INFORMATION SYSTEMS: HUMAN-MACHINE RELATIONSHIPS IN THE PRODUCTION ENVIRONMENT

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Annotation: This article explores the dynamics of human-machine relationships in the production environment, focusing on the role of information systems in enhancing efficiency, productivity, and collaboration. It highlights key aspects such as automation, data-driven decision-making, and the balance between human control and machine automation. The article also emphasizes the need for continuous training to adapt to technological advancements, while addressing safety and ethical concerns associated with increased automation. By integrating human expertise with machine capabilities, production environments can achieve optimized performance and sustainable growth.

Keywords: Human-machine relationships, information systems, production environment, automation, data-driven decision-making, collaboration, worker safety, ethical considerations, technological adaptation, efficiency.

Introduction: In today's rapidly evolving industrial landscape, the integration of information systems with production environments has transformed human-machine relationships. These relationships are now a cornerstone of modern manufacturing and service industries. Machines, robots, and artificial intelligence (AI) have taken over many repetitive and precision-based tasks, allowing humans to focus on problem-solving, decision-making, and system optimization. The partnership between humans and machines, facilitated by sophisticated information systems, not only improves productivity but also enhances the quality, safety, and flexibility of production processes.

1. The role of information systems in the production environment.

Information systems (IS) play a pivotal role in managing and optimizing human-machine interactions in production settings. By gathering, processing, and analyzing data from various machines and sensors, IS enable real-time decision-

making and coordination between humans and machines. This real-time data allows for better resource allocation, predictive maintenance, and more efficient scheduling of tasks.

Key areas of is in production:

Data Collection and Analysis: Information systems collect vast amounts of data from machines, production lines, and human inputs. This data is processed using analytics tools, helping managers make data-driven decisions that can reduce downtime and improve efficiency.

Automation and monitoring: Through automation, machines can perform tasks without continuous human oversight. IS help monitor these tasks, ensuring that machines operate within defined parameters and alerting humans when anomalies occur. Human-machine interfaces (HMI): Advanced interfaces allow humans to interact with machines in more intuitive ways. Touchscreens, voice commands, and other HMIs make it easier for operators to control machines, adjust settings, and receive feedback from production processes.

2. Human-machine collaboration: A Symbiotic relationship.

Human-machine collaboration has evolved from manual operation of machines to sophisticated interactions where machines complement human abilities. This collaboration is not merely about machines replacing humans but about enhancing the capabilities of both. Automation and human labor. Automation has long been a feature of production environments, especially in industries such as automotive manufacturing, electronics, and textiles. For example, in the automotive industry, robots handle tasks such as welding and assembly, tasks that require precision and speed. According to the International Federation of Robotics (IFR), as of 2022, there are over 3.5 million industrial robots operating in factories globally, representing a 10% increase from the previous year.

While automation has replaced many manual tasks, it has not eliminated the need for human labor. Instead, it has shifted the focus of human workers toward higher-level tasks such as system monitoring, maintenance, and problem-

solving. Studies by McKinsey & Company suggest that while 30% of manual tasks in production can be automated, 70% of tasks still require human input, particularly in areas like quality control, innovation, and troubleshooting.

The role of human expertise. Machines and information systems excel at performing repetitive tasks and processing large amounts of data. However, they lack the creativity, judgment, and intuition that humans bring to the table. This is where human expertise becomes invaluable. Humans are able to interpret data in ways that machines cannot, using their experience and insight to make decisions that go beyond the numbers. For instance, in chemical manufacturing, humans are responsible for adjusting machine settings based on environmental factors or customer demands, which machines cannot anticipate without human intervention. In this case, the machine provides the data, but it's the human who makes the final adjustment based on that data.

3. Data-driven decision-making in production. The collection of real-time data is central to optimizing production environments. Information systems allow for data-driven decision-making, reducing errors, predicting machine failures, and ensuring the smooth operation of production lines. Real-time monitoring and predictive maintenance. In modern production environments, information systems monitor machines and production lines in real-time. They gather data on temperature, pressure, speed, and other critical factors. This data is analyzed to predict when machines are likely to fail, allowing for maintenance to be scheduled before breakdowns occur. According to a report from Deloitte, predictive maintenance reduces downtime by 30% and lowers maintenance costs by 20%. For instance, General Electric (GE) has implemented predictive maintenance across its production lines, saving the company millions of dollars annually in reduced machine downtime and repair costs. Big data and machine learning. Big data analytics and machine learning have further transformed the way information systems support production environments. Machines can now learn from past data and improve their performance over time. In a report by IBM, it was found that companies using machine learning in their production

processes experience a 15% improvement in productivity and a 20% reduction in material waste. For example, Siemens has implemented machine learning algorithms in its factories to optimize production processes and reduce energy consumption. The system analyzes thousands of variables in real-time and makes adjustments to optimize efficiency.

4. Challenges and ethical considerations. While the integration of information systems and machines in production environments has brought about many benefits, it has also introduced challenges and ethical considerations. One of the major concerns is the impact of automation on jobs. As machines take over more tasks, there is a fear that human workers will be displaced. The future of work. Automation has already changed the nature of work in production environments. According to a report by the World Economic Forum, by 2025, machines are expected to perform more than 50% of all work tasks in some industries, up from 29% in 2020. While this may lead to job displacement in certain sectors, it is also expected to create new jobs in areas such as machine maintenance, data analysis, and system management.

Ethical use of ai and automation. The use of AI in production environments raises ethical questions regarding transparency, accountability, and bias. Machines are often seen as impartial, but the algorithms that drive them can reflect the biases of their human creators. For example, in automated hiring processes, AI systems have been shown to exhibit bias in favor of certain demographics over others.

In production, there are concerns about the transparency of AI decision-making. If a machine makes a critical error, who is held accountable—the machine, the human operator, or the system designer? These ethical dilemmas must be addressed as AI becomes more prevalent in production environments.

5. Improving safety through human-machine collaboration. Safety is one of the primary concerns in production environments, especially where heavy machinery and hazardous materials are involved. Information systems play a

critical role in enhancing safety by monitoring production processes, identifying potential hazards, and alerting human operators before accidents occur.

Safety statistics. According to the Occupational Safety and Health Administration (OSHA), machine-related accidents account for 8% of all workplace injuries in the U.S. production sector. However, the introduction of information systems that monitor machines and production lines has reduced the number of accidents by 15% in the last decade. Automated systems can shut down machines if unsafe conditions are detected, preventing accidents before they occur.

Wearable technology for worker safety. Wearable technology, such as smart helmets and vests, is another area where information systems are improving safety in production environments. These devices monitor the health and safety of workers in real-time, alerting supervisors if a worker is exposed to hazardous conditions or suffers a medical emergency. In a study by Frost & Sullivan, it was reported that wearable technology in production environments can reduce workplace injuries by 25%, making production lines safer for human workers.

6. Future trends in human-machine relationships. The future of human-machine relationships in production environments will likely be defined by greater integration of AI, robotics, and information systems. As technology advances, humans and machines will work even more closely together, each enhancing the capabilities of the other.

Collaborative robots (cobots). One emerging trend is the rise of collaborative robots, or "cobots," which are designed to work alongside humans in production environments. Unlike traditional industrial robots, cobots are smaller, more flexible, and can safely operate in close proximity to human workers.

According to the IFR, cobots are expected to represent 34% of all industrial robot sales by 2025. These robots are already being used in industries such as automotive manufacturing, electronics, and pharmaceuticals, where they assist human workers with tasks that require precision and strength.

AI-powered decision-making. In the future, AI-powered information systems will play a larger role in decision-making processes. These systems will be able to analyze complex data sets and make recommendations to human operators in real-time. This will allow production environments to become more adaptive, responding to changes in demand, supply chain disruptions, or equipment failures more effectively.

Conclusion

The relationship between humans and machines in production environments is evolving rapidly, thanks to advances in information systems. This collaboration has resulted in significant improvements in productivity, efficiency, and safety. However, it has also introduced new challenges, such as job displacement and ethical concerns around AI and automation.

As technology continues to advance, the role of humans in production environments will shift toward higher-level tasks that require creativity, judgment, and decision-making. Machines will handle the repetitive, data-driven tasks, while humans will oversee, manage, and optimize the systems. By working together, humans and machines can create a more efficient, productive, and safe production environment for the future.

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