Design of Educational Program for Management of Market, Procurement and Production

― Case Study of Educational Program for Supply and Demand Management in University―

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Abstract. In a global manufacturing, collaborative between departments (such as such as marketing, production and procurements) is requested. On the other hand, recently, in the university education of the management engineering field, the acquisition of knowledge and the technology concerning the cooperation of the two or more operations connected with the business management is demanded. In this background, this research presents a design of educational program for management of market, procurement and production. The program to educate the administrator is developed and is performed in curriculums for undergraduate students and graduate students in Nagoya Institute of Technology. This paper proposes an educational program for supply and demand management considered work and process design. In this paper, the program is performed for the case study of production & sales & service in a virtual business company. In addition, the developed educational program is explained and the effectiveness of the program will be shown.

Keywords: education design, MRP system, marketing management, production management

1. INTRODUCTION

In today's global manufacturing management, collab-orative between departments (such as such as marketing, production and procurements) became more important. On the other hand, recently, in the university education of the management engineering field, the acquisition of knowledge and the technology concerning the cooperation of the two or more operations connected with the business management is demanded.

As a research of practicing management education, a program with ERP tool that studied sales, purchase and service was developed in Nagoya Institute of Technology from 2010. By taking part in the maneuver with ERP tool, learner was able to be actually felt the improvement of the stock, procurement, and production using the uniform management of corporate information. However, because the experience in the manufacturing premise is insufficient, the voice was heard that it is difficult to under-stand the relationship of managerial judgement and production site.

Table 1: A competency dictionary of supply and demand management considered production design

Process	Competency	Content of Competency	Level
Business process	Business scenario of company	・Company organization and dealings between enterprises ・Business flow and hybrid production method	Knowledge Knowledge
Purchase & sale process	Purchase and sale management	・Business process of purchase ・Business process of sale	Application Application
Demand-to-supply process	Demand forecast	・Demand-to-supply management ・Method of collecting data of supply and demand ・Demand forecast method and exponential smoothing ・Application of exponential smoothing method	Knowledge Knowledge Knowledge Application
Production process	Aggregate production planning	・Basic method of production plan ・Make-to-stock production and make-to-order production ・Hybrid production	Knowledge Knowledge Knowledge
	Process capacity management	・Calculation method of the workload ・Calculation method of worker production and machining capacity ・Adjustment and countermeasure of workload and production capacity	Knowledge Knowledge Application
	Production scheduling	・ Outline, purpose, and basic structure of scheduling management ・Method of loading scheduling	Knowledge Knowledge
	Material requirements planning (MRP) & stock management	・MRP system and bill of materials (BOM) ・Master production schedule (MPS) ・Calculation procedure of material requirements planning and lot sizing rule ・Fixed quantity ordering system and fixed cycle ordering system ・Economic order quantity (EOQ) and ABC management	Knowledge Knowledge Application Knowledge Application
Information process	Management of master data	・Classification and function of master data	Knowledge
	Data flow management	・Data flow of Make-to-stock production and make-to-order and hybrid production ・Relation between information process and master data	Knowledge Knowledge
Logistics process	Supply chain Management (SCM)	・Outline and system of SCM	Knowledge
Environmental process	Environmental management	・Environmental countermeasure of production, logistics and business process	Knowledge

On the other hand, to study the methods of work and process management using a real demonstration, the educational curriculum is performed for second-year undergraduate students concerning work and the process design of the production line for the assembly operation.

In this background, to understand the connection of the management strategy and the production site shown in Figure 1, this paper proposes an educational program for supply and demand management considered work and process design. The program to educate the administrator is developed and is performed in curriculums for undergraduate students and graduate students in Nagoya Institute of Technology. In this paper, first, a competency dictionary of educational program for management of market, procurement and production proposed. Then the program is performed using the case study of production & sales & service in a virtual business company. In addition, the developed educational program is explained and the effectiveness of the program will be shown.

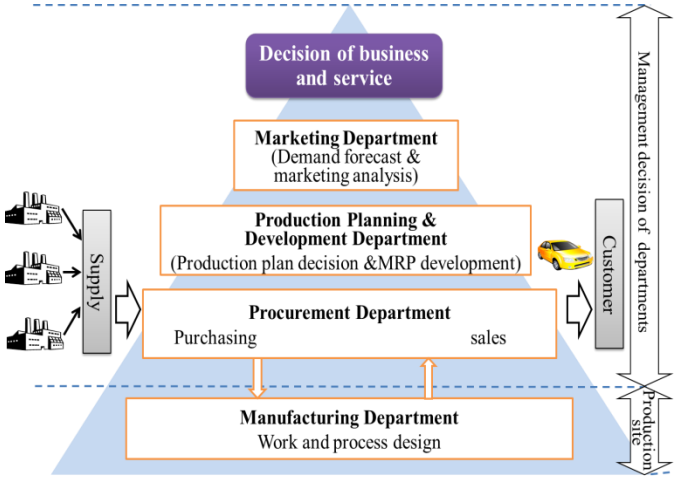

Figure 1: A virtual model of business company used in education design

2. EDEUCATION DESIGN FOR SUPPLYAND DEMAND MANAGEMENT CONSIDERED THE WORK AND PROCESS PLANNING

In order to develop an education design for supply and demand management based on the work and process planning, we propose the competency dictionary of supply and demand management , which shown in Table 1.

To verify this competency dictionary, an educational program for management of market, procurement and production is discussed in this research.

2.1 Curriculum Design of Procurement and Production Management

Table 2: An educational program for management of market, procurement and production

No.	Content	Related Department (Manager)
Phase I: Stock & MRP Systems		
1	・Base of stock management, Order method ・The exercise lesson of ABC method for stock management	Procurement, Production
2	・Economic order quantity (EOQ) ・The exercise lesson of Economic Order Quantity and Order Point	Procurement
3	・The exercise lesson of lot sizing rule（LFL、EOQ、POQ、MCP）	Procurement
4	Group Discussion: Using the technique of the 1-3th times, discusses the strategy of stock and procurement for a LOGO robot enterprise, from the standpoint of the managers of the procurement and production.	Procurement, Production
5	・Presentation, summary, and evaluation	Procurement, Production

No.	Content	Related Department (Manager)
Phase II: Demand-to-Supply Management and Production Plan		
1	・Demand forecast method and exponential smoothing	Marketing
2	・Planning of Production Plan	Production
3	・Match technology of demand and production	Marketing, Production
4	Group Discussion: ・design a business model of enterprise ・discusses the strategy of demand forecast and production plan for this enterprise, from the standpoint of the managers of the marketing and production.	Marketing, Production
5	・Presentation, summary, and evaluation	Marketing, Production

The candidate for this research is the exercise lesson of management system engineering in Nagoya Institute of Technology.

This paper proposes a program of market, procurement and production considered work and process, which is shown in table 2. The phase I and II are composed of five times of 1.5 hours every week, respectively. They are executed in the latter term of 2-year undergraduate and first term of 3-year undergraduate for the same learner.

In the latter term of 2-year undergraduate, the lecture of production management and the exercise lesson II of management system engineering are given. In the lecture of production management, theoretical of production instruction method, plan method and stock control etc. are learned.

To bury the gap of the theory and real place of production management, in the exercise lesson II of management system engineering, the first half is an exercise lesson of the process design and operation design using Lego assembly work, the latter half is an exercise lesson of an exercise lesson of stock & MRP system (phase I in Table 1) to understand the procurement and production management.

As a background of this paper, the first half of the exercise lesson of the process design and operation design are introduced as follows:

(1) <u>The process design and operation design for multi process</u>

1) Explanation of BOM
   Making of e-BOM of LEGO (Robot)
2) Work notation by MTM, explanation of working time conversion, and maneuver of execution assembly work (decision of the work order)
3) Explanation of process design method (positional weight method etc.)
   Measurement of assembly working time of LEGO robot and process design
4) Assembly operation
5) Practice I of assembly operation (competition at time)
6) The presentation of summary, evaluation, and improvement idea proposal

(2) <u>Process design intended for mass production</u>

7) Estimate calculation of production by process design and simulation
8) The process idea is instructed from the process design group to the work execution group.
   Improvement of operation in work execution group

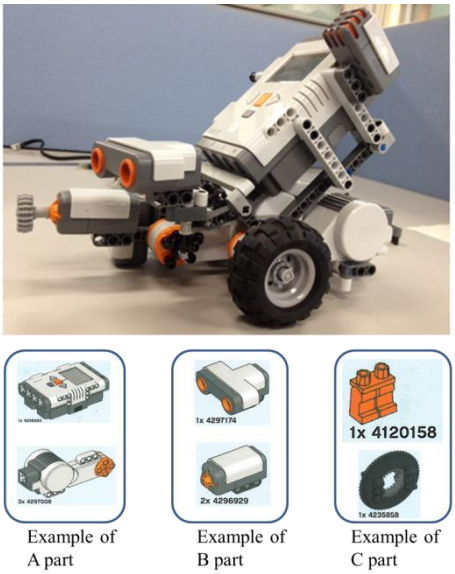

Figure 2: Example of Lego robot and part used in education design

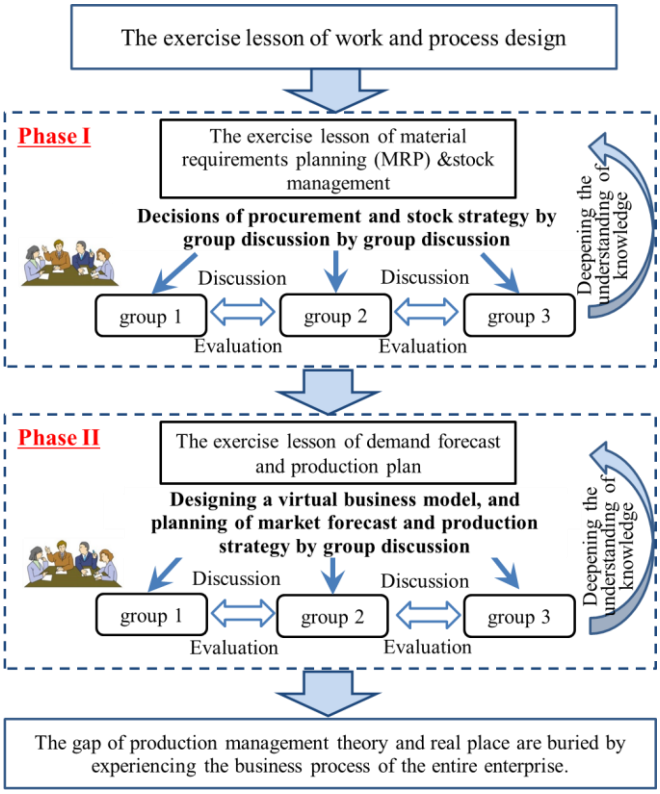

Figure 3: The relation of each exercise lessons

9) Operation and improvement work of line production
10) Practice II of assembly operation (competition at time)

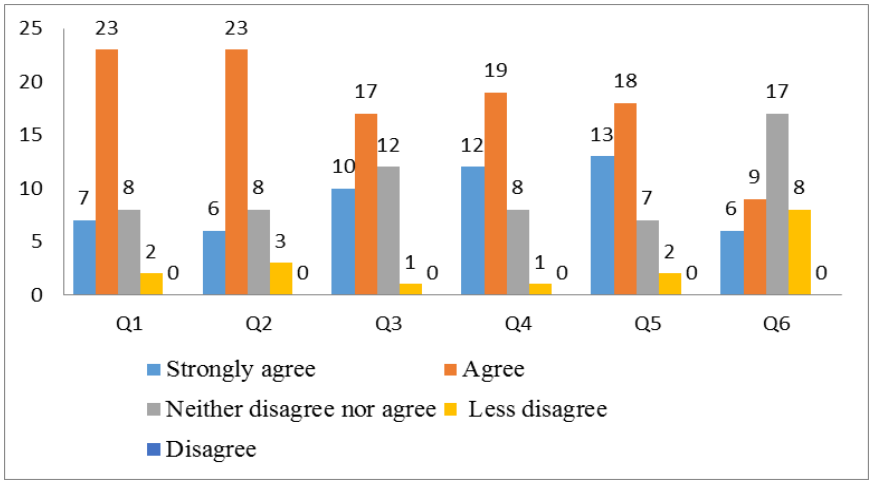

Figure 4: The result of the questionnaire

The latter half is an exercise lesson of stock & MRP system, which aims at the understanding of the strategy of production and the procurement, based on the knowledge of BOM and the assembly operation. Four students are in a group, who are the managers of procurement and production sections.

In the 1st~3th time, first, base of stock control, order method, amount of order, stock control method by ABC analysis, Lot sizing rule (LFL(Lot for Lot), EOQ(Economic Order Quantity), POQ(Period Order Quantity), MCP(Minimum Cost per Period)) etc. are learnt. Then, the mechanism of the stock and the MRP system is understood by simulating the stock and procurement. In the 4th time, using the technique of the 1-3th times, the strategy of stock and procurement for a LOGO robot enterprise are discussed from the standpoint of the managers of the procurement and production. Finally, in the 5th time, the group presentations about summary and evaluation are made.

2.2 Curriculum Design of Demand-to-Supply M anagement and Production Plan

The exercise lesson of demand-to-supply management and production plan aims at the understanding of the strategy of demand-to-supply management. The same four students are in a group, who are the managers of marketing and production sections.

In the 1st~3th time, first, demand-to-supply management, method of collecting data of supply and demand, demand forecast method and exponential smoothing and application of exponential smoothing method are learnt. Then, the mechanism of the demand-to-supply and production management is understood by simulation of marketing demand forecast and production planning. In the 4th time, a virtual business model is designed, and a planning of market forecast and production strategy is discussed by group. Finally, in the 5th time, the group presentations about summary and evaluation are made.

Fig.3 shows the relation of each exercise lessons. Fig.3 also shows the feature of the education design proposed in this paper.

3. EVALUATION OF EDUCATION DESIGN

The result of the questionnaire of the exercise lesson of stock & MRP system is shown in Figure 4. From figure 4, we can note that some study target can be achieved. From this result of the questionnaire, learner's understanding level could be confirmed.

Questions of questionnaire are show as follows:

(Q1) I have become interested in the stock management, the production plan and the procurement strategy by the participation of this exercise lesson.

(Q2) I have learned the knowledge of stock management, production plan and procurement strategy by the participation of this exercise lesson.

(Q3)I have been able to understand that knowledges of stock management, production plan and procurement strategy are necessity for manufacturing management, by the participation of this exercise lesson.

(Q4) I have been able to understand that knowledges of stock management, production plan, and procurement

strategy are necessity for work and process design, by the participation of this exercise lesson.
(Q5) I think that the group work was able to solve the problem (e.g. the problems of stock management, production plan and procurement strategy) than individual.
(Q6) I have become interested in a realistic problem of manufacturing by the participation of this exercise lesson.

4. CONCLUTIONS

In order to improving the collaboration of global manufacturing management, educating and training the department managers of market, procurement and production becomes an important problem. In this research, first, a competency dictionary of educational program for management of market, procurement and production proposed. Then the program is performed using the case study of production & sales & service in a virtual business company. Finally, the developed educational program is explained and the effectiveness of the education program proposed was able to be confirmed.

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