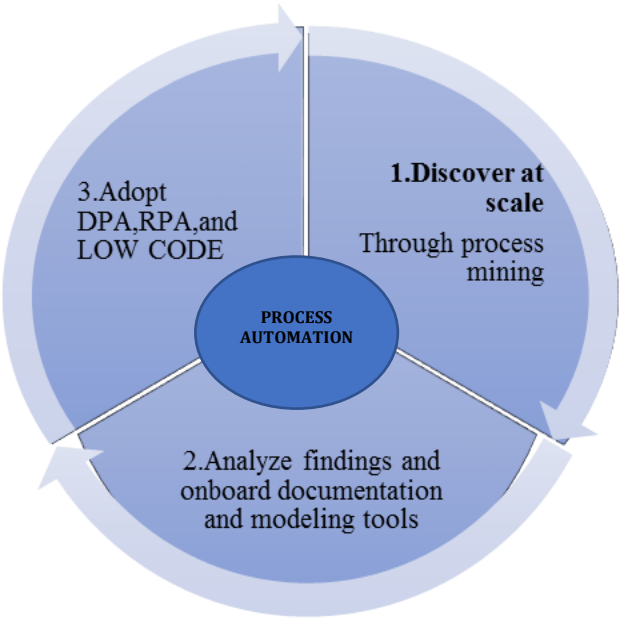


**Figure I. Automation Process Steps**

According to S.G. Selivanov, A.F. Shaikhulova [4] following principles must be followed in the development of automated production:

- the principle of completeness, which refers to the goal of performing all processes within an automated process system.

- The notion of minimal operational technology, which states that the number of intermediate procedures should be kept as low as possible.

- The sparsely populated technological principle, i.e. assuring automatic operation throughout the process.

The principle of optimality, which states that all manufacturing facilities and services must serve a single optimal solution[4].

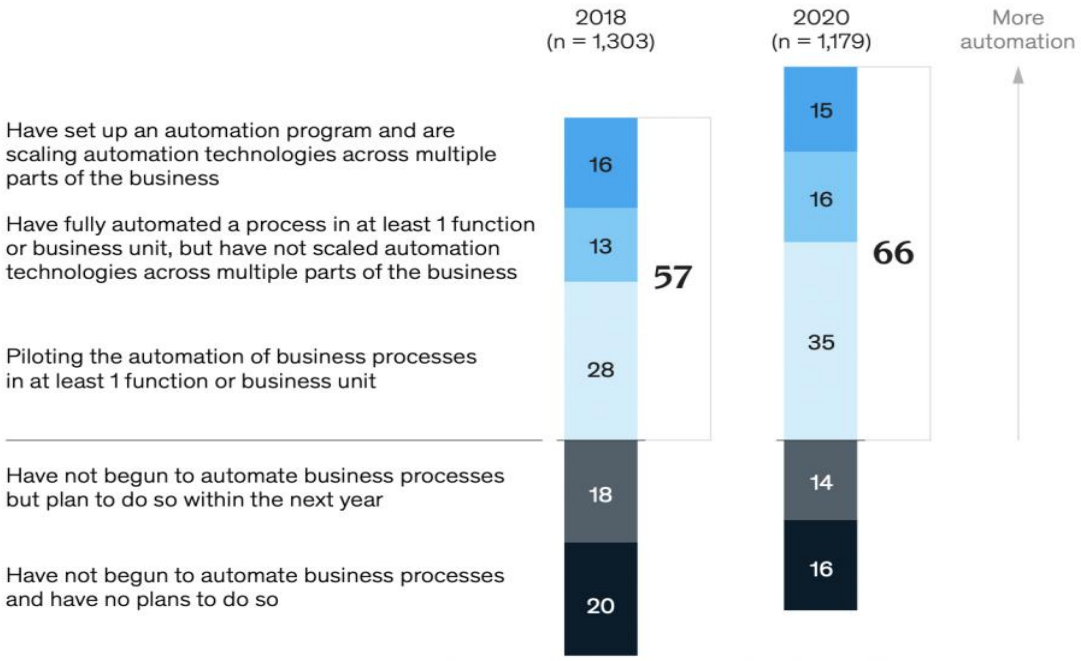


**Figure 2. McKinsey & Company – The imperatives for automation success[2]**

According to Poezzhalova S.N., Selivanov S.G., Borodkina O.A., Kuznetsova K.S. implementation of manufacturing automation results in:

- improved product quality;
- positive labor productivity growth dynamics;
- Increasing the efficiency of activities is one of the goals;
- a boost in the level of security[5];
- phased introduction of the system into operation and its development.

S.G. Selivanov, M.B. Guzairov analyzed that, increase in revenues, a decrease in production rejects, lower product costs, improved product quality, and better control are all favorable outcomes of implementing an automated system. The difficulty of the production system, retraining of workers, and the increase of unemployment are all serious features of automation of production [6].

Kujawa et al. describes the necessity of enabling changes within the life cycle of a production unit to facilitate improvements in the re-design and change process. The more flexibility that can be built into the production unit, the easier it will be to address changes to accommodate production of future models. To ease the development of solutions and stay ahead of technological adaptation, innovation and adaption is necessary. According to Halicka, competitive advantage is largely determined by the adoption of innovative technologies and thus, the early identification of these technologies is therefore critical. One way to increase innovation is to take advantage of Open Innovation, the opening of a permeable boundary of a company's research and development process, allowing innovation to come from other companies. Methods exist which aim to prepare for implementation of future changes and reduce uncertainty, by examining new and emerging technologies. These methods can be called External Technology Searches (ETS), and aim to bring new technologies into a company. ETS is an umbrella term to cover many of the existing methods in the field [7].

According to Chesbrough, Open Innovation is the process of transferring innovation over a company's boundaries. Organizations following this concept are able to make use of ideas detached from their original portfolio. More importantly, there is potential to get ideas for core products or unique products that can help ensure a firm's technological leadership [8].

**Research methodology.** When choosing a research methodology, it is very important that it is chosen correctly, because the research methodology always occupies the main place in any research. A wrongly chosen research methodology can harm the whole work and slow down the research process. When choosing a methodology, we follow three main considerations: what is the most reasonable choice for our research, what methods do we want to use to collect data, and what practical questions do we need to answer. In the conditions of digitization of the economy in Uzbekistan, based on our task of studying the legal-normative foundations of this field, empirical and theoretical methods are used, i.e. induction, deduction, analysis and synthesis, observation methods.

**Analysis and results.** *The fundamentals of manufacturing automation*

*The following are examples of innovative production systems:*

1. Robots are integrated right in the middle of the manufacturing process. The rapid spread of microelectronics is linked to their rapid spread.
2. Control methods for quality. They work on a computer system. Technical applications that are in charge of determining the quality of a product.
3. Computer-aided design (CAD) software. They're used in the creation of new items as well as the drafting of technical and financial documentation.
4. Complexes of robotic technology (RTC). Serve as a platform for software and communication amongst cutting-edge gadgets.
5. Storage systems that are automated. They enable you to do an inventory, as well as receive and transfer items, and locate a specific set of products in the warehouse.
6. Systems that are adaptable. Moving processed technical parts and changing tools is the responsibility of this position.

Production operations can be automated.

Because of the lower hardware costs, automation of industrial processes is the most profitable economic argument in favor of integrating several systems.

*Therefore, complex automation of production includes:*

- high information content;
- the ability to analyze the technological situation;
- high accuracy of measuring technological parameters and their regulation;
- automatic dosage of components;
- the prospect of expanding control systems;
- the ability to create automatic jobs.

A process is defined by organization theory and cybernetics as a sequential change in the states of a system or object that leads to changes and development.

Production cannot work without the involvement of four different sorts of stages.

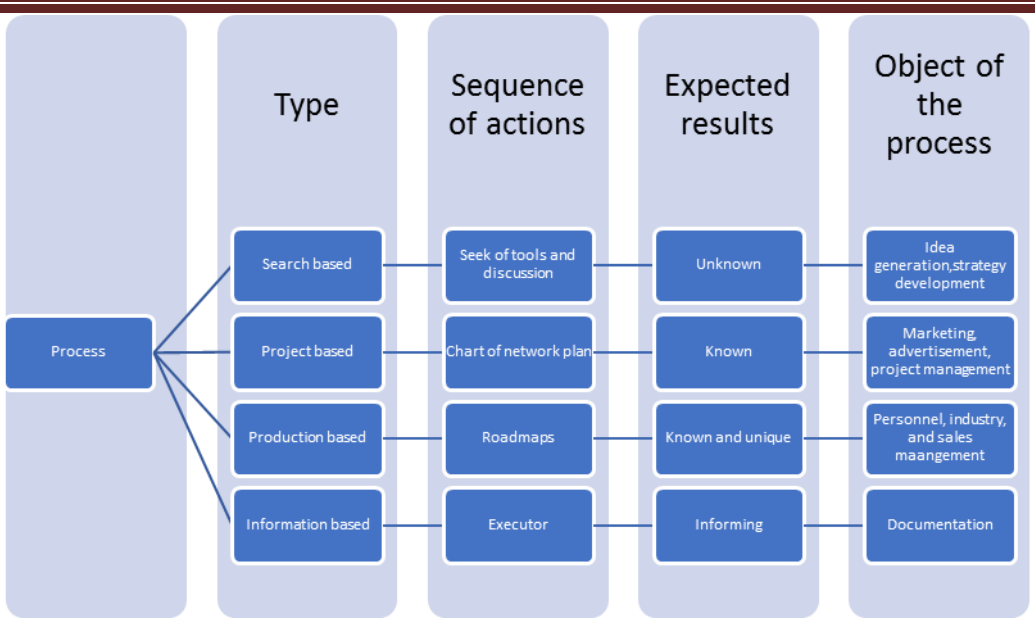


**Figure 3. 4 stages of production**

Automation of manufacturing processes reduces the impact of the human component and is used to increase:

- speed with which repetitious chores are completed;
- job of high grade;
- the amount of information that can be used to compute and assist procedures;
- control precision;
- availability of solutions in a timely manner for both routine and emergency scenarios.

The owner or CEO of the company, as well as the heads of structural divisions, are in charge of strategic management.Accounting and technological departments handle the automation of production processes, as well as the development of tactics, by using specialized software to manage resource storage and distribution, calculate financial and material costs for completing tasks, control product quality, and perform maintenance and repairs. The implementation of software for the economic department, logistics, and procurement is included at this level.

Automation's functions, structure, and levels

The study of automated systems for gathering and processing information for technical process control necessitates the use of a unique data transmission network structure based on a hierarchical concept with a multi-level structure.

*Levels of automation in production:*

1. Human participation is only allowed for the purpose of accomplishing labor steps.

2. When executing idle runs on specified equipment, automation of the first level operating cycle eliminates human participation.

3. Automation at the second level. The difficulties of supply and shipment, machine system control, and waste disposal are all addressed here.

4. This is the third stage of automation. Covers all aspects of the manufacturing process, from the simplest to final product testing and shipment

Note that the integrated automation of industrial production requires the full development of the initial levels. This is due to the high technical equipment and capital investments of production facilities.

Automation and production control processes are technological processes.

Automation and control of technological processes and manufacturing contribute to the industry's current subjects' successful development.

*The following are some of the goals of technological solutions based on the usage of electronic equipment and software:*

- enhancing product quality and competitiveness;
- decreased energy usage;
- lowering costs;
- a reduction in the number of people involved in the project;
- a rise in the quantity of manufactured items;
- Sales marketplaces are being expanded.

The use of automated controls optimizes production processes and reduces costs.

Automation systems for manufacturing processes are designed.

Computer and software tools are used to automate and control technical processes and production.

The creation of an automation system is targeted at the efficient management of an industrial facility's technologies and mechanisms.

A technical assignment is created at the initial stages of designing such systems.

Installation, programming, and setup of hardware equipment are all done during the operation of automated systems.

In automation projects, the main properties of the created control system are described. Also, the main technical solutions and schemes for the construction of the complex are introduced.

*The projects' structure is as follows:*

1. On a joint plan of an industrial facility, a map of automation item distribution.
2. Automatic control, regulation, signaling, and power supply schematic drawings in use.
3. Calculation of revenue and maintenance expenses for an automated control system.
4. Technical regulations are described.
5. Application for technological equipment that has gone lost.
6. Economic results from the use of automated technology are calculated.

In addition to the formulation of technical specifications, audits are carried out in production to select the most suitable software and technical resources for automation.

Automation and control systems in production equipment

*The following equipment is for sale by companies that provide engineering services, such as the preparation of an automated control system for technical processes:*

- shields that regulate;
- cabinets for distribution;
- gadgets for signaling;
- relays, controllers, and switches; electrical equipment starting and protection devices
- tools for software

Process engineers determine the best location of automation devices on technical equipment, the placement of console controls, switchboards, and the installation of cable lines while implementing projects.


**Figure 4. 3 levels of the organization's operations**

*Business process automation*

Automation of business processes ensures the continuous development of the company, increasing competitiveness and increasing income, facilitates data analysis, planning and management:

- lower (executive) - for routine operations, conveyor production, and maintaining environmenttal conditions and operating modes within a specified range;
- medium (tactical) - allocates tasks to lower-level components, participates in resource and data planning and management;
- Enterprise management, analytics, and forecasting are at the top (strategic) level.

First and foremost, AI is employed in production and accounting in document flow to transfer management and control functions.

In businesses, automation and planning of manufacturing processes are important.

If an entrepreneur wants to use automation in manufacturing, he must first learn about its key aspects. This is important primarily to shorten the preparation process and lower the cost of implementing such a system.

*The following are the major principles of industrial automation:*

- the processes that are automated must be consistent with each other;
- the operations carried out are carried out with a minimum of interruptions;
- automated processes must be rhythmic;
- actions are performed in parallel, when several processes are started at the same time.

*Conclusion and recommendations*

Following your decision on the main rules, you must determine which procedures will be automated. These are the stages of production, management, and planning.

Production planning automation is based on the use of programs that collect data quickly and accurately, as well as take proactive steps. These programs analyze a vast amount of data rapidly and accurately based on the defined parameters.

The use of automation in production management is not as ubiquitous as it was in the previous generation. This is because management decisions are based not only on factual data, but also on the management team's intuition.

*There are such degrees of production automation:*

1. Partial. The degree to which individual production units and devices have gone through the process.

2. Complex. This is the degree when entire workshops or departments have undergone automation. They work in isolation and carry out a specific task.

3. Complete. A type of involvement in the process, in which production is fully autonomous.

Most often, enterprises introduce automatic processes of the first or second degree. The third is still promising and practically does not occur in practice. There are various systems for the automation of production management, for example, such as MMS, ERP, and so on.

The article outlined the subject's key principles, benefits, and drawbacks. So, based on the foregoing, we can infer that the advancement of scientific knowledge creates enormous prospects for the development of production, the advancement of technology, and the development of equipment, which is a solution to many difficulties in the manufacturing process. And it is automation of production that allows companies to cut product manufacturing time, improve quality, and boost their competitiveness, all of which has a favorable impact on the product sales market.

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