Digital twins aided stitching leather goods process improving

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Introduction

Recently Guanajuato´s government has been awarded in the Digital Transformation category as part of the XII Award to the best practices in local governments 2022 by the Alcaldes de Mexico magazine. The statal management might extend this technology in the leather goods area becoming into a new era of new practices related to disruptive technology implementation improving problems solution systems in this industry.

It is known that digital transformation has been helping industries all over the world for not less than 40 years. The new way to plan and act using it for the leather industry may has created some contributions to reduce costs at preventing and fixing errors or machinery damages. The implementation of digital twins for engineering through the leather industry can be the start of a new era for solving problems that reach for the human capital profit. Making and being part of the new way to live and produce leather goods means to change the way we do what we expect to achieve.

In the following document can be found some important reasons to automate a manufacturing process specifically at the stitching area by using digital twins. As this kind of automated software is able to predict changes in the stitching machine using future predictable results and act before it starts to result a lost profit to the company. Mainly based on the innovative idea of the Shoe Lab that is located in Leon, Guanajuato which is a perfect example of why is necessary to keep adding new practices in this industry and in the state way to elevate the competitivity forming talent with skills following the industry 4.0.

Objectives

The digital transformation may help human capital to make the manufacturing process easier and useful by using the real leather features to predict future changes that may happen in the next few years creating digital twins ready to replan the current manufacturing system.

- Improve the accessibility and quality of digital services offered to the population.
- Improve the facilities of a production system.
- Use a digital twin in a stitching machine for leather goods to predict future failures.
- Improve the framework standards for leather products.
- Increase the quality of the manufacturing support systems.

Hypothesis

“Digital transformation is the key to a manufacturing system aimed at improving the human capital environment. By employing digital twins that can predict and solve future changes on it”.

Development

The leather manufacturing industry may adopt a new way to solve future problems that will affect the industry business environment. Having a public knowledge of software technology would increase the human capital opportunities known that in the leather goods industry the working process depends on 20 percent by the machine and 80 percent on the human capital skills in the area which involves working risk in the process.

Even though digital twins can be used in multiple manufacturing industry applications. The leather goods production system might be deeply helped to predict errors on the facilities used on it to improve the stitching area. This dissertation has been based on the leather goods sticking area and takes data from a real process done by Original Leather Goods company located in Leon, Guanajuato, Mexico. This company uses a semi-automatic stitching machine created by The Global Industrial Sewing machines (illustrations 1,2,3 and 4). It will be able to implement a new way to avoid lack of production time caused by using digital twins for its software. This machine is able to make a single needle lockstitch with needle feed and walking foot, thread trimmer and automatic back tack. It has a fully automatic lubrication, direct drive built-in motor and a separate control box and panel. The bobbin winder is built-in the machine head.

Illustration 1. Stitching machine used at OL GOODS company.

Illustration 2. Stitching machine.

Illustration 3. Stitching machine backside.

Illustration 4. Stitching machine control box panel.

Theory and methodology

“Digital Transformation (DX) is about adopting disruptive technologies to increase productivity, value creation, and the social welfare”. (Just a Moment. . ., n.d.). “Digital transformation is the integration of digital technology into all areas of a business” (What Is Digital Transformation?, n.d.), fundamentally changing how a process operates. It pretends to change organizations culturally to continue experimenting and get comfortable with failure itself. It has been the reason for several examples of business dynamism, particularly in technology intensive industries. The Shoe Lab project in Guanajuato is the best example to give talking about the benefits of what to focus on to create economic increase. Some companies have reorganized themselves to operate the standard mode for traditional businesses and operations, meanwhile a disruptive mode seeks additional opportunities to exploit new markets and innovate in technologies, processes, products, or services that are also running.

Additionally, “a digital twin is a virtual representation of an object or system that spans its lifecycle, is updated from real-time data and uses simulation, machine learning and reasoning to help decision-making” (What Is a Digital Twin? | IBM, n.d.).

Some reasons for automating companies in manufacturing operation and specialty in this topic:

- To increase labor productivity. This can be achieved using digital twins to great output per hour of labor output while errors are predicted before they happen and might restrict productivity.
- To mitigate the effects of labor shortages. This has stimulated the development of

automated operations as a substitute for labor reprogramming it using digital twins.

- To improve product quality. Automation might help to highly support manual operation at performing the manufacturing process with uniformity and conformity to quality specifications. In addition to decreasing most of the working risks.

Moreover, there is a significant competitive advantage gained in automating a manufacturing plant. The current case using automation using a system created of digital twins can benefit the company controlling their process in the future without being on it physically.

Eventually in Guanajuato the leather goods industry can benefit at getting the Industry 4.0 way to act. It is based on identifying opportunities since machines collect data giving information of maintenance, performance and issues analyzed. The main example in spite of helping the stitching area are the Shoe Lab machines shown in the illustrations 5 and 6. Knowing that it has high technology that can achieve leather good industry problems adding value to the product and frameworks.

Illustration 5. Massive automatic Stitching machine at the Shoe Lab

Illustration 6. Automatic stitching machine at the Shoe Lab.

Conclusions

Automation improves the productivity and quality of fashion products by minimizing human intervention and avoiding manufacturing errors.

Digital transformation for the leather goods industry is the key to improve the current ways to work and solve and prevent problems. As a result of the new practices era leather goods stitching might be helped to predict lost profits by using the digital twins technology since it can be integrated in the process.

Considering that the Stitching area and its process as such in this productive sector, represents between 30 and 40 percent of the total cost. Manufacturers of leather goods, as practiced until now by the OLGOODS company, have reduced labor costs through the management of the global supply chain during the last decades by locating production facilities in developing countries. At present Shoe Lab is the main example to follow to keep learning and acting as part of the Guanajuato leather industry.

However, due to the COVID-19 pandemic and the influence left by the armed conflict between Russia and Ukraine, this business strategy is more difficult to maintain due to recent changes in the global labor market. It is necessary and urgent to find alternative manufacturing solutions and the automation of the sewing process and other manufacturing areas is an option. While Industry 4.0 is still evolving companies can upskill their current workforce to take advantage of the competitive production systems.

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