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# IMPLEMENTATION OF ROBOTICS FOR LEAN MANUFACTURING IMPROVEMENT

***Abstract:*** *Robotics is very prevalent today in various fields and industries. Although there are many guidelines for its successful implementation, many companies have problems with it. This paper aims to give an overview of case studies that deal with the implementation of robotics and, accordingly, to deal with its future sustainability and enable companies to decide on process automatisation easier. The literature search included a term search: Autonomous robots, Lean manufacturing, and Industry 4.0 (and its technologies). Some cases are presented and accordingly, a method for deciding on implementing and integrating robots in one company is given.*

***Keywords:*** *autonomous robots, lean manufacturing, industry 4.0*

## 1. Introduction

Industry 4.0 is based on cyber-physical systems. Cyber-physical system is enabled by end-to-end digitalization. Also, within industry and academia, the next industrial improvement is considered to be driven by digital technologies application (Pinho & Mendes, 2017 ). In general, Industry 4.0 leads to the digitalization era, and Industry 4.0 aims to make companies more efficient and productive through higher automation (Motyl, et al., 2017). One of the technologies that is defined as a participant in Industry 4.0 is robotics (Moeuf, et al., 2018). The aim of implementing robots in production is to delegate tasks and increase operational efficiency. Higher operational efficiency is the objective not just of Industry 4.0 but also of Lean manufacturing. The benefits and shortcomings of robotics have already been confirmed by previous publications. Even though robotics implementation has been expanded to different sectors, there are areas with prospects of being developed in the future. In different fields, companies must make continuous improvements, and this requires the engagement of all resources. To stay competitive, companies are going to digitalize everything that can be digitalized (Schweer & Sahl, 2016).Today, in different industries, autonomous robots are applied at different levels, from beginning to total automation. In some industries, autonomous robots are already widely represented, while in other industries, this is a new term. The implementation of autonomous robots can affect changes in the business model.A robotic system may consist of a single robotic cell or it may be extremely complex. These stations contain multiple robots. This study concern how to implement robotics in existing Lean manufacturing.The term "lean" robotics refers to a method that enables the efficient placement of robotic units in factories. Study answer questions: How to determine the current state of Lean production? How to define improvement

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points based on the current state? How to determine the future state of the system? What factors are to be considered when deciding on the implementation of robots? The study also presents an overview of case studies in different industries and proposes a method for deciding on automation. The focus was on the implementation of robots in Lean manufacturing. In general, depending on the industry, users are more or less inclined to approach process automation. Further research activities can be defined based on shortcomings and fields of action. The study is based on the mapping of the current state of the company and finding out what are the benefits of robot implementation. One of the future activities refers to the development of a tool in accordance with the proposed method. This tool should be able to assess benefits and investments. This tool should establish the advantages of robotics implementation, predict weaknesses, and avoid the lack of flexibility that can occur during it. The article consists of five sections. The first section is the introduction. The second section represents basic terminology, definitions, and a short literature review in terms of Lean manufacturing, Industry 4.0, and the implementation of robotics in Lean manufacturing. In the third section, some of the case studies reviewed are represented. Case studies analyzed in the field of robotics application in companies, with a focus on Lean production. The fourth section proposes a method for easier deciding on the integration and implementation of robots in Lean manufacturing. Also, in the fourth section, it is given an example of the application of the proposed model in the construction equipment manufacturing industry. The method consists of five steps: determining the current state; choosing the manual cell to be replaced with a robot; choosing the robot; predicting future statements; and making decisions based on KPIs. In the end, the fifth section refers to the conclusion.

## 2. Basic work and terminology

### 2.1. Lean manufacturing

The lean concept was primarily developed in Japan, particularly at Toyota (Sundar, et al., 2014). There is no common definition of Lean manufacturing among the authors. Lean manufacturing could be defined in different ways, from method to the system (Bhamu & Sangwan, 2014). It could be said that the implementation of the Lean concept contributes to the maximization of value through the minimization of waste. Lean denotes reducing and eliminating all types of waste, or "muda" in Japanese. Some of the main tools used in the implementation of the Lean concept are value stream mapping, kanban, total production maintenance, 5S, and others. Lean manufacturing can be defined as a method that should be adopted in companies that are forced to transform management styles and make improvements in performance (Sharma, et al., 2016). Today, Lean manufacturing is implemented in all developed economies (Chaplin, et al., 2016). For companies, the implementation of Lean manufacturing contributes to waste reduction and, in the end, to the total elimination of waste (Gamage, et al., 2016), while for customers it provides value not only on the shop floor but also within the whole organization (Hu, et al., 2015).

### 2.2. Industry 4.0

Since the First Industrial Revolution world is facing limited resources from which more goods need to be produced (Muller, 2018). Today, the aim of the Industry 4.0 is still to make companies more efficient. One of the aims of the Industry 4.0 is the connection between the physical and virtual world. According to some authors (Lu, 2017), Industry 4.0 refers to a cyber-physical system and it is correlated to the Internet of Things, big data, and cloud computing... German economic development agency first coined the term Industry 4.0. In general, Industry 4.0 is the term correlated with enhancing flexibility, reducing cost, increasing speed, and improving quality. Between Industry 4.0 and Lean manufacturing there are significant interdependencies (Dombrowski, et al., 2017):

- Lean as a basis for Industry 4.0,
- Industry 4.0 completes Lean,
- Industry 4.0 increases Lean efficiency,
- Lean principles are changing.

For companies, Industry 4.0 concept implementation is also very important to deliver high-quality products. In order to achieve the Industry 4.0 concept, it is necessary to do both, horizontal and vertical integration (Issa, et al., 2018). Small and medium-sized enterprises have bigger problems in implementing the Industry 4.0 concept. The main problems are based on the link between technologic and business. Nowadays, the market is constantly changing. Companies are exposed to the obligation of adapting products and operations accordingly to market requirements. Companies are trying to exploit benefits from digital technologiesand this requires engagement not only of resources but also changes in the organizational business model. Transformations made in an organization need to be based on management practice of product and process transformation as well as the transformation of operations and organizational structure (Matt, et al., 2015).Several authors defined nine pillars of Industry 4.0(Motyl, et al., 2017):

- Internet of Things,
- Cloud computing,
- Big data,
- Simulation,
- Augmented reality,
- Additive manufacturing,
- Horizontal and vertical system integration,
- Autonomous robots,
- Cyber security.

Robotics, simulation, additive manufacturing and the Internet of Things are the most frequently analyzed technologies.

For those problems where standard mathematical models are not enough, simulation can be used. Simulation is one of the tools that are very useful for understanding the dynamics of business systems. Simulation models are dealing with different parameters such as time-dependent, duration of recovery, and others. In running simulation studies knowledge of experimental design should be used. To understand simulation studies it is necessary to understand the design, execution, analysis, and report of simulation.

Today many manufacturing processes can be potentially replaced by additive manufacturing. There are different definitions of additive manufacturing. One of them defines additive manufacturing as a process of creating 3D objects under computer controlled contour crafting system. Additive manufacturing is appropriate for new products as well as for new business models (Alcacer & Cruz-Machado, 2019). In every company manufacturing impacts costs. Higher costs compared to competitors can significantly affect the market position. Additive manufacturing can affect not only manufacturing costs but also the reduction of time needed for design or manufacturing.

The Internet of Things can be defined by defining separately words "Internet" and "Things". „Internet" is a network of networks (Alcacer & Cruz-Machado, 2019) and „things" can be something like an object or a person. The advancement of mobile devices caused an increase in Internet of Things. Key technologies to achieve the Internet of Things are connected RFID, middleware, Internet of Things application software, software defining networking, and others. There is four layers of Internet of Things architecture: sensing, network, service, and interface layer.

### 2.3. Robotic and Lean manufacturing

Improving Lean manufacturing with the implementation of industrial robots is being studied by many authors (Botti, et al., 2017). Automation allows for improved production performance without sacrificing competitiveness or increasing costs. Besides standard robot implementation, collaborative robots are also very permanent in the manufacturing industry. Collaborative robots refer to a workspace in which robots and human workers are working together. Robots and human workers should impact key performance indicators. Automation, in general, has an effect on the cost reduction and differentiation of one company compared to competitors. This article considers different factors that could be affected in Lean manufacturing by the implementation of robots. Some authos(Stork , 2018) emphasize that the use of robotics in Lean manufacturing is a factor that has a positive effect on flexibility, optimization, and standardization to achieve goals related to the Lean philosophy. The robotic workstation can impact different aspects of Lean manufacturing. Lean automation can contribute to production system flexibility. Automation in Lean manufacturing also contributes to the simplification of solutions. In the end, implementing robots in Lean manufacturing is very useful for the visual presentation of information, the reduction of time, and the improvement of many production aspects (De Oliveira, et al., 2018; Tilahun et al., 2020). It is very important to have an adequate strategy for the implementation of autonomous robots to make them successful. Autonomous robots can be implemented in different companies, but they do not have the same importance. For production systems, robots are very important to reach the demand flexibility level. Robots can be defined as one of the artificial intelligence forms but also in combination with artificial intelligence, can impact production costs. In every production, robots can contribute a lot to the flexibility of demand level (Pedersen, et al., 2016), and robots with artificial intelligence can contribute to cost reduction.

## 3. Case studies on autonomous robot implementation

Along with other Industry 4.0 technologies used, the improvement of Lean manufacturing can be based on robotics implementation. Robots are primarily used to support autonomy levels. A lot of authors analyze production adjustments according to products by using autonomous robots (Rosin, et al., 2019). Besides this, collaborative robots are often in the field of interest. Collaborative robots assist employees and respond to production requests in order to ensure ease of production. Some of the case studies in the field of robotics implementation are given below.

A retrospective on the main achievements in the field of robotics, depending on continent and industry, is given in (Grau, et al., 2021). In this article, there is a review of robots' implementation in Industry 4.0, and future directions for their development are proposed. Future directions refer to new materials, new sensors and actuators, wearable machines, and, in the end, issues that are related to new technologies with an emphasis on flexibility, intelligibility, adaptability, and transparency. Navigation methodology for robots that cooperate in a hypothetical industrial environment (like a smart factory) is placed in space that does not change and the robot must access every place. A robot automation model that follows robot movement and sensing and task manager modules is proposed. The structure that is created allows the decentralization of planners according to the robot and it is in accordance with the architecture of other environments. Using the theory of supervisory control makes sure that the robot moves in a safe way.

One of the future developments in the field of robotics is the development of humanoid robots. A case study of technological approaches for facilitating the interaction of human operators with an advanced human robot was conducted in the automotive industry (Michalos, et al., 2018). A case study was done under the ROBO-PARTNER project. The approach for the planning and design of the collaborative application was based on end-user requirements. Software that was developed is analyzed as well as hardware tools that were used. Axle assembly stations and rear wheel groups in the automotive industry are used in the case scenario. To enable human-robot interaction, several modules have been developed and integrated. Results refer to cycle time reduction, human operator strain, and environmental issues.

Providing a guide for humanoid robots can also be used in multimedia ontological models as a general knowledge base (Russo, et al., 2021). A humanoid robot learns from those semantic guides. Knowledge acquisition is based on two different approaches (top-down and bottom-up). The top-down approach consists of knowledge acquisition from pre-established semantic knowledge. The bottom-up approach implies knowledge acquisition by exploring the environment. Exploring the environment includes audio data, images, and distances. The approach that is proposed in the article is implemented on humanoid robots and tested in a real-world environment.

Today, it is not uncommon for one company to strive for full automation. Software that implies full automation with reasonable costs and was inspired by the Amazon Picking Challenge is present in the article (Huang & Mok, 2018). The system that is created includes deep learning, computer vision, and trajectory optimization. The pick and place system in the study is the robotic arm, which ends with a specialized gripper. The system is programmed with computer vision algorithms. After generating 6D end-effector poses, it is needed to plan the path from the initial to the desired pose for the gripper. The experiment with pick and place tasks is performed on a shelf with eighteen objects.

Cost reduction has been analyzed often to show the impact of robotics but also of digital transformation in general. Cost reduction and its benefits are examined, regardless of the observed Industry 4.0 technology (Atzeni & Salmi, 2012). The impact of autonomous robots on life cycle and cost is analyzed by comparing robotic electric lawn mowers and conventional gasoline and electricity-powered-pushing mowers (Saidani, et al., 2020). Also, energy efficiency is one more field of focus in the era of digital transformation. Energy efficiency is analyzed through simulation (Benzegra, et al. 2017). A system that was used for simulation has four KUKA KR2102700 robots. Those robots have four technologies: handling, riveting, gluing, and spot welding. The use of robots can save energy consumption until 40% of robot movement is reached. The research part of the article contributes to knowledge about the implementation of digital transformation. The practical part of the article gives an example of potential innovation in IT and business.

## 4. The proposed method for deciding on robotics implementation in Lean manufacturing

Even though there is a lot of guidance on the implementation and integration of Industry 4.0 in Lean manufacturing, some concerns still exist. Lean manufacturing as a philosophy delivers value to customers. Lean manufacturing delivers value to customers by eliminating waste. Some companies have problems with the implementation of Lean in the production system. The main problems are related to the culture in the company, leadership, and deficiency of an action plan(Duarte & Cruz-Machado, 2019). Integration of Industry 4.0 technologies into

Lean manufacturing should have a positive impact on waste reduction, performance improvement, a decrease in the number of human errors and other benefits. As can be seen, Industry 4.0 refers not only to equipment but also to people and machine interconnectivity (Vlachos, et al., 2018).

The benefits of robot implementation have been shown in different cases. Cost reduction is one of the common benefits defined in reviewed cases. The research showed an interest in researching the impact of robotics in different sectors. There is great diversity among the industries in which the research was conducted. It is often emphasized that changing the business model is necessary for the implementation and integration of robots. On the other hand, it is emphasized that the implementation of robots opens numerous possibilities for companies and enables access to new markets, increases the possibility of continuous improvement and contributes to maintaining competitiveness. Some of the questions that arose are related to the way a company should manage robots, what are the costs that will arise from their implementation, how these costs should be recognized and how to manage them.

To implement robotics in Lean manufacturing and draw conclusions about its benefits and drawbacks, it is necessary to first understand the current state of Lean manufacturing. Visualization of the transformation of raw materials into finished goods can be represented by using Value Stream Mapping (VSM). VSM contributes to the visualization of cycle times, manpower deployment, information flow, and so on. It also includes value-added activities as well as non-value-added activities. Based on VSM, the main information about the manufacturing process is gained. VSM shows people, tools, metrics, and requirements that are needed to achieve requirements in a lean enterprise. VSM is a powerful tool for improving and understanding Lean manufacturing concepts. It includes different symbols, product and information flow, production data and insight into potential bottlenecks and other production issues. VSM gives information which can be considered to gain insight into possible improvements. When the current state is met through VSM, one company can consider the future state in the case of the implementation of robot cells in different parts of manufacturing.

Waste in the manufacturing process should be identified and, according to this, a manual cell which will be replaced with a robot cell can be identified. Some of the waste that could be eliminated by integrating and implementing autonomous robots into Lean manufacturing are overproduction, defects, inventory, and waiting... However, not every cell is adequate for automation. Some cells are more suitable to be replaced with robots, and others can be just partly automated. The manual cell that will be replaced by a robotic one should be chosen so that the most benefits can be gained and the most important problems can be solved.

Except for choosing the manual cell that should be replaced with a robotic one, the decision on the robot should be made. Some main categories that should be considered are the model of the robot, its specifications, and correlations with tasks that need to be done. Specifications of the robot are very important to meet all the needs of the process. The characteristics of the product that should be manipulated, like size, weight, material, and others, will significantly affect the capabilities of the robot, like reach and speed. Software that will be used for programming the robot, safety measures that it must meet, and tools that will be used for performing work tasks also must be considered. Some of the main categories of robots that can be chosen, and are represented in Figure 1, are:

- Cartesian robots - very precise robots whose speed is adjustable
- Collaborative robots - adequate for quality inspection, pick and place, and other tasks. They are very safe.

- Articulated robots - similar to collaborative robots, look like a human arm and move on four to six axes. Adequate for material handling and packaging tasks
- Scara robots – adequate for assembly and similar tasks. They move on three axes and have rotary movement
- Delta robots – can be used in different industries (for example, pharmaceutical and food)
- Polar robots – adequate for die casting and injection modelling. Those robots have two rotary joints and one linear

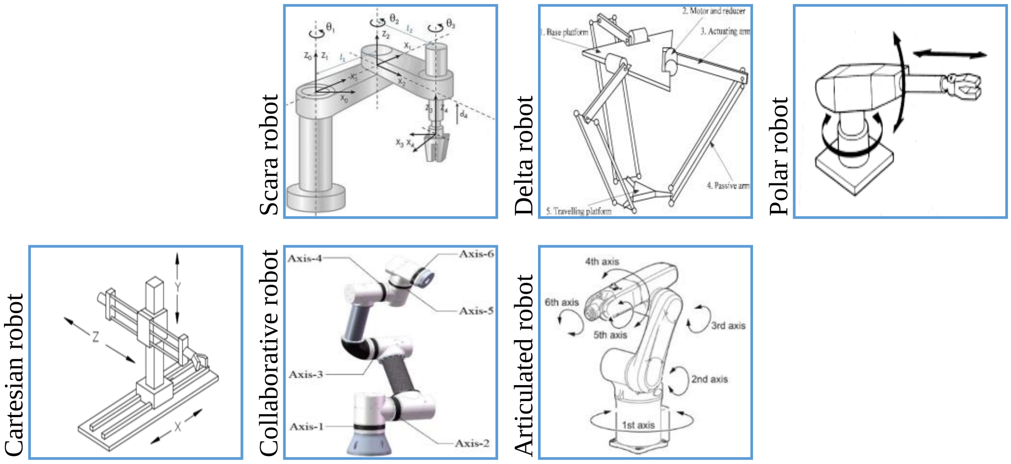


**Figure 1.**Main categories of robots

After choosing the robot, future statements for every possible combination can be predicted. The implementation of robots in Lean manufacturing must meet some criteria, primarily referring to the value-added activities. Despite this, some non-value-added activities can still be necessary for the manufacturing process. When one robotic cell is implemented in the manufacturing process, the value should be provided even though non-value-added tasks are done. A lot of factors can be analyzed in predicting future statements, and those factors will depend on every company. Considering that a robot, unlike a human, can work in three shifts without a break, and there is no absence due to injury, a lot of changes can be made. However, sometimes the robot needs a human in order to serve it. Even after the introduction of robots, it is necessary to have an adequate work distribution. In addition to those and other internal factors, the future state of the company can also be influenced by external factors. External factors that can influence the future performance of one company include political, sociological, fiscal policy measures, and environmental awareness. There are also times when a robotic cell has an effect on another cell or when equipment needs to be moved.

After all, the decision on implementing and integrating robots into Lean manufacturing should be based on the improvements that it could bring. Like in many cases, this decision can be based on overall equipment efficiency but also on many other criteria, depending on the case analyzed. As can be seen from case studies listed in section 3, different authors observed indicators like cycle time, impact on environmental issues, human operator strain, costs, energy efficiency, product lifecycle, flexibility, intelligibility, adaptability, and transparency.

At the end, a systematized method for easier deciding on the implementation of robots can be presented as follow:

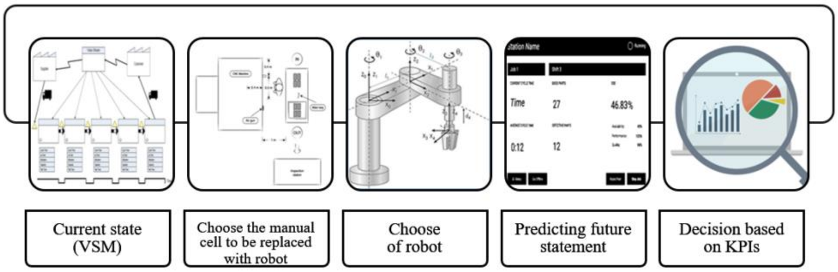


**Figure 2.**Proposed method for deciding on implementation of robotics in Lean manufacturing

Figure 2 represents the steps of the proposed method for deciding on the implementation of robotics in Lean manufacturing. The first step involves establishing the current state. Based on the bottleneck and other detected problems, the manual cell to be replaced with a robot should be chosen. When the robot is chosen, future statements can be predicted. To make the final decision, performance indicators that can be observed are capacity utilisation, overall equipment effectiveness, optimised maintenance schedules, average lead time, average cycle time, defect number, return on investment, breakeven point, cost on maintenance and repair against productive value, failure frequency and time between failures.

### 4.1. Application of the proposed model in the construction equipment manufacturing industry

The practical application of the model will be shown by the example of a company engaged in the production of construction equipment. Figure 3 illustrates the current state of production without robot cell integration.

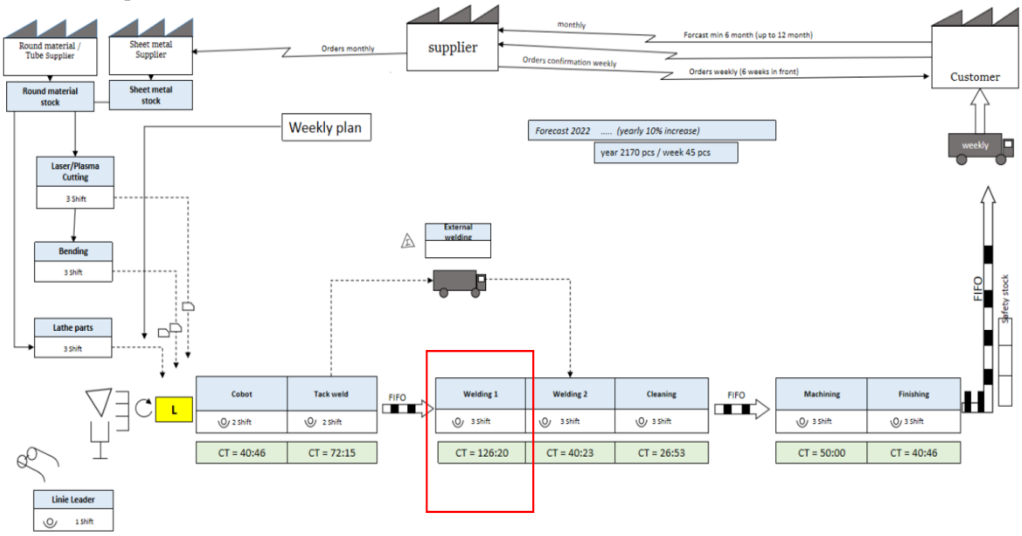


**Figure 3.**VSM

Based on VSM, it can be seen that the time required for process „welding 1” is significantly longer than the other times.

In the example, the production associated with the robotic welding of a single component is contrasted with the current manual welding process. In order to precisely determine the time differences between manual and robotic welding, both processes are standardized. The information is provided in the tables below.The time necessary to manually execute the process "welding 1" is comprised of the times listed in Table 1,where VA refers to activities that add value, NVA refers to activities that do not add value, and NNVA refers to activities that are required but not paid for by the customer.

**Table 1.**Time for manual execution of activities

| Activity | Time (min) | VA/NVA/ NVAA |
|---|---|---|
| Placing the piece in the tool | 06:16 | NNVA |
| Dressing | 01:00 | NNVA |
| Marking the piece | 05:50 | NNVA |
| Welding | 78:18 | VA |
| Changing the position of workers or pieces | 23:43 | NNVA |
| Adjusting the appliance, replacing the wire, … | 07:08 | NNVA |
| Removal of pieces from the tool and transport on the pallet | 04:05 | NNVA |
| **Total time** | **126:20** | |

According to the determined times, more than a third of the cycle time is required for preparation prior to the welding. Even 48:02 min refers to NVAA. If cell "welding 1" is replaced by a welding robot, it is possible to predict the future condition of production.

The choice of the robot itself is determined by the process being automated. When it comes to welding, robot cells are most commonly designed to isolate humans from the process. After executing the program, the worker is free to leave the robot. This significantly improves worker safety in comparison to manual welding.When automation is used, Table 2 shows how long it takes to finish the welding process.

**Table 2.**Time for manual execution of activities

| Activity | Time (min) | VA/NVA/ NVAA |
|---|---|---|
| Placing the piece in the tool | 05:51 | NNVA |
| Welding | 86:46 | VA |
| Removal of pieces from the tool and transport on the pallet | 03:41 | NNVA |
| **Total time** | **96:17** | |

A human's working period for a shift is 450 minutes, while a robot can work 480 minutes without a break. If the number of pieces that can be produced in a shift is proportional to the ratio of working time to the time needed for "welding 1," then:

$$x = \frac{450}{126} = 3{,}57$$

Where ***x***is the number of pieces in the case of a manual cell, and:

$$x' = \frac{480}{96} = 5$$

Where***x'***is the number of pieces in the case of a robotic cell.

Considering the previously defined times, it can be determined that a worker can manufacture 3.57 pieces of product per shift, while a robot can make 5 pieces of product per shift. Production capacities for a period of one month are shown in Figure 4.

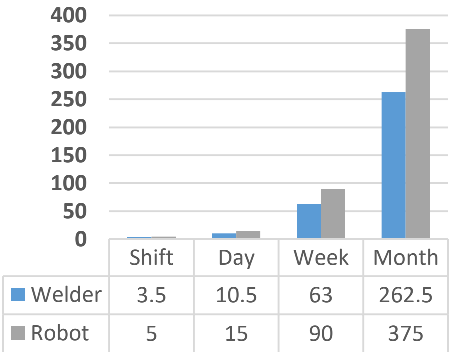


**Figure 4.**Production capacity

Taking into account the fact that the selling price per unit is 600 euros and the profit margin is thirty percent, the monthly revenue would increase by 20,250 euros if the robot were implemented. As the price of the robot with installation and integration is seen to be 310,000 euros, ROI can be estimated.

$$ROI = \frac{310.000}{20.250} = 15{,}31$$

The conclusion is that investment will yield a return in under two years.

Considering the reduction in cycle time, the elimination of the bottleneck, and the return on investment in less than two years, the company should decide to automate the manual cell.

Also, the worker is exposed to significant dangers, which is another reason for choosing to implement robots in this particular process.

In addition to being exposed to fumes of chromium and manganese, nitrogen, arsenic, etc., workers are also exposed to ultraviolet radiation, which can lead to burns, the loss of certain skin properties, and serious diseases.

If every worker in this process wore an adequate protective suit, it would be crucial to reduce their exposure to both physical and chemical hazards. The consumable value of protective equipment is not taken into account, but it is important to emphasize that reducing its wear and tear results in significant cost savings.

The exact choice of welding current and voltage is prescribed for each gap. Important is the robot's consistent speed and welding technique, which cannot be accomplished manually regardless of the worker's experience.

## 5. Conclusion

This article considers the implementation and integration of robotics in order to improve Lean manufacturing. The article considers case studies in different industries on the topic of robotics. Case studies are permanently searched in the field of Lean manufacturing. Through analysis, it is concluded that there is a positive relationship between Lean manufacturing and robotics. As it is assumed, a positive relationship is identified no matter the company size or industry. The benefits of robotics have been shown through cost reduction in a lot of cases. Other indicators are also analyzed depending on the case study. For example cycle time, impact on environmental issues, human operator’s strain, energy efficiency, product lifecycle, flexibility, intelligibility, adaptability and transparency.

Automation can have numerous positive effects on businesses. In addition to the savings reflected in the reduction of production costs, waste, takt time, and cycle time, there is the elimination of bottlenecks. The automation of the production process can contribute to the improvement of product quality as well as the health of employees by eliminating repetitive tasks or other forms of tasks that contribute to the deterioration of employee health.During the redistribution of jobs, workers whose jobs will be replaced by a robotic unit will receive new responsibilities that will increase the efficiency and effectiveness of work. Frequently, robots will require human maintenance.

The paper aims to represent a method for easier deciding on the implementation and integration of robotics in Lean manufacturing. The proposed method consists of five stages. The first stage refers to determining and representing the current state of the company. The current state can be represented by using VSM. After detecting waste that could be eliminated, the decision to the manual cell to be replaced with a robot should be made. As there are a large number of different robots on the market with different characteristics, performances and functions, the next step involves making a decision about which one should be used. The robot is chosen in such a way that it best meets the needs of a specific manual cell. Based on data generated in production and data that can be inferred based on the specifications of the robot selected for the application, it is possible to predict the future state. The future state is compared with the current state and the final decision is made based on key performance indicators improvement possibilities.

In the example given in chapter 4, it is evident that the implementation of robots in the production process for the specific welding process is primarily profitable. The return on investment according to a calculation would be realized in less than two years. The fact that the robot has a significantly faster welding rate than the worker has the greatest impact on this outcome. In a company that manufactures construction equipment, a robot produces 1,350 more units annually than a human worker.

The quality of welded joints is significantly higher. According to this, the potential complaints is lower and it is also extremely important. Safety is one of the additional cost-cutting parameters, as the worker in this example is exposed to extremely complex physical and chemical dangers.

In the literature reviewed, interviews are often used as a source of data, which is not a good enough indicator of the future progress of the system compared to the current state. Some limitations related to methodology should be taken into consideration. In addition, the next step refers to the creation of a tool that will enable the assessment of performances after introducing robotics. The tool should be designed so that it can be applied in companies regardless of size, industry, portfolio and other parameters. Based on business data in each company, it would be possible to gain insight into the usefulness of robotics in different segments and the best way to move towards industry 4.0. This tool should be able to assess the benefits versus the investment that the company will have. Based on the results one company should decide whether to approach or not automation and which part of the organization should be focused on.

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