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MBA Education through Joint Projects with Private Companies:

Two Case Studies

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Abstract

Two cases from our MBA program that give our students opportunities to gain actual experience in management technology practices are shown here. These two examples are joint projects with a manufacturing company and a logistics company, both of which are Japanese companies in Japan. Students from China were engaged in both projects and they worked on the projects successfully. This paper will outline each project and report on how it benefited not only the student, but also the company involved.

Key Words: MBA education, dynamic scheduling, pull system, work measurement

1. Objective of the Article

This paper will report on how the following two cases gave our students opportunities to gain actual experiences of management technology practices, benefitting not only the students, but also the companies involved. Also, this paper will demonstrate the effectiveness of utilizing the technical experience method in MBA education.

2. Purpose of the MBA Program

First, the purpose of our MBA program is clarified. In fact, we have two different types of students in our master's degree course: one is a group of students who come directly from the undergraduate school, and the other is a group of students who have years of working experience. Although only the latter group can be officially titled as MBA students, both types of students here have the chance to engage in joint projects with outside companies. The reason is as follows. Of the students who directly come from the undergraduate course, most of them have no intention to go on to the doctor's degree course; they would like to get jobs at companies after graduation. A small percentage of the students will go on to get a doctor's degree. For a student who has no working experience, we basically provide chances for internships or for working as a student trainee. However, even for the student who has no working experience, it is possible to give some of them the chance to join a joint project depending on the research theme concerned.

Note: This paper was written for a lecture at Dalian University of Technology given in June 2008.

Most of the students who have working experiences so far would like to get better jobs after graduation. The main purpose of our program at Josai University is to educate people as higher management technologists. That is why we provide the chance to be involved in practical experiences and encourage them to write master's theses which are based on the joint research projects with companies.

The school motto of our university is "the fruition of the human spirit through education". This was written by our university's founder, Mikio Mizuta, who had been the Finance Minister of the Japanese government for a long time and founded Josai University in 1965. This school motto indicates the following meaning. The purpose of our education is to help students to attain the fruit of human spirit which is expected in the society, and this is how we intend to educate our students.

To realize the purpose of our MBA education, we consider the following three mainstays as important. The first one is, needless to say, that our own professors give the best lectures and the best consultation with students for writing their master's theses. This is the first mainstay of their education.

The second mainstay is to provide our students as many special lectures as possible by people from outside companies, by management consultants and other specialists. Students can request what things they would like to know and whom they would like to give the lectures. According to the requests, we arrange the special lectures extensively. Most of the requests relate to the themes of their master theses. Since these special lectures are only for a small number of students, they can not only listen to the lectures, but can also have discussions with the lecturers that are much more effective in fulfilling our educational purposes. The titles of the special lectures which were held recently, for example, are "Carbon Dioxide Reduction and Green Logistics" and "The State-of-the-art of Electronic Money using RFID, Such as IC cards and Cell Phones". These topics are very attractive for our students. Some of them are writing their master's theses about these topics.

The third mainstay is joint projects with outside companies. If our students are considered as our customers, it is essential to know what the customers hidden needs are during the two year period of the MBA program. Therefore, a hypothesis is set up for the customers' wants. This is to give some projects to our students. A project is formed by three parties: a professor of our university, an outside company and the student. The project leader is basically from the company, while the professor engaged should be a project advisor or consultant. Through making progress on the project, the student can have a good experience and learn many things.

3. Two Cases of Joint Projects

3-1 Development of a Dynamic Scheduling System

(1) About the Student Engaged in this Project

The first case is by Niville Ho, or Ho Kwan in Chinese. He was born in Amoy or Xiamen, Fujian province. After his family left Amoy, he was educated in Hong Kong. He graduated from The City University of Hong Kong. After he worked in Hong Kong and in Singapore about eight years as a programmer and a system analyst in the area of production planning and control systems, he came to the graduate school of Josai University. Then, he graduated from our MBA course two years ago. He is now working as a system analyst for a Hong Kong manufacturing company which has factories in mainland China. While he was in our university in Japan, we gave him a project with a precision machinery company in

Japan. His role in the project was to make a detailed design of the system and to develop the programs. Since the company was a rather small to medium sized enterprise, he could be a key person for the system development. Also, he invented a good algorithm of work-capacity adjustment, which was published in an academic journal in Japan.[1]

（2） Company Providing the Project

The precision machinery company is in Nagano Prefecture, in a basin city surrounded by 3,000 meter high mountains. The place is about 3 hours car drive by expressway from Tokyo. The company makes and sells automatic assembling machines, mainly for the electronics industry. It has three departments: design, parts manufacturing and assembling. After the machine is finally adjusted, the product is shipped to the customers. The number of employees is about 110. Although it is not a big company, the company is quite highly evaluated for its technology level in this industry area and it has a good business performance. The customers are Japanese electronics companies; also, quite a large percentage of the products are exported to Korea, China and Taiwan.

（3） Basic Concept of the System

The production of the company is basically a “make-to-order” system. All the products are designed, parts manufactured and assembled only after the actual order from the customer comes to the company. Traditionally, and particularly in Japan, this type of machinery factory has used a “seiban-kanri” system or a system controlled by production numbers, which is not completely the same as MRP, but similar to it. The Japanese word “seiban-kanri” has no appropriate English translation. Probably there is a similar system in Europe or in the US, but the “seiban-kanri” system was invented in Japan during World War Two. The system was developed for factories making military weapons. After World War Two, the system came into wide use, in particular, for “make-to-order“ type factories of various industries.

As for the master data of parts, it is maintained by a summary structure in the “seiban-kanri” system, while it is stored by a multi-level tree structure in the MRP system, because the MRP system was developed on the premise that the computer is fully utilized at a time when business computers became popular for many private companies in the beginning of the 1970’s.

The machinery company who gave us the joint project had been using the “seiban-kanri” so far. It had a rather long history for using the system. Of course, today the system has already been computerized, but it should be considered a legacy system.

In both the “seiban-kanri” and MRP systems, all of the parts have a predetermined lead time for processing. This means that they start the first process before the lead time of all the necessary processes for this particular part. According to APICS, American Production and Inventory Control Society, the dictionary explains that a “push system” makes products by a given schedule planned in advance.[2] In other words, if any predetermined lead time is applied to make the production schedule, the system is called a push system. In this defining way, it can be said that the company has used a push system so far.

This project aimed to design and develop a pull-type dynamic scheduling system. Before going down to the details of the system, it is necessary to show how a pull system is meaningful in this type of machine factory. To say this from the opposite side of the above APICS dictionary, a pull system does not make any schedule in advance. Therefore, a “pull system” and “scheduling” cannot coexist. However, even if some planned schedule is always pulled tightly by the customer’s requested due date, it should not be incorrect that the system is called “pull scheduling”. Since there may be some other readings for the APICS definition,

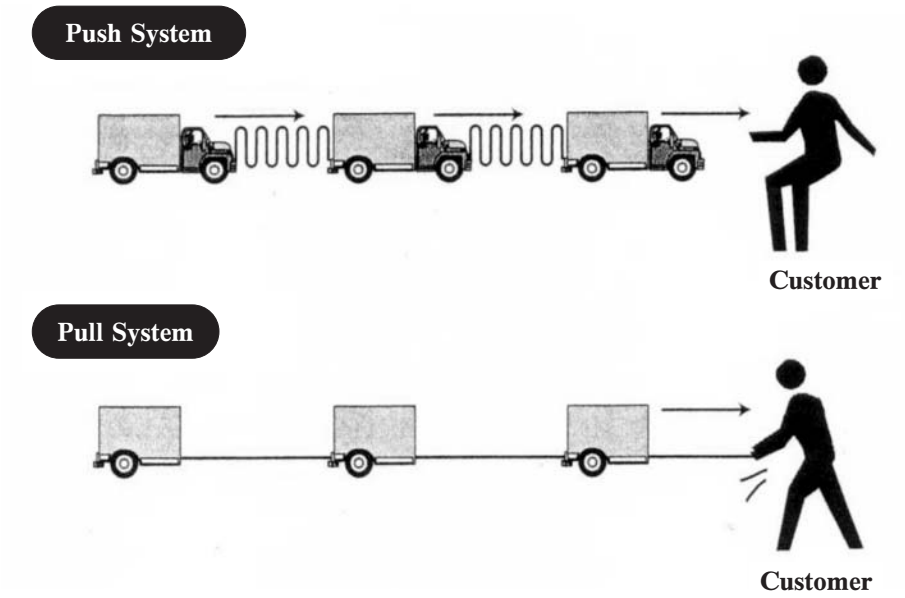

Figure 1 Push System vs. Pull System

in fact, it is difficult to categorize it simply.

To give rigour to the definition of the scheduling system, the following three characteristics were proposed for the system we developed in this joint project.

a) The schedule is allocated backward to the capacity of each process. Thus, the scheduled results can be considered to be tightly pulled by the customers' due dates.

b) The scheduled result is used as the production instruction to each process. In other words, it should be dynamic scheduling, which means scheduling is executed frequently. The system can give the best production instruction every time when the current status of both the due dates and the production progresses change.

c) Capacity control becomes the key factor to successfully realize such a scheduling system. Since it is theoretically finite-capacity scheduling, it always needs some practical way to adjust the capacity with the workload. For this purpose of capacity control, we invented an algorithm called a "squeezing method" which was published in the Journal of the Japan Industrial Management Association.[(1)] The article was written by three co-authors including myself and this student, Niville Ho.

(4) Outline of the System

The company has the following processes: nine processes by three work groups in the design department, 20 processes by eight work groups in the parts manufacturing department and nine processes by three work groups in the assembly department.

As for the computer system, the legacy system has 14 terminals and works for the company's accounting and production management systems as well. This legacy system connects to the new scheduling engine which has 25 client PCs. This is the system we developed in the joint project.

The scheduling is automatically executed every early morning by the scheduling engine. All the data used has been maintained and renewed by the end of the previous day, so the results of the scheduling in the early morning should be based on the most current situations. In this way, when the working time begins in the morning, everyone in each process is informed through a list of what should be done in the day by order of the priority. Even during

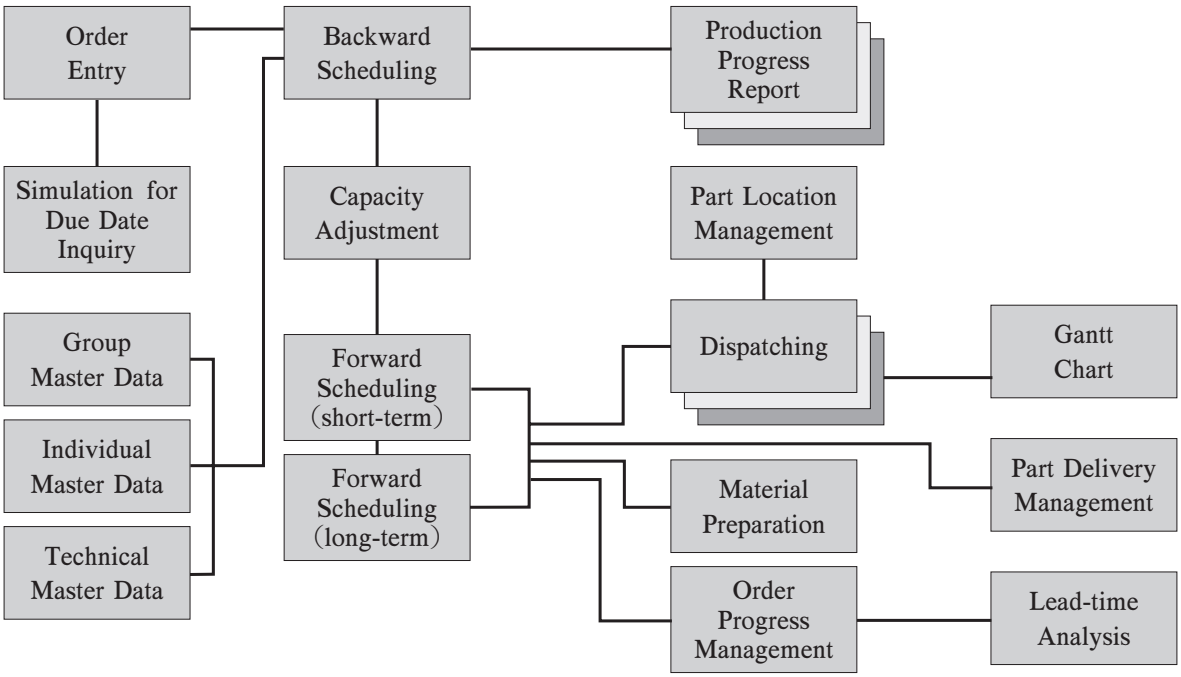

Figure 2　Functions of the production scheduling system

the day, if some big change happens in the customer's due date or in the progress of any process, all the production orders are rescheduled on time. That is why every time they start production at any process of all the 38 processes in the company, they are instructed what should be done first. As the outcome, the total lead time of each order is surely reduced. This reminds us of an image of a tight rope pulled by the customer, which has no slack at all.

This type of scheduling could not have been realized if it were more than ten years ago. The recent evolution of the PC and information technology has contributed to the scheduling in practical use. Because the algorithm of this type of scheduling is quite complicated, the processing took a very long time by the older generation's computer. But today's PC can do it in a short processing time.

The programs of this scheduling system were developed by the following two programming languages. The scheduling engine itself, which is the core algorithm of scheduling, was developed by low-level C language which makes the processing speed faster. For the interfaces, such as input and output functions, the programs were developed by Visual Basic. These interface functions are frequently requested to amend the programs from the system users for enhancing easiness of the system handling and level of the functions. Visual Basic is a suitable programming language for this kind of system improvement and for the system maintenance.

（5） Results of the New Scheduling System

After the system implementation, the following results were reported:

a） The average lead time from the machine design start to the assembly completion was reduced from 40 days to 25 days.

b） The number of works-in-process which exist on the shelves between processes in the parts-manufacturing department was reduced by one-third.

c） A quicker and more precise response to enquiries from the customers for the delivery dates was realized.

d) Since the whole picture of all the work in the company became visible, any necessary action could be addressed adequately.
e) To cope with the inconsistency of the capacity with the workload in each group and department, the temporary transfer of operators could be more easily accomplished between groups and departments.

This system has been fully used after the implementation and now it is indispensable for the company. It is not too much to say that all the design and production activities in the company are instructed basically by the scheduling system. Moreover, the system can show a simulated result from calculating the expected delivery date for the customer's enquiry.

(6) Things the Student Learned

By involving this student in the joint project, he could have actual experience to design and develop the scheduling system. Since the project theme was to develop a kind of one of the most advanced systems in the production area, and since it was a rather rare example successfully implemented for such a sophisticated system, the experiences could be a valuable opportunity for him. In other words, he could get some essential successful know-how for developing a sophisticated system. The secret of know-how will lead him to a better way in the case of developing some rather complicated system in the future. This has made him a more competent system analyst, and he now plays an active part in the system development of a Hong Kong company which has manufacturing factories in Shenzhen and other cities in Canton province.

3-2 Work Measurement for Activity-Based Costing

(1) About the Student Engaged in this Project

The second case is by Men Rong who is from Jinzhou, Liaoning province. She had three years' working experience in China after her graduation from a technical college. Then she came to Japan and learned Japanese language. She got one year of a preliminary course to MBA in our university, and she is now in the second year of our MBA program.

(2) Effectiveness of the Study

Although work measurement is a very fundamental technical method, it is still effective in management practices. Since the method is considered to be already well established, it is no longer enumerated in research topics among university researchers. In fact, in the beginning the author started to study from the so-called classic IE, such as work measurement. However, now the topics most concerned for academic research are of the modern IE, such as advanced production scheduling and supply chain management.

The author has been a lecturer of "work study in logistics" for 20 years, in a short program at the Japan Institute of Logistics Systems (JILS). Among the many seminar programs held at JILS, it has been one of the most participant-gathering programs. Thus, work study has proven still to be a basic management technology which should be taught even in MBA level education.

(3) Company Providing the Project

The company which provided the second project is one of the major companies which makes snack foods, such as potato chips, shrimp chips and cereals. One of the company's distribution centers is located in a city 45 minutes north of Tokyo by bullet train. In the distribution center, they planned to develop an activity-based costing (ABC) system. To start an ABC, it is very necessary to determine the time data for each activity. That is why the

company requested a joint project. Our Chinese student, Men Rong, is interested in this area, so she joined this project.

（4） Purpose of this Study

The main purpose of this study was to set a standard time for each activity at the distribution center. In any distribution center, the workload varies drastically according to the day of the week and the time of day. That is why it is necessary to have data giving the volume of work, so that the necessary number of workers can be calculated. It is the activity time data which also can be applied for ABC.

（5） Study Procedure

Phase 1: Setting activities

The first thing to know is what the activities at this distribution center are. All the work contents at the center are summarized as 12 activities, such as receiving, shipping, picking, current-stock taking. The total number of employees at this center is about 35, which does not include management staff and other indirect workers. This is one of the medium-sized centers, and is not considered a large one.

Phase 2: Development of operations

Each activity consists of a plural number of operations. Describing the work contents of the activity by operations is the purpose of this phase. According to the principle of work study, time is measured at the element level which is classified as the second level of a work unit. However, in this study we measured time at the third level of operation. Thus, an activity is described by a number of operations. This is the SOP, standard operation procedure which can be used in the training for newcomers to understand the work procedure.

Phase 3: Time study

A time study is done for each activity and the time of each operation is measured by a stop watch. First though, all the activities are shot on a video at least 12 times. Then, from the measured times of each operation, the median time is selected as the base time of the operation.

Phase 4: Calculating the activity time

Summing up all the operation times of an activity, the base time of the activity is calcu-

Table 1 Time calculation of the activity “Receiving products”

Operation	Time（min.）	Frequency	Time（min.）
（1） Move to receiving machine	0.37	1	0.37
（2） Move from the machine to pallet	0.09	1	0.09
（3） Receiving inspection	0.29	0.06	0.02
（4） Transport by fork truck	0.32	1	0.32
（5） Adjustment of the load	0.32	1	0.32
（6） Placement at designated location	0.48	1	0.48
（7） Labeling	0.48	0.06	0.03
Total Time for one pallet			1.63

lated. The appropriate rate of time allowance is applied to the base time, which then becomes the standard time of the activity. An allowance rate is set, in this case 15%, including personal allowance, fatigue allowance and delay allowance.

Phase 5: Planning work volume

For each time period in a day and for each day of a week, the work volume of each activity is planned in advance. Although the future figure cannot be forecast exactly, it is necessary to apply some statistical method to the actual volume figures for making the planned volume.

Phase 6: Calculation of the required number of workers

From the planned work volume for each time period and for each day, the required number of workers is calculated. The work volume is multiplied by the standard time for each activity, and from this the necessary man-hours of the activity are calculated. Precisely speaking, the unit of man-hours is counted here by "minutes". By summing up the necessary minutes of all the activities, the total necessary minutes of each time period or of each day is calculated. Then, the figure is divided by the paid time to get the necessary number of workers in the time period. The paid time in the case of this company's distribution center is set as follows. The working time is basically 24 hours in a day. They have three working group shifts, and the portal-to-portal hours for each shift is 8 and half hours. Since each shift has a meal time and two short-term rest periods during the hours, the net working time of each shift is 7 and half hours, or 450 minutes. The total necessary man-minutes of each day are divided by 450 minutes. Thus, we get the necessary number of workers in the day. Actually, there is no person below decimal, so the figure should be raised to an integer.

Phase 7: Calculation of Work Utilization

Comparing the required number of workers with the actual allocated number of workers, the work efficiency is calculated. If the net required number is 31 and if the actual allocated number is 36, the total work efficiency becomes 86%. Theoretically speaking, a total efficiency is explained by the following two terms.

Total Work Efficiency
= Work Performance × Work Utilization
= Required work time ÷ Actual work time used
× Actual work time used ÷ Portal-to-Portal paid time

In this particular case where the Actual work time used data is not collected, the work performance rate can be considered as 100%. That is, if the work efficiency is 84%, the work utilization is also evaluated as 84% for convenience sake. Because the work volume varies on a large scale, it is impossible for the workload to coincide perfectly with the work capacity. The ratio of 86% means that the remaining 14% is the vacant time ratio in the whole paid working time. In other words, during the peak working time the utilization may be near 100%, but during the less busy time the workload is not enough for the work capacity. This means that the utilization level should be considerably less than 100%.

(6) Improvement of the Method

During the work measurement in the above procedure, a number of ideas for improvement of the method are generated. The ways to make the work methods better are found in the analysis of the work measurement. Although most of the ideas generated here are just the ideas they happen to get and do not seem to be effective, some of them may be applied

actually to improve the work methods.

The improvement ideas are categorized into two groups, one by the improvements for each activity, the other one by leveling the peak workload. In this case, workload leveling and capacity adjustment made up most of the improvements. For the workload leveling in a day, the daily vehicle diagram was reconsidered so as not to be swamped with much workload at the same time period. For coping with the workload differences by the day, the way of taking days-off for each worker was changed. For example, the latter half of a week is busier than the first half. The weekly day-off schedule had been planned as the same for all the days in a week; however, an improvement idea was proposed here to allocate the days-off more to the first half of a week. Thus, the work capacity can be reduced in the first half, while it cannot be reduced in the latter half of a week.

（7） Things the Student Learned

Although this is basic technology in management, many logistics companies think it very necessary. Just learning it from the textbook is not enough. For this kind of technique, the actual experience in practice is essential. Also, in this project, we applied some trials in the calculation methods using Excel. This is a new part of this research project. The student, Men Rong, gave a presentation about this project at the Japan-Korea Next Generation Academic Forum, which was held at Seoul National University, Korea on June 21, 2008[(3)]. By engaging in this joint project, she experienced good opportunities, not only technical experiences, but also experience in preparing and giving the presentation in an international academic conference. We hope that she will be an able staff person in a logistics company after her graduation from our MBA program next year.

4. Summary of the Conclusion

Through our joint projects with private companies in these several years, we could prove that the joint-project research satisfies our MBA students' desire for gaining some valuable professional experience. At this moment, we think it a very important part of their education. Of course, having such a joint project with a company is not an easy thing, because for the professor it takes much time not only for teaching the student, but also for consulting, if the project is to proceed successfully. Moreover, sometimes it becomes necessary to negotiate with the company about the budget for the project to progress.

However, in conclusion, we will continue to give our students the following opportunities.

a） For a master's degree student who has no working experience, an internship or a student trainee position seems to be more effective. It becomes a valuable opportunity for the student to get a good job after graduation.

b） For the MBA student who has sufficient working experience, there is no necessity to work in an internship or as a student trainee, but it is necessary to have more high level experience, which can be gained through the joint project with companies.

The two cases shown here are examples of joint projects with private companies. In the first case, the theme was a quite advanced system development. Such a scheduling system has been considered as one of the most difficult systems to be developed successfully. However, it was successfully developed and the people of the company now rely on the system. For reference, the company paid enough to cover the system development and our student, Niville Ho, got the appropriate development fee.

In the second case, the theme was a quite fundamental management technology application. The study procedure is not considered new technology. That is why the researchers of most universities are not interested in it any more. However, it is still a very necessary management technology in many companies. That is, we concluded that it should be taught and be experienced in an MBA program. As for research results, our student, Men Rong, found a new calculation method using Excel to get the required number of workers and the utilization ratio. For this, she could have a chance to present the research results at an international academic forum held at Seoul National University in Korea. The company granted our university enough research budget for our student to use, including the travel expense of our student to go to Seoul National University.

Acknowledgements

We greatly appreciate the Tenryu Seiki and Calbee companies for giving us the opportunities for the joint projects, because through the projects our students could learn many useful procedures and practices which they will take to their next position.

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