Building the Machining System Database for Matching Supplier and Customer

Hoai-Nam Dinh and Shang-Liang Chen

***Abstract*—Industry 4.0 aimed use of the IOT (Internet of Things) to change the future of industrial innovation including in the field of equipment manufacturing and production efficiency. The supplier can respond quickly to the customer demand. The customer can directly order in a manufacturing enterprise marketing platform and select the processing machine with lower production costs. This paper builds the knowledge engineer of machining process that analyze the supplier information, customer demand information and the manufacturing process information. Using Analytic hierarchy process (AHP) for supplier selection methodology, it helps the customer with a reliable way to find suppliers and select the right machining tool.**

***Index Terms*—Tool machining knowledge, supplier selection, customer matching.**

I. Introduction

From 2013, Taiwan has begun up to 4.0 (Productivity) the automation industry in Taiwan, including the field of equipment manufacturing, production efficiency, speed, and flexibility will be the most important issue, in order to demand the diverse needs of customers, "high-end custom" has become one of the main reason for development. Manufacturing knowledge used hybrid knowledge to estimate the product cost [1]. The cost estimation is based on the manufacturing features with machining cost and operation time [2]. A framework with geometric design data set up the estimated manufacturing cost [3]. In market environment, manufacturers provide users a convenient and simple platform to connect with users. Previous researches based on the web service technology [4], [5]. FIPA (Foundation of Intelligent Physical Agent) platform has set up the standards of cutting situations and error compensation that effect in intelligent agent system [6]-[8].

However, the demand has changed from lower types to large volume into various types with small volume, and challenged the mechanical technology. Therefore, how to get the optimal technology and develop the suitable mechanical tools, have become a major problem for machinery and equipment manufacturers. We design the center of a delivery model of manufacturers and factories: more connection, more adaptability and more responsiveness from expecting customers. It reduces assembly times, increases availability and offers network production processes.

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The authors are with the Institute of Manufacturing Information & Systems, National Cheng Kung University, Tainan 700, Taiwan, ROC. (e-mail: dinhhoainam52@gmail.com, slchen@mail.ncku.edu.tw).

II. Processing Operation Analysis on Cloud Information System

A. System Flow Chart

In the traditional way, all their methods just match for only one target, in our case we have a list of targets needs to find the best solution. Then we are developing another method, to match all function with a list of companies that suits the requests of customers shown as in Fig. 1.

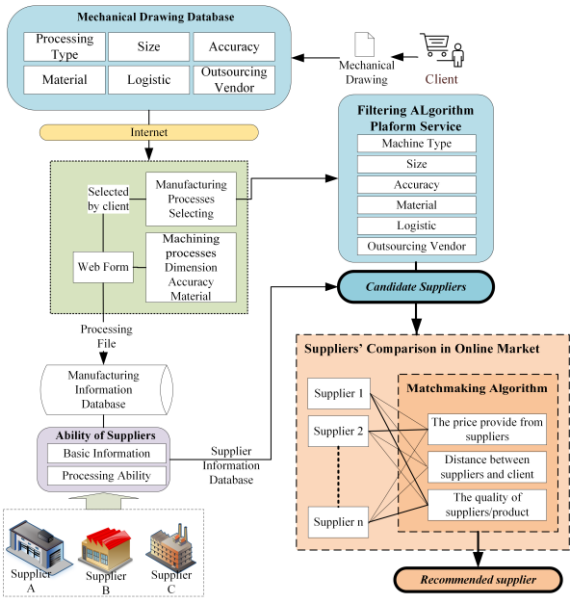

Fig. 1. Cloud knowledge base system in machine tool flow chart.

The architecture includes the following features:

Upload: Upload the objects who enter the system through the web platform interface and upload process engineering drawing to drawing kit library.

Analysis: The machining process based on the engineering drawings and then analyzed via NX software. The processing of information contains data sharing and evaluations of component features.

Estimation of the product cost: The solution evaluates the information of different parts and supports the total product cost, include materials cost, processing cost and tool cost.

Choose their own decision: Via the matchmaking algorithm to obtain compliance with the manufacturer's recommended candidate ranking manufacturers, and processing capacity of this section will depend on the flow chart of the blocks for system introduction.

B. Build the Database Information of System

The system uses Microsoft SQL Server database software build drawings, processing information database vendor

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information repository, as described below.

Mechanical drawing: Processing needs will be processed through the web platform engineering drawings uploaded to the drawing database includes uploaded file, drawing file, drawing number and demanded ID. The recording processes a demand ID, uploads time and distributes a set of graphs face number to use for the system.

Supplier Information database: Collection through telephone interviews with personal interview each tool machining includes processing information, machine information with suppliers of basic information and records to the design of the study record table. The obtained information will be stored in the database vendor.

Manufacturing for medium and small enterprises, such as a structure that the industry faced limited industry resources, technical capacity and working capital. It may be difficult to resist the US, Europe and Japan and other major competitive advantages. In addition, the machines in the market with large quantities production equipment in China, but the machinery and equipment of domestic production to discounts manner compressible local market share of Taiwanese manufacturers.

These factors make the machinery and production equipment from Taiwan move towards customization to increase value added. However, the trend of customization issues arising from the mechanical parts of its equipment in style, lower quantities, complex process, and require vendors to handle various production and processing variable cooperatives with stringent quality requirements. These factors make the manufacturers of machinery and equipment difficult to find a treatment provider.

The access organizes information into the structure, lists of rows and columns of information about the company and machine tools with their specificity. The structure consists of the field:

- Type of machine: that helps supply the various types of machine tools widely used in industries, milling machine, drilling machine, lathe machine…
- Description: a consistent way to combine information about machine, name, model, images and company.
- Detail specification: holds distinctive information about the machine, such as deep throat, max speed, the number of spindles, X/Y axis stroke.

Manufacturing Information database: Information of Processing File contains dimension drawings of machining precision feature lists, materials, surface treatment, drawing number, processing needs by ID and processing procedures.

Background engineer station in accordance with commonly used tool factory business opportunities, its diameter, under radius, cone angle, pointed, length, blade length, blade, holder and other tool parameters established comprising various types of simulation tools of the magazine.

C. Matchmaking Algorithm

We operate the comparison between suppliers in the market by using AHP. Suppliers can establish a database to find their own company name, platform manager to an application and certification for the company. The certification will be delivered successfully to a group account and password, provided to the supplier uses. If the database does not contain the suppliers' information, suppliers must fill in the relevant information through the registration mode, and wait for using the platform after the platform manager's approval.

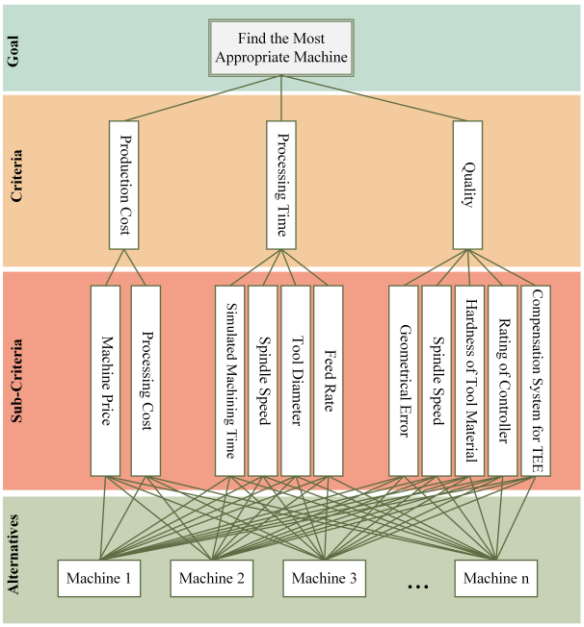

Fig. 2. Schematic analysis AHP.

AHP decompose decision-making situations into several smaller elements, then these elements of the organization as a tree hierarchy, shown in Fig. 2. Then, for each element of the relative importance set up the right value, after that analyzed the various parts priority of the hierarchy to organize the selection of alternatives related conditions or standards, weights and analysis, and provide an effective method for complex decisions. Numerical simulation of the system will be right over with varying degrees of processing firms. The web platform will be based on this ideal level recommended by the manufacturer rankings, sort search results in accordance with the recommended level. Service offers are generated for the specific service request of vendors. A client searches the system to get the recommended suppliers. Cloud service filters their order to arrange the machines of factories satisfying vendors then ranking the best result according to companies qualifying preferences.

III. The Structure of Knowledge Data for Intelligent Machines System

A. Building, Integrating the Processing Information and NC Codes Database

Chung Yeh and Flourish gave us the processing of business via the internet [1]. The process information of machines is controlled by using a computer network. In this method, the contracting processing is uploaded to the network by an engineer, it includes the collaborating factories and CNC machine operating codes. From orders of the customer, we estimate and simulate the processing components through the UG software. This value is then compared to the allowed values imposed by the constraints. Besides, we get the data of the heavy industrial companies by interviewing and collecting of data of its company by the vendors investigated supplier's online record sheets and the evaluation record sheet. Data will

be stored in a large number in the database, which uses a variety of information, monitoring possible customer behavior analysis, behavioral analysis of vendor, platform optimization profitability analysis system. It is recommended, optimization algorithms search the Internet processing industries established. The study uses matchmaking process with their own search match making, take into account the privacy of client part the drawing, without the need for a small variety of privacy of the customer.

B. Structure of Processing Operation Analysis on Cloud Information System

In this study, we support the algorithms for automating the selection of composite Cloud services, the processing will be shown in Fig. 3. Cloud infrastructure and systems are integrated. After logging into the system, customers and suppliers can use the cloud machining system service for processing supplier and client development. In this case, supplier users can access organization networks with their information including: company information and machining information. Besides, each customer demand logs an entry onto the cloud system and stores them in its own log files.

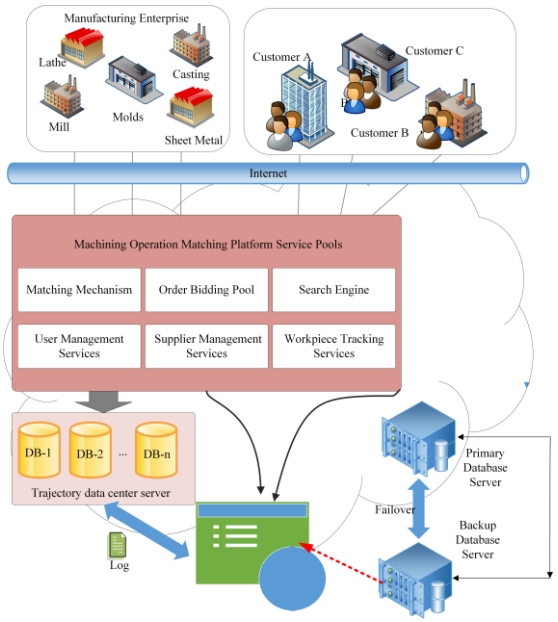

Fig. 3. The structure of processing operation analysis on cloud information system.

Development of the matching mechanisms is the accountability in the primary of the log files. Log files store data that has read only permissions by administrators. Both user and supplier do not allow to access its internal data.

IV. Experiment

In the IaaS cloud structure, we plan to implement the services providing shunt, and build web servers with Windows Server 2012. Cluster architecture will be built by 4 servers, and use the Windows Server 2012 NLB Load balancing technology to implement the continual service. It can also provide reliability and efficacy that web server and other servers need. In this case study, after customers upload their demand, the requirements of work-piece are entered into the server and transferred to selected machine modules. The correct geometry of workpiece base on the drawing engineering displays recommendations for the type of machine tool, shown in Fig. 4. This process is operated in the computer of our system only. The whole process is operated in the computer of our system only, shown in Fig. 4.

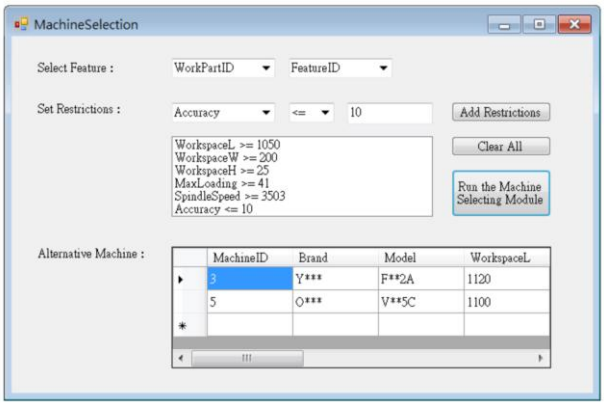

Fig. 4. (a) Home page system interface, (b) Sorting machine module interface; (c) AHP module interface.

In the website, we provide the information of manufacturers e.g. registered address, company name, and feature of machine tools. Customer's personal information and their demand are provided to the website, as shown in Fig.5. The matching between supply and demand is performed by AHP method. Relative weights in AHP are decided by customers based on the important of criteria. As shown in Fig. 6, some manufacturers are recorded in the candidate list with machine tool meet with customer's requirements.

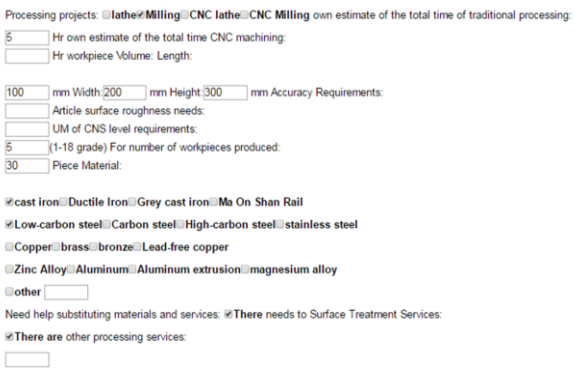

Fig. 5. Entering the parameters value of customer demand.

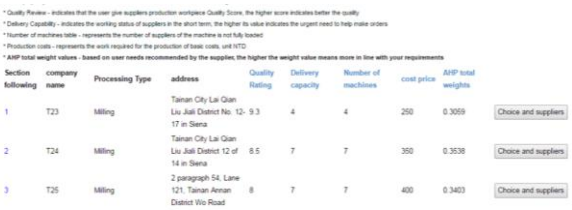

Fig. 6. List of companies and the desired machine tools with AHP weight.

V. Conclusions

In this paper, we built the cloud knowledge base system in machine tool for searching and comparing information on similar machine tool. The cloud system proposed matching service for manufacturers and customers. The knowledge

base allows users to search by unique keywords or filters results. This project will be further platform for customers to want to bargain cooperation suppliers browsing permission and for every home between suppliers and customers build one chat room to discuss private parties, the supplier cannot know each other, and the presence of each other. This advantage at the same time customers can request parity and to identify the most capable to meet the needs of suppliers to cooperate, and even can be used cash flow and logistics mechanism of this platform to trade, boost efficiency and reduce costs.

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Hoai-Nam Dinh got her B.S. degree from DaNang University of Technology, Vietnam in 2008 and M.S. degree from National Cheng Kung University, R.O.C. in 2010. Now she is studying Ph.D. degree from National Cheng Kung University, R.O.C.

Her research interests are in the areas of control mechanic, logic controller, CAD/CAM, CNC programming, cloud-based monitoring environment, cloud-based integration information management system.

Shang-Liang Chen got his B.S. degree from National Cheng Kung University, R.O.C. in 1979; M.S. degree from National Cheng Kung University, R.O.C. in 1984; Ph.D. degree from University of Liverpool, U.K.in 1992. He was a professor at National Cheng Kung University Institute of Manufacturing Engineering; and director of Computer Network Center, National Cheng Kung University from 2011-2013. He was also the president of Taiwan Shoufu University from 2013 to 2015. He is now a consultant of Locks Association.

His research interests include cloud-based monitoring environment, cloud-based integration information management system, could virtualization application, mobile monitoring and real-time information delivery system, information and mechatronic integration, intelligent remote monitoring system, pc-based multi-axis controller design, work piece and machining sequence detection and CAD / CAM. He has published over 40 papers in international peer reviewed journals. He received prices: Silver Paper Award of Science and Technology Advisor (2008), Gold Medal National Invention and Creation (2006).