

Industry 4.0: Implementation of Technologies in Medical Manufacturing Companies

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Abstract. The term Tic's, in this context, refers to the information systems that infer in the data process, allowing its easy access and distribution, thanks to automation through databases and storing in trusted servers, this also refers to the media such as the use of digital marketing through social networks, advertising through advertisements on television or radio stations, for which it is widely used by companies that want to grow, allowing them to have a better image and better quality of their services. In a business context, information systems generally serve the purposes of any other system, such as: data processing, entity data storage, reporting, and other types of data summary tools. However, in the era of digital transformation, the use of information systems, especially those related to management, plays an important role in ensuring the technological integration of all operations. Service management gives the company access to the right knowledge to make quick and accurate decisions.

Keywords: Easy acces and distribution, automation, technological integration.

1 Introduction

The concept of "Industry 4.0" appeared in Germany in early 2010, coined by a multi-disciplinary group of specialists convened by the German government to design a program to improve the productivity of the manufacturing industry; The term was first introduced at the Hannover Messe in 2011 and quickly gained popularity. Sung (2018) That means that machines work independently or in conjunction with humans to produce customer-centric manufacturing that works to keep up at all times. Rather, the machine is an independent instance that can collect, analyze and advise on data. This is made possible by the introduction of self-optimization, self-awareness and self-adaptation in the industry, which allows manufacturers to communicate with computers, not just operate machines (p.41). The industrial sector is considered an engine of innovation, growth and social stability; however, competition is becoming increasingly intense. Customers demand high quality, customized products with shorter production time. So, only those companies that manage to achieve customized products and reduce

production time, through maximum efficiency in their plants, will be able to remain competitive (Siemens, 2018). Similarly, the manufacturing industry is facing major challenges today, such as, globalization, competition increasingly.

The fourth industrial revolution is the digitalization phase of the manufacturing sector, driven by increased data, computing power and connectivity. While many of today's converging technologies already existed, albeit in their infancy and lacking the robustness they provide today, the difference with the past is how they come together to create significant breakthroughs.

It was established with a concept that emphasizes some basic design principles of Industry 4.0. These principles are as follows: Efficiency and productivity, integration, flexibility and adaptability, decentralization, personalization, virtualization, safety and security, it's global, ubiquitous, collaboration, modular, operational robust and reliable, real-time information The leading decision-making that needs to be processed and optimized and created is service-oriented, balancing the work and personal life of the worker, motivating his continuous professional development, and finally. Be autonomous and intelligent Belman (2020).

2 Definition of Terms

TiC: All of these are technological tools and solutions that allow you to organize and efficiently process information and communication of any type of person, company or organization in an efficient and agile way.

Industry 4.0: Combining advanced manufacturing and operational technologies with intelligent technologies, we promise a new revolution in integrating organizations, people and property.

Manufacturing: It is a work organization system that focuses on improving the production system. It is based on eliminating activities that do not add value to the process or to the customer.

3 Methodology

At present, the demand for services through ICTs (Information and Communication Technologies) is greater, which is why companies choose to introduce these services in their logistics, allowing them to streamline processes effectively with a minimum margin of error, thus have more autonomy to manage its operations, interact with suppliers and customers, and compete in the market with others who have not yet done so, thus allowing the increase of production or clients, for which the scope of these services can be expanded.

3.1 Research Objective

The healthcare industry is currently dominant in many European countries, but it is also dominant around the world. Manufacturing in Slovakia and the Czech Republic in particular contributes significantly to the state's GDP. The technology of the Fourth Industrial Revolution has given this segment an unprecedented dimension and is taking

a leap forward. These two countries have the highest per capita production. In our research, we decided to evaluate the fitness and progress of companies in the implementation of technology and automation elements of the Fourth Industrial Revolution. Studies with a similar approach at this level have not yet been documented, so we believe this study will be useful for what we apply to the healthcare industry. The goal of our work is to identify the level of technology usage within Industry 4.0, focusing on automation support in samples from Slovak and Czech companies in the healthcare sector. The survey also used questions about implementing automation, providing IT services, network failures, or industry 4.0 support technologies.

Based on our personal experience and observations in the field of automobiles, we have made two hypotheses based on theoretical knowledge, technical and current articles on this subject. For ease of validation, the results show the average utilization of individual automation elements in classes of various enterprise sizes. The sample was divided by company size in terms of employee numbers (micro / small, medium, large). The various question items were qualified on a scale of 1: not done yet, 2: simple implementation, 3: medium implementation, 4: high / high implementation.

Assumption 1: Bots and software devices are the most popular elements of automated production in the health industry.

Assumption 2: Large manufacturers implement automation elements at a higher level than SMEs.

3.2 Sample and Methods

The quantitative-qualitative documentary methodology will be used, for which information from different sources will be recorded, to later analyze and write them up in this work.

To understand in more detail the method we are going to take, (Baena, 1985) observes a technique consisting of selecting and collecting information by reading and critically reviewing documents, opinions and bibliographic data from libraries, press library, resource and information center.

Therefore, the literature referred to above has been obtained from information media and analyzed for the collection of data and its introduction in the present work, thus fulfilling the purpose of being able to support the research, which has a relationship with the qualitative variable research.

For the veracity of the information collected, a series of surveys to companies that have TiC's tools are carried out by means of a form, in order to later analyze the results and write them up, with the purpose of informing the readers about how TiC's changed the work processes.

For which the technological tool Google Forms will be used, which allows to make dynamic surveys, of easy understanding to be able to distribute in a free way to the candidates who will fill it.

3.3 Research sample and data collection

To collect data, we conduct a survey using a secret quiz that allows companies to freely express themselves. The quiz is designed to help detect a more comprehensive picture of the Peruvian medical device regional manufacturing industry of Lima, while preserving the know-how aspects of these companies. For data collection, we chose to use an electronic questionnaire. To formulate the questions, we used theoretical evaluation of the study. We looked at companies in the medical device manufacturing sector operating in Surco, with a focus on manufacturing. For research purposes, we have divided them into three groups: small, medium and large companies. The questionnaire was sent to about 5 selected companies operating in Lima. We have chosen companies like Ajaime Rojas. The survey was addressed to operational managers or technical director. A total of 18 participants completed the test correctly.

For the purposes of the study, the companies were grouped by size, age, and core business life cycle. Results of the distribution of samples are shown in Table 1. Most of the respondents were representatives of large enterprises (1), three micro and small enterprises. Most of the companies surveyed have been on the market for over 15 years and are currently in the growth stage of their life cycle. These companies believe that they are well suited to apply the concept of Industry 4.0. A comprehensive analysis of the market and external and internal conditions, Supplier network and technical staff, and independent research are basic requirements for success in conditions.

Table 1. Table of survey of the 5 companies of Medical Technology

Variable	Category	Quantity
SIZE	Micro/ Litte	1
	Medium	3
	Big	1
	TOTAL	5
YEAR	Lower than 5 years	2
	5 – 15	2
	Upper than 5 years	1
	TOTAL	5
LIFE OF CICLE	Establish- ment	2
	Growth Phase	1
	Stabilization	2
	Critical phase	0

4 Results and Discussion

4.1 The level of automation implementation

We used the next chart, 1 - no automated production introduced, 2 - significant utilization level, 3 - medium utilization level, 4 - higher automation level.

Figure 1 shows that only 13% of organizations reported the least or no use of automation assets. About the same number of companies (33% and 42%) showed primary or intermediate level implementations, and 12% chose advanced degree responses.

As expected, the adoption of autonomous technology was the normal reaction of micro or SMEs during the stabilization phase that had been on the market for 5 to 15 years.

By industry category, highest/advanced level of use of automation was reported by the organization that manufactures medical devices.

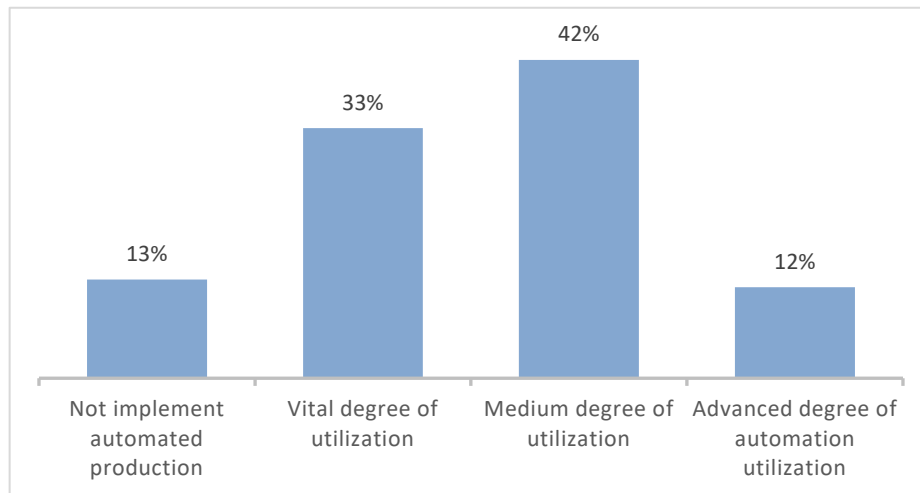


Fig. 1. The degree of implementation of automation elements.

4.2 Advantages of Industry 4.0

We have identified the following benefits: increased production efficiency and cost reduction, digitize paper documents, eliminate errors and problems, improved product quality, simplified manufacturing processes, tracking tool predicts downtime and overviews the current state of production and, ultimately, increased stability and defense at work.

In the picture 2, we see accumulated results for all business surveyed. The attributes that were most appreciated (on a scale of 4 and 3) were the following categories: increased production efficiency, cost savings, optimized product quality, and simplified production-process. Attributes as error suppression, a tool to track and digitize paper

documents also dominate the positive impact (mainly on a scale of 3 and 2). On a scale of 1 and 2 ratings, attributes such as increase stability, defense in the workplace, and prevention of error suppression prevailed.

Benefits such as improved production efficiency, cost reduction, digitization of paper documents, elimination of errors and malfunctions, improved product quality, simplified production process, tracking tools, downtime forecast, overview of current production status, etc., are finally confirmed to make work more stable and defensive.

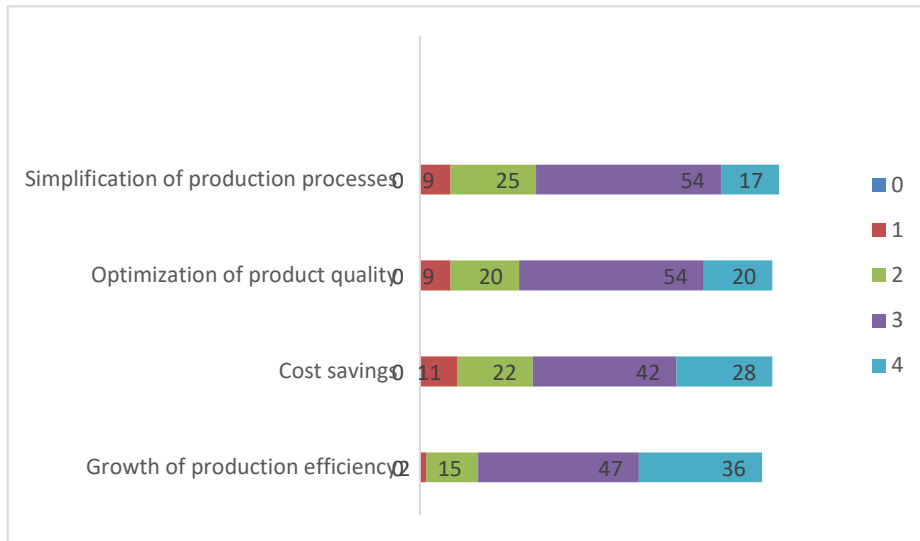


Fig. 2. Advantages in realizing automatic production

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