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# HUMAN-ROBOT TECHNOLOGY COLLABORATION (COBOT) & HOW IT WILL BE PROFITABLE FOR APPAREL INDUSTRIES

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***Abstract:*** Fast-paced, high-volume production processes are the foundation of all clothing brands. To increase efficiency and productivity, every part of the process, from raw materials to final products, needs to be carefully monitored and controlled. Automation and robotics technology in clothing production has grown exponentially. Robots can be used in many industries, but their application in the textile industry is the best. Fortunately, innovations in robotics have brought new and improved methods to clothing production. Many specialized robots are equipped with advanced sensors. The integration of many of these features makes it easier for companies to perform tasks such as cutting, sewing, labeling, and packaging.

***Index Terms*** **- Industry 4.0, Automation, Robots, Universal Robots, ROI**

In manufacturing industries, especially where we produce in mass quantities like apparel, accessories, and footwear industries, the "Industry 4.0" movement can be a revolution. The rapid maturity of the latest technologies allows innovations in manufacturing processes that optimize existing systems and cause the invention of the latest processes. An apparel smart factory can also make iconic breakthroughs like making affordable mass customization a reality by entirely reimagining the assembly workflow to become more agile, modular, and cost-effective. Nowadays, industrial robotics is about robots replacing laborers who are tasked with non-ergonomic duties. Robots are tough, fast, and really accurate machines that may complete their tasks faster, with better quality, and for a lower cost than humans. (Ales Vysocky, 2016) Collaborative robot (shortly known as CoBot) arms from Universal Robots (1, 2023)
complete many operational tasks a day they have taken the step towards Industry 4.0 by deploying collaborative robots to automate various production and manufacturing tasks, and reaped immeasurable benefits through Human Robot Collaboration. (See, 2019) Collaborative robots are also called cooperative robots or robotic assistants. A cobot intended for cooperation with humans doesn't need to have a strictly different design from standard industrial robots which are in conformity with safety standard ISO EN 10218. (10218, 2011) The workspace of the CoBots must be monitored, because they react in a presence of foreign objects like humans or other collisions with objects. Therefore safety is well maintain by providing alarms & lighting signals. The workspace is divided into several areas & these areas are inspected with Scanners or a vision system. (Villani, 2018) If the cobot's workspace is breached, it'll stop working. The CoBot can operate at maximal parameters & the parameters like – speed, grip, position, velocity, and force are well monitored. The presence of a person within the area where a heavy robotic arm is moving at high speed urges to affects the difficulty of safety. Generally, they are available in warning colors & surrounded by a fence.

When the operational range of the cobot is disturbed, the cobot is stopped immediately to avoid any harm or fatal injury. Also, Cobots have no sharp edges all their dangerous parts are rounded So no parts where fingers could be pinched. The surfaces are softened with plastic materials (Frigola, 2006). Manufacturers have chosen different strategies to assure the safety of their products, Some examples of them are MRK-Systeme KR SI, Fanuc CR-35iA, ABB YuMi, UR-10, KUKA LBR iiwa, etc. The first Cobot that has been approved worldwide is the lightweight robot LBR iiwa from KUKA. It can pick up & place almost 10kg of weight at a time; & for lightweight purposes, easy to install in industries. (Sonnenberg, How Manufacturing Profits from Human-Robot Collaboration, 2019)

Keeping up with the competition and implementing the latest technological advancements SMEW Textile Machinery Pvt. Ltd. Ahmedabad collaborated with Universal Robots and deployed their first UR10 robotic arm in January 2017. The UR cobots are used for pick-and- place applications. This was a new addition to the workforce but the simplicity & operator- friendly features of the cobots made the completion of tasks easier & faster. After the addition of the cobot to their manufacturing, SMEW realized that

their production had increased from 30 pieces per week to 80-90 pieces per week; a 300% boost in production, over a brief period of 8 months. They have witnessed a return on investment in less than a year. The staff are tremendously satisfied with their new co-worker as the cobot is easy to program according to their requirements & are appreciating employed along with robots (2, 2023).

"The simplicity and the non-fencing requirement met our requirements specifically for these machines. Our operators find it very easy to use. The safety features are extremely important and the +/- 360° movement helps the robot to work in a constrained space. We hope to have a long-term relationship with Universal Robots." (NAGARSHETH, 2018)
The current systems, however, are only a primary step within the field of human-robot interaction. Because of further research in Artificial Intelligence (AI), the programming of cobots will probably become much easier or maybe unnecessary in the future. Cobots can change the restructuring of entire production process in a company. "A collaborative robot can influence many processes in a suitable way & manage an increased efficiency of at least 30 to 40%." (Sonnenberg, 2019) This increase will be achieved on the one hand through higher productivity, but also through the reduction of workforce & medical leave. However, it is not possible to calculate the exact amount of increase in efficiency achievements by cobots, as this can vary significantly from company to company & industry to industry.
"Automation & the cost of robotic machinery may soon become modest with low-wage workers. If machines replace garment assembly workers on a large scale, the implications for the industry and for developing economies would be dramatic. As the world's population expands to an estimated 9 billion people by 2030, the apparel industry is expected to double in size to a $4.4 trillion business with regional production clusters emerging as new consumer markets. Just as in previous industrial revolutions, when factory owners adopted new technologies to leverage a competitive advantage in their industries, it is incumbent on today's manufacturers to invest in the education of tomorrow's workforce." (Hertveldt, 2020)

A Cobot is particularly suitable as an automation entry-level model for companies that have little experience with technology and robots and/or don't have much to spend. Cobots are an attractive option due to their low entry threshold. It's a limited investment. A cobot is right for gaining experience with robots. Programming experience is required. This makes a cobot extremely suitable for companies with little in-house technical knowledge, additionally to automating the machining process. Cobot also can be more cost-effective. Within the assembly & packing industry, for example people often work with products that weigh less than 10kg, a cobot would be sufficient in such a situation. A cobot is additionally fine during a clean working environment where the actions to be administered consist purely of picking & placing. Furthermore, cobots are often procured as an automation solution for cheap or existing machines, for giant series, or if the cobot only must be wont to a limited extent. Even in such cases, however the shortage of flexibility remains a drag. (Koning, 2023)

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