The reformation and restruction of traditional manufacturing industry study in industry 4.0 times

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Abstract

Manufacturing is the principal part of national economy. Nowadays digital wave is washing over the whole world. And it has inflicted a rather big impact on traditional manufacturing industry, so traditional companies try their best to jostle high position of new industrial revolution by reformation and restruction Informatization,automatization and networking are the mainstreams of industry 4.0.Traditional manufacturing industry should firmly grab these three technical characteristics to set up basic ecosphere, which are based on interactive system. This system includes mass data, cloud compatation,shift, social intercourse , clients and staff. If companies use the capability of data ,they will release its own potention and achieve transconformation and promotion.

Keywords

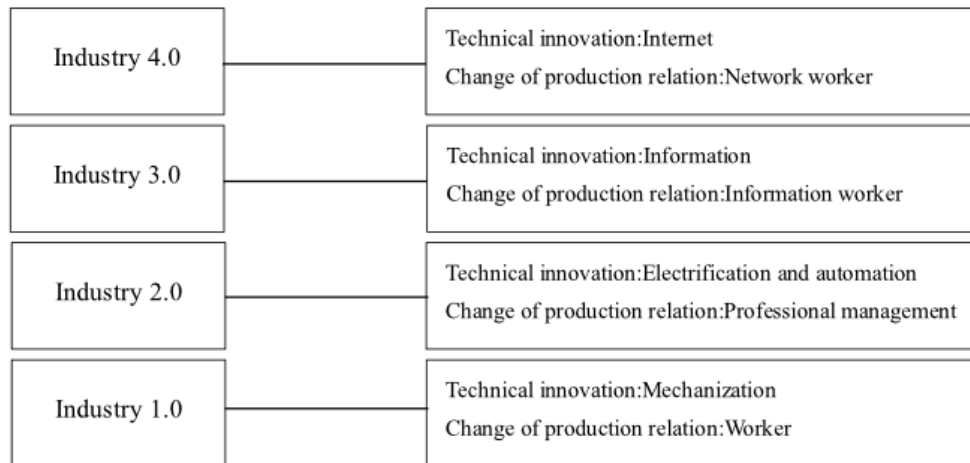**Industry4.0 ; traditional manufacturing ; reformation.**

1. Introduction

The industrial 4.0 come of Germany, but in China,it has got a wide range of identity, and the developments trend will become very vigorous.Although it is difficult to accurately describe the industrial 4.0,it's fundamental can be found from the new technology of Intelligent manufacturing, intelligent traffic, intelligent city,and 3D printing ,Crowd-sourcing and crowd-funding. The industrial 4.0 will lead to an enormous alter for the mode of thinking,mode of protection and consumption patterns,which means the transformation of business model, organizational structure and strategic path. At the same time, this is also the Chinese manufacturing enterprise achieve beyond the self, beyond the opponent.

2. Development Of Industry 4.0

The German platform industrial 4.0(platform industrie 4.0,it's an organization that created by the German associations and enterprises in order to responsible research for industrial 4.0 system and promote) is clearly defined the industrial 4.0 for the fourth meeting of the industrial revolution. From the point of view of the definition of the industrial revolution,there must be exist changes in the relations of production, so it can be called the industrial revolution.Therefore,only increased production should be regard as he quantitative change it can not be called industrial revolution.For the first time of the industrial revolution in Britain, technology innovation is the application of mechanization, therefore the factory come into the word,so a new stratum arise,it's called worker that never never appeared in the society,this is a revolution for human society, because it affects the development of human the society.According to Chandler's argument that the second industrial revolution which happened at 150 years ago,leads to continue to push forward the process of industrialization and the wide application of electrification and automation.So that the large-scale production began to appear, which requires professional managers to manage the factory. Thus people began to use professional managers to manage the factory, which greatly improves the efficiency of the plant management.For the third industrial revolution, the application of information technology had became the main innovation,so information workers can be regarded as the third industrial revolution of production representatives.By understanding of the three industrial revolution which based on the above, we can carry on the description of the fourth industrial revolution,he fourth

industrial revolution is a new industrial revolution after the third industrial, it is mainly to CPS (Cyber-Physical Systems) as the core technology.The characteristics of the fourth industrial revolution is that it may emerge new workers, the workers may be everyone of the society, which is mainly composed by the application of the Internet in the field of production . Therefore, for the industrial 4.0 concept which is proposed by he German industrial 4.0 platform,we should have a new understand by times,which is not only caused by the technological innovation to enhance the productivity and business mode change, but also have the change relationship of the production ,Development Of Industry 4.0 can be shown as the chart1.

Industry 4.0	Technical innovation:Internet Change of production relation:Network worker
Industry 3.0	Technical innovation:Information Change of production relation:Information worker
Industry 2.0	Technical innovation:Electrification and automation Change of production relation:Professional management
Industry 1.0	Technical innovation:Mechanization Change of production relation:Worker

From the final goal, the 4.0 industry has the same common theme as the three industrial

revolution(or industrial 1.0,2.0 and 3.0),that is improve the production efficiency.But the difference of the three and 4 industry,it can be summarized in two words: "Internet" and "integration".From the industry 4.0 describe of the future situation,we can get that people, equipment and products will be integration by Internet technology, in the enterprise,we can realize people and people,human and machine,machine and the products Seamless connection.At the organizational level,it will finish the docking of enterprise and enterprise, enterprise and consumer.The industrial 4.0's main line is based on the CPS, to achieve the docking of integration of information technology and manufacturing technology.product design, manufacturing process, service process and enterprise management digital, networking and intelligent.

3. The technical characteristics of the industrial 4.0

Industrial 4.0 has high degree of automation,altitude information and high network these three highly technical characteristics.In general ,automation is characteristic of industrial 2.0 and informatization is 3.0 times the industry characteristics,but at industrial 4.0,automation and information technology will continue to in-depth development,at the same time ,we will due to a variety of equipment and system to realize the network with characteristics of highly networked.this is industrial 4.0 times unique technical features.As shown in Figure 2.

（1）Supermatic

Supermatic is the second industrial revolution of technological innovation,by the application of electrification,we realize the large-scale pipeline, which greatly release the power of machine,so that we avoid the limits of the physical constraints.So,the productivity is increased greatly. In the industry 4.0,automation will get more extensive development and application.From the view of the development trend of technology,automation will show as the intelligent robot which more intelligent than before,with more and more the intelligent robot will be used in the factory that will lead to the automatic production line is more flexible,you can achieve a variety of products, at the same time as the production site of the automation equipment integration increases, to achieve the so-called high automation, a lot of work will be mainly composed of automation equipment to achieve,it is possible to achieve unmanned chemical plant.

（2）Altitude information

Altitude information is the information the third industrial revolution,Information of manufacturing industry can be achieved through the management system and production system.The former is mainly for ERP, CRM and HRM system,and the latter is mainly embodied in PLM(Product Lifecycle Management, product lifecycle management) MES Execution System. Manufacturing execution system and DNC Numerical Control, distributed numerical control) system.Specifically, the management information system is mainly to achieve involving non production site management and the manufacturing information system is mainly to solve the core product value creation process management, for example, product R & D design, manufacturing, etc.As the sane as automation information technology will also continue to develop in the industrial 4.0,it will regard the more highly integrated as the features. Some of the enterprises which provide intelligent plant or digital factory solutions,they will hold the ERP, PLM, MES and SCADA (Supervisory Control And Data Acquisition)system integrated together, forming a complete solution, this is known as digital factory solutions.

（3）High network

Highly networked is the industrial 4.0 unique characteristics which is not had of the industrial 2.0 and industrial 3.0,besides is the result of the Internet technology in the production of manufacturing field application.What needs to be pointed out is,with the deference of the consumer Internet technology based on the TCP / IP protocol group core,the industrial field need to have different technical indicators of industrial grade Internet,such as real-time, safety specific technical requirements these are the deference of the industrial 4.0 displayed.
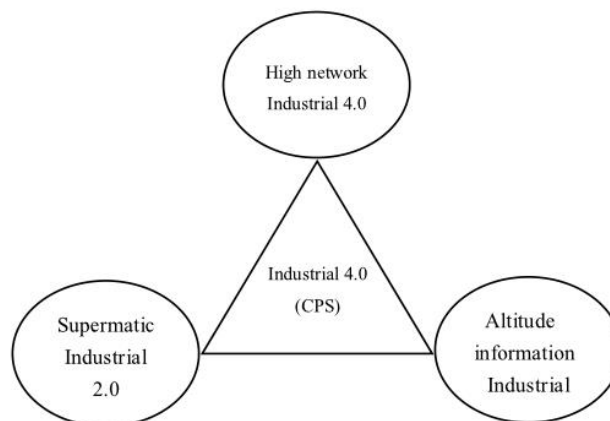
4.　The traditional manufacturing's transformation caused by industry 4.0

Industrial 4.0 essence is constructed in the mobile Internet, cloud computing, remodeling of the 3D printing and other advanced technology system of organization and management.Owing to the CPS emerge intelligent production environment and "man - machine -"to the Internet which means that the traditional manufacturing industry and the user will realize the value of creating in a new way .Industrial 4.0 to traditional manufacturing industry is mainly reflected in the following aspects:

（1）Strategic thinking is from the integration of transition to the whole process of ecological circle

The industrial 4.0 strategy is to establish a new intelligent manufacturing model that is include a highly flexible, personalized, digital.With the Application of Internet and virtual technology,product manufacturing will be liberated from the limitation of the scale of the region.Faster and better meet the individual needs of users will become the core source of competitive advantage intelligent.By the integration of construction,so that the enterprise is no longer protected enterprise boundary walls,but more like the cage that limit the enterprise protection. The internet of the factory that undertake the industrial 4.0 is not an assembly line or a workshop, but is a process ecosystem that covering design, procurement, manufacturing, marketing and service and a kind of system and the

ability to content users need.Without enterprise boundary, in order to satisfy the needs of users,they can lead to the highest quality resources to their intelligent manufacturing terminal.

（2）Production from mass manufacturing to customized manufacturing

In the era of large-scale manufacturing,customers only can choice the products that provided by the enterprises,however the cost only in exchange for a "closest" customer demand for the product. At the industry 4.0,the position and the role of the customer and the enterprise will change. The customer is no longer limited to the enterprise provides options rather than they can expect Enterprises can truly meet their needs. For the enterprise,intelligent manufacturing not only means they have the ability to provide customized products for each customer, but also they can find and meet each customer needs,so that they can ensure their own survival. In the customized production, the customer is not only the product of the buyers and users,but also the initiator and designer.Industrial4.0 provide a real understanding of the needs to the users,they will also provide a choice for the customer about the products' difference.Who can the fastest, most accurate to meet the needs of users, create the highest value for the user to create the highest value, who will get the user's choice, so as to get ahead in the competition.

（3）Organizational processes from series to parallel

The traditional tandem type organization procedure and mass production mode of production are interwoven.When the product's designed is completely by the "dark" of enterprise complete, every link in the whole production process is a part of the service for the last link, the only goal is to make the design drawings to actual products, and push them to the front of the customer customization.In the customized mode of production,enterprises become the intelligent tools for the customers to meet their needs,the whole process is to provide service to the customer.The traditional series of organizational processes can not meet the needs of customers in full contact,must be changed to parallel organization flow.The ability of enterprises is like building blocks, in order to meet the needs of customers, which will require building blocks which blocks together, customers can contact to each block and eventually set up their desired function.

（4）The organizational structure from the form of Pyramid to the platform

At the Pyramid traditional organization structure,enterprise is like a large precision instrument, in order to safe and efficient operation,they must use various orders and regulations issued to ensure that every employee is in the correct position, do the right thing. With the transition from series to parallel everyone in the enterprise have to face the user directly and be responsible for the user.The enterprise from a product output "black box" so that become a platform that can meet the unique needs of the user service.The enterprises Accumulated manufacturing ability and knowledge in the era of the large-scale will become the platform tools for users to select in the era of customization.the enterprise by helping the user to meet the demand,to realize the value with the user to create.

5. The path of innovation and reconstruction of traditional manufacturing industry in the industry4.0

（1）Building a user centric intelligent manufacturing system

Intelligent manufacturing system is the whole process of ecosystem to Internet based plant. Interconnect plants are only the ultimate load of intelligent manufacturing, rather than intelligent manufacturing itself.To build a real smart manufacturing system is not the core of the smart factory, but the user.The "user centered" is not a fresh idea,but for many years the traditional manufacturing enterprises are "showing" user centric, the essence is still in the enterprise itself.For manufacturing enterprises, it's the linchpin that based on user value, to bring the best experience of manufacturing intelligent system for users, is the Internet era, to win customers and win the future .Especially those manufacturing enterprises directly to consumers,C2B's business model will become the mainstream,of the benefits of C2B is customized, a very good cash flow; the removal of the channel, to help users, also allow for their own ends; seize the most valuable smile curve of R &

D and services; zero inventory. However, to want to build user centric intelligent manufacturing system, traditional manufacturing enterprises need to effort under the strength in the following aspects:establish a platform to interaction with the user,allowing users to participate in the design,involved in the production; companies need to have the ability to meet the personalized needs of users, which requires the construction of a starting from the needs of users, has been to to meet the needs of the users of the end-to-end digital integrated support system;The information support system can fully support the development of enterprises, supply chain and manufacturing and other sectors to respond rapidly to the various individual demand and order; enterprises must construct a very flexible, flexible and efficient factories, will ultimately be the individual needs of users and orders into real production. For some enterprises, can also end the chain does not have its own factory in the end to, but must choose other manufacturing enterprises to their common and form a complete value network. The traditional manufacturing industry 4 times to achieve innovation and reconstruction to build intelligent manufacturing system, and this system can only make to user centered to drive.

（2）Change production - R & D model

Industrial 4.0 factory strength is reflected:put the factory embedding the end-to-end closed loop, and can realize the smooth,the most efficient flow of information, , and most smooth, the most efficient of the materials and flow of the products. The industrial 4.0 factory will fulfill, the user's difference and customization orders.One of the aim for the industrial 4.0 infrastructure construction of the factory is to construct a system of integrated development supporting products.More importantly, the industrial 4.0 factories need to think about is how to support the realization of "custom" this function in the infrastructure. Therefore, Industry 4 of the plant must be the source of product development to sort out, look back to the product development process, the need to build a product design standardization and modularization of the R & D system.Standardization and modularization will form a combination of a limited number of modules,this will result in a large number of ability to meet the demand for the users. This will be the alienation in the very core of a power industrial 4.0. industrial 4.0 scene industrial factory is to achieve flexible and efficient customization different needs of users. And operational excellence will produce the corresponding conflict, too many different types of products and will reduce the efficiency of production of large quantities of traditional manufacturing efficiency must come from a single species Production. Industrial 4.0 times of traditional manufacturing industry through a combination of a finite number of module and realize a lot of differentiated products and models. Therefore, in order to realize the modular production, traditional manufacturing enterprise first in production, R & D mode innovation and reconstruction, around the user's personalized and operational requirements, the ability to form a "integrated development". Only in this way traditional manufacturing enterprises to change the current has been in manufacturing industry smile curve at the bottom of the situation, extending to both ends of the R & D and service.

（3）The organization process of the remodeling of the end to end parallel

Innovation and reconstruction of the organizational process change traditional manufacturing industry to the end. Specific performance in the past the end to end the series process and change the end-to-end parallel organization process. According to the individual needs of users, and product lifecycle management needs, different departments will have to integrate the series of activities different project management team. The team included from the market, R & D, quality, testing, manufacturing, procurement, supply chain and cost staff. Everyone in the initial project, the formation of a parallel work team, common to the external market demand, internal quality, testing, manufacturing. Procurement and supply chain demand decomposition and allocation, thus forming the outline design, detailed design to further form, the manufacture of the prototype, small batch verification, until mass production. This project will even continue to product batch Volume production, which has been to the end of the product life cycle, this end to the end of the parallel organization process, will become the 4 era of industry a mainstream organization process.

（4）Zero distance contact of the whole process

Industrial 4.0 brings not only the production capacity of the upgrade, but also to buy and use the products and user experience improvement. User customization and design, Industrial 4.0is the brought by the advanced experience of innovation and reconstruction of the traditional manufacturing industry from product design until the user really use the product research and development, production and delivery flow to pass through the "zero distance with the user to enhance the user experience. In the link of product design, organization members around the link, and the specific needs of users in real-time, multi solution a personalized interactive form of zero distance. When the plan was finalized, the production system directly into the Internet factory. The user can check the production status, logistics status, until the product is delivered to the user.

6. Conclusion

In summary, in the industrial 4.0,the innovation and reconstruction of traditional manufacturing industry is a contains the transformation of the Internet, model transformation, end to end integration, but also contains a flexible and efficient very large, complex changes. The industrial 4.0 and the traditional manufacturing industry to upgrade, enhance the competitiveness of the necessary conditions are grasp the macro strategy, mode and direction, on the methodology of system thinking, on the technology system of Internet, integrated and intelligent.

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