USE OF IT TOOLS IN NONCONVENTIONAL TECHNOLOGY APPLICATIONS

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ABSTRACT: : For the first time, computers could be an important part of measuring systems more than 20 years ago thanks to serial communications like RS-232 and GPIB. By connecting measuring equipment directly to the computer, potential increases in productivity and reductions in error rates could be realised, processing that was unique to the manual transfer of data that was eventually fed into the computer for further analysis Some manufacturers are thinking of ways to use voltage deviation from average discharge as a signal to automatically adjust the feed rate to the amount of metal being processed or to retract the tool if a short circuit occurs, thus eliminating the need for human intervention. The knowledge-based organization stands to gain significantly by incorporating computerization for nonconventional technologies, making this a matter of strategic importance. Knowledge management could greatly benefit from the automation of routine, time-consuming tasks made possible by combining IT and information systems. This is the subject of the article below.
KEYWORDS: programming, knowledge-based organization, automation, quality, performance, nonconventional technologies

1. INTRODUCTION

The challenge of materializing an existing geometric model on a designer's drawing board led to the development of computer-aided manufacturing (CAM). CAM was developed as a solution to this difficulty. These applications were originally developed as a computer drawing tool, a tool intended to take over the role of the traditional drawing board [1]. Despite this, over time they have been improved to make them not only easier to draw, but also easier to design. At first, they could only draw in two dimensions (2D), but now they can build a virtualisation, or computer representation, of a physical object, such as an engine shaft, as well as a spatial (3D) image of an assembly on a computer screen. At first, they could only draw in two dimensions (2D).

Making a digital representation of the required geometric model on a computer with the help of a specialised program is the initial step in the computer-aided manufacturing process. This stage can be carried out with any of the many programs currently available on the market; however, selecting the application that best suits your needs depends on a number of different criteria [2].

Mechanical processing and electroerosion processes, as well as some potential applications for each, will be used to develop this study.

2. CURRENT SITUATION

Metalworking processes can be divided into three categories: plastic deformation processes (rolling, forging, stamping, extrusion), cutting processes (turning, planing, milling, drilling, boring etc.) and nonconventional processes (chemical erosion, electroerosion, plasma, laser, etc.).

Nonconventional means of turning metallic materials into goods have evolved as an objective, complementary, vital, and sometimes separate requirement alongside traditional methods of turning materials into products. Utilizing technologies that are not often used, these procedures include the transformation of metallic materials. [3].

Chipping processes may be economically inefficient or impossible to perform in certain circumstances, including:

- Complex workpiece surface configurations - Machining of metal and alloy components with unique properties such as exceptional fracture toughness, high refractoriness, high corrosion and fatigue resistance and high brittleness;
- The need to achieve precise dimensional accuracy and high quality of machined parts and micro-dimensional bores;
- The search for increased productivity while achieving substantial savings in conventional fuels, raw materials and energy resources.

The above constraints have given rise to and led to the birth and advancement of new processing techniques, known as nonconventional technologies. In these methods, the removal of machining additives takes place through the generation of microparticles, which are formed as a result of the interaction between the workpiece (also called a blank) and an additive substance.

The erosion agent can be described as a multi-faceted system that applies several forms of energy to the workpiece, such as electrical, electromagnetic, electrochemical, thermal, chemical, mechanical or radiation energy. The energy of the erosion agent causes degradation of the surface layer of the workpiece by several mechanisms, such as melting, vaporisation, sublimation, fragmentation into microparticles or corrosion.

In each case, in order to erode the surface layer of the workpiece, it is necessary that the energy of the eroding agent exceeds the binding energy of the material particles. Removal of the eroded particles from the working medium is crucial, as their presence has the potential to hinder or stop the erosion process. Schematically, Figure 2.1 shows the components of a

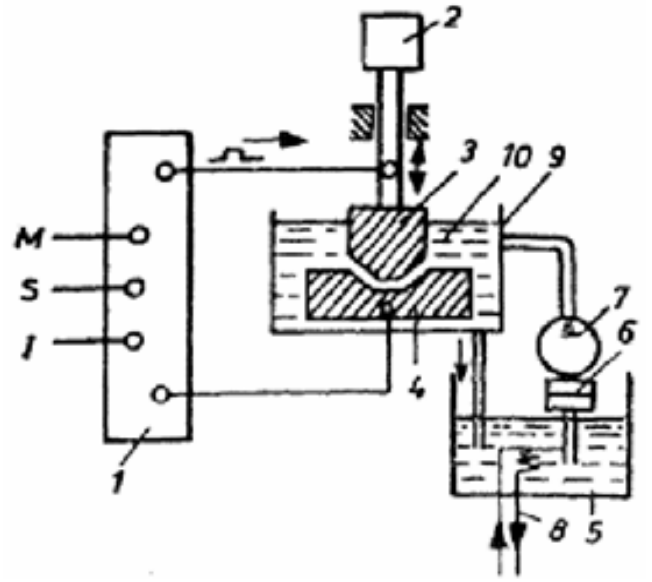

Figure 1 Schematic diagram of an EDM machine: 1-Pulse generator; 2-Feed regulator; 3-Electrode; 4-Workpiece; 5-Dielectric reservoir; 6-Filter; 7-Pump; 8-Cooling system; 9-Working medium tank [8]

nonconventional take-up equipment.

At the same time, nonconventional technologies involve higher costs in processing operations due to the high capital investment required to purchase machinery and the sophisticated level of automation involved.

Conventional machining methods are more efficient when applied to components characterised by easy machining and low complexity. In contrast, conventional technologies are more suitable for parts with difficult machinability and high complexity. The categorisation of erosion machining processes is determined on the basis of several factors, such as the type of destructive energy, the erosion agent involved and the underlying phenomena.

3. OPERATIONAL QUALITY ASSURANCE FOR NONCONVENTIONAL TECHNOLOGIES THROUGH IT SYSTEMS

The concept of quality may be understood in a variety of ways and has been given a wide range of interpretations over the course of history [4]. The following characteristics are included in the definitions:

- Obeying the necessary and recommended guidelines.
- Satisfying the requirements of the consumer. Usability is what we'll be talking about today.
- The fulfillment of the requirements for the item.
- The capacity to fulfill the consumers' predefined needs.

When discussing the idea of a knowledge-based organization, one way to define it is as an institution that takes a learning-centered approach. This means that employees actively participate in the ongoing cultivation of knowledge, exhibiting a mindset and behavior that places an emphasis on learning and information accumulation.

When referring to technological solutions that act as alternatives or substitutes for existing conventional or traditional technologies in a specific sector, technical solutions that are referred to as "alternative technologies" or "nonconventional technologies" are the terms that are utilized. The aforementioned technologies are categorized as alternatives due to the unique characteristics that set them apart from traditional technologies. These characteristics include innovation, sustainability, efficiency, and environmental friendliness [5]. These characteristics distinguish alternative technologies from traditional technologies.

The application of technologies that are not generally considered to be mainstream is consistently growing and gaining acceptance. Processes such as electroerosion and water cutting were examples of nonconventional technologies that were utilized in the past. However, in the present day we are seeing the development of new examples of unconventional technologies, one of which is the printing of three-

dimensional objects. The creation of three-dimensional things may be accomplished with this technique by layering materials successively.

The term "artificial intelligence" (AI) refers to the practice of utilizing computer algorithms and models to aid the acquisition of information, the capability of problem-solving, and the making of autonomous decisions by systems [6].

The Internet of Things (IoT) refers to the integration of physical objects with internet connectivity, allowing them to establish communication channels and engage in mutual interactions.

Virtual reality (VR) and augmented reality (AR) are technological advances that make it easier to create simulated experiences or incorporate virtual components into the physical world.

Blockchain technology is a decentralised system that uses a distributed ledger to guarantee the integrity, transparency and security of digital transactions conducted over the internet [7].

Renewable energy refers to a category of energy sources characterised by their cleanliness and sustainability. These sources include solar energy, wind energy and hydropower.

Given the significant investment implications associated with TN processing, which is only cost-effective for large production runs, it is important to consider the potential for optimising TN equipment to provide control and integration into the operator's working environment.

For excellent execution to be achieved, specialized domain expertise is required, and one way to collect this information is through the use of knowledge-based management.

The use of these ideas in a business setting carries with it a number of potential advantages and avenues for development.

Acquiring specialised knowledge and skills in sophisticated technologies is necessary for the effective implementation of IT-based management of NT processes. The team of specialists should have an in-depth understanding of the principles and functional qualities of TN equipment, in addition to the capacity to properly fit them into the production ecosystem that already exists. Knowledge-based leadership gives businesses the ability to create an environment conducive to lifelong education and to foster the skills essential for efficient management and the maximization of operational productivity.

In addition, effective execution of computer-controlled management for NT processing requires meticulous strategic planning and a comprehensive assessment of the organization's unique requirements. It is essential to identify certain areas and jobs that could effectively facilitate cost recovery, taking into account the distinctive characteristics and requirements of manufacturing processes. Achieving ideal outcomes in terms of enhanced quality, increased productivity, and fewer human mistakes requires careful selection and organization of the manufacturing process, as well as efficient integration into workflows that are already in place. This plays a crucial role in the achievement of optimal results [8].

4. DEDICATED SOFTWARE FOR THE PROCESS OF DATA COLLECTING

Measuring systems are an essential component of any process or procedure involving the manufacture of products. In the last twenty years, measuring systems have undergone a period of profound transformation, a real revolution, which has led to the development of a new concept in which the computer plays the leading role, based on the principle shown in Fig. 2.

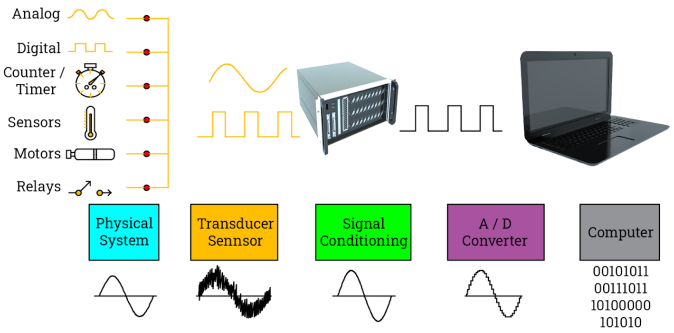

Figure 2. Data acquisition model [9]

This article looks at three main classifications for software that runs on computers, sometimes known as programs.

- System programs manage the actions performed by the computer system and ensure that a link is maintained between its components and the application programs and utilities that are used. Their task is to make users' work easier by simplifying tasks such as allocating memory, displaying and printing letters on the screen and printer, reading characters from the keyboard, accessing information stored on magnetic drives and other similar activities;
- Application programs come into direct contact with the user and specialise in performing specific processing tasks that are precisely defined. Text editors, database management programs, typing programs and computer graphics programs, among

other types of programs, are all included in this category.

- Utility programs have a direct user interface, but unlike applications, they are designed to perform processing of a broader nature. They make it easier for the user to "manage" the computer system and software products by transferring data, preparing disks and other magnetic media for use, generating backups, testing the computer system and other tasks. Interface programs are a subset of utility programs that serve as "interpreters" between the user and the operating system. This makes them a unique type of utility program.

By using them, a tool is obtained that can complete the collection, processing and presentation of data. Coordination of the tasks performed by the acquisition hardware and its incorporation with the computer system resources, acting as an intermediary between the application program and the hardware.

4.1 ARDUINO

ARDUINO is a physical or embedded platform, which indicates that it is an interactive system and may, as a result of its use of hardware and software, interact with its surrounding environment. Because of this, ARDUINO is known as an embedded platform. It is possible to think of an Arduino development board as a minicomputer, on which you may exercise control over the inputs and outputs of the chip.

The ARDUINO motherboard consists of a microprocessor, a crystal or oscillator (basically a raw clock that sends pulses to the microcontroller to keep it on time), There are a few different types of Arduino, and each may or may not come with a USB connector that allows it to be connected to a computer via the USB port. ARDUINO development boards may be used to create items that are capable of interacting with themselves, or they can be linked to a computer in order to acquire or transmit data and then act on that data (for instance, you can transfer data obtained by a sensor over the internet using an Arduino development board). You will be using the Arduino IDE, also known as the Integrated Development Environment, for programming. This is an example of what is known as an integrated environment.

The board also has a number of input pins and output pins through which other circuits (sensors, LEDs, motor), Fig.3

Programs that can be loaded on Arduino physical platforms can be written in the Arduino embedded development environment. Java is used for the interface and open source languages such as Processing and avr-gcc are used for the programming environment.

ARDUINO is a comparable physical computing platform that is based on "Wiring", which is a programming language that is based on Arduino. In short, the language that ARDUINO uses is a mixture of C and C++. After the actual software has been loaded onto the development board, the Arduino will follow the instructions that have been provided and interact with the program as well as the environment. These applications are referred to by ARDUINO as "Sketches".

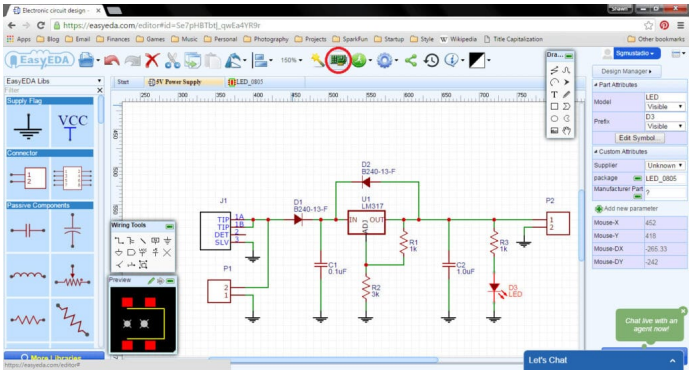

Figure 3 Example of circuit with ARDUINO acquisition board [10]

A simple programming environment, Arduino IDE software is intuitive even for inexperienced users and offers a high level of customization for more experienced programmers. Because it is built on a simple and easy-to-understand programming language, it is useful for instructors because it ensures that students and learners are already comfortable with the programming environment.

There are several different types of ARDUINO development boards available, including Mega, Ten Thousand, Two Thousand, Mini, Nano and even ARDUINO Bluetooth. The ARDUINO UNO and ARDUINO MEGA 2560 are two of the latest devices in this line.

4.2 LabVIEW is a programming environment.

In 1983, work began on various projects related to this environment. Three years later, he became a pioneer in an innovative new method of instrumentation in the field, laying the foundations for virtual instrumentation. This system centered on application software that offered the features of a specialized instrument, especially performance at an inexpensive price, and combined some high-performance peripherals with the processing, display and connectivity facilities of highly popular Macintosh computers. A strong argument in favour of this specialised software was that it allowed total freedom of configuration and was based on a mathematical process.

"It's a revolutionary approach to software engineering: it's a graphical programming environment," says the company behind the technology. It allows the user to take advantage of the versatility of a robust programming language without having to write a single line of code, Fig.4.

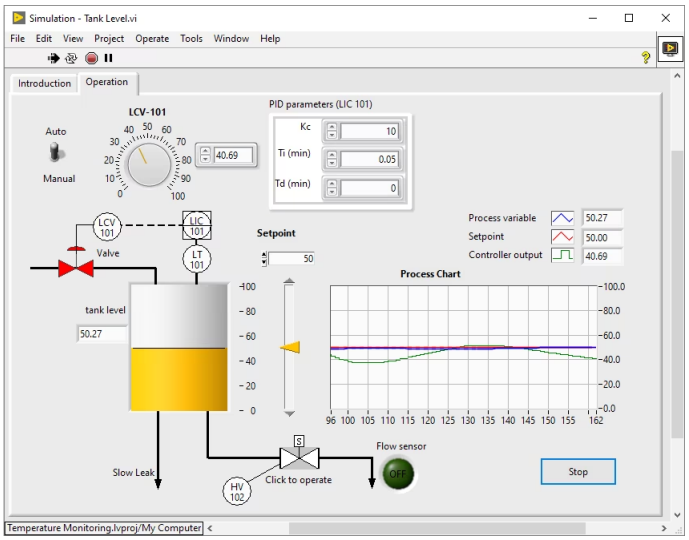

Figure 4. Model of the front panel of a VI, consisting of various controls and indicators for electrode feed control [11].

Provides the advantages of the environment, including the ability to run a large number of programs simultaneously, virtual tools or instances of these tools. The functional diagram includes an explanation of the data flow, which also includes an implicit specification of the processes occurring simultaneously. Due to the fact that the other was designed to be modular, it is possible for any previously developed virtual tool to be incorporated into the system. The integrated compiler produces optimised, 32-bit executable code and its speed performance is equivalent to that of a compiled C/C++ application. LabVIEW is a programming environment that is mainly used for creating measurement and control systems, monitoring the activities of automated systems. LabVIEW is an environment that has many different function libraries that can be used to collect, process, display and transfer information.

Visual tools (VI), are the names given to programs that can be created using LabVIEW. These programs are built on the ideas of modularity and tree hierarchy. When building a VI, it is important to keep in mind the modular nature of the component, which means that it can serve both as a main program and as a subroutine within another VI. A VI that has been used to build the other VI is the one that is called within the vi and acts as a subroutine. The user can make multiple VIs by producing the sub VI and use it when working on other VIs.

A VI is composed of the following three parts:

- Front panel forward;
- An organisation chart;

- The connection is represented by an icon.

Front panel: The front panel is what the user will see and is responsible for defining the graphical user interface displayed on the computer screen. The graphical user interface elements that are available for the Front Panel is separated into controls and indicators, and the indicators are used to identify shows the results of processing. If the VI is considered to be below the VI, then the controls will correspond to the formal input parameters, while the indicators will be the values of the formal output parameters.

The LabView environment provides the application developer with a variety of buttons, toggles and sliders are examples of prefabricated elements that can be used for front panel design, visual representations, tanks, etc. Controls and indicators are available for most types of equipment as well as data: numeric, strings, Boolean, tables, matrices, data groupings, graphs, etc. There are often several different controls and indicators to choose from when working with a particular type of data.

LabVIEW is the most popular test and measurement development environment in 30 years. LabVIEW's simple graphical programming language, availability of an extensive library, exceptional hardware integration, and large developer community increase productivity over similar competitive environments.

Many engineers, researchers and scientists have developed complex test, measurement and control applications using LabVIEW. LabVIEW has interactive wizards and configurable user-defined interfaces, but its strength is its general-purpose graphical programming language (G language) and development tool chain, which includes a compiler, linker and debugger. G is a high-level programming language that increases productivity while running at speeds comparable to FORTRAN, C and C++.

LabVIEW has two key differences from other programming languages. First, G programming is done graphically by plugging icons onto a schematic, which is then converted into machine code for a microprocessor. Despite its graphical style, G adheres to the same fundamental programming ideas as the vast majority of traditional languages. G contains a variety of programming constructs, including data types, loops, event handling, variables, recursion, and object-oriented programming. Data flow rules instead of procedural commands are the second difference

between LabVIEW G code and most text-based programming languages such as C and C++. G, like Agilent VEE, Microsoft Visual Programming Language, and Apple Quartz Composer, emphasizes data as the central notion of every program. Data-oriented or data-dependent data flow execution. The sequence of program execution depends on data flow between nodes, not on sequential instructions.

Only after receiving all the data, a G node executes. Following the completion of an operation, a node in the data flow path is responsible for transferring the data to the subsequent node. The direction of data flow determines how the nodes in the diagram are arranged. Now consider Figure 3. The Subtract node of diagram G cannot be executed before Add completes and transfers data to it. In the adjacent G-diagram, the Add, Random Number, and Divide nodes have the input data they need to execute. Threadless nodes can run in any sequence because they do not need data from each other. Users cannot choose which node executes first.

4.3 The programming environment known as MATLAB.

MATLAB®, which stands for "matrix lab", is both a programming language and an application development system that can be used in a variety of fields. The software known as Matlab was created by The MathWorks, an American company.

- Computational mathematics, including symbolic and mathematical calculations - Algorithm creation - Modelling, simulation and testing of prototypes
- Acquisition, analysis and display of sensory data.
- Application development, including graphical user interfaces (GUIs) - Engineering graphics and applied sciences.

The following components make up MATLAB:

1. MATLAB language: a high-level programming language in which the most fundamental type is an array and in which control statements, functions, data structures, I/O and object-oriented programming features can be found. Six directories are used to arrange programming capabilities, starting with toolbox and continuing with MATLAB.

2. The MATLAB operating system is comprised of a set of modules that allow for the manipulation of variables in space, the import and export of data, as well as the creation, processing, editing, and debugging of MATLAB (.m) files and MATLAB programs.

3. Handle Graphics® is used here. represents the graphics system that is part of MATLAB to which it belongs. Includes commands for the following: a high degree of capacity for two-dimensional and three-dimensional data visualization, as well as image processing, animation, and graphical presentation. Also included are the instructions. In addition to this, it makes it possible to construct graphical user interfaces (also known as GUIs) using low-level instructions.

4. Naturally, the mathematical function library that comes with MATLAB. The MATLAB. An extensive library of different kinds of computing methods, ranging from the most elementary (sine, cosine, and so on) to the most sophisticated (matrix inversion, eigenvalues, Bessel functions, FFT, and so on). Represents the entire spectrum of computing functions, ranging from the most elementary to the most complex ones. Users are able to construct MATLAB applications by communicating in C or Fortran thanks to a library called the MATLAB Program Application Interface -de (API). These applications might be created utilizing the MATLAB Program Application Interface (API), which is available for use. It offers capability for generating and reading specified files, calling MATLAB procedures, and running MATLAB as a computing machine..

4.4 PYTHON SYNTAX

Python, created in 1989 by Dutch programmer Guido van Rossum, is a dynamic, flexible, and adaptable paradigm [12]. Van Rossum is still a leader in the software engineering community trying to perfect Python and its main implementation, CPython, which is written in C. Python is a multipurpose programming language that is used by a number of different companies, such as Google and Yahoo! for building online applications. However, Python is also used to create a variety of scientific and entertainment applications, either in part or in whole. The growing number of users, in addition to Python's prowess as a programming language have led to it being chosen as the primary language used for development is by specialist programmers and even in the classrooms of some educational institutions dedicated to the study of languages. For the same set of reasons, much of the Unix-based systems, such as Mac OS X, Linux and BSD, included with OS X from the beginning the Python decoder or interpreter Python is a multilingual programming language. paradigm, focusing on imperative, object-oriented and functional programming. Python's syntax has a variety of constructs and keywords common to programming

languages in general, but it also has a concept that is unique to it: indentation depth carries a connotation based on its syntax. Simple indentation serves as a boundary between pieces of code.

The Python programming language emphasizes orderliness and simplicity of code, and the grammar allows software developers to express certain programmatic concepts in a way - clearer and more succinctly than is possible with other programming languages. Python is an example of an object-oriented programming paradigm that can be used as a language for object-oriented software development, in addition to allowing programming in operational, functional or procedural mode. Both the type system and memory management are fully automated thanks to a garbage collector service. The printing process is an interactive one. Another one of the language's flaws is that it already has a big number of standard methods and a complete standard library of methods.

Python Libraries The inclusion of structures and functions that allow manipulation and processing, as well as many other function libraries are present due to the concept of "BatteriesIncluded", which can be explained by the fact that Guido van Rossum and the community around the language believe that a programming language has no practical use unless it has a set of libraries that are important to most developers. For this reason, Python includes libraries for working with files, archives, XML files, and a set of libraries for working with the network and the main Internet communication protocols (HTTP, Telnet, FTP). A large number of Web platforms are built with Python. The language's abilities as a language for CGI programming are beyond doubt. For example YouTube, one of the world's most trafficked websites, is built on Python. However, Python allows functionality to be extended through additional third-party packages that focus on a specific functionality.

5. CONCLUSIONS

The widespread use of metals and alloys with increasingly high physico-chemical and physico-mechanical characteristics has presented several challenges related to their machinability. The use of unusual depletion processes, commonly referred to as electro-technologies, has been included in the industry for the purpose of machining high hardness metals and alloys. These materials include refractory steels, stainless steels, corrosion resistant steels and metallic carbides, among others [13].

User text is already academic and does not require rewriting. These methods can be used in either circumstance, due to their various advantages.

- Machined components show a significant level of competitiveness, especially in the case of dies and flat cutting of steels,
- Workpieces are composed of materials that present significant challenges or difficulties for chip-based machining;
- The materials used for the parts fall into the category of non-metallic materials such as porcelain, glass and ceramics;
- In situations where modification of the surface properties of the metal material by thermal or mechanical means is not feasible,
- In cases where conventional processing methods would require a substantial amount of cutting tools.

There are several disadvantages associated with nonconventional processes [14]. Firstly, the initial investment required for the construction of the plants is very high. Secondly, the auxiliary materials used in these processes, especially electrodes composed of expensive materials, contribute to the increased costs. Finally, the efficiency of some installations using nonconventional processes is low, mainly due to high electricity consumption.

Because of the limitations mentioned above, electrotechnologies have found greater use in the aviation, automotive and military sectors [15]. In many different industries, these components find application in the machining of single parts, such as propellers for naval propulsion, propellers for turbine generators in hydroelectric plants and components used in specialized dies.

In order to achieve remarkable performance and success in the business world, it is essential to correlate high-quality unconventional technologies with computerized management systems. This is especially true in the industrial setting. It is impossible to exaggerate the significance of quality in terms of the influence it has on the satisfaction of customers, the development of a solid reputation, and the acquisition of a market edge. There are a number of benefits associated with the use of information technology (IT) systems for the management and regulation of nonconventional technologies, including an increase in the efficacy and efficiency of industrial activities. These technologies have the ability to give solutions for complicated preprocessing tasks, boost productivity, and simplify workflows, which will ultimately lead to production processes that are faster and more efficient [16]..

The use of information technology in non-traditional sectors also contributes to the advancement and progress of industry. These emerging technologies

offer new design and production possibilities, enabling organisations to generate inventive goods and services. In addition, they contribute to increasing competitiveness and meeting evolving market demands.

However, incorporating nonconventional technology requires the inclusion of quality assurance as a crucial element for good results. Delivering high quality items is crucial to guarantee consumer happiness and promote customer loyalty, thus cultivating a solid reputation in the market. Achieving the necessary level of quality requires eliminating human error and establishing uniform and consistent manufacturing practices. The effective use of nonconventional technologies to ensure quality at all operational stages relies on the provision of adequate training and education to employees.

Because it has the potential to bring about significant improvements, a knowledge-based business ought to give serious consideration to the adoption of informatization for nonconventional technologies as a strategic problem. In order to maintain and improve their position in the market, knowledge-based businesses place a high priority on the efficient administration and use of their in-house expertise and information. The automation of procedures that are routine and time-consuming is one way that the integration of information technology and information systems has the potential to significantly improve the efficiency of the knowledge management process. This enables the allocation of human resources to activities that generate additional value, such as fostering creativity, coming up with innovative ideas, and promoting information sharing between members of the team.

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