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GEARBOX (China) Ltd.: Will the Company's ERP System Support its Ambitious Growth Strategy?

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GEARBOX (CHINA) LTD.: WILL THE COMPANY'S ERP SYSTEM SUPPORT ITS AMBITIOUS GROWTH STRATEGY?

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Abstract

In November 2000, on one of those bright and sunny days typical for northern China's winter, the managing director of GEARBOX (China) Ltd. (pseudonym) glances over the new manufacturing facilities erected next to the shimmering office building to meet the expected growth in Chinese domestic demand for GEARBOX's products. Essentially being a duplicate of GEARBOX's existing production facilities, which were completed just three years ago, this new plant is a manifestation of the company's ambitious plans for growth in the dynamic Chinese market. He wonders if the company's capacity to handle its logistical processes will match this new production capacity and, specifically, how to leverage the company's ERP system to maintain its 100 percent annual growth rates over the coming couple of years.

Company Background

GEARBOX (China) Ltd. is part of the globally operating, family-owned, German-headquartered GEARBOX Group with worldwide sales of DM 1.6 billion and 7,000 employees in 2000. Its main business is the manufacturing, distribution, and servicing of gear units (gear boxes) and motors that drive a diverse set of machinery such as retractable roofs in stadiums, baggage conveyor belts in airports, escalators in department stores, and assembly lines. With the industry defined as such, the GEARBOX group maintains a global leadership position.

The parent company was founded in 1931. In 1945, the founder's son-in-law took over general management responsibility, expanded the company internationally and, as early as 1965, devised a strategy of modularizing the company's main products so that the manufacture of components could be centralized in a few select sites while globally dispersed plants would assemble the finished products according to customer requirements (see Exhibit 1 for a map of GEARBOX' global reach). From a set of roughly 3,000 components, millions of variants can be assembled. The group now comprises eight manufacturing plants in Germany, France, the United States, China, and Brazil and more than 40 assembly plants. The company continues to be managed by the founder's grandsons.

GEARBOX in China

In 1995, GEARBOX started construction of assembly and manufacturing facilities as well as of an office building, all in Tianjin, the giant harbor city neighboring Beijing. One year later, the company commenced assembly operations and, in 1997, began producing components. GEARBOX (China) Ltd. is the only manufacturing site in Asia within the group; however, only mechanical gearboxes are produced and assembled there while electronic components continue to be imported.

The initial investment of DM 150 million was made in view of a long-term growth strategy. Accordingly, all manufacturing, assembly, and office facilities were designed to accommodate much larger capacity requirements than existed initially. Therefore, current capacity is also used to supply other Asian markets such as Hong Kong, Korea, Singapore, Malaysia, Japan, Thailand, Australia, and New Zealand. However, all production capacity will be required to satisfy domestic demand once the company's ambitious goal of emerging as the market leader in China is reached. The director of sales and marketing explains

> Our market strategy is very clear: GEARBOX is the number one in the world in the power transmission market....[Regarding] the worldwide turnover, we account for 17 percent, 40 percent in Germany. The same strategy applies to the Chinese market. We want to be the number one.

The Chinese market is developing rapidly and reliable market statistics are hard to come by. GEARBOX reckons that it holds 5 to 6 percent of the total market while claiming a share of more than 60 percent among the foreign branded (completely or partly imported) products. GEARBOX's sales in China represent a higher volume than the sales of the next three importers taken together. Local competition is highly fragmented and focuses on the lower end of the market while GEARBOX exclusively serves the market's higher end. The marketing director explains GEARBOX's market strategy in China:

> Our strategy to reach this target [to become the market leader] is first…[to create] a superior brand name, that means the best quality, the best service, the best delivery time [and] accuracy, and also, in the meantime, to apply a flexible pricing policy. That means, German standard quality, German standard service [at a] reasonable and flexible price [in the] Chinese market.

Regarding delivery time, he continues,

> Our standard is, first, accurate [delivery]: I promise the customer…three weeks—so we deliver in exactly three weeks.…Second, it is trying to be shorter; the third is being flexible.

Currently, standard delivery time is two to three weeks. However, the firm keeps some extra assembly capacity to satisfy urgent customer orders in up to 24 hours.

The target for delivery accuracy is 98 percent while the company currently manages to sustain a 95 to 96 percent on-time order fulfillment rate in China. The marketing director explains the problems the company faces regarding the goal of accurate deliveries:

> The main reason for [occasional problems] to deliver on time is that we still have certain parts from Germany, so we cannot make 100 percent of the parts here [in China]. The parts from Germany need air freight, transportation, customs clearance, and so on. So this is one reason. [The] second reason is, [we have] six series of gear motors, each series has dozens of sizes, each size has different ratios, different power [units]—we have several million combinations of products. We have a certain stock value, we keep stock of 80 million [RMB] to [ensure] accurate delivery time. But sometimes a big order rushes in, [then we run] out of stock.…So, [we] still have this room for further improvement. It is not 100 percent accurate.

In its fifth year, the company has already reached its break-even point which is a record within the GEARBOX group. Over the past three years, the company has sustained yearly growth rates of 100 percent. Over the past eight months (January to August 2000), the company has realized revenues of 180 million RMB. It plans to continue to grow at this rate over the next three to five years to achieve a market share of 10 to 15 percent. Maintaining this growth rate is probably the company's biggest challenge. The company struggles to increase its inventory of semifinished goods (which are used to assemble finished products according to customer orders) from 60 to 80 million RMB. At the same time, operating such a large inventory efficiently and, more generally, ensuring a smooth logistical process while growing rapidly is no easy feat. This is where the company's ERP system, based on SAP's R/3 software, comes into play.

The History of the ERP System in GEARBOX (China) Ltd.

The decision to implement SAP's R/3 system in GEARBOX (China) Ltd. was made as part of the original investment decision. Thus, the budget for the R/3 implementation project was part of the overall initial budget for establishing GEARBOX's production and marketing operations in China. At that time, several alternative ERP packages had been evaluated. However, since the parent

company was an experienced user of SAP's mainframe version (the R/2 system),it was decided to implement R/3 in order to (1) make maximum use of the parent company's competence in this area, (2) exploit favorable licensing conditions obtained by the GEARBOX group, and (3) ensure maximum compatibility among systems within the group.

The company did not have to rely on external resources to implement the system with the exception of the financial modules.[1] Apart from the financial modules—financial accounting (FI) and cost accounting (CO)—the scope of the project comprised all basic logistical modules of SAP's ERP system, namely purchasing and inventory management (Materials Management), Production Planning, and Sales and Distribution (see Exhibit 2 for more details on the scope of the implementation project and Exhibit 3 for a summary of its technical infrastructure).

Two members of the corporate IT department frequently visited China for periods of one to several weeks to help configure and test the system. The local IT department was responsible for solving hardware-related problems and select users from the functional departments received intensive training, partly in Germany. They provided the requisite knowledge about the company's internal processes which was then fed into the configuration process.

The company adopted a phased implementation strategy (i.e., it implemented several functional modules of the system in two phases; see Exhibit 4 for a time line of the implementation project). The implementation process was quite smooth as only minor problems occurred. These were mainly due to differences between the German and the Chinese business environments. For example, the format for printed invoices had to be adapted to Chinese financial regulations; similarly, the radix and the thousand points in numerical data fields had to be changed since, in Germany, a comma is used as a symbol for radix while a dot is used to indicate the thousand point whereas in China usage is the other way round. This created some confusion initially and it took about one month to identify and eliminate the source of the problem.

One issue requiring more attention turned out to be data regarding standard work times for individual production processes which were originally taken from GEARBOX's German operations. These had to be adapted significantly (generally, they were too short) in order to provide reliable production scheduling data. This required time measurements for each machine operation.

Another problem concerned the necessity to simultaneously train employees on the system while commencing general operations, as the managing director explains:

> [The] main difficulty was to understand the system, you know, R/3 is such a complicated system. [This] is one part [of the problem]. Another is, we are a new company, most workers are new, not very familiar with [our] product. We use the system to [assemble all] products…product knowledge and operations are new, so initially we have some difficulties…but we solved them.

The required training, however, led to a situation where employees found it increasingly difficult to resist other job offers since employees with good knowledge of R/3 are in high demand among Chinese manufacturing companies. About one fifth of all employees involved in the implementation project have already left the company including five managers and key users. However, it is not deemed necessary to develop countermeasures, as explained by the human resources manager:

> Three key persons left the company, one is in marketing, another is in production, and the former EDP manager.[2] These people were very important to the company, but I don't think it is necessary to give [a] special policy to these people to [make] them stay, I mean to upgrade their salary, because operating the system [requires] teamwork and does not only depend on these three people.

The general result of the implementation process is considered to be satisfactory by top management. The managing director comments:

> Problems always exist, you can never see a system solve all problems. What is important is how big the problems are. [Our] people get information from [this] system whenever they want it; they give me reports from the system and the figures are right…the sales department uses SD [the sales and distribution module] to work out order processing; so the system is a success, maybe not 100 percent, but 99 percent.

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[1]External consultants helped to adapt the financial module to Chinese accounting requirements.

[2]After this interview was conducted, the company's second EDP manager also left the company.

More importantly, the system is considered to have helped the company sustain its breathtaking growth, as claimed by the managing director: "If we did not have this system, certainly we could not have grown at this speed." However, he also clearly spells out his general philosophy regarding the extent to which he is willing to rely on this system for controlling the company's operational processes:

> The system may not work as perfect if you just leave it alone, so some human factor is needed.…You cannot let the system work out orders without checking; you have to check.…Each individual department will have to do it. The production department will have to check…when the system generates an order, whether it is [the correct quantity], because…at a certain point [in the past], the system really made a blunder.

Using the System in Purchasing

The central purchasing department had been established in 1998 since that was when the assembly plant began to purchase parts from Chinese suppliers (see Exhibit 5 for the company's current organization chart). Before that, only the production plant bought raw materials and parts from Chinese suppliers so that the purchasing function was located in the production plant. Upon implementing the R/3 purchasing module (MM: Materials Management) in the production plant, the current manager of the central purchasing department became the first key user for this module. He describes the main task of his department:

> Our main task is to create the purchasing order and to post the order to the vendor, very simple.…MRP[3] will be done by production and assembly, these two plants have their own planning departments.…[Our responsibility includes vendor] evaluation, [vendor] selection, and the maintenance of the safety stock.

The general process in the purchasing department starts with the department's six purchasers opening the requirements list every morning. Each purchaser is assigned one type of product such as castings, motors, and steel. (This is how the purchasing department has grown: as additional types of products were procured locally, a new person responsible for purchasing these parts was employed.) The requirements list is created by the planning departments in both the production and the assembly plant (see Exhibit 6 for an outline of the workflow in these two plants) who use the R/3 MRP functionality for this purpose. As a general rule, each requirement should be processed into a purchasing order on the same day. However, sometimes several requirements will be combined to realize economies of scale in purchasing and transportation. When creating a purchase order, the purchaser chooses the vendor from a list of two or three pre-defined vendors and adjusts the quantity according to factors such as the current production capacity of vendors.

The purchasing lead time is specified as part of the material master data. These specifications are binding for the purchasing process and are the object of frequent discussions between purchasing on the one hand and production and assembly on the other hand. Purchasing has to ensure that required parts will arrive in the warehouses within the specified time. This requires a strict follow-up process.

After goods have been quality-checked, purchasing informs suppliers about the amount accepted and thus the total sum to be paid by GEARBOX. Upon receiving this information, suppliers issue an invoice to the purchasing department; all three pieces of information (purchase order, goods receipt, invoice) are then transferred to the finance department which is responsible for issuing payment, typically by check. Via purchasing, the check is then sent to suppliers, thus concluding the purchasing process.

Among these several tasks, only the process of purchase order creation is currently supported by R/3 at GEARBOX. The process of following-up with vendors (which occupies most of the working time of the purchasers) and the payment process still rely on manual, paper-based procedures. The manager of the central purchasing department comments:

> I always try to use the R/3 system to help my people to follow-up the vendors automatically, but I think we need more time to be trained. So this kind of thing cannot be done [right now]. This is may be a knowledge problem or something, I don't know. Actually, we cannot do it.

[3]MRP stands for material requirements planning. Its main task is to translate a customer order for a finished good into production or purchase orders for parts or required materials.

Instead, purchasers use Excel documents to support the follow-up process. Similarly, when selecting vendors, purchasers rely on additional information rather than on information provided by the R/3 system since the R/3 system currently provides information only about prices and lead times; therefore, information about accumulated sales with vendors, quality of products, and reliability of suppliers regarding delivery times has to be retrieved from other documents and electronic files. The same situation holds for the process of approving purchase orders which is done by the purchasing manager himself. He relies on a document which draws together information from a variety of sources in order to check whether a required quantity seems reasonable or not.[4] Although most of the information contained in this document is, at some point, taken from the R/3 system, the purchasing manager does not trust the reporting function of the R/3 system to provide this information directly. Inventory data, for example, are provided by the inventory managers who print a list of stock levels which is used by purchasers to create the document used by the purchasing manager to approve purchase orders. The purchasing manager explains:

> Before we found the problem of this information system [SAP's reporting function], I [trusted] this information system, so I always made mistakes. Therefore I have to ask my people to do this paperwork.

Finally, the payment process is completely paper-based. Goods receipt documents are created by the warehouse department although the same information is also entered into the R/3 system. Upon receiving the paper documents, purchasing compares the information from the two sources item by item and calls the warehouse department in case of inconsistencies. Once the invoice arrives, copies of the purchase order, the goods receipt document, and the invoice are physically transferred to the finance department which issues the check and subsequently creates the account payable in the R/3 system. Frequently, due to a backlog in the accounting department, creation of the account payable is delayed. The purchasing manager comments:

> In my own opinion, this R/3 system will provide information in time, but I don't think that this system in our company [provides information] in time. So, some information in this system is, how to say, too late.

Using the System in Manufacturing

The manufacturing plant uses a reorder point system to control the production process. Thus, the production process is initiated by stock levels reaching or falling below the reorder point for each part number. A production order is then created specifying the required quantity and the planned delivery time. Together with a detailed work plan (containing information about operations, tooling, required materials, etc.) the production order then travels through the manufacturing plant along with the materials that are gradually transformed into the required part. Once the part is finished, it is delivered to the assembly plant and stocked in the semifinished goods inventory which is under the control of the assembly plant. (From the point of view of the whole company, the manufacturing plant is treated more like an outside supplier than an internal department or division. Thus, the transfer of goods from the production plant to the assembly plant is regarded as a delivery process rather than an internal transfer.)

The R/3 system is currently only used for creating production orders (quite similar to the situation in the purchasing department where the system is used for creating purchase orders). As stock levels reach the reorder point, the system automatically creates production orders taking information about lot sizes and delivery time from the material master data (as with parts procured from outside vendors, material master data for parts produced internally include information about [standard] lead times). Lot sizes are determined mostly on the basis of experience by the production manager who was also the first key user for the production planning (PP) module during system implementation. He explains the process of determining lot sizes as follows:

> For all these years, I am responsible for setting the economic [lot] size. One source is from the German training. The other source is from the practice in China. I mainly set lot sizes [according to] market demand. For example, the market demand is 1,000 per year, the general principle is three to six times finishing them [per year]. There [are] exceptions. If demand is 500 annually, the lot size can be 200, 300, or 400, but it cannot be 500. Otherwise, it will influence other parts.

Lot sizes and quantities suggested by the system are, as a rule, changed for each production order as the production manager explains: "We will change according to materials used, machine load, worker schedule, etc." The main reason for the need to

[4]The purchasing manager is expected by the managing director to frequently check the quantities requested by the assembly plant because it is assumed that the assembly plant, being under the control of the sales department, requested quantities that might be too high in order to increase flexibility for the sales process. This double-check is recognized and accepted as legitimate by the sales director.

make this type of manual adjustment is that the capacity planning function of R/3 is not used. Capacity planning simulates a production run, given machine capacity, by simultaneously taking into account all production orders planned for a given period of time. Since different choices of lot sizes as well as of production order routing affect the available machine capacity, actual production cycle times (delivery times in GEARBOX's parlance) may vary significantly. At GEARBOX, these interdependencies are taken into account by adjusting production order quantities and delivery times on the basis of experience.

The production manager has proposed to implement the capacity planning function to the managing director:

> The GM [managing director] must support [the project], then we can do it. But [concerning] the money, [we are still] not talking about details, how much it will cost to solve the problem. Like me, I have too much work to do. Maybe the point of view of [top] managers is different from ours. It is easy to calculate the money the project needs, but it is difficult to decide how long it will take. I have given the plan [to top management], but there is too much work in our department and there are more [urgent jobs] than this project.

Implementing capacity planning requires not only accurate capacity data for each (machine) operation, but also accurate data about production progress and actually available machine capacity. Currently, the process of production control is separated organizationally from the production planning process.[5] The production control department collects information on production progress twice a day, at 8:00 a.m. and 3:00 or 4:00 p.m. Data collected include actual operation time, number of units produced, and problems occurred (such as damaged tools). This information is stored in a separate information system (not integrated with the R/3 system) which is used to analyze machine capacity and sources of operational problems. The vice general manager responsible for manufacturing says that having a separate department monitoring production progress (rather than having workers themselves recording production progress on either a paper document or in a computer system) is necessary. He explains the function of this department:

> The logistic unit [the production control department] will determine the requirements for the production people and they [the production people] will have to comply with them. [So the production control people] have to control the production people. Otherwise, if something happens, nobody [will take responsibility].

In short, the current use of the system is limited to the production planning function. Regarding the company's ability to sustain current growth levels in the production planning and control area, the production manager thinks that

> the assignment of tasks does not have to be changed; we just need more people. New people will not [be required] for new functions, but for [managing] higher output levels.…The company installed this system just like it built this office building, it is not very necessary. We can work without the system; we just need more people.…the money for buying the system can pay so many years of salary for employees, [but] the investment has no visible benefit.…when adding investment to the system, maybe [we have to] pay more attention to the benefits.

Among the three people originally involved in the PP implementation process, two have already left the company; only the production manager still works for GEARBOX. He remarks:

> Using [this system] in China, some decision makers know little about it, some even don't know it [at all], so the degree of [taking the system] serious [varies]; this is not good for R/3's development. [Only] the people who use the system know it is good; but the people who don't use it will [be concerned] about [the necessary] investment…[and] managers will think it will give them too much trouble, that it is not better than working manually, and these people always have their own experience.

Using the System in Distribution

Whereas the operational principle in the manufacturing unit is make to stock, the assembly process works according to a make to order principle. When an order arrives either via a sales representative or directly from a customer, it is first determined whether parts need to be purchased from abroad. Next, inventories are checked with regard to availability of required parts. When

[5]In the organization chart (see Exhibit 5), this department is labeled "Production Process."

all parts are available, the product is assembled according to customer specifications but delivery is blocked until full payment has been received (thus, finished goods may be stocked for some time). Once payment is received, goods are delivered.

Again, the system is basically used for printing the picking list which is used by assembly as the main document to control the assembly process. Orders are only entered into the system once availability of parts, delivery times, and prices have been checked through telephone calls with the other departments involved in the delivery process. For example, the sales administrators (who are the main R/3 users in the sales and marketing department) call the purchasing department to decide whether a part has to be bought from abroad. The inventory department provides them with a printed list which gives roughly accurate information on stock levels.[6] Prices and delivery times are then decided by communication with the managers from the other relevant departments. A Sales and Administration (SD) key user summarizes the role of the sales administration department:

> Our department is a connection point for the whole company: we harmonize sales offices, determine the price by talking with departments, and handle the order process, monitor the fulfillment process, arrange production and delivery.

Once prices and delivery times have been established, orders are confirmed and entered into the R/3 system. This task consumes about three hours per day for the sales administrators since it involves entering a large number of technical parameters (reflecting the large variety of combinations possible for customization). Assembly then uses the system to print the picking list, basically leveraging the bill of materials (BOM) data to explode the final product into its component parts. The warehouse manager uses the list to provide assembly workers with required parts since it turned out that when assembly workers were allowed to take the parts themselves from the warehouse, inventory data tended to be inaccurate. The sales director explains:

> Before, it was only one position, sitting in the office monitoring the system. Certain workers in the workshop just pick [the material from the warehouse] and use and damage [them] and throw away the damaged part and take another part.

Once the products are finished, sales administration is again involved in coordinating the further process. After sales administration has been informed by assembly that a certain product has been finished, sales administration prompts the finance department to receive payment and triggers delivery once the finance department has signaled clearance.

The semifinished goods inventory is monitored by two people who are both using the R/3 system for that purpose, the warehouse manager and the inventory manager, the latter being responsible for availability checks and material requirements planning, the former being responsible for the accuracy of the inventory data.

The sales director comments on the overall impact of the R/3 system on sales administration:

> you cannot say that the R/3 system makes the delivery time shorter, but [it] makes the lead time more clearly understandable and also makes it easy to assess the whole picture. One year ago, when we [started to] use this system, we had only 100 million [Chinese Yuan] yearly turnover; [now] we manage 200 million turnover. The delivery time is still fixed to two or three weeks. This is contributed [by] this R/3 system.

According to the SD key user, the time required for determining delivery times and prices has not changed before and after implementing the system:

> Before [starting to use] the system, we could get the answer on the same day and now we also get it on the same day.

Using the System in Finance

The following processes are supported by the R/3 system (R/3 functions and modules in parentheses): general ledger (GL), accounts payable (A/P), accounts receivable (A/C), and product costing (CO). Asset accounting (AM) (i.e., the calculation of

[6]The reason why this information is only roughly accurate is that the list is given to the sales department only once every fortnight.

depreciation rates and asset values) is currently done manually.[7] Among these tasks, the accounts payable and receivable processes consume the biggest part of the finance department's work capacity.

The accounts receivable process is quite simple due to the specific cash-on-delivery process customary in China, which is also strictly adhered to at GEARBOX. Every day, a report is created listing all products that have completed the assembly process and are waiting for delivery as well as the goods that have already passed the packing procedure. Finance uses this list to remind customers of due payments. Once these are received, the block in the system is removed so that delivery can start.

In contrast, the accounts payable process involves more information and coordination work. Purchasing is charged with overseeing the whole process until goods arrive in the warehouse and the invoice is received. Together with the original purchase orders and the documents created when receiving the goods in the warehouse, invoices are then transferred to the finance department, which double-checks all three types of documents and issues payments accordingly (by preparing a check). Larger amounts have to be approved by the managing director. Therefore, purchasing prepares a weekly cash requirements estimate so that the finance department can prepare payments in advance.

The R/3 system gets involved in this process only after the checks have been issued. Then, the account payable is created so that the whole process becomes visible in the system. However, sometimes the daily work burden is too high so that creating these accounts is delayed by one day or more. Hence the purchasers are sometimes confronted with the problem of noncurrent data.

The finance manager explains the situation:

> Based on my understanding, the SAP system, in principle, requires each activity to be done in the system. But actual practice sometimes deviates from this. The main reason is that it is hard for people to get rid of the concept of manual work. They are very focused on [paper-based] documentation.

He illustrates this situation with respect to the process of creating accounts payable:

> To be honest, I think R/3 is really a good system, but we are in a dilemma. For the materials purchasing, our GM [managing director] needs all related documents, purchase requisition and invoice, then approves it. But according to R/3, it is not necessary. If each department [acts according to] its responsibility, it will be quite simple in R/3. First the purchasing department initiates the purchase requisition, the warehouse checks the goods, and the finance department creates the account payable and we can transfer cash according to the account we have set up. But this is not the real situation although the procedure is the same. But we must get all the documents for approval for the transfer of cash.

All master data, except bill of materials data, are maintained in the finance department.[8] Specifically, customer and vendor master data are maintained in the finance department although the information is collected by the sales and purchasing departments respectively. The finance manager explains:

> Because all [of] the master data will have an effect on the data structure and report structure and classification [they are maintained in the finance department]. Every [piece of] master data is controlled by one account. And if the finance department is in charge of data maintenance, we can make appropriate categories. If this is delegated to the purchasing department, there may exist some confusion in the final accounting report.

All reports to the managing director are prepared by the finance manager. These include monthly reports on sales and gross margin reports for individual product categories. Production cost levels are only reported to the managing director if significant exceptions occur.

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[7]The reason is that at the time of implementation, comprehensive data on machine book values were not available.

[8]Bill of materials data are maintained by the production planning department.

The Future

Looking back on the lessons learned during the implementation of the R/3 system, the managing director is satisfied with the outcomes of this ambitious project. However, looking forward, he is concerned about the company's ability to maintain its high growth rates. Already, manufacturing is struggling to increase inventory levels as planned. He wonders where else bottlenecks might pop up as output continues to increase at an annual growth rate of 100 percent. How can he prepare to meet these challenges and, specifically, how can he leverage the company's R/3 system to avoid these bottlenecks? What difficulties might he encounter in this process and how can he overcome them?

Exhibit 1. Global Coverage of GEARBOX's Assembly, Distribution, and Servicing Facilities

Exhibit 2. Extent of Usage and Scope of the Implemented R/3 System

Number of users:
- Finance: 7
- Other modules: 14

Implemented functionality:
FI (Financial Accounting):
- General Ledger Accounting
- Accounts Receivable/Accounts Payable

CO (Cost Accounting)
- Cost Center Accounting
- Product Costing

MM (Materials Management)
- Inventory Management
- Purchasing

PP (Production Planning)
- Handling of Production Orders

SD (Sales and Distribution)
- Handling of Customer Orders

Exhibit 3. The R/3 Hardware and Software Infrastructure

R/3 Release: 3.05

Data and application servers:
Hardware: Siemens
Database: Oracle
Operating System: NT

Clients:
Over 30 PCs with MS Office

Telecommunication system:
Office building and production facilities fully cabled for telephony and computer network

Direct link with headquarters via X.25 for:
- Remote maintenance of R/3
- Access to SAP's Online Support System (OSS)
- Transfer of programs used to control CNC-machines

Exhibit 4. Time Line of the R/3 Implementation Project

Construction works:

1995: Begin of construction works in Tianjin
1996: Begin of assembly operations
1997: Opening of manufacturing plant and office buildings (April)
1998: Creation of a central purchasing department

Phase I (FI/CO, MM, PP):

	Q4 95	Q1 96	Q2 96	Q3 96	Q4 96	Q1 97	Q2 97
Definition of functionality							
Definition of req. infrastructure							
Partner selection							
Training of key users & admin. staff							
Hardware installation							
Configuration of system							
Training of end users							
Definition & creation of master data							
Initial stock entry in prod. & assem.							
Transfer of account balances							
Parallel run of R/3 & man. bookkeep.*							

*In bookkeeping, parallel operation of a manual system and the R/3 system has been maintained for one year.

Phase II (SD):

	Q1 98	Q2 98	Q3 98	Q4 98
Project preparation				
Configuration and testing				
Integration, testing and training				
Support of productive operation				

Exhibit 5. Organization Chart of GEARBOX (as of July 2000)

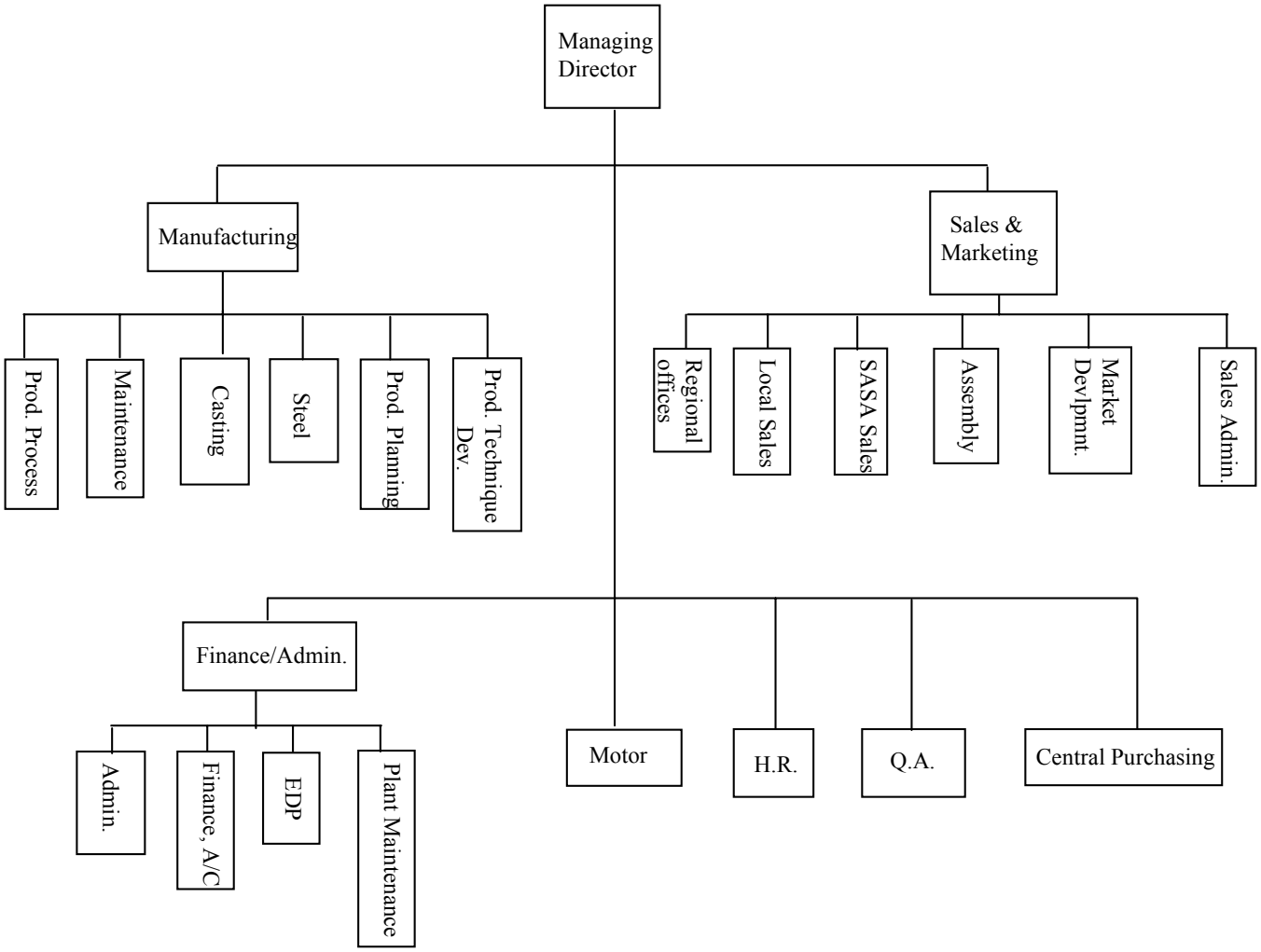
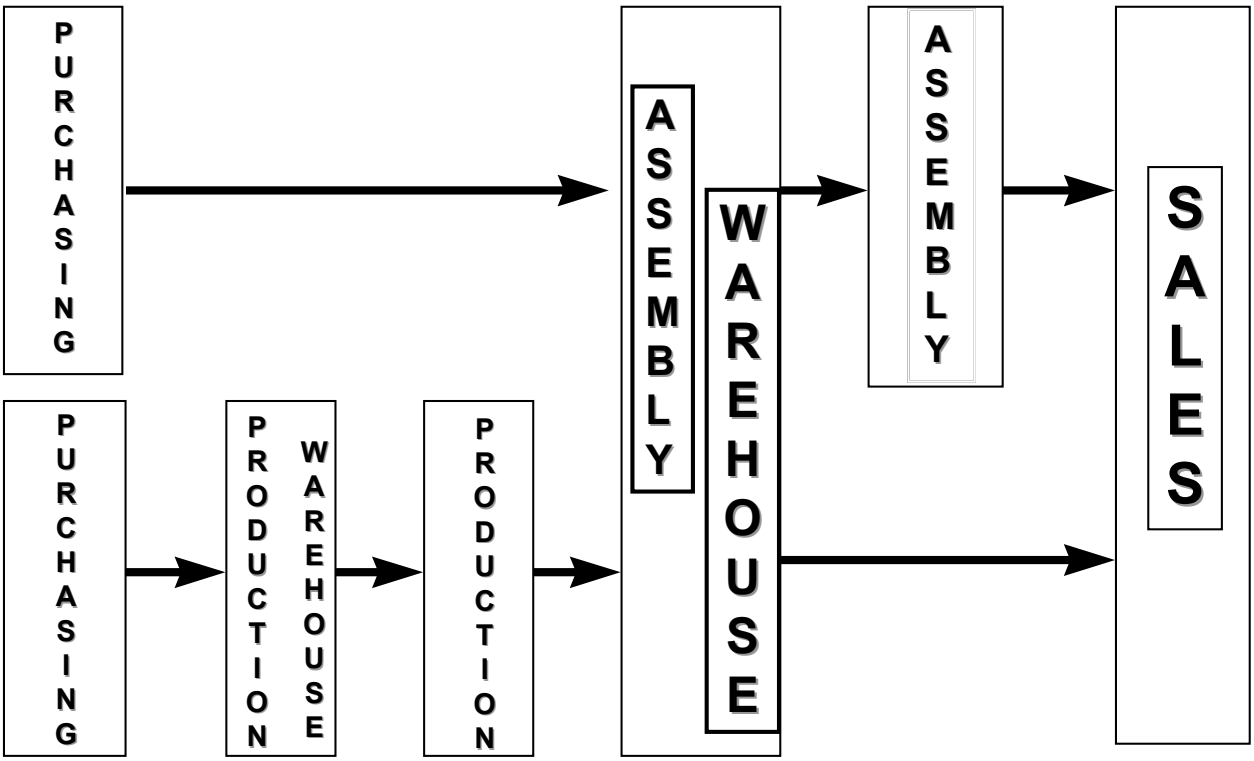


Exhibit 6. Outline of the Workflow in the Production and Assembly Plants



GEARBOX (CHINA) LTD.: WILL THE COMPANY'S ERP SYSTEM SUPPORT ITS AMBITIOUS GROWTH STRATEGY?

— Teaching Note —

The teaching purpose of this case is to:

- Identify the way an ERP system is constrained by a traditional management philosophy.
- Discuss ways to transform a traditional management system on the back of a successful ERP implementation project.

It is designed to be taught in a course on IT management but may also be used in courses on operations management, global management, and organizational behavior.

The case describes a quite common situation among China's many new manufacturing companies established to exploit the vast new market that has opened in the wake of China's economic reform policy and China's accession to the World Trade Organization.

Although the company is owned by a German group, its management system displays distinct Chinese characteristics. The managing director as well as the director of marketing and sales are ethnic Chinese, albeit recruited from outside mainland China. They are fluent in spoken Mandarin but cannot read or write Chinese characters. Apparently, with this approach the parent company tried to avoid alienating staff through imposing Western management style on them while, at the same time, maintaining a high level of control over their Chinese production and distribution operations. As the group has significant experience in global operations management, it can be assumed that this praxis has been honed over the years based on experiences in running similar operations in other countries.

GEARBOX (China) Ltd. is positioned to become a regional hub for Asia. Thus, it is of strategic importance for the parent company. The level of investment reflects this stance. Specifically, all investments, including the investment in the development of the ERP system, have not been based on return on investment calculations but on strategic considerations in view of China's huge and dramatically growing market potential. The (opportunity) costs of missing out on that potential are much higher than any costs resulting from less-than-optimal operations or over-investments. Thus, the general manager was not under pressure to justify the ERP investment or to provide an *ex post* evaluation for this investment. Rather, in-budget/on-time implementation was accepted as an indication of a successful implementation project. In addition, the managing director noted that all reports prepared for his use are drawn from this system (albeit he would not access the system himself to obtain these reports) which he considered to be a sufficient indicator of implementation success.

However, the detailed description of how the system is actually used in several functional operational areas (purchasing, production planning, distribution, and finance) shows that system use is very limited and, in any case, far from the optimal system use suggested as a benchmark for evaluating ERP implementation success by Markus and Tanis (2000). System use is characterized by two general assumptions:

(1) Information provided by the system cannot be trusted but needs to be double-checked against other information sources.
(2) Operational decisions suggested by the system cannot be trusted but need to be double-checked by managers (rather than staff).

The consequence of the first assumption is that all information flows in the system are duplicated via a paper-based information flow, in spite of the fact that the source of this paper-based information flow often is the ERP system itself, thus negating many of the benefits that could be obtained from deploying an ERP system (which provides real-time data). An example is the accounts payable process which involves the cross-checking of three paper documents although all information would be available from

the ERP system as well. This, in turn, leads to the frequent build-up of a back-log in the processing of accounts payable causing operational disruptions in the purchasing department.

The second assumption, that operational decisions suggested by the system have to be double-checked by managers, creates another bottleneck in the process of approving these decisions. Although the system would facilitate delegation of these approvals to staff concerned with the operational processes, managers firmly believe that they have to continue approving these decisions themselves. Some bad experiences in the past have persuaded managers that they cannot automatically follow system-generated decisions but, it seems, they also do not feel comfortable with entrusting their subordinates with these decisions. For example, payments to suppliers have to be authorized by the managing director and purchase orders have to be authorized by the purchasing manager. One explanation for this behavior is that, in China, a manager defines himself/herself as a decision maker. Since most decisions in this company are of an operational kind, authority over these decisions must be retained by managers in order to legitimate their positions. In terms of operational efficiency, this behavior slows down processes as it creates additional bottlenecks.

This general distrust toward information contained in the system and decisions suggested by the system also hampers the further growth of the system, for example, in the field of production planning. Production planning is mostly concerned with determining the lot size of production orders. This continues to be done on the basis of experience and rules of thumb as the production capacity planning function of the system has not been implemented and is not seen as a desirable extension of system use by top management. Also, capacity planning would require the integration of the production progress control process with production planning. Production progress control, in turn, is organized as an independent function that mostly serves a motivational purpose (rewarding/punishing production workers) rather than a coordination purpose. (For this reason, recording production progress could not be delegated to workers.)

Finally, the two assumptions pertaining to legitimate system use also extended to the general management system as can be seen from the system of checks-and-balances the managing director has established among middle managers. For example, MRP is done independently in the assembly plant and in the central purchasing department in order to check on the quantities suggested by the assembly plant. This system of mutual control (and distrust) is recognized and accepted as legitimate throughout the whole company.

In sum, the general management philosophy (as expressed by the two assumptions about legitimate system use) stands in the way of a more extensive use of the system. More importantly, it blocked the many efforts of operational managers to extend system use after implementation had been completed. Thus, the system could not grow over time. This constrained level of system use prevents most benefits the system could have offered to the company from being realized.

Case discussion in class may first focus on the question of how to properly evaluate the success of this ERP implementation process. Generally, top management is satisfied with the results of this case and views it as a successful implementation project. Since no pressure existed to justify the project in advance or *ex post* in financial terms, any form of system use can be seen as an indicator of a successful implementation project. However, from the point of view of the system's potential, the assessment would, at the very minimum, be more mixed. An important aspect in evaluating any implementation project can be well illustrated by this case, whether system use tends to grow over time or not. Most companies initially use a new ERP system only for a small number of functions because, first, there is usually a period of operational difficulties the company has to contend with in the wake of the cut-over experience and, second, users, although having received initial training, are not yet familiar with the whole range of system functions and capabilities. As initial operational difficulties are overcome and users experiment with the system on a day-to-day basis, they discover new functions or new forms of use which can then be incorporated in standard operational practices. Thus, the important question for assessing the result of an ERP implementation project may not be the extend of system use directly after cut-over, but whether or not system use grows over time. A company that initially uses only a small fraction of the system's capabilities but continuously extends the range of used system functions will ultimately benefit more from its ERP investment than a company that starts off with a broad range of actually used system functions but fails to extend this range over time.

From this perspective, class participants may conclude that the investment in this system is in danger of failing to generate a positive net-benefit for the company as there seems to be a systemic barrier to extending the extend to which it is used.

Following this discussion, the instructor may either directly proceed by asking how to overcome this systemic barrier to further extending system use or insert a discussion on whether or not the growth potential of this company would be seriously affected by a failure to extend system use. The case provides only limited information on this question. However, some inferences may

be drawn from the company's experiences in the past. Specifically, the company has grown in the past by adding staff accordingly. However, so far this process has been facilitated by the fact that the company started small and also by the fact that operations were commenced in a phased manner. For example, all components were first imported so that operations only consisted of assembly. Only later did the company start to manufacture components locally. Also, materials for these components were first imported before the company started to source locally and, again, this shift was done on a category-by-category basis. Thus, new fields of responsibilities emerged step by step. For example, when the company decided to source castings locally, a new person was employed and assigned responsibility for purchasing castings. However, as the company continues to grow, growth will increasingly extend the work load for existing types of tasks rather than adding new categories of tasks. Thus, new hiring will increase the division of labor in this company and, by implication, increase coordination requirements. So far, coordination requirements are dealt with by departmentalization and direct supervision. This, however, is acceptable only on a relatively low scale of operations. Once the company starts to grow beyond a certain critical threshold, its responsiveness to market requirements will be seriously hampered if it does not use other coordination mechanisms based on delegation of decision authority and process standardization.

Regarding the question of how to overcome the systemic hindrances to further extending system use, the instructor may suggest that the current managing director is planning to retire soon and ask discussants to take on the role of his successor. Thus, the constraint which results from the mindset of the current managing director, who obviously does not see a need to extend system use, can be hypothetically removed.

The main problem the new managing director is likely to face is that middle managers would not easily give up their decision-making authority, even when asked to delegate decisions to subordinates, because they would have difficulty justifying their own positions as managers. On the other hand, subordinates would likely feel uncomfortable with their extended decision-making authority too since they are not used to taking this type of responsibility. Expectations of subordinates and managers are linked to one another in a self-reinforcing cycle. Initial failures of subordinates in their decision making would be seen as an indication that such delegation of decision making authority is not feasible. Similarly, a decision to abolish the paper-based information flow would be seen as causing data inaccuracies that are likely to exist in the system leading to operational problems and disruptions. On the other hand, employees would view any such occurrences as an indication of a failure of management to supervise their activities.

Thus, a change in the overall management system seems only feasible if the new managing director succeeds in first creating an environment that is tolerant of making mistakes. Mistakes would have to be viewed as opportunities for learning rather than as occasions requiring punishment. This may be done through the creation of several quality circles (the names of these group should be chosen in accordance with existing company terminology and tradition) aimed at identifying and solving problems in operational areas. In these groups, subordinates will learn that they will not be punished for mistakes they may have made but will be rewarded if they come up with proposals that help avoid similar mistakes in the future. Managers, in turn, have an opportunity to change the roles they are playing by becoming facilitators of this learning process, thus finding a new basis on which they could justify their role as managers.

These quality circles would not have to be directly related to the ERP system. However, once managers and subordinates have gained sufficient experience in terms of this new approach toward dealing with mistakes, the managing director may require that operational decisions are delegated to subordinates while managers would be charged with fine-tuning and adjusting operational processes. Also, the managing director may choose to introduce these measures department by department, based on which departments are more advanced in the overall learning process.

Of course, other approaches to solving this problem are possible. The instructor may ask class participants to assume the roles of select middle managers such as the purchasing manager or the finance manager and proceed by considering the range of possibilities these managers have with regard to extending system use. One result of such a discussion could be that, unless the managing director is replaced, the self-reinforcing characteristics of the system represent an insurmountable hindrance for any organizational member, individually or in various coalitions, to extending system use.

Possible assignment questions for this case are:

- How would you evaluate the success of the ERP implementation project in GEARBOX (China) Ltd.?
- Is the current level of system use sufficient to enable continued growth at a rate of 100 percent per year?
- Which factors constrain the further growth of system use?

- Assume that you were asked to become the successor of the current managing director. What would you try to do in order to extend current levels of system use?
- Assume that you are in the position of the purchasing/finance manager. What would you do in order to extend system use in your area of responsibility?

References

Markus, M. L., and Tanis, C. "The Enterprise System Experience: From Adoption to Success," in *Framing the Domains of IT Research: Glimpsing the Future Through the Past*, R. W. Zmud (ed.), Pinnaflex Educational Resources, Cincinnati, OH, 2000, pp. 173-207.