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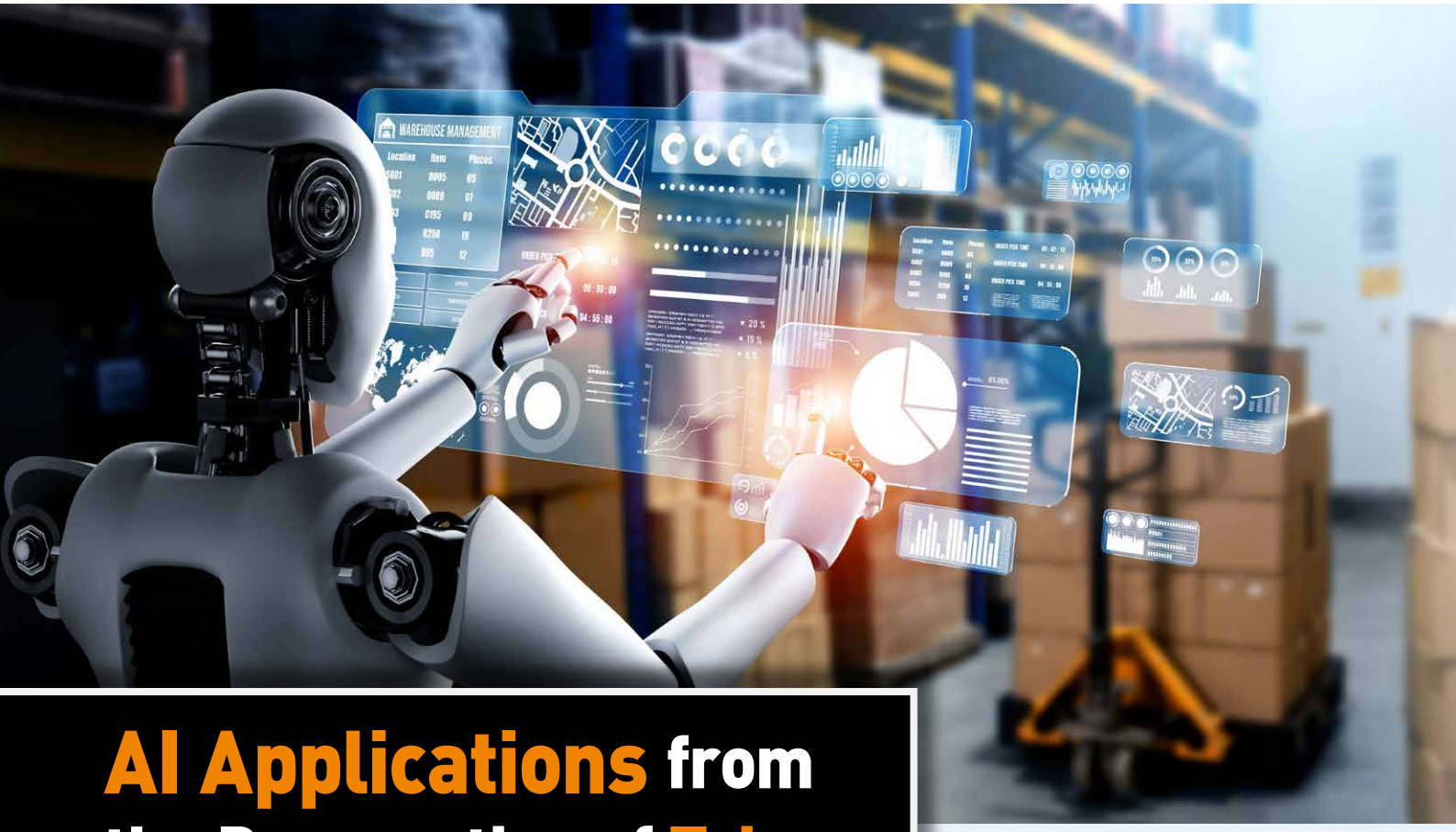


AI Applications from the Perspective of Taiwan Fastener Industry

The export of Taiwan fastener industry in 2023 entered into a deep freeze suddenly under the impact of the market recession. Compared to 2022, its turnover in 2013 declined by 1,540,583,000 U.S. dollars, down 25.09%, while its export weight dropped by 376,549 metric tons, a decline of 23.42%. Generally speaking, its capacity and sales value appeared a reduction of about 1/4. After considering the exchange rate conversion between USD and NTD, the export value in 2019 was NTD 87.482/KG, and in 2023 it was NTD 114.661/KG, and the sales value/KG increased by 31.068%, thanks to the depreciation of NTD in 2022, which actually made up for part of the loss of the fastener industry's declining business performance. In ***Table 1*** "Taiwan Steel Fastener (7318) Export Statistics from 2019 to 2023", under the impact of the trade war between China and the U.S. in 2019 and the AD duty of the EU on Chinese fasteners in 2022, the orders to China began to shift to Taiwan and Taiwan fastener industry was not affected by the Covid-19 in 2021 and 2022. Instead, it has hit a peak in recent years, with both export volume and output value hitting record highs. Compared to the golden two years in 2021 and 2022, 2023 was a relatively difficult year for Taiwan fastener industry to operate and this situation also continued to Q1 2024. Externally, Taiwan fastener industry is faced with Europe's continued economic downturn, U.S. inflation and high bank interest rates, Russia and Ukraine's ongoing war, and Israel-Hamas War that has yet to end. Domestically, it is faced with the fact that Taiwan's DPP does not hold a majority of seats in the new Congress, the realization of the DPP's 2025 nuclear free homeland policy, the pressure of rising electricity costs, whether cross-strait relations will remain stable after President-elect Ching-Te Lai takes office, as well as the competition from emerging countries in Southeast Asia, and the European CBAM, etc., Taiwan fastener industry is facing the pressure of having to change, and in 2022, OpenAI's AI ChatGPT was officially launched, and in 2023 the world officially entered the era of AI, which is the beginning of a new business transformation. Will AI have an impact on the future industry and how? Taiwan fastener industry should definitely know!

Artificial Intelligence (AI), also known as machine intelligence, refers to the intelligence expressed by a human-made machine. AI can be defined as a machine or computer that imitates human cognitive functions related to human thinking, and AI has the ability to learn and solve problems on its own. A computer has the ability to sense its environment and interact with it, which improves the chances of success of the function, and AI is able to learn from past experiences, make reasonable decisions, and respond quickly, and under the learning function, AI is able to correct its mistakes, and gradually achieve the ability to work towards perfection.

In the article "How Taiwan Fastener Industry Should Use Smart Production to Improve Operating Capabilities" in the #197 issue of Fastener World Magazine in 2022, I described the 1st Industrial Revolution at the end of the 18th century, in which human beings got rid of the limitations of manpower and animal power, and used water and steam as the motive power for production and transportation. The 2nd Industrial Revolution in the 1920s, in which the development

Table 1. Taiwan Steel Fastener (7318) Export Statistics from 2019 to 2023

Year	1,000 USD	Weight (Ton)	USD/KG	NTD Exchange Rate on Dec. 31 of the year	NTD/KG	Important Events
2019	4,316,160	1,479,292	2.918	29.983	87.482	1. US-China Trade War Began 2. The Hong Kong's Anti-Extradition Law Amendment Bill Movement
2020	3,968,861	1,363,250	2.911	28.097	81.799	1. China-U.S. Trade War Continues 2. Covid-19 Outbreak Spread Worldwide 3. Britain formally left the European Union
2021	5,319,169	1,610,698	3.302	27.717	91.533	1. China-U.S. Trade War Continues 2. Joe Biden assumed the 46th U.S. President
2022	6,140,351	1,607,481	3.820	30.663	117.128	1. China-U.S. Trade War Continues 2. Europe imposed AD duties on Chinese fasteners 3. Russia-Ukraine war began 4. Nancy Pelosi visited Taiwan 5. Chinese military exercises around Taiwan and its missiles flied over Taiwan 6. RCEP agreement came into force 7. OpenAI's AI Chat Robot ChatGPT was officially launched.
2023	4,599,768	1,230,932	3.737	30.684	114.661	1. The U.S.-China trade war continues 2. U.S. inflation caused bank interest rates to rise sharply. 3. Silicon Valley Bank (SVB) went bankrupt after a run on the bank 4. Israel-Hamas War began. 5. 28th Conference of the Parties to the UN Framework Convention on Climate Change (COP28)

of the electric power system was carried out, utilized electricity to replace water and steam as the power source of production, and entered the stage of utilizing machines for production. In the 1970s, the 3rd Industrial Revolution began to enter the era of production automation and precision, using electronic devices and IT to increase production capacity, turning purely mechanical products into mechanical-based, supplemented by motors, electronics and computers that can be programmed to set up the operation of machinery and vehicles. Industry 4.0, proposed at the Hannover Messe in 2011, is a big step forward in intelligent perception. The proposal provides a complete description of how to combine massive database operations, Internet of Things (IoT), machine network, cloud computing, Big Data analysis and AI to achieve a high degree of automation to enable production environments with self-awareness, self-learning, self-determination, self-execution and self-adaptation.

All of the above points are based on the manufacturing industry's point of view to illustrate the advancement of technology and production techniques. The system integrates the core businesses required by the enterprise's production, such as ordering, suppliers, logistics management, production, equipment maintenance, quality and yield control, etc., and visualizes all kinds of management information in the factory, such as the number of finished products on each line, analysis of defective product data at the quality inspection station, monitor screen, machine parameter control, and anomaly. All of these information can be displayed on the screen, which can effectively reduce the production control risk and improve production efficiency. I will not go into details in this article, so please refer to the article in Issue #197 of Fastener World Magazine.

This article will discuss how to apply AI to other business-oriented aspects of enterprises. ChatGPT, an AI chat robot program developed by OpenAI, was launched in November 2022. ChatGPT is text-based, and in addition to interacting with natural human conversation, it can also be used for very complex linguistic tasks, including automatic generation of text, automatic Q&A, automatic summarization, etc. ChatGPT can automatically generate answers based on input questions, as well as the ability to program and debug computer programs, and all people can register free of charge and log in to use ChatGPT to talk with the AI robot. There are already many AI application websites on the market, which are listed in ***Table 2***.

I tried to type in "In the future world of technology, a transparent screw symbolizes hope and practice." Bing Image Creator returned ***Figure 1***, **Screws bring hope**.

Fig. 1. Screws bring hope

With the availability of AI application software for translation of business documents, market analyses, and writing of business documents, it will be easy and simple for enterprises to apply AI in workplaces. **The future of intelligent enterprise management can be divided into: intelligent manufacturing, intelligent office, intelligent carbon management**, as shown in ***Figure 2***- "AI will be the core of the enterprise management."

Table 2. Websites for AI applications			
Item #	Name	Function	Website
1.	ChatGPT	It can automatically generate answers based on input questions and has the ability to write and debug computer programs. **Application: Company business document processing and translation**	https://chat.openai.com/
2.	Bing Image Creator	Simply enter a command that describes the image, and AI will automatically generate the picture based on the content. **Application: Photo editing of company products**	https://www.bing.com/images/create?toWww=1&redig=6E696DD96B2C469CB0A447A78D3749A2
3.	Claude AI	Specializing in text processing, it can generate a large amount of content including documents, letters, Q&A, etc. It can automate workflows, and it can logically solve tasks according to the instructions given by users. **Applications: Interpretation of judicial documents, contract preparation**	https://claude.ai/login?returnTo=%2F
4.	Capcut	Video editing software that allows you to quickly get started with a variety of powerful features including editing, text, transitions, and more. **Application: Corporate video production**	https://www.capcut.cn
5.	Luma	3D Picture Generator **Application: Mechanical design of products**	https://lumalabs.ai

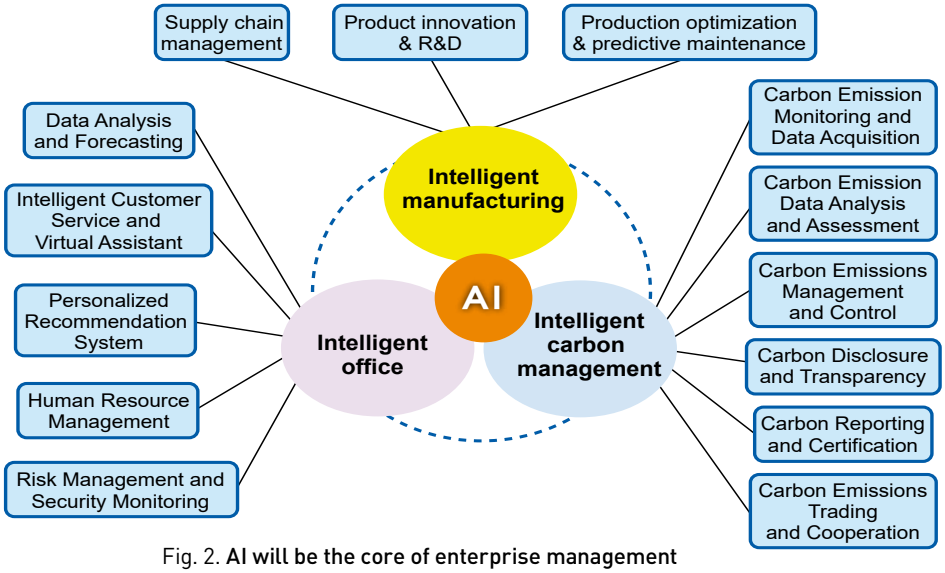


Fig. 2. AI will be the core of enterprise management

The AI talents needed by enterprises can be divided into "AI design" and "AI application". The former refers to professional information personnel who know how to design algorithms and train models; the latter is good at using AI-related software, such as ChatGPT, Bing Image Creator, Claude, etc., which can improve the efficiency of existing operations, and does not require a professional background in information technology, **so Taiwan fastener industry should actively introduce specialized talents who are good at applying AI-related software to quickly improve AI application capabilities, which can accelerate the increase in competitiveness of enterprises.** The three major areas of AI application in enterprises, namely intelligent manufacturing, intelligent office, and intelligent carbon management, are described as follows.

1. Intelligent Manufacturing:

(1) Product Innovation and R&D: Leveraging AI technology for product design, optimization, and innovation to accelerate the R&D cycle, improve product quality and performance, and meet market demands and customer expectations.

(2) Production Optimization and Predictive Maintenance: Using AI technology to monitor and optimize production processes to improve productivity and quality, and enable predictive maintenance to reduce equipment failures and downtime, and reduce costs.

(3) Supply Chain Management: Applying AI technology to optimize supply chain planning, inventory management, and logistics transportation to match supply and demand, reduce inventory backlog, lower logistics costs, and improve delivery efficiency.

2. Intelligent Office:

(1) Data Analysis and Forecasting: AI technology is used to analyze and mine large amounts of data to help enterprises understand customer needs, market trends, and business models, and predict future development trends. This helps enterprises make smarter decisions and plans.

(2) Intelligent customer service and virtual assistants: Using the help of natural language processing (NLP) and machine learning technologies to develop intelligent customer service systems and virtual assistants that can automatically answer customer questions, handle complaints, and provide personalized services to improve customer satisfaction.

(3) Personalized Recommendation System: Utilizing machine learning and data acquisition technologies to recommend personalized products, services, or content to customers based on user preferences, historical behaviors, and interests to improve sales and marketing results.

(4) Human Resource Management: Applying AI technology to optimize human resource management processes, including recruitment, training, performance evaluation and employee benefits management, to improve human resource utilization efficiency and employee satisfaction.

(5) Risk management and security monitoring: AI technology is utilized to monitor and predict risks within and outside the enterprise, helping the enterprise to identify and respond to potential risks in a timely manner, as well as to strengthen data security and network security protection.

3. Intelligent Carbon Management:

(1) **Carbon Emission Monitoring and Data Acquisition:** Using sensors, monitoring equipment and other technologies to conduct real-time monitoring and data acquisition of carbon emissions generated by various activities of enterprises or organizations, including energy consumption, production processes, and transportation links.

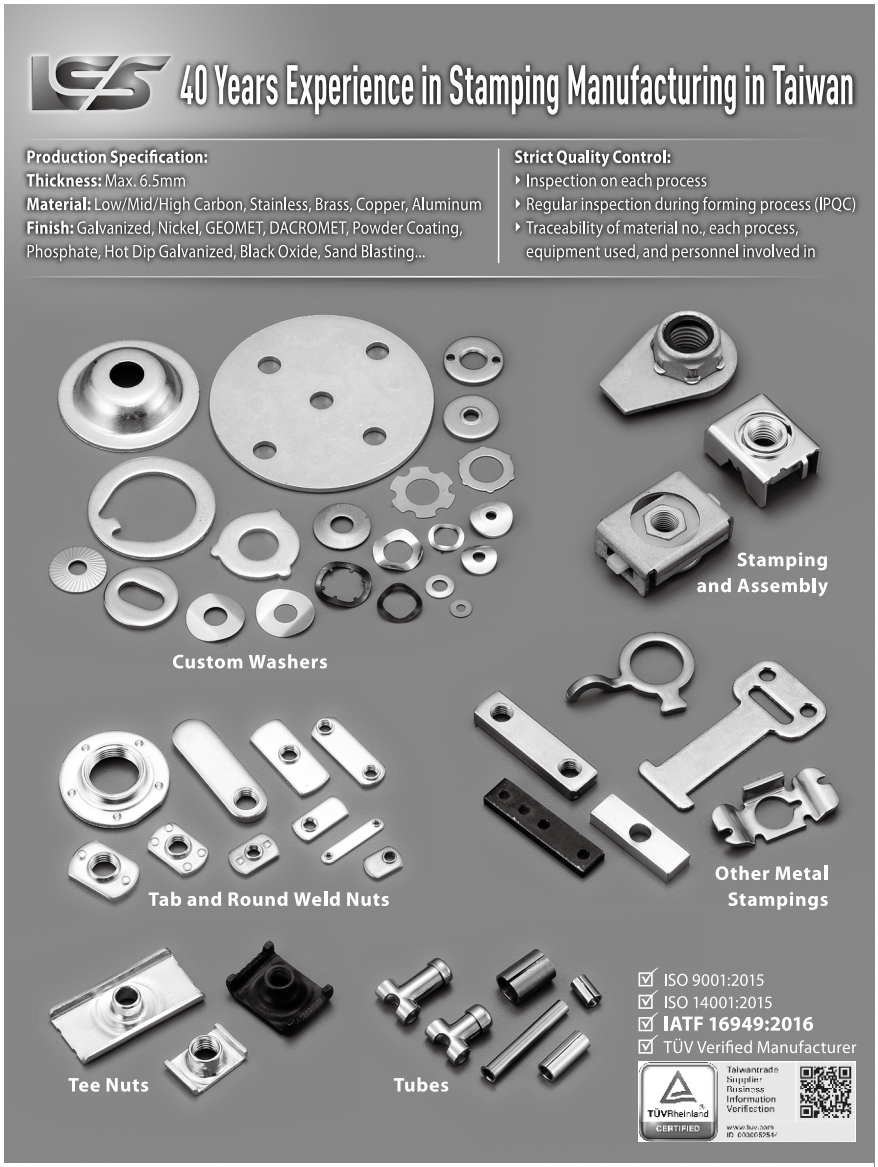
(2) **Carbon Emission Data Analysis and Evaluation:** Analyzing and evaluating the carbon emission data collected, including the analysis of emissions, emission sources, emission trends, etc., in order to gain an in-depth understanding of the carbon emission situation and its influencing factors.

(3) **Carbon Emission Management and Control:** Based on the results of data analysis to formulate reasonable carbon emission management strategies and control measures, including energy saving and emission reduction measures, carbon emission allowance management, carbon trading, etc., in order to reduce the level of carbon emissions and realize the carbon emission reduction targets.

(4) **Carbon Emission Information Disclosure and Transparency:** Proactively disclosing carbon emission information and management to stakeholders to improve information transparency and social responsibility, and enhance the image and reputation of the enterprise or organization.

(5) **Carbon Emission Reporting and Certification:** Regularly compiling and publishing carbon emission reports, and certifying and auditing the carbon emissions of enterprises or organizations to ensure the accuracy and credibility of the information.

(6) **Carbon Emission Trading and Cooperation:** Participating in carbon market trading to purchase and sell carbon emission credits, or cooperating with other units in carbon emission to jointly realize carbon emission reduction targets and promote the healthy development of the carbon market.

The mainstream of data science in the development of AI has evolved from expert systems and data exploration to machine learning and its advanced deep learning stage, and has been applied in business operations. The key to the implementation of machine learning and deep learning applications lies in the ability to process large amounts of data in real time. With the rapid accumulation of huge amounts of data and the advancement of AI technology, previously unknowable rules and correlations among industries, society, and nature, as well as personal preferences and behavioral patterns, can be further obtained through intelligent analysis. The future development of AI technology on the industry and the society will inevitably bring the impact and influence, Taiwan fastener industry needs to face up to the issue and respond to it ASAP.

To analyze the impact on Taiwan fastener industry, low carbon, flexibility and efficiency will be the keys to victory. Under the concept of intelligent enterprise management, all production equipment, personnel, processes and customer business records will be linked together, and various equipment is interconnected to monitor the surrounding environment at any time, and problems are eliminated immediately when they are detected. Then, the market and customer preferences and orders, sales, inventory and other information are combined for optimal analysis, and mass standard production is replaced with mass customized mass production (multiple low-volume production) to increase the added value of products. The key lies in the use of huge amounts of data, AI analysis, and the formation of synergistic operational systems to improve the overall operational processes of the enterprise, and to achieve a closer match with the needs of target customers. Under the purpose of quickly responding to market changes, it is also necessary to consider the factors of low-carbon emissions, because the changes in the low-carbon production process and supply chain mode will also change the original value chain structure. As a result, in order to quickly and accurately seize the opportunity to create new value, data must be properly collected and analyzed for application and the convenience of rapid application of AI will be the new core competitiveness of enterprises.