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Professionals and Implementation of Artificial Intelligent Manufacturing Process in Manufacturing Industry

[1st] Handiso Selamu Yisihak
(PhD Candidate)
Tianjin University of Technology and Education
Address: No.1310 Dagu South Road, Hexi District,
Tianjin, P.R.China

[2nd] Yujun Cai
(Professor)
Tianjin University of Technology and Education
Address: No.1310 Dagu South Road, Hexi District,
Tianjin, P.R.China
Postal code: 300222

Abstract:- **The professionals activity and implementation of Artificial intelligent manufacturing process in modern smart Industries and Micro and Small Enterprises (MSEs), have better to changes the production of smart product and production system. Different modern Industries, smart manufacturing capacity have a clear understanding of the work content and changes in each working areas .**
Therefore, In different smart industries and also in Micro and Small Enterprises (MSEs), to produce well designed and produce smart product, using well educated and trained professionals (Experts and Technicians) from Technical and Vocational Training and Education (TVET) sector is essential and basic.

Key word:- Well educated and trained professionals (Experts and Technicians) from Technical and Vocational Training and Education (TVET).

INTRODUCTION

The Artificial intelligent Manufacturing and manufactured goods administration Lifecycle shows the procedure Industries and Micro and Small Enterprises (MSEs) characteristically employ to expand open and direct products. Same Industries and Micro and Small Enterprises (MSEs) be able to employ it to examine and get better the procedure of rising and advertising its products.

Product lifecycle reproduction gives you a step-by-step visual guide to cover all the stages any Artificial intelligent Manufacturing manufactured product will go from side to side, accompanied by helpful checklists to make sure we have everything in place at each stage. It works whatever your development approach[1].

From the perspective of the product life cycle, this article analyzes and studies the changes in the job content of Technical and Vocational Education and Training students from the three work areas of the smart production process before, during and after production.

WORK AREAS BEFORE PRODUCTION

The main task before production is the management of the production process and the preparation of artificial intelligent Manufacturing manufactured products. Currently, Smartly manufactured product updates are fast, customers frequently change product data, and product quality consistency control is difficult to effectively manage and control only relying on human experience.

Therefore, artificial intelligent manufacturing industries and micro and small enterprises (MSEs) adopt the following basics software's to create, Organize, publish and manage detailed production data, and conduct operation guidance and real-time monitoring of the production process:-

i. **Enterprise Resource Planning (ERP)**
It is business process management software that allows an organization to use a system of integrated applications to manage the business and automate many back office functions related to technology, services and human resources.

ii. **Manufacturing resource planning (MRPII),**
It is defined as a method for the effective planning of all resources of a manufacturing company.

iii. **Manufacturing execution systems (MES,** are computerized systems used in manufacturing to track and document the transformation of raw materials to finished products. like recording, capturing the data, processes and outcomes of the manufacturing process.

iv. **Product lifecycle management (PLM)**, refers to the handling of a good as it moves through the typical stages of its product life: development and introduction, growth, maturity/stability, and decline.

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Fig 1:- Product lifecycle management

The above Artificial intelligent Manufacturing software's to create, Organize, publish and manage detailed production data, and conduct operation guidance and real-time monitoring of the production process, which not only reduces human experience factors, but also enhances the enterprise's information and standardized management. Due to the use of software management, staff are required to have a clear workflow, especially for software application capabilities and information application capabilities. Compared with the traditional design software, the design software used by intelligent smart manufacturing industries is much more intelligent. Due to the standardized and modular design concept, the standardized structure is directly extracted from the database without design, forming a very small amount of design, which is for training. The design ability of technical and vocational education and training (TVET) trainees or students provides convenience. Similarly, the integrated software of design, process analysis, automatic programming and virtual simulation makes the preparation of machining programs easier.

The following changes have taken place in the activity content of technical and vocational education and training (TVET) trainees or students:-

1. **Electronic work order management:-** Artificial Intelligent smart manufacturing Industries and Micro and Small Enterprises (MSEs) use software to scientifically and standardize production management. Efficient production provides a scientific basis. The staff uses the enterprise resource planning (ERP) software to formulate the master production plan, and generates the material requirement plan list according to the master production plan; the manufacturing execution system (MES) generates reasonable and effective electronic work orders according to the master production plan, and Develop workshop production plans and scheduling; based on the Product lifecycle management (PLM) of the product's full life cycle, perform data management on workshop products. Industries and Micro and Small Enterprises (MSEs) technicians and experts in all aspects of production can know their work content, work requirements and workflows through managers can monitor the progress of electronic work orders in real time.
2. **Out sourcing management of production materials:** Smart products are gradually developing in the direction of standardization and modularization. The Internet network facilitates the procurement of smart standard parts and raw materials. The Internet can provide information to multiple suppliers, such as product or raw material specifications, accuracy, and prices comparing, analyzing, screening, and maintaining and updating the screened data in real time. The staff can select the appropriate supplier according to the material demand plan, and enter, maintain, and merge the purchase order on the internal data platform of the enterprise, and can realize the operation of generating the purchase order from the purchase order.
3. **Artificial Intelligent, standardized, and modular design:** The design software used by intelligent mold manufacturing enterprises has the characteristics of intelligence, standardization, modularization and virtual manufacturing integration. Can use After standardization and modular design of Computer-Aided Technologies (CAX):-

    - Computer-Aided Design (CAD),
    - Computer-Aided Engineering (CAE),
    - Computer-Aided Manufacturing (CAM),
    - Computer-integrated manufacturing (CIM),
    - Computer-Aided Process Planning (CAPP),
    - Computer-Aided-Translation (CAT),Complete
    - Information Management System (CIMS),
    - Computer Associates (CAI)

software simulation can be used to simulate the strength under various working conditions, and the strength analysis data can be used to guide product structure design. Artificial Intelligent Manufacturing design has shown the characteristics of organizational decentralization, including collaborative design, crowd sourcing design, virtual design and other forms.

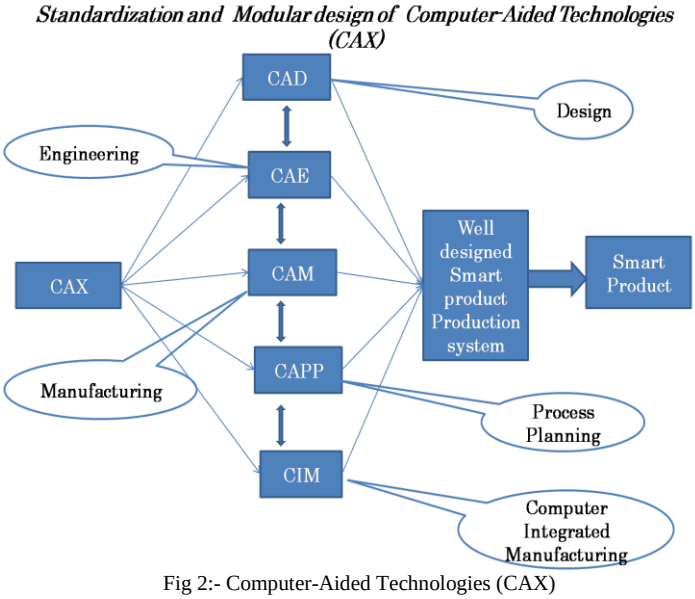

Fig 2:- Computer-Aided Technologies (CAX)

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4. **Programming and simulation:**

Artificial Intelligent Smart manufacturing Industries and Micro and Small Enterprises (MSEs) need not only the support of intelligent software, but also the hardware support of high-end Artificial intelligent equipment.

A. **The original three-axis CNC machining equipment**

It can no longer meet the processing needs of high-precision smartly manufactured products. three-axis milling evolved from the practice of rotary filing, and is a milling process that operated on two axes, the X & Y axis[1]. In three axis machining, the work piece remains still while the cutting tool moves along the three axes to mill the part. three-axis machining still one of the most widely used techniques to create mechanical parts, and can be used for automatic/interactive operation, milling slots, drilling holes, and cutting sharp edges. Because three-axis machining only operates on the three axes, it's relatively simple and allows material to be removed in these three axes represented by back to front, side to side and up and down. While it is a more basic machining process, three-axis machining may be ideal for your project depending on the size of your production run, the work piece requirements, accuracy and finish constraints, materials used and your holding capabilities.

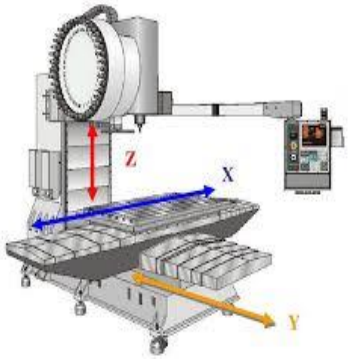

Fig 3:- Three-axis CNC machine

B. **Multi-axis high-end CNC machining equipment**,

Multi-axis machining offers some serious capability advantages to Industries and Micro and Small Enterprises (MSEs) Artificial Intelligent manufacturing Manufacturers. Multi-axis machines are capable of producing highly complicated components by moving the table (and work piece) as well as the machine tool. This combination provides the ability move in multiple axes. i.e. X,Y and Z typical of conventional machines.

Fig 4:- Multi-axis high-end CNC machine

C. **3D printing**,

3D printing, or additive manufacturing, is the construction of a three-dimensional object from a CAD model or a digital 3D model[2]. The term "3D printing" can refer to a variety of processes in which material is deposited, joined or solidified under computer control to create a three-dimensional object[3] with material being added together (such as liquid molecules or powder grains being fused together), typically layer by layer.

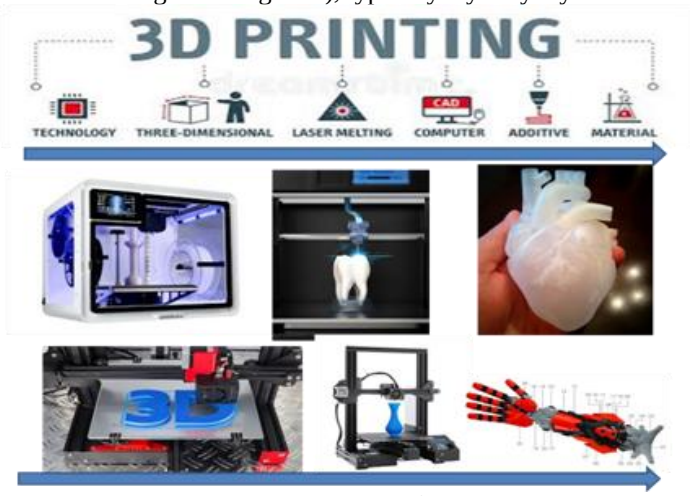

Fig 4:- 3D printing, or additive manufacturing process

D. **Industrial robots**, It is a robot system used for modern smart manufacturing. Industrial robots are automated, programmable and capable of movement on three or more axes[4]. Typical applications of robots include welding, painting, assembly, disassembly[5], pick and place for printed circuit boards, packaging and labeling, palletizing, product inspection, and testing; all accomplished with high endurance, speed, and precision. We can assist in material handling. In the year 2020, an estimated 1.64 million industrial robots were in operation worldwide according to International Federation of Robotics (IFR)[5] .

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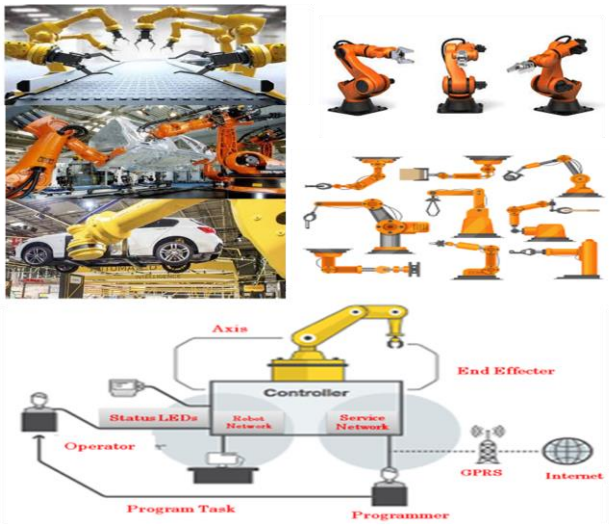

Fig 5:- Industrial robots

E. Georg Fischer (shortened GF, comprises three divisions GF Piping Systems,

I. GF Piping Systems

GF Piping Systems supplies is piping systems made of plastics and metal as well as solid and hollow bar stock for machining. The division makes components for the transport of water and gas in industry, utilities, and buildings. Its product line includes fittings, valves, pipes, automation and jointing and covers all water cycle applications[6].

Fig 6:- GF Piping System

II. GF Casting Solutions (formerly GF Automotive)

GF Casting Solutions is a development partner and manufacturer of lightweight cast components made of ductile iron, aluminum and magnesium for the automotive industry as well as a variety of industrial applications[7].

Fig 7:- GF Casting Solutions

III. GF Machining Solutions

GF Machining Solutions' electrical discharge, high-speed milling, laser texturing machines and smart manufacturing make it a provider to the tool and mold making industry and to manufacturers of precision components. Most important customer segments are information and communication technology, aerospace, and the automotive industry[8]. And others new equipment have been continuously put into production, which has improved processing efficiency and product accuracy.

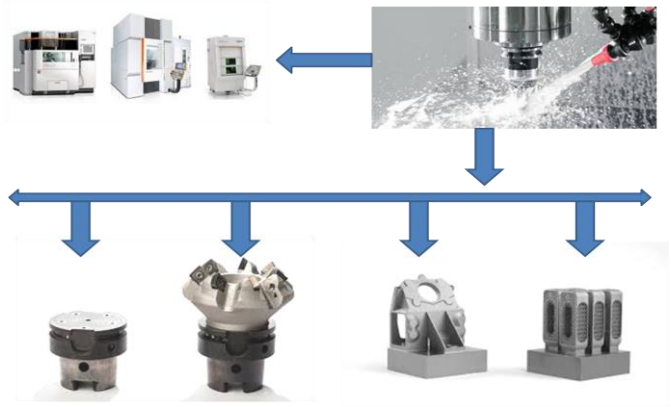

Fig 8:- GF Machining Solution

All belong to the category of Artificial Intelligent manufacturing, and the operation of the equipment needs to be controlled by a program. Before the program is transferred to the equipment, it is necessary to simulate the operation of the equipment to avoid damage to the machine tools.

To summarize the above, The focus of the pre-production work area lies in the proficient application of intelligent software, the operation and maintenance of intelligent equipment, and the ability to apply new technologies.

Technical and Vocational Education and Training Institutes, Colleges and Universities are currently involved in the training of professional competence in this field less, most of which are not involved, but from the perspective of product life cycle integration.(i.e. there is less training and production

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of well educated and trained human capital on artificial Intelligent Manufacturing field for smart Industries and Micro and small enterprises(MSEs).

The following basic areas also a category that should be mastered (well educated and Trained) on Artificial intelligent manufacturing professionals from Technical and Vocational Education and Training (TVET) sector.

A. Work areas in production

The main work in production is the visual monitoring, data collection and analysis of the Artificial intelligent flexible production line. Artificial Intelligent life Production is through the integration of Artificial intelligent software and automatic (Automation) processing technology, through the Internet of things (IoT) ((Internet (Network)) technology to integrate the processing information of people, machine tools, and products, so that people can leave the production site, and the production activity position is changed from operating machine tools to data on flexible production lines.

The monitoring, collection, analysis, use product information to automatically drive the production process to achieve a highly automated, less humanized, and black light operation mode. The Artificial intelligent flexible production line is the integration of the physical level and the network level in the fields of "equipment like:-

- Internet of Things (IoT) (i.e Total Networking system),
- Human-Machine Interaction,
- Artificial Intelligence,
- Visualization,
- Distributed and Embedded Systems,
- Hardware and Software Connection", etc.

The above processing equipment realizes networked communication, and the smart machine tool. The program-tool-part-inspection corresponds to ensure the accuracy and uniqueness of the processing program. The Internet of Things technology (Networking system) enables the flexible production line to achieve efficient and scientific tracking and management.

The following changes have taken place in the activity content of Technical and Vocational Education and Training (TVET) Trainees or students in field of artificial intelligent manufacturing:

- **Networked monitoring of artificial intelligent** flexible production line:

- **Artificial Intelligent production realizes visual monitoring** of production conditions through the Internet of Things technology (Networking system). For example, production data can be collected and analyzed in real time. For a certain smart product, from raw material to finished product, processing time and product quality qualification rate and other information;

- **Visual monitoring and data collection** of production equipment, such as the preparation time, cycle time, processing time, down time and idle time of the five-axis Computer Numerical Control (CNC) machining center, positioning /tracking/ scheduling of industrial robots;

- **The collected data analyzes** whether the production parameter setting is reasonable, and remote parameter setting can be performed.

B. Workshop data collection and analysis:

Technicians use online monitoring equipment to query the operating status of equipment in a certain stage in real time or continuously to understand the actual production status of the flexible production line and use. The collected data to scientifically decide on the plan to improve production efficiency, such as which should be in the link, production preparation time, processing waiting time and idle time can be reduced. The collected data can also be used to conduct close-up analysis of the correspondence between employees, equipment, and production efficiency, and rationally configure production tasks.

C. Product quality monitoring:

Processing quality is the lifeline of a company's survival. smart products are mostly single-piece or small batch customized production. Reducing the scrap rate has become one of the important factors in reducing costs. Artificial Intelligent manufacturing enables smart products to monitor production quality data in real time during the production process, analyze the key points of the problem according to the abnormal data, and repair them in time. In addition to high-end processing equipment, high-quality products also require precision testing equipment. Online precision testing ensures the processing parameters Correctness.

D. Product assembly and testing:

Artificial Intelligent manufacturing Industries and Micro and Small Enterprises (MSEs) put forward higher corporate standards for the assembly of smart products. If some smart Industries and Micro and Small Enterprises (MSEs) are not allowed to use repair tools such as files during assembly, the products are returned to the higher-level processing department if there are problems, and the Industries and Micro and Small Enterprises (MSEs) uses production data Tracking the cause of the problem, therefore, abiding by corporate standards, operating in accordance with specified norms, and being able to complete the assembly and testing of smart products with others or man-machines has become a new professional ability requirement in this field of work.

To summarize the above, having the ability to analyze production data and be able to find out the reason from the analysis results is the ability that the artificial intelligent flexible production line staff should have. However, this aspect has never been involved in the existing teaching of Technical and Vocational Education and Training (TVET).

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E. Post-production work areas

The post-production work area is mainly to actively provide services to users, which is an on-demand and proactive Smart service. The integration of production and service is a new business model. For smart Industries and Micro and Small Enterprises (MSEs), the smart products they produce are equipped with chips and have communication functions. After-sales manufactured smart products are communicated through manufacturing communication can realize remote monitoring. The following changes have taken place in the activity content of Technical and Vocational Education and Training (TVET) Trainees or students:

i. **Remote monitoring and operation and maintenance of smart manufacturing**: Smart manufacturing have communication functions that can be monitored remotely. This is the essential difference from traditional manufacturing. Staff can perform data management on the use of smart manufacturing based on remote monitoring Provide maintenance service suggestions according to the situation, and discover potential problems of the Industries and Micro and Small Enterprises (MSEs) through manufacturing product failure analysis and user demands.

ii. **Remanufacturing of smart molds**: Remanufacturing of smart manufacturing is aimed at manufacturing repair. The manufacturing with repair value can be disassembled first, and then repaired and processed by repairing technology. Parts that need to be reprocessed can be processed by the original drawing, and there is no original drawing Or parts that are difficult to measure can be repaired in time using reverse manufacturing technology and rapid prototyping technology.

F. Artificial Intelligent service:

This is an active service. Users can track logistics information, Industries and Micro and Small Enterprises (MSEs) can provide technical services, deal with customer complaints in a timely manner, and provide solutions to problems that arise during user use.

Summarize, the focus of the post-production work area is to remotely monitor products and provide maintenance suggestions, as well as services that meet user needs. This requires not only knowledge of manufacturing maintenance, application of Internet of Things technology, but also good communication skills. The comprehensive content of this aspect is rarely involved in Technical and Vocational Education and Training (TVET) teaching.

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