



Logistics Management for SPK Co.,Ltd.

by

Ms. Phetnara Aphiraksattayakul

A Final Report of the Three-Credit Course  
CE 6998 Project

Submitted in Partial Fulfillment  
of the Requirements for the Degree of  
Master of Science  
In Computer and Engineering Management  
Assumption University

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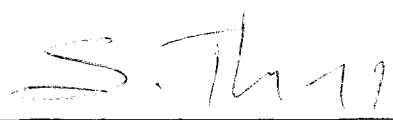
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The Graduate School of Assumption University has approved this final report of the three-credit course, CE 6998 PROJECT, submitted in partial fulfillment of the requirements for the degree of Master of Science in Computer and Engineering Management.

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## ABSTRACT

It will be apparent that the mission of logistics management is to plan and co-ordinate all those activities necessary to achieve desired levels of delivered service and quality at lowest possible cost. Logistics must therefore be seen as the link between the marketplace and the operating activity of the business. The scope of logistics spans the organization, from the management of raw materials through to the delivery of the final product. Logistics management, from this total systems viewpoint, is the means whereby the needs of customers are satisfied through the coordination of the materials and information flows that extend from the marketplace, through the firm and its operations and beyond that to suppliers.

In this study, a Logistics Management System is developed by using computers in Inventory Management System and Supplier Information Development for a speaker manufacturing company has been conducted.

After the implementation of the proposed Logistics Management System, it can be said that the material inventory quantity, productivity and systematic material inventory control and customer satisfaction on products delivery, and costs performance have been improved. The proposed logistics management system can provide relevant information (in various types of report) on the inventory status of the warehouse in a timely way for the management to make inventory related decision and for supplier's system development. The new logistics management system will also give up-to-date and more reliable information for manufacturing planning, sales and marketing planning, and also purchasing planning and for suppliers to reduce inventory wastefulness to improve the costs performance in the supply chain effectively.

## ACKNOWLEDGEMENT

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# **I. INTRODUCTION**

## **1.1 General Background**

In the past 10 years, Thailand has experienced a rapid economic growth. As the economy grows, the Thai government and the private sector have promoted the infrastructure. Related businesses have likewise experienced a rapid growth rate. Manufacturers of audio & visual products are one group of businesses to have benefited from this. Now, the situation has changed. Thailand's economic recession happened a few years ago. Infrastructure in business faced the most impact from this situation. The intense competition in manufacturing has provided a strong incentive for management to seek new and more effective ways of managing production to maintain or achieve a competitive edge. As a result, many companies have implemented effective logistics management system.

Generally, in many manufacturing companies, logistics management system is considered to be the largest single expenditure. Not only the basic company owns inventory control system, but also the value added information system between the company and suppliers in the supply chain is to be kept as a buffers between fluctuating demand and supplies to ensure continuity of production and customer satisfaction. Therefore, logistics management plays an important role in the development of a survival strategy for the company.

The overriding objective of any inventory control system and information to suppliers are to provide logistic support to the production and marketing functions with the lowest practicable investment in inventories and at in the same time generating timely and reliable financial information. This study investigates the logistics management system at SPK Company Limited in Thailand. It aims at proposing an

efficient logistics management system within the scope of study. This new system is considered to give a better policy and logistics management than before.

## **1.2 Objectives of Project Study**

The main objective of this study is to investigate and choose an effective logistics management system for dealing with the problem facing the firm under study. To achieve the main objectives, several specific objectives should be met:

- (1) To understand the current inventory system, problems of the communications between the company and suppliers and procedures at the company.
- (2) To analyze, design, and develop a computerized inventory management system process and to make a better value added information system to suppliers for purchasing section, which should provide the following applications.
  - (a) To update the stocks in a timely and easiest way and reduce redundancy and inaccuracy of information.
  - (b) To provide information to achieve the minimum inventory level.
  - (c) To provide management with timely, meaningful and reliable information which effects management's decision-making , planning and controlling in order to achieve the organization's plan and goal.
  - (d) To provide necessary real-time information such as P/O forecasts to suppliers.

## **1.3 Scope and Limitation**

The main points focus on inventory control of raw materials for manufacturing and information on the supply chain network. Spare parts and finished goods are not covered. Because now the raw material cost accounts for 60% of total cost and it is the main inventory for the company and lack of effective information between parties on the supply chain causes many problems. The company currently faces problems of

appropriate information processing on the logistic system because most of its transactions are done manually which require too many documents and much paper work concerned parties on the supply chain are not informed in a timely manner. Therefore, the scope of this project is being proposed to solve the problem by dividing it into 3 areas: they are the scope of data, the scope of processes, and the scope of interfaces.

(1) The Scope of Data

This project includes all data or information that play as input or output in speaker material inventory system. The names are listed below:

Purchasing Order and Forecast Information

- (a) Invoice Information
- (b) Production Plan Information
- (c) Purchasing Requisition Information
- (d) Materials Information

(2) The Scope of Processes

In this project, all ongoing processes that occur in the speaker material inventory system will be studied and analyzed. The names of processes are listed below.

- (a) Material Status Checking Function
- (b) Incoming Material Function
- (c) Outgoing Material Function
- (d) Generating Report Function

(3) The Scope of Interfaces

The external entities concerning logistics management system will be covered in this project as follows:

- (a) Suppliers
- (b) Purchasing Section
- (c) Marketing Section

#### **1.4 Deliverables**

The deliverables of the project on speaker products logistics management system are as follows:

- (1) New logistics management system design.
- (2) New logistics management system implementation
- (3) New hardware and software implementation
- (4) Database and Interface design
- (5) Systematic appropriate information to suppliers at a lower costs

#### **1.5 Methodology**

In order to gather primary data about the existing logistic policy, the Factory Manager, who is responsible for inventory management, was interviewed. All information about raw material inventory control and supplier information system, company existing procedure and problems that the company has faced using this procedure have been collected and analyzed. After that, existing literature about manufacturing materials, inventory management and supplier information system were searched and reviewed. Then secondary data and information were collected by observing the production and inventory system and gathering real data, which will be used, in the new logistic system from the company. Finally, a new logistics management system will be proposed to the company, and suggestion and discussion about the decision-making process for ordering raw material will be presented to the company.

## 1.6 Organization of the Project

Company profile with a description of the system under study including product and process descriptions are presented in Chapter 2. The proposed new logistics management system is described in Chapter 3. The project implementation is presented in Chapter 4. Conclusion and recommendations are finally presented in Chapter 5.



## **II. COMPANY PROFILE**

### **2.1 Company Background**

SPK Company Limited is a joint-venture company, which started operation in 1996. The company specializes in the manufacturing and distribution of speakers by utilizing high technology in production. The company's factory is located in Bangplee Industrial Zone, which has received BOI privilege. The company therefore gets an exemption from import duty on machinery and corporate income tax exemption for eight years. The company production positions its market to audio & visual companies located in Eastern Seaboard zone, Hi-Tech Industrial Zone and Bangkok area. The company products are almost 100 percent make-to-stock. SPK Company Limited is a medium size company utilizing high technology production. So the firm's maximum production rate is around 400,000 pieces per month. The sales routes are domestic market and export to Japan.

### **2.2 Organization Structure**

The organization structure of the company is divided into 6 sections with different functions and responsibilities. The following describes the details of each department. The organization chart is illustrated in Figure 2.1

#### **(1) Financial and Accounting Section (F&A)**

This department has one of main functions that they are to record all transactions, which take place both inside and outside the company. Its duty is to prepare the financial and accounting report for the outside section and the company's executive as well as to manage and control all the company's budgets.

(2) Purchasing Section (PU)

In this department there are 4 functions: finding and recording the list of suppliers who provide goods for the organization, choosing appropriate suppliers, submitting issue to the executive for marketing decision to buy expensive goods, and purchasing direct raw material and facilities according to the production plans.

(3) Production Section (PD)

There are main 5 functions in this department: issuing weekly and monthly production plan, producing goods, maintaining all machines to create efficient and effective production, controlling quality of product and controlling raw material inventory.

(4) Administration Section (Admin)

Recruiting and selecting new employees is one of the duties in this department. Another 3 major duties are: controlling the company rules, recording the employees' personal records and issuing all mails and declaration to all related parties.

(5) Quality Control Section (QC)

There are 3 major functions in this department: inspecting quality of raw material, work in process and finished goods, controlling the quality of product in process and controlling the quality of finished goods.

(6) Marketing Section (MK)

There are 4 functions in this department: selling and providing goods for customer, collecting important marketing information, making weekly and monthly sales plan, and receiving complaint from customer and declaring to related operation.

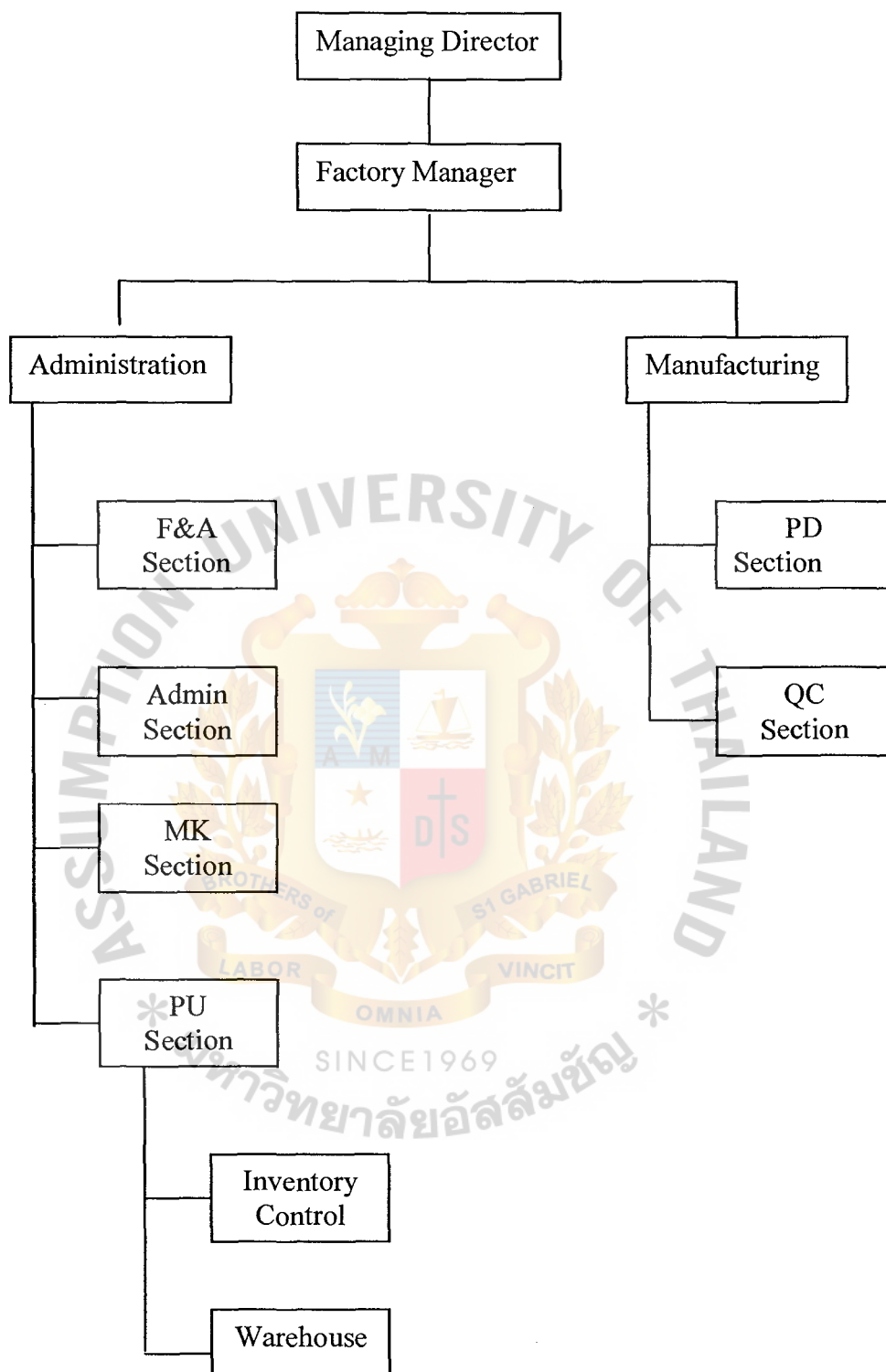


Figure 2.1. Organization Chart of SPK Co., Ltd.

### 2.3 Product Description

SPK Company Limited is a high technology loudspeaker manufacturing company able to produce home-stereo speakers , and car speakers. Because almost 100% of production type is made-to-order, there are varieties of products from this company which will vary in diameter size according to customers' specifications. At present, the products of the company vary with different diameters. Suppliers' locations are in Thailand (Local) and in overseas (Import). The size of diameter and spacing depends on the standard usage and customers' orders. The size of speaker and suppliers' locations are shown in Table 2.1

Table 2.1. Product of Company and Suppliers' location

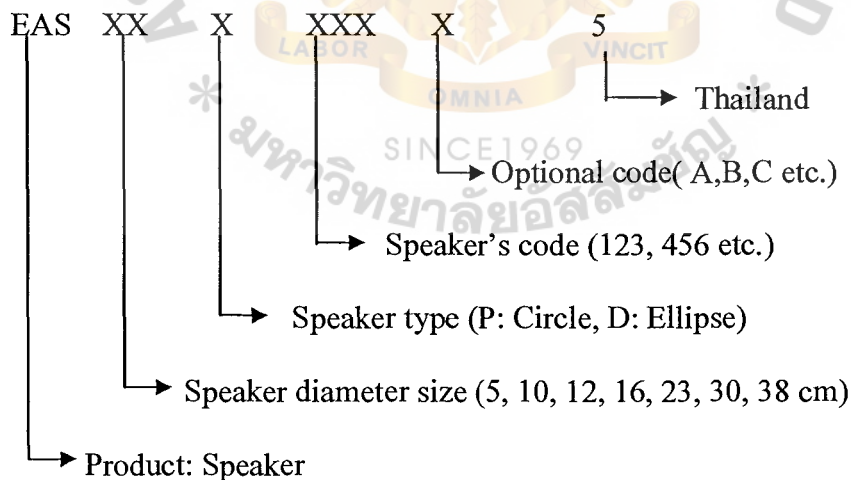
Speaker size	Suppliers' location
5 cm.	Local / Import
10 cm.	Local / Import
12 cm.	Local / Import
16 cm.	Local / Import
23 cm.	Local / Import
30 cm.	Local / Import
38 cm.	Local / Import

Direct raw materials are purchased from local suppliers and oversea suppliers, which takes different lead time in procurement. And unfortunately most speakers do not use common parts in production . These raw materials come from two sources.

- (1) Local Suppliers: Generally, purchasing lead-time from local suppliers will take shorter time than oversea suppliers', on average by 14 days.
- (2) Oversea suppliers: There are suppliers in many countries, but mainly Japan, China, Taiwan, Indonesia and Singapore supply direct materials, metal parts and vibration parts of speakers. When the company purchases material from oversea suppliers, the company has to issue purchase order to suppliers with a longer lead time than the locals, on average, at least 45 days in advance. Furthermore, the company has to give purchase order forecast at least 2-3 months to suppliers for keeping the necessary raw material stock for production.

## 2.4 Product Classification

The finished-goods (Item) code is used on the computer program. The following controls the good qualitatively by the following format:



Each speaker has its own BOM (Bill of Materials) or in other words, part list. So, the purchaser issues the purchase order to each supplier by calculating lead time and the delivery order carefully to correspond to the speaker production plan.

## 2.5 Production Process Description

The production process of speaker product generally has 30 processes. Each process has one operator to do the process. We can divide the production processes into 2 kinds, one is the preparing process or called sub-process, and the other is the main process. At the preparing process, the work-in-process will be produced as semi-product and will be brought to the main process line for assembly with other materials and parts. During the assembly process, the adhesive must be dried up at the appropriate stage of process (because, in production of speaker product we use the adhesive mainly to assemble each material or part together). So, we can divide the production process into 4 kinds of processes as follows;

- (1) Preparing process (Frame + Terminal + Magnets)
- (2) Assembly process (Materials or parts + Adhesive)
- (3) Drying process (To dry up the adhesive)
- (4) Inspection process (To do in-process inspection)

The detailed processes of each operation are simple and similar for each type of product. The process can be described in an outline diagram as follows:

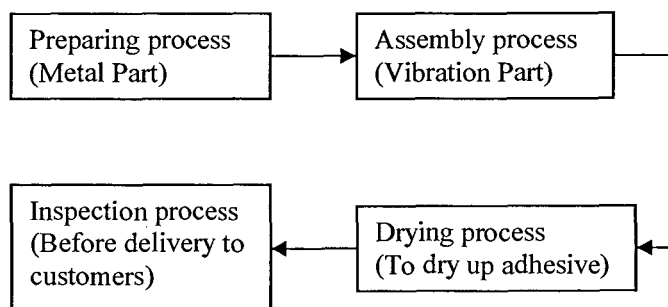


Figure 2.2. Manufacturing Process Flow

The manufacturing process of this company starts from Marketing section which receives product purchase order from customers and then, makes and/or revises weekly and monthly sales plan. The approved weekly/monthly sales plan will be distributed to concerned sections and Production section. Then, Production section will make weekly and monthly production plans for production line to produce the products. The production process, is shown in Figure 2.2. When production line receives the plan, the responsible persons will check the in-process stock immediately and produce strictly according to the production plan, namely preparing process -> assembly process -> drying process -> inspection process. The capacity per day is 3,500 pieces per 8 hours on average. The neck process is drying process, that takes about 45 minutes to dry up the adhesive applied to speakers. At the inspection process, there is a sound-proof room with a sound inspection machine installed in a quiet environment to check any abnormal sound of the produced speakers. The inspected speakers are carefully handled and moved for storage in the finished goods warehouse and prepared for shipment to customers.

## **2.6 Supplier Information System**

Purchasing section is the window section between the company and local / oversea suppliers in terms of issuing material orders and giving important information to suppliers. When the monthly production plan is approved, the production quantity of each model will be passed to purchasing section to breakdown the needed quantities of material by using BOM (Bill of material) of each model. The purchase orders are issued to all suppliers. Sometimes, changes in material purchase orders are made because of the changes in product orders from customers.

## 2.7. Current Problems and Areas for Improvement

Since the company is itself a manufacturer of its products, it puts strong importance on purchasing, inventory control, and long lead time of raw material purchasing.

The current problems and areas for improvement of the existing system can be summarized as follows:

- (1) It is difficult and it takes time to check the inventory status and inventory valuation of all transactions.
- (2) Updating information is inaccurate and not updated so that raw material inventory system cannot provide correct information to support high level management.
- (3) The erroneous information, caused by data entry people can occur easily because the manual system does not have an effective checking system. The existing system is shown in Figure 2.3 and 2.4
- (4) The purchasing lead time of materials takes too long to respond to the movement of marketplace or customer requirements. And due to the much different purchasing lead-times between local suppliers and oversea suppliers, this can cause non-profit material inventory or redundant material inventory, because the production line cannot produce products until all necessary materials arrive.

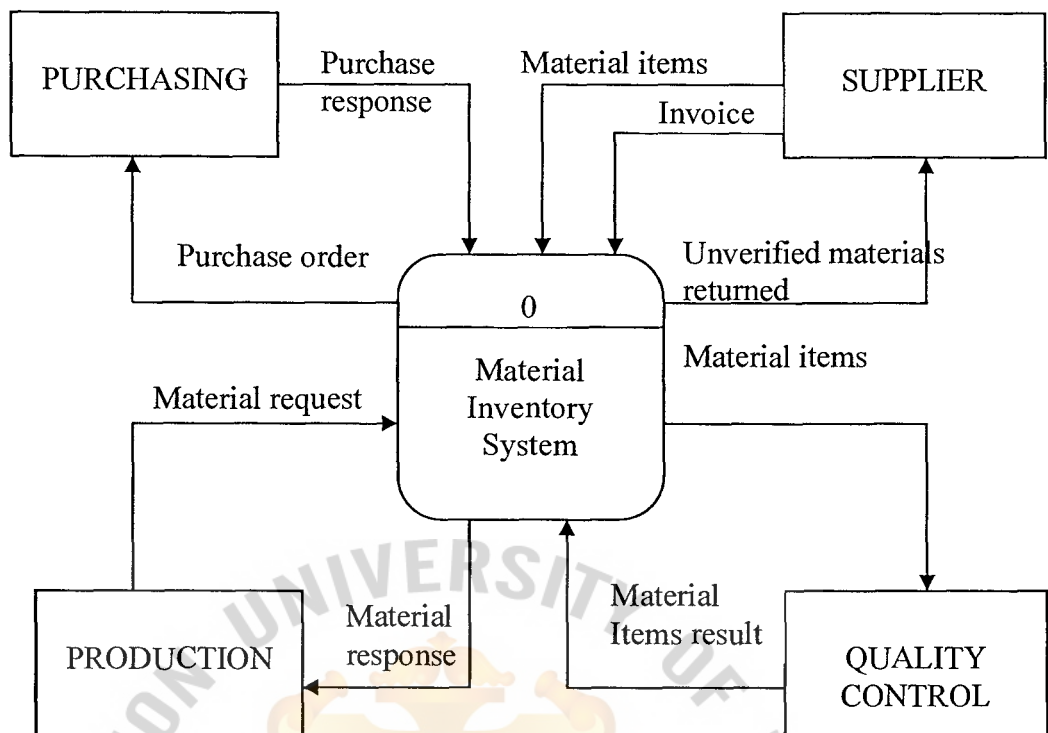


Figure 2.3. Context Diagram of the Existing System

### Context Diagram

To construct the context diagram, we need to establish the initial project scope. The context diagram contains only one process and external entities are interacting with the process. It is used to represent a picture scope of the system boundaries. The context diagram of the Existing System is shown above in Figure 2.3.

From the above figure, we can briefly explain the relations of each process. The Purchasing section will check the inventory of material before issuing the purchase order. Then, suppliers deliver the ordered material items together with invoices to the system. Quality Control section has responsibility to inspect the quality of incoming materials and Production section disburses material from the inventory system by issuing the material request to produce finished goods.

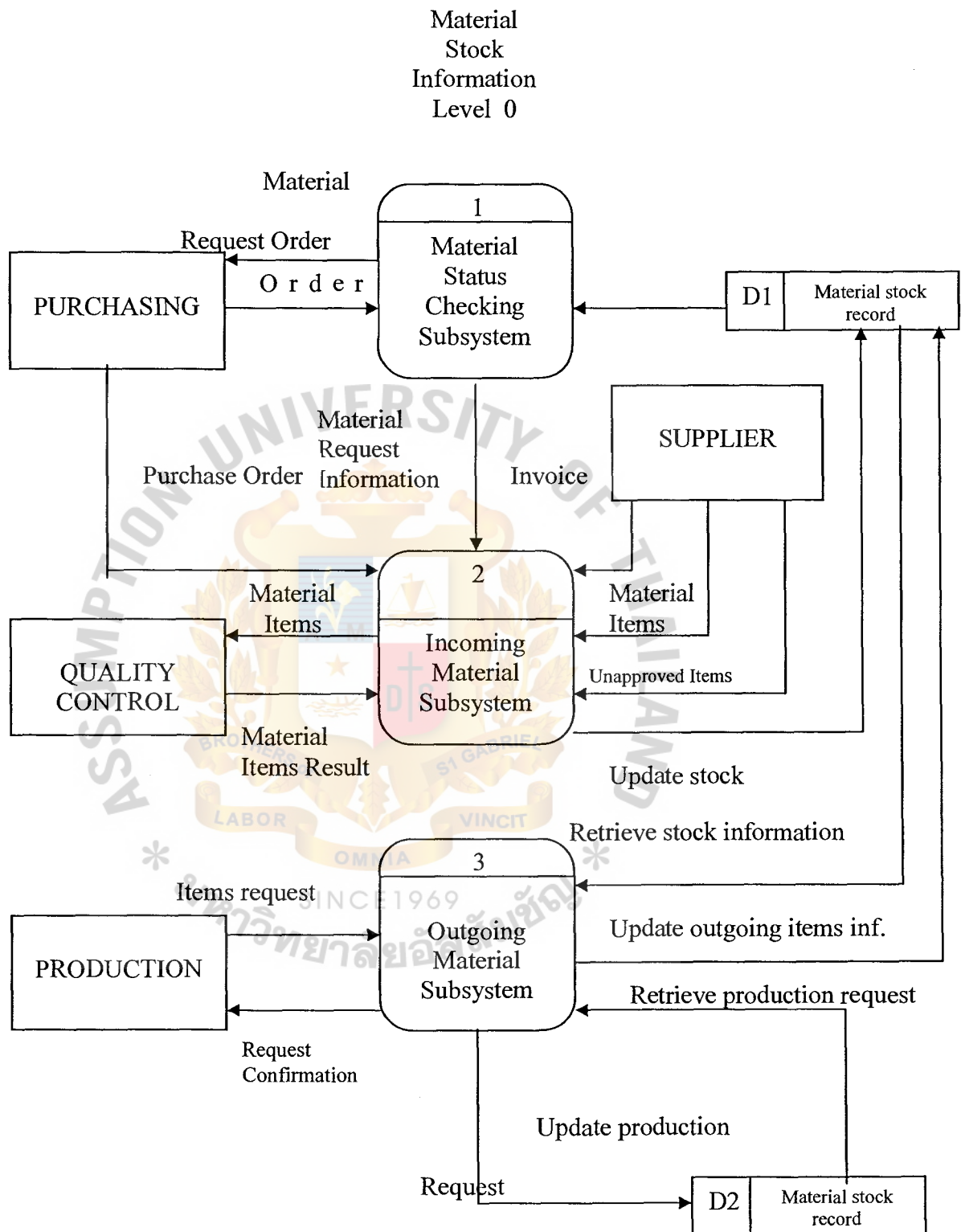


Figure 2.4. Data Flow Diagram of the Existing System

The above Figure 2.4. shows the Data Flow Diagram of the Existing System of the SPK Co.,Ltd in more details. We divided it into Level 0 and 3 Subsystems. Level 0 is the Material Stock Information of the system.

Subsystem 1: When the purchasing section plans to issue the materials purchase order, the purchasing section will send the order confirmation to confirm about those ordered items.

Subsystem 2: The inventory system controllers receive the order information from the status checking subsystem and they receive the invoice and material items from the suppliers. Then, they check the invoices against the order information to ensure the correctness of materials. After that, they send all items to the Quality control section to ensure the quality of the items. Finally, they update the material items to the stock records.

Subsystem 3: First, the inventory system controllers get the material items request from production section. Then, they retrieve the information from the stock record to ensure that the material items are available and send the material items request information form. After that, they send the request confirmation to production and update the outgoing items to the stock record and update the completed production.

### **III. THE PROPOSED INVENTORY CONTROL SYSTEM**

#### **3.1. User Requirements**

The users' requirements can be divided into 3 major categories: input, process and output requirements as shown in the following.

##### **3.1.1. Input Requirements**

- (1) To verify the correctness of input data by providing Automatic Data Collection (ADC).
- (2) To provide a familiar interface to the users who have little computer skills.
- (3) To provide automatically calculation of the quantity of material items.
- (4) To control direct material items in order to control their needs.

##### **3.1.2. Process Requirements**

- (1) To update new materials inventory automatically on distribution or purchase.
- (2) To inform the controller about pre-purchasing and purchasing order when reorder point is reached.
- (3) To store data in suitable formats, thus guaranteeing no data redundancy and loss of information.
- (4) To support the annual plan and the additional plan of the company's strategies.

##### **3.1.3. Output Requirements**

- (1) To provide information that supports controlling and auditing inventory process.
- (2) To provide up-to-date and reliable information which is essential for managers in planning and decision making processes.

- (3) To provide security in accessing the data and protect the system from unauthorized users.
- (4) To provide overall efficient report of inventory control system :
  - (a) To reduce data and report redundancy.
  - (b) To reduce paper based cost.
  - (c) To reduce manpower in non-productive manual work.
  - (d) To reduce waste items.

### **3.2. System Specification**

According to the existing system, SPK Co., Ltd. requires an effective and efficient Inventory Control System, which ensures the smooth flow of data processing and solve the problems occurring in the current system.

In order to achieve the objectives, the new proposed system should have the following components:

- (1) Database designed, developed and converted to high performance and consistent database server to be available to serve all concerned divisions and staff. The new database should be a real time database so that users can create, manage, edit, view, and make up-to-date report on time.
- (2) Material items status database replaces the existing manual one to provide up-to-date items information to control the transaction for generating the report status.
- (3) New network designed and implemented to serve all concerned divisions to enable the system's users to retrieve, update and create the data in the Database Server with high performance and good response time.

### 3.3. System Design

In designing the proposed inventory management system to improve performance and to make the system user friendly, it can be divided into 3 major parts: process design, database design, and input and output design. We will design the system by defining the candidate solutions, using data modeling, and process modeling in the system design phase.

#### 3.3.1. Candidate Solutions

The purpose of this activity is to identify, analyze and recommend a target system that solves the problem and fulfills the business requirement during system analysis. Given the business requirement established in the definition phase of the system analysis, we have 2 candidate solutions for the proposed system.

##### (a) Candidate Solution 1

In the first solution, the inventory staff implement the software package to support inventory control system required functionality. This solution can be operated easily and implemented quickly.

##### (b) Candidate Solution 2

In this candidate, in-house software is hired to develop customized package for the proposed system required functionality. The in-house writing program can provide high efficiency in customizing the usage of the proposed system and can fulfill any business requirements.

#### 3.3.2. Candidate System Matrix

The candidate system matrix is a useful tool to compare, analyze and communicate the characteristics of candidate solutions. The characteristic of this matrix consists of the following:

- (1) Portion of System Computerized
- (2) Benefits
- (3) Server and Workstation
- (4) Software Tool Needs
- (5) Application Software
- (6) Method of Data Processing
- (7) Output Devices and Implications
- (8) Input Devices and Implications
- (9) Storage Devices and Implications

Candidate System Matrix is shown in Table 3.1

### 3.3.3. Feasibility Analysis Design

After alternative solutions have been identified, each candidate solution must be analyzed for feasibility and ranked. Each of them will be evaluated against four sets of criteria. The criteria are as follows :

- (1) Technical Feasibility
- (2) Operation Feasibility
- (3) Economic Feasibility
- (4) Schedule Feasibility

According to the analysis, we have to weigh each feasibility type according to their degree of importance. The percentage weights for each feasibility are presented in Table 3.2.

In economic feasibility analysis, we have 2 additional analysis tools. They are payback analysis and net present value analysis of each candidate solution. After analyzing the feasibility of each candidate, Candidate Solution 2 is chosen as the proposed system for inventory control system. Because the

system provides full support in accessing data, updating data, and creating data for users, managers, and also executives in decision-making. Although, this solution requires more expertise in constructing the program and in training users, but it gives more benefit than Candidate Solution 1.

Table 3.1. Candidate Solution Matrix.

Characteristics	Candidate 1	Candidate 2
Portion of System Computerized	Software Package would be purchased to satisfy inventory control functionality.	Hire in-house software to develop customized package for inventory control required functionality.
Benefits	This solution can be operated easily and implemented quickly because it is a purchase solution.	Fully supports users requirement and all inventories information can be accessed by manager immediately.
Server and Workstation	Technically architect requires Pentium III Server and require Pentium II Workstations.	Same as Candidate 1
Software Tools Needs	Windows NT 4.0 Oracle DBMS software	Window NT 4.0 Oracle DBMS software MS Office 97 MS Visual Studio 5.0 Borland Delphi 5.0
Application Software	Package Solution	Custom Solution
Method of Data Processing	Client/Server	Same as Candidate 1
Output Devices And Implications	(1) HP Laser Printer 2100 (2) Epson Dot matrix LQ-670	Same as Candidate 1
Storage Devices And Implications	Sea-Gate Hard Disk Drive 20GB	Same as Candidate 1

Table 3.2. Feasibility Analysis Matrix.

Feasibility Criteria	Weight	Candidate 1	Candidate 2
Operation Feasibility	30%	Package solution will provide faster updating, accessing, and report making than the existing system. But it has users' requirement limitation and documentation flow limit. Score: 85	Fully supports more users' requirement and provides more efficiency in accessing data for users, manager and executive, in decision-making Score: 100
Technical Feasibility - Technical  - Expertise	30%	Package solution has limitation of users' requirements so the company charges an additional fee for updating the program. In the long-term requires trainers to train users and requires programmer to set up network Score: 95	Borland will support and increase capabilities of access software and Oracle DBMS software decrease time required to access information. Requires experienced programmer to write program and set up network. Requires expertise for training staff on how to operate and maintain the program. Score: 92
Schedule Feasibility	10%	6 Months Score: 95	12-18 Months Score: 92
Ranking:	100%	Score: 92	Score: 96.2

#### 3.3.4. Analyst Design.

Data Modeling is a technique for organizing and documenting a system's data.

Entity Relationship Diagram (ERD) is the technique to depict data in terms of the entities and their relationship described by the data.

Process Modeling is a technique for describing the flow of the process of the system. Data Flow Diagram (DFD) is the technique that depicts their relationship in terms of the flow of documentation. Process Modeling consists of the following:

- (1) Context Data Flow Diagram
- (2) Decomposition Diagram
- (3) Data Flow Diagram
- (4) Data Dictionary
- (5) Structure Chart

##### Context Diagram

To construct the context diagram, we need to establish the initial project scope. The context diagram contains only one process and external entities that interact with the process. It is used to represent the picture scope of the systems' boundaries. The context diagram of the proposed system is shown in Figure 3.1.

##### Decomposition Diagram

A complex system is difficult to understand when viewed as a whole. Thus, in system design we separate the system into its subsystems. Decomposition is the act of breaking a system into its component subsystems, processes and sub-processes. Each level of abstraction reveals more or less details about the overall system or a subset of that system.

A decomposition diagram is a top down functional diagram, which shows an hierarchy chart of the structure of the system. Decomposition diagram is shown in Figure 3.2.

### Data Flow Diagram

The data flow diagram is the flow of the data to and from within a system. Data Flow Diagram consists of its process, data store, external entities, and the flow of data that is represented by arrows. The data flow diagram of the proposed system (level 1) is shown in Figure 3.3. The following is the explanation for DFD level 1 of the proposed system by each process.

Subsystem 1: Material Status Checking: The users retrieve material information from the stock record to check the items value. After that, the users need to order the items to the purchasing department. The purchasing department sends the order confirmation to confirm the ordered items. Then, the users need to update any order items in the material request record.

Subsystem 2: Incoming Material : The users receive the order information from the status checking subsystem and they receive the invoice and items from the suppliers. Then, they check the invoice against the order information to ensure the item's correctness. After that, they send all items to the quality control department to ensure the quality of the items and get the result of checking from Quality control section. Finally, they need to update the items in the stock record.

Subsystem 3: Outgoing Material : First, the users get the request and retrieve the previous request from the production order. Then, they retrieve the information from the stock record to ensure that the items are available and send the items request confirmation form. After that, they send the request to the

production and update the outgoing items in the stock record and update the completed production request in the production request record.

Subsystem 4: Generate Summary Report: First of all, the users get the summary request from the management. Then, they retrieve stock information from the stock record, material request information from the request record, and production request information from the production request record to define the flow information. After that, they generate the summary report for the management, and the pre-purchasing form for the purchasing department.

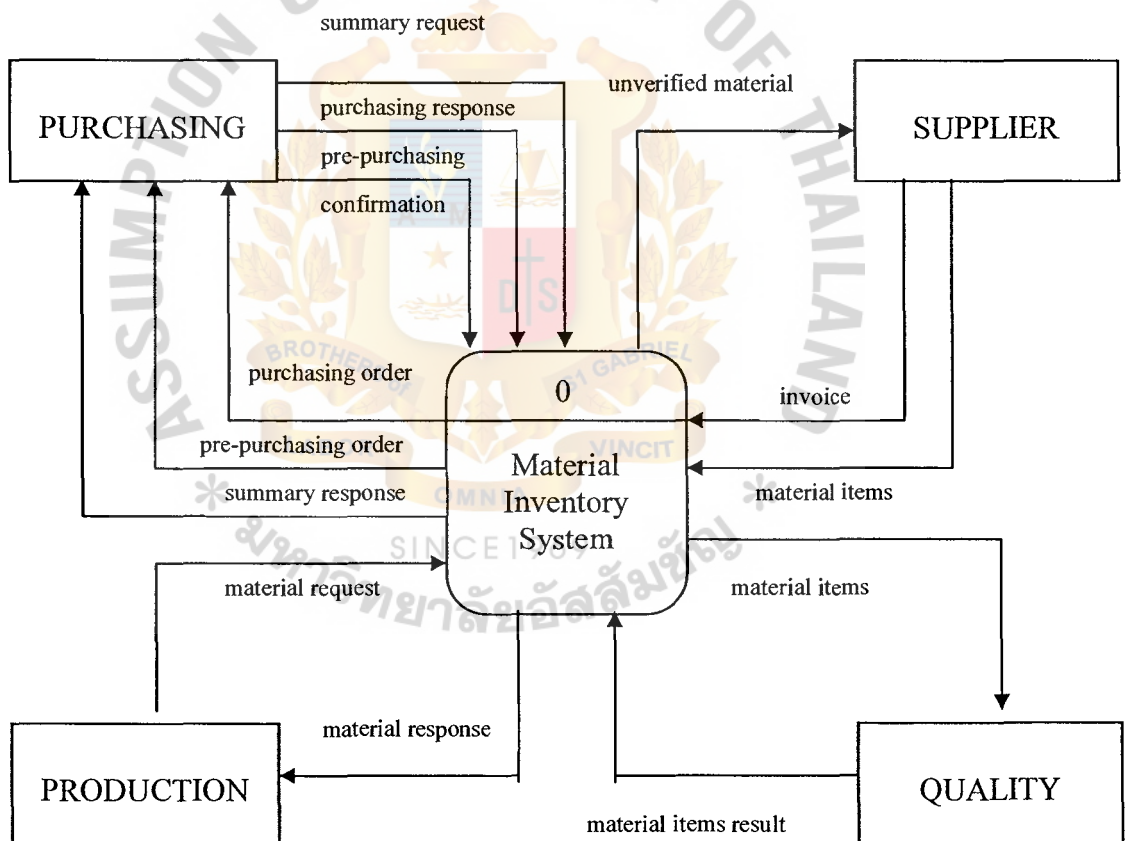


Figure 3.1. Context Diagram of the Proposed System

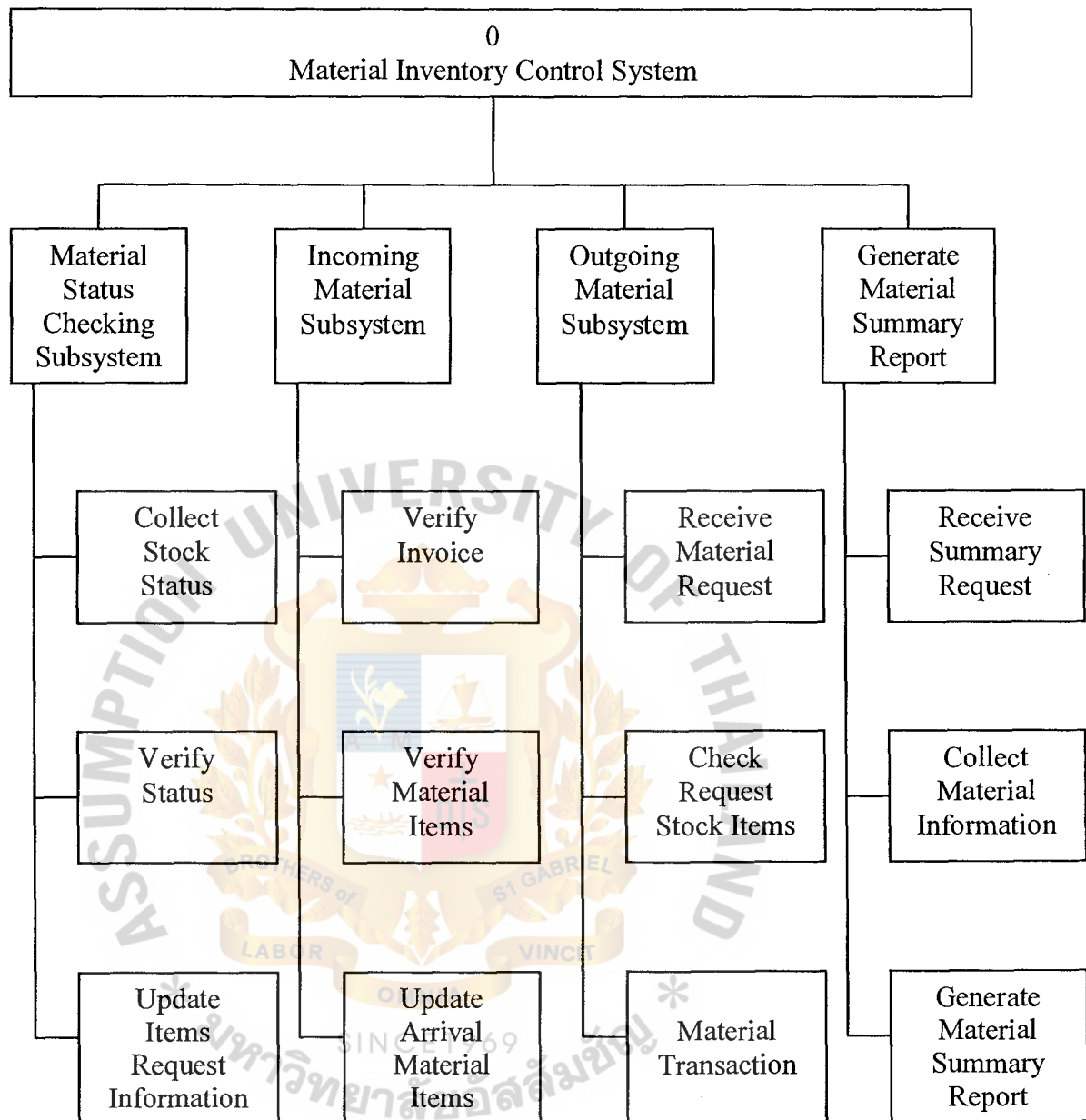


Figure 3.2. Decomposition Diagram of the Proposed System

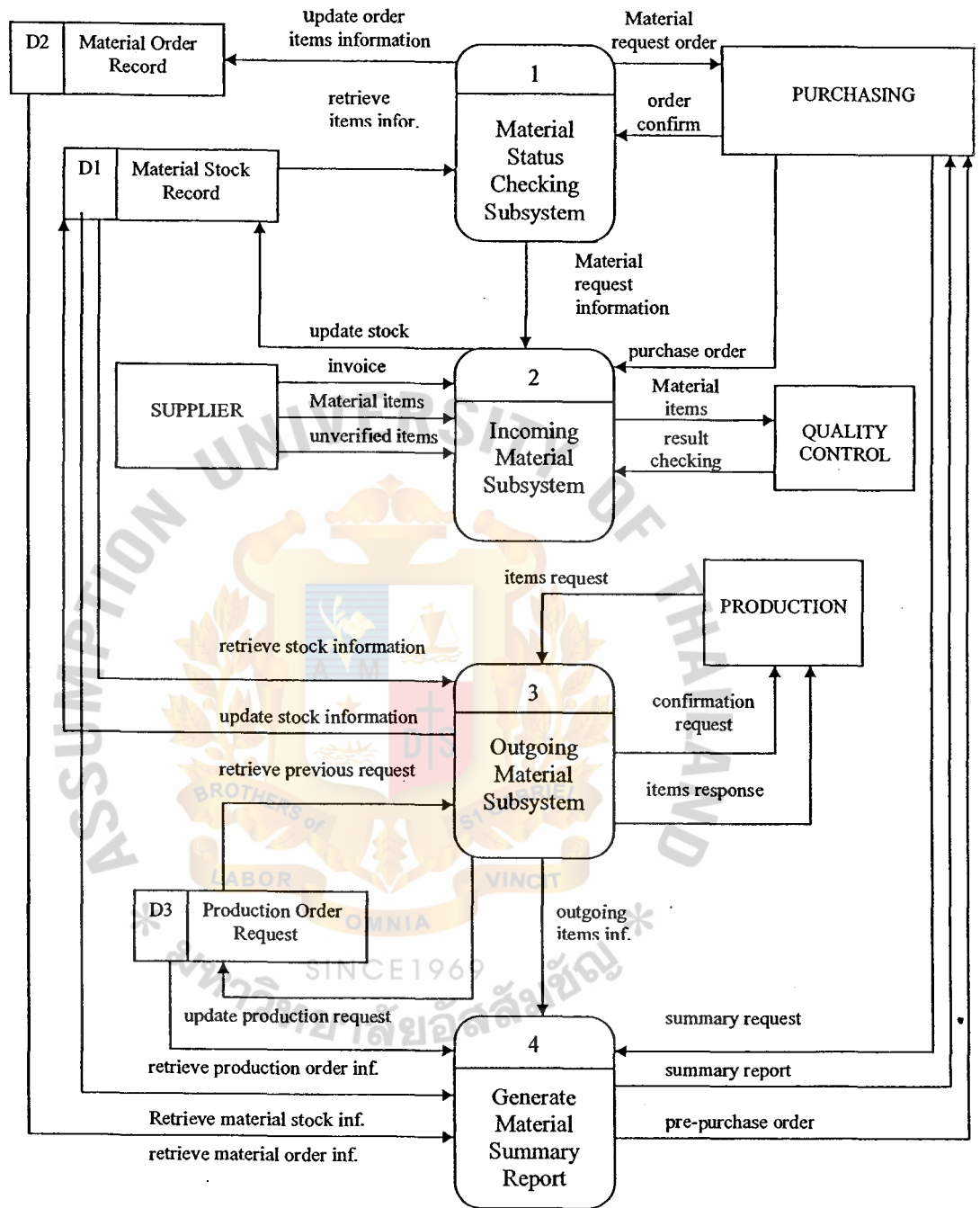


Figure 3.3. Level 1 of Material Inventory Control System

### Structure Chart

Studying the flow of the data through the program derives the structure chart. It is an hierarchy diagram that shows the control structure imposed on the system process. It represents the subordination or the hierarchical levels of rank between processes. The objective is to show which module is the boss and which is the worker.

### Data Dictionary

It is the documentation that supports data flow diagrams. It is listing of definitions of all data items and data stores within the inventory control system. It contains field name, definition, size, and data type.

#### 3.3.5. Database Design

Before we design the database, the analysis of database has to be developed. Data analysis is a process that prepares a data model for implementation as simple, non-redundant, flexible, and adaptable database by using Entity Relationship Diagram (ERD) technique. Database design for this system is the relational database. The data is stored in a tabular form that contains attributes, records, and keys. It can relate data stored in one table to data in another via foreign keys.

After we get the database in the 3<sup>rd</sup> normal form we are ready to design our database by using a model called database schema. A database schema is the physical model for a database. It represents the technical implementation of the logical data model.

#### 3.3.6. Interface Design

In designing the interface, this application uses GUI (Graphical User Interface) that provides flexibility, integration and user friendliness. For this application, on-

line processing is selected as the input method. On-line input is to capture the data at it is.

### 3.4. Hardware and Software Requirement

According to the existing system, switching hubs have been used to share the printer between 2 personal computers, which are used in printing of documents.

The proposed system is introduced, designed and implemented with the new Local Area Network (LAN) Server, which provides all users with effective access, update data and information. New hardware and software are required as shown in the following lists.

#### 3.3.1. Hardware Requirements

##### (a) Database File Server (one set)

Specifications:

- (i) CPU : Pentium III 866 MHZ
- (ii) RAM : 128 MB
- (iii) Hard Disk : 20 GB
- (iv) Floppy Disk : 1.44 inch
- (v) CD-ROM Drive: 52X
- (vi) USB port : 10 USB External V9.0

##### (b) Client Computer (three sets)

Specifications:

- (i) CPU : Pentium II 566 MHZ
- (ii) RAM : 64MB
- (iii) Hard Disk : 20 GB
- (iv) Floppy Disk : 1.44 inch
- (v) CD-ROM Drive: 52X

- (vi) Monitor : 16", standard color (800x600, 256 color)
- (c) Other Requirement
- (d) HUB Server (10/100 Mbps, 8 ports)
- (e) LAN Card and others network equipment
- (f) UPS 1200 VA and UPS 800 VA
- (g) Backup Drive 20 GB
- (h) LAN Laser Printer
- (i) LAN Dot Matrix
- (j) Wiring cable and ports

### 3.3.2. Software Requirement

- (a) Server Software
  - (i) Oracle DBMS Server Software
- (b) Operating System
  - (i) MS Window NT 4.0 for Server
  - (ii) MS Window 98 for Workstation
- (c) Software Package
  - (i) MS Office 97
  - (ii) Borland Delphi Version 5.0
  - (iii) MS Visual Studio Version 5.0

### 3.5. Security and Control

Security of the database should be considered for secrecy, availability and integrity of data. Security and control policies for the proposed system are the following:

- (a) They must be passwords for log-in security control to prevent unauthorized users from accessing the system and to detect improper modification of data.
- (b) Data must be input on the same day or the day after the transaction is done and the list of input data must be correct with the input form.
- (c) Data correction must be made immediately after the error of data report is found.
- (d) Report must be produced upon the predetermined number and schedule or on management request as needed. The used report must be kept in the sorted file.
- (e) There must be backup diskettes for all data and programs.

#### 3.5.1. Security

The security in network operating system is necessary because the server resembles a library, which stores various programs and data files, and it determines the person who gets access to the server. The security subject of the project is totally concerned with all policies, procedures, and technical tools to prevent any information system from unauthorized users. To prevent unauthorized access to data and applications, theft and physical damage, security implementation of an information system provides 2 levels follows:

## (1) Physical Security

This level of security actually uses physical technique such as door locks, safe, and guards to prevent physical access to areas containing sensitive data. Indeed, physical security alone is not sufficient to protect the data so that an interrupted power supply (UPS) attached to the network and virus protection and prevention software are required. Furthermore, other security levels and data access security should be added.

## (2) Data Access Security

Data access security is based on the corporate-wise guidelines and it is intended to support implementation of access control requirements. There are many data access securities that are used to protect data from unauthorized users. The data access security measures used in the proposed system are the following:

### (a) Identification and Authorization

To provide each user with a user identification number or password and after that, the user must typically go through an authentication procedure. Authentication verifies that the person who has been identified is not an intruder. It means that user authentication provides some additional information supposedly known only by the user.

### (b) User Profiles

The user who is allowed access to the files should receive the obligation rights to access where the files are located. The obligation rights determine the ability to retrieve, detect, copy or create, and update files or directories.

### 3.5.1 Controls

The control of this project is subject to specific technology and policies used to protect assets, accuracy and reliability of an information system. The types of controls that will be presented in this proposed system are the following:

#### (1) General Controls

This type deals with the security and accuracy of policies and standards of computing environment. It ensures system availability, which avoids denial of access provided by the system. The areas covered by general control are hardware and software computer operation, and data security. They include such safeguards as data security measures, error checking in hardware, restriction of an access to programs requiring logs of operation system activities, and establishing procedures for running computer jobs correctly.

#### (2) Application Controls

There are three types corresponding to these controls: input, processing, and output. At each step, there are specific types of application control. It will check for error and incompleteness of data when the data has been entered for an information system processing controls.

### 3.6. Cost and Benefit Analysis – I

#### 3.6.1 Benefit Analysis

The benefit of the proposed system can be categorized into two types; tangible and intangible benefits.

(1) Tangible benefits are those that can be measured in terms of monthly or annual savings or profit of the firm. Examples of tangible benefits are reduced manpower, increased speed of processing, reduced time consumption in accessing the information, reduced time in generating the report, and decreased work redundancy. Tangible benefits of the proposed system are as follows:

(a) Reduced Expenses:

Decrease 2 Operators (2*12,500 Bht./month)	300,000 Bht.
Decrease Office Facilities (7,000 Bht./month)	84,000 Bht.
Decrease Paper Work (300 Bht./month)	3,600 Bht.
Total Estimate of Reduced Expenses:	387,600 Bht.

(b) Increased the Efficiency in Accessing Information and Processing

Time:

Additional Minutes of Processing Data	15 Minutes
Average Annual Data Processes	7,500 Processes
Annual Minutes of Processing Data	112,500 Minutes
Annual Hours of Processing	1,875 Minutes
Total Annual Saving on Time (52 Bht./hr.)	97,500 Bht.

(c) Advantage in Reducing Error

Additional Minutes of Duplicate Work per Entry	20 Minutes
Average Annual Data Error Entries	2,850 Entries
Annual Minutes of Duplicate Data	57,000 Minutes

Annual Hour of Duplicate Data (57,000/60 Min.) 950 Hours

Total Annual Saving on Time (52 Bht./hr.) 49,400 Bht.

(d) Decreased Amount of Time Consumption:

Additional Time Consumption per Work 20 Minutes

Average Annual Data Processes 7,500 Works

Annual Minutes of Duplicate Data 150,000 Minutes

Annual Hours of Duplicate Data 2,500 Hours

Total Annual Saving Time (52 Bht./hr.) 130,000 Bht.

Total Estimate of Tangible Benefits: 664,500 Bht.

\*\* Employee salary = 12,500 Bht./Month

12,500 Bht. / 30 days./8 hours per day = 52 Bht/hr.

(2) Intangible benefits are those benefits believed to be difficult or impossible to quantify. Intangible benefits of the proposed system are shown as the following:

- (a) Reduce the time needed to process data.
- (b) Improve the response time of performing data.
- (c) Enhance competitiveness; the new system will give the company more competitive advantages over the competitors.
- (d) Reduce wasting stationery such as paper, office equipments.

### III. THE PROPOSED SUPPLIER INFORMATION SYSTEM

#### 3.7. Supplier Information System Design

##### 3.7.1. Purchase forecast to suppliers

Purchase forecast is one kind of important information from the company to local and oversea suppliers. When production section issues a monthly production plan and passes the approved monthly production plan to purchasing section, the purchaser will issue material purchase order, including material safety inventory. At the same time, purchasing section will calculate the forecast purchase order including safety inventory to suppliers, according to location of suppliers.

##### Local supplier :

Purchase order of the N+1th month will be issued and purchase order forecast of the N+2th and N+3th month will be calculated and passed to suppliers respectively. The purchase order usually is generated on every 20<sup>th</sup> of each month.(N means the present month).

##### Oversea supplier (Imported material):

Purchase order of the N+1th and N+2th month will be issued and purchase order forecast of the N+3th and N+4th month will be calculated and passed to suppliers respectively.

Table 3.3. Table of Purchase Order and Forecast to Suppliers.

Items	N	N+1	N+2	N+3	N+4
Local supplier	P/O	P/O	Forecast	Forecast	none
Oversea supplier	P/O	P/O	P/O	Forecast	Forecast

Remark: N = the present month

For both cases, the official material purchase order is usually generated on every 20<sup>th</sup> of each month. So, the additional purchase order of Nth month is normally not issued because there is enough material inventory. Except in case of over inventory, purchaser has to adjust with concerning suppliers to extend the delivery due date affected.

Material purchase order forecast is forecasted by purchasing section, which is based on customer forecast information and market movement from marketing section. The forecast information will be informed immediately together with the purchase order of that month.

### 3.7.2. Purchasing order quantity and forecast quantity

The calculation of purchasing order quantity and forecast quantity is based mainly on 2 kinds of objectives. One is the top management's policy on how much safe inventory is suitable, and the other objective is the marketplace movement depending on how much the market fluctuates. Generally the purchasing quantity can be calculated by using the formula below.

#### Purchase order quantity calculation:

Purchasing Qty = Ending inventory (plan) + Consumption Qty – Beginning inventory

Where ending inventory is the planned inventory of the current month (N+1th month) and this quantity is based on the safe inventory quantity set up by top management policy (in SPK Co.,Ltd it is generally 50% of the consumption of material in the coming month: N+2th, but when the consumption becomes lower caused by the marketplace movement the figure will be reconsidered).

Consumption is the quantity of material consumption or production quantity planned to be produced in N+1th month.

### Forecast quantity calculation:

Purchasing forecast quantity can be calculated with the formula below.

Purchasing forecast = Mat ending forecast + Sale forecast – Mat beginning Invent forecast

Where;

- (1) Purchasing forecast is the forecast quantity of that month (N+2, N+3th etc.)
- (2) Sales forecast is the sale forecast of that month (N+2, N+3th etc.) for which information is received from customer monthly.

For example;

Purchasing forecast Qty of N+2th month is Material ending forecast of N+2th (50% of the consumption qty in N+3th month) plus Sale forecast of N+2th month, minus Material beginning inventory forecast of N+2th month(50% of the consumption qty in N+2th month).

This formula shows that how the company uses the information received from customers in the supply chain to utilize the logistic supply chain.

#### 3.7.3. Market and forecast movement analysis

The company analyzes the movement of the marketplace by using previous data in the year 2001 and 2002 to increase accuracy of the forecast. We found that the 16 cm diameter speaker (3 main customers)for which market movements are shown as below;

From Figure 3.4, we conclude that we can forecast the quantity from the trend of the graphs. Audio & visual product sale quantity will increase gradually from the early part of the year when new models are launched and reach the peak in the middle of the year, in May, June, July and then gradually decrease till the end of the year.

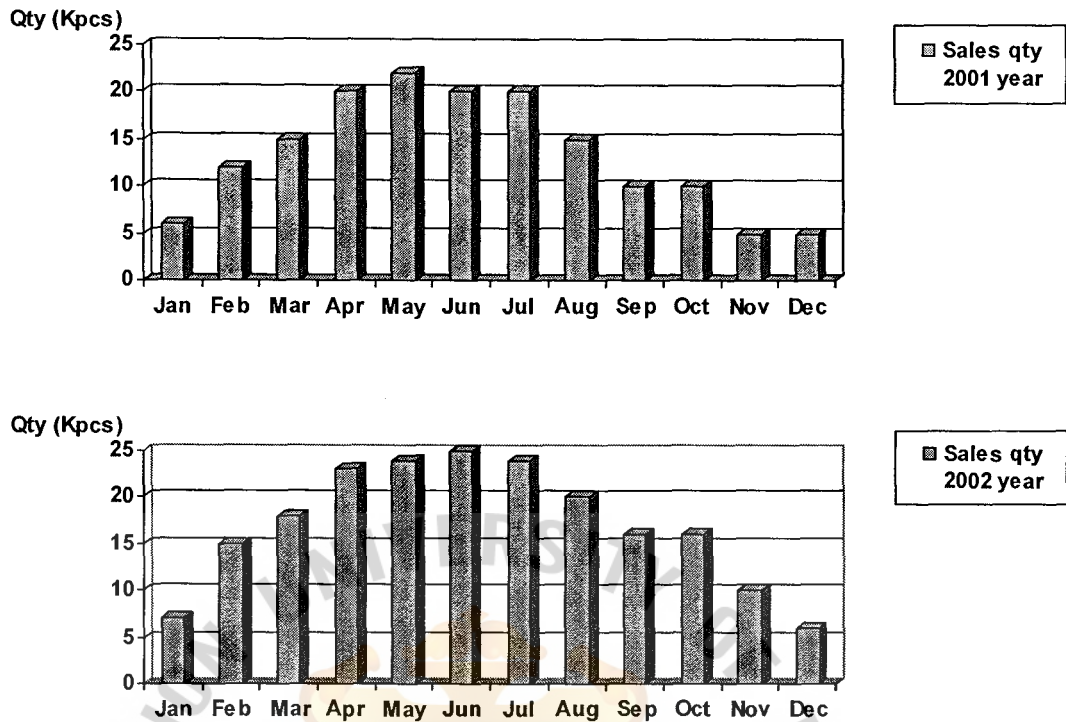


Figure 3.4. Yearly Sales Quantity Movement.

#### 3.7.4. Determination of safe inventory for materials

It can be concluded that in the early and middle part of the year, the company can keep safe inventory at 50% (which means 15 days) of the next month, but at the end of the year especially, in October or November, the from safe inventory is less than 50%, or just only 10% or none to protect the company from non-profit inventory.

#### 3.7.5. Timely delivery from Oversea suppliers and Local suppliers

When the purchasing section issues material purchase order to suppliers, one important thing is when the material shall be delivered to and arrives at the company.

The arrived date or ETA will be fixed depending on the location of suppliers as shown below;

Local suppliers: 1<sup>st</sup>, 10<sup>th</sup>, 20<sup>th</sup> of each month, 3 shipments per month

Oversea suppliers (imported materials): 1<sup>st</sup>, 10<sup>th</sup> of each month, two shipments per month.

Table 3.4. Relation between ETA and percentage of material shipment

Description	Beg Inv.	ETA qty On 1 <sup>st</sup>	ETA qty on 10th	ETA qty on 20 <sup>th</sup>	Ending inventory
Local material	50%	25%	45%	30%	50%
Import material	50%	40%	60%	0%	50%

The above table shows the beginning inventory of material and ETA of the material from local suppliers and oversea suppliers (imported materials) and the percentage of purchased quantity lot for shipment. At the end of the month the company will has inventory of material 50% of the consumption in the next month.

The company like to keep inventory in term of material more than in term of finished goods, because material inventory cost is not including the labor costs, machining costs and manufacturing costs.

### 3.8. Cost and Benefit Analysis–II (Performance of the information system)

#### 3.8.1. Performance and benefit analysis

The developed performance of the company in terms of logistics management after simulations can be divided into 3 indices.

##### (1) Premium freight decreasing (monthly base)

The proposed information management system can give effective information to local and oversea suppliers, so that they can better correspond to the company's requested ETA.

##### (a) Reduced air freight expenses:

Air freight by material shortage(8times\* 5,000Bht) 40,000 Bht

Air freight by delay shipment(3times\*10,000Bht) 30,000 Bht

##### (b) Reduced production line stoppage:

Line stoppage (30prs\*480min\*1.5Bht/min) 21,600 Bht

##### (2) Delivery performance (survey result on 10 main customers by survey sheet)

The company improves the production plan achievement, which affects the performance improvement of delivery to customer. The company got score 190 points of 200 points by survey sheet Appendix C.

##### (a) Customer satisfaction improved: up to 95%

##### (3) Increasing sales

The proposed system can increase the productivity and make a clear production plan because there is enough material for smooth production.

##### (a) Monthly increased sales from 14MBht to 20 MBht.

## IV. PROJECT IMPLEMENTATION

### 4.1. Overview of Project Implementation

Project implementation of the proposed system includes all activities that pass through the system analysis and system design phase. Each phase usually represents considerable work and time, and the phases are usually broken down into its activities and tasks that can be more easily managed to meet the desired objective. System implementation is the construction of the new system and the delivery of that system into its production for the inventory control system, and suppliers meeting held by the purchasing section to explain the information system about the purchasing order forecast, and delivery due date. For inventory control system, system implementation consists of construction and delivery phases.

#### Construction Phase

The purpose of the construction phase is to build and test a functional system that fulfills the business and design and to implement the interfaces between the new system and the existing system. To implement the proposed system, it is divided into 2 phases as follows :

- (1) First build and test LAN network that is required to construct the network system. Second, build and test the database that is required to record all wire rod items. Third, install service pack for Window NT Version 4.0. Service pack is used to debug those residing in Window NT 4.0 and install software package for client. Fourth, write and test the program that is developed in-house. We hire a programmer to write the database on Microsoft Access and test on the server side.

- (2) Inform local and oversea suppliers about the new system of logistics management system. Main suppliers have to be informed well to achieve the target of the project.

#### Delivery Phase

Delivery phase means delivering the new system into operation. In inventory control project, after the hardware and software installation and testing the system have been done, manual document is prepared and used for training users.

#### **4.2. Testing Plan**

Testing is to conduct a final system test to ensure that all software packages, custom-build programs, and any existing programs that comprise the new system can work together. Important tests include unit testing, system testing, and regression testing.

- (1) Unit testing ensures that the stand-alone program fixes bugs without side effect. The test data and current performance that you benchmark are used here.
- (2) System testing ensures that the entire application programs written in isolation work properly when they are integrated into the system.
- (3) Regression testing extrapolates the impact of the changes on program and application throughout and response time from the before and after results using the test data and programs.

#### **4.3. Training**

- (1) For the Inventory Control System project, training will deal with all staff in the Inventory Control System that operate the system in their daily work. Proper training of the proposed system will reduce error in inputting data and reduce time in searching data and preparing report.

(2) For information management system, training will mainly deal with the purchaser and suppliers to familiarize with the system.

- (a) Supply chain management concept
- (b) Market movement analysis method
- (c) How to calculate purchase order forecast for suppliers
- (d) Inventory policy announced by top management (inventory policy is an important thing according to the cash flow of the capital)
- (e) How to negotiate with suppliers

#### **4.4. Data Conversion**

Since the existing system is a manual system, the conversion plan of the existing system must be converted to run on the proposed system. Important things to be concerned during the conversion are the following:

- (1) List of all detailed conversion plans to provide smooth transition from the existing system to the new system.
- (2) Identify all data required to build new computer files.
- (3) Identify all controls to be used during conversion.
- (4) Assign responsibility for each activity.
- (5) Verify conversion schedules.

#### **4.5. Conversion to New System**

After implementing the proposed system and completing the data conversion, ownership of the system is officially transferred from the programmer to the end-user. The purpose is to convert the old system to the new system and evaluate the project experience and final system. It provides valuable feedback of the new system that has been placed into operation.

#### 4.6. Supplier meeting

After making the decision of the parameters, the purchasing section manager will call all local and oversea suppliers for a meeting, to explain the new concept of supply chain network and to share the information of the situation. The manager has to convince all suppliers to give good cooperation about the delivery due date requested by the company and the necessary inventory of raw material at the suppliers' sites.



## V. CONCLUSIONS AND RECOMMENDATIONS

### 5.1. Conclusions

The study of this project is to analyze, design and develop, and implement the logistics management system for SPK Co., Ltd. During the analysis of the existing system, some problems were found in manual running process. A large amount of material quantities and transactions occur each day. The process of daily transaction is difficult to manage in the manual operation. Excess or shortage of material stocks always are occur. Premium freight needs to deliver material by air and not by the usual route. And customer delivery on time performance is in crisis. Some materials are missing or misplaced, some are waste items and the quality does not match the production demand. The company's cash flow is tight as there is too much cost of investment on the inventory. The computerized system and information system for supply chain are then developed to support the work of this business.

The proposed system is designed and implemented in the way to solve the existing problems and to satisfy the users' and business requirements. It also improves the management of inventory control system, purchasing section and supply chain management.

The proposed computerized procedure and database system will help the inventory control much more than the manual system. The supplier information management system will help the suppliers to deliver materials on time and put the information in order. It also provides several benefits such as reducing time expenses on access to the information, provides timely re-order point information, provides accurate information for management and lower costs in logistics management. The data will be kept in a computerized system, which can be easily accessed and retrieved, so that the report can generate the request.

The proposed system operates in less time than the existing system. Table 6.1 shows the time performance on each process of the proposed system which uses less time than the existing system because it uses the database for storing items.

Table 5.1. Degree of Achievement of the Proposed System – Inventory control system.

Process	Existing System	Proposed System	Total Difference (5 times / day)
Materials Status Checking	3 hrs.	1 hr. 40 mins.	400 mins
Incoming Material	1 hrs. 30 mins.	20 mins.	350 mins
Outgoing Speakers	1 hrs. 15 mins.	15 mins.	300 mins
Generate Summary Report	1 hrs. 15 mins.	30 mins.	225 mins

Degree of Achievement of the Proposed System – Supplier information system

Items	Existing System	Proposed System
Extra Air freight expense	70,000 Bht/mth	0 Bht /mth
Production line stop loss	21,600 Bht/mth	0 Bht/mth
Customer satisfaction on delivery performance	80% ( 160 pts of 200 pts)	95% (190 pts of 200 pts)
Sales amount per month	14 MBht	20MBht

Details of each process why the Proposed System uses less time but performs better than the Existing System are as follows:

#### (1) Material Status Checking Process

The proposed system reduces time consumption in operation by 1 hour and 20 minutes because the system has the database to keep the records well organized in the right place, So it uses less time than manually checking all of item status. Moreover, it uses less time to access the information and generate reports. In the manual system, the information of each item is kept in paper files, which are misplaced and unorganized so that it takes much time when the user searches for information.

#### (2) Incoming Material Process

It uses one hour and 10 minutes less than the existing system since the proposed system can be replaced by the incoming material form, which automatically manages and updates the information of each category in the database system. This form helps users to keep the record in relational database files of the new material management system.

#### (3) Outgoing Material Process

The proposed system reduces time consumption in operation from 1 hour and 50 minutes to 15 minutes because the system is replaced by the Material Request Form, which automatically retrieves and updates the information of each material category in the database. Furthermore, this form helps the user to track records of the items in relational database files and it also generates Material Request Form and confirmation form, which takes a few minutes.

#### (4) Generate Summary Report Process

The proposed system uses an hour less than the existing system because the information is kept in the relational database files. It reduces time to collect all data to generate the summary report and the pre-purchasing report.

Moreover, the proposed system can retrieve and update information automatically, so it is easy to collect and generate summary reports in 30 minutes.

(5) Premium freight control

The proposed system sets up the safety stock bases on the data analysis of the market movement accurately. And also the systematic ETA date is set up to continue the safe stock quantity and plan for material shipment arrival. So, shortage of material becomes zero time. It is not necessary to import materials from oversea suppliers by air anymore and can eliminate production line stoppage problem due to lack of material.

(6) Delivery on time to customer

The proposed system can solve material shortage problem effectively. So, production activity can run smoothly according to the sales plan required by the customers. This result reflects on customer satisfaction on delivery performance of the company from 80% to be 95% on average.

(7) Increase sales amount without new machines investment

The proposed system makes the input of the production process: materials run smoothly on time. It also increases the moral of operators, and decreases the pressure of material shortage production, thus having total effect on increasing production quantity and sales amount.

## 5.2. Recommendations

Based on the above conclusion and on the results of the system, the following recommendations are made to the company under study.

- (1) The current manual inventory management of the company does not seem to be desirable.
- (2) It has been observed that the demand forecasting is one important parameter in the inventory control system under uncertain demand. So the company should continuously forecast demand of each raw material in detail by month using past sales data.
- (3) More market movement analysis is still continually needed for improvement according to higher competitive markets.

The scope of this project deals with 3 areas of the Logistics Management System, which are the scope of data, the scope of processes, and the scope of interfaces. They are designed to serve the immediate needs of production, management, and purchasing.

However, in further development, a fully computerized system should be developed to take place in any divisions of organization function, suppliers and customers on the supply chain. Each of them should be developed and tested by using the Internet technology such as Local Area Network (LAN) between administration and manufacturing function. Moreover, Electronic Data Interchange System (EDI) should be considered for construction between the company , suppliers, and customers in the supply chain network, so that any sections can access to check the availability of material, and sales and marketing can be coordinated with customers in Thailand and foreign countries. Marketing personnel can check inventory status anywhere/anytime. Not only the above, but it can also coordinate with purchasing of customer to order the finished goods and check all items in inventory.

Keyless data entry such as bar code is another Internet Technology that the company should consider because it will control speaker material inventory items, decrease the errors being made, and increase the efficiency of inventory control system.

In addition, the proposed automated system will serve the ability to support future growth and expansion of the company's business. All the source documents must be kept separately for the period of time. The user must be able to understand, and operate the system well so as to and can control the proposed system.





**APPENDIX A**  
**MATERIAL INVENTORY REPORT**

Material Inventory System for

SPKCo., Ltd.

Store Report

Date: 01/12/2004

Code	Name	Description	Update
W01	Finished Goods Store	Stock for Goods	01/12/2004
W02	Material Store	Stock for Material	01/12/2004

Figure A.1. Store Report.

Material Inventory System for

SPKCo., Ltd.

Store of Area Report

Date: 01/12/2004

STORE:	Area Code	Area Name	Description	Update
W01 – Finished Goods Store				
	1FL01	Goods Area ONE	Stock Area For...	01/12/2004
W02 – Material Store				
	2GL01	Material Area Two-1	Stock Area For...	01/12/2004
	2FL01	Material Area One-1	Stock Area For...	01/12/2004
	2FL02	Material Area One-2	Stock Area For...	01/12/2004

Figure A.2. Store Area Report.

Material Inventory System for

SPKCo., Ltd.

Qty of Material Report

Date: 01/12/2004

Code	Qty	Update
LV-213	2,000 pcs	25/01/2004
C-1601	2,000 pcs	25/01/2004
C-1621	1,780 pcs	25/01/2004
D-1690	2,000 pcs	25/01/2004
D-1667	2,200 pcs	25/01/2004
AH-221	120 kg.	25/01/2004

Figure A.3. Material.

Material Inventory System for

SPKCo., Ltd.

Material Report

Date: 01/12/2004

Material:	Code	Unit	Update
Bottom plate	BT01	PIECE	01/12/2004
Bottom plate	BT02	PIECE	01/12/2004
Bottom plate	BT03	PIECE	01/12/2004
Bottom plate	BT04	PIECE	01/12/2004
Bottom plate	BT05	PIECE	01/12/2004
Bottom plate	BT06	PIECE	01/12/2004

Figure A.4. Material Stock Report.

Material Inventory System for

SPKCo., Ltd.

Summary Stock Material Report

Date: 01/12/2004

From Store: W02 --- Material Store

Material (Code—Name)		Unit	Area	Balance
BT01	Size 5.0 mm.	PIECE	2FL01	450
BT02	Size 10.0 cm.	PIECE	2FL01	500
BT03	Size 12.0 cm.	PIECE	2FL02	300
BT04	Size 16.0 cm.	PIECE	2FL02	200
BT05	Size 30.0 cm.	PIECE	2GL01	350
BT06	Size 38.0 cm.	PIECE	2GL02	4500

Figure A.5. Summary Stock Material Report.

Material Inventory System for

SPKCo., Ltd.

Summary Under Quantity Report

Date: 01/12/2004

Material (Code—Name)		Unit	Area	Balance	Minimum
BT01	Size 5.0 cm.	PIECE	2FL01	450	1000
BT02	Size 10.0 cm.	PIECE	2FL01	500	1000
BT03	Size 12.0 cm.	PIECE	2FL02	300	500

Figure A.6. Summary Under Quantity Report.

Material Inventory System for

SPKCo., Ltd.

Summary Over Quantity Report

Date: 01/12/2004

Material (Code—Name)	Unit	Area	Balance	Minimum
BT04      Size 16.0 cm.	PIECE	2FL02	1200	1000
BT05      Size 30.0 cm.	PIECE	2GL01	1500	1000
BT06      Size 38.0 cm.	PIECE	2GL02	600	500

Figure A.7. Summary Over Quantity Material Report.

Material Inventory System for

SPKCo., Ltd.

Delivery Report

From Date: 01/12/2004 To Date: 04/12/2004

Date: 15/01/2004

Date	No.	Type	Code	Reference No.	Material Code-Name	Quantity	Area
01/01/2004	1	I	IN001	RF00001	BT01 Size 5.0 cm.	300	2FL01
02/01/2004	2	I	IN002	RF00002	BT01 Size 5.0 cm.	300	2FL01
03/01/2004	3	O	OUT003	RF00003	BT01 Size 5.0 cm.	300	2FL01
04/01/2004	4	I	IN004	RF00004	BT01 Size 5.0 cm.	300	2FL01
* Type I = In Stock							
O = Out Stock							

Figure A.8. Delivery Material Report.

Material Inventory System for

SPKCo., Ltd.

Incoming Material Report

From Date: 01/12/2004 To Date: 04/12/2004

Date: 15/01/2004

Date	No.	RT	Code	Reference No.	Material Code—Name	Quantity	Area
01/01/2004	1	0	IN001	RF00001	BT01 Size 5.0 cm.	300	2FL01
02/01/2004	2	0	IN002	RF00002	BT01 Size 5.0 cm.	300	2FL01
04/01/2004	4	0	IN004	RF00004	BT01 Size 5.0 cm.	300	2FL01
* Receive Type 0 = From Purchasing							
1 = From Production							

Figure A.9. Incoming Material Report.

Material Inventory System for

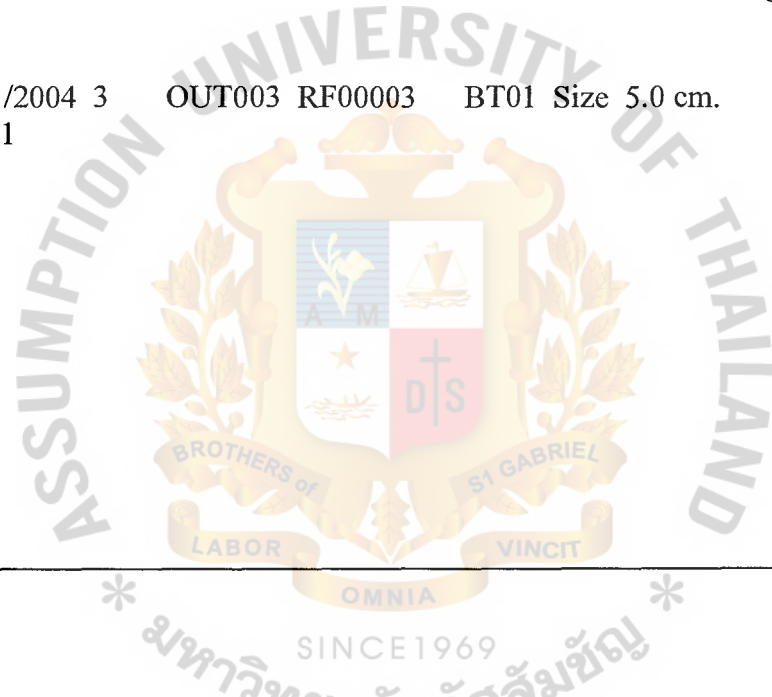
SPKCo., Ltd.

Incoming Material Report

From Date: 01/12/2004 To Date: 04/12/2004

Date: 15/01/2004

Date Area	No.	Code	Reference No.	Material Code-Name	Quantity
03/01/2004 2FL01	3	OUT003	RF00003	BT01 Size 5.0 cm.	300



The watermark features the Assumption University of Thailand logo, which includes a shield with a cross, a star, and a sailboat, surrounded by the text 'ASSUMPTION UNIVERSITY OF THAILAND'. Below the shield is a banner with 'BROTHERS of LABOR' and 'S1 GABRIEL VINCIT OMNIA'. At the bottom, it says 'SINCE 1969' and 'มหาวิทยาลัยอัสสัมชัญ'.

Figure 9.10. Outgoing Material Report.



**APPENDIX B**  
**PROCESS SPECIFICATION**

Process Name: Material Status Checking Subsystem

Process Number: 1.0

Input:

1. Material Stock Record
2. Order Confirmation

Output:

1. New Material Request Order
2. Update New Material Request Information

Process:

BEGIN:

1. Retrieve stock information from stock information that contains information about stock items information.
2. Verify stock status from stock information and defined material that needs to be ordered.
3. If material is sufficient , no need to order.
4. If it is insufficient , order to purchasing department.
5. Receive order information.
6. If it is ordered, update status to material request record.

END.

Process Name: Incoming Material Subsystem

Process Number: 2.0

Input:

1. Invoice
2. Purchasing Order
3. Material Items
4. Material Items Results

Output:

1. Approved and Unapproved Material Items
2. Update Incoming Stock

Process:

BEGIN:

1. Receive invoice from supplier that contains information about the ordered material items.
2. Receive purchase order from purchasing department, which matches with invoice.
3. If invoice's details do not match , return items and invoice to supplier.
4. If invoice details match , receive items and invoice.
5. Send items to quality control to approve quality of items.
6. Receive item results from quality control.
7. If it is approved , send to warehouse for updating in material stock record.
8. If it is unapproved , return to supplier.

END.

Process Name: Outgoing Material Subsystem

Process Number: 3.0

Input:

1. Production Request
2. Previous Production Request Information
3. Material Stock Information

Output:

1. Material Confirmation Form
2. Update Outgoing Information
3. Update Production Request

Process:

BEGIN:

1. Receive material request from production department.
2. Retrieve previous production request information to check against the new request, which controls the material items outgoing.
3. Retrieve material information from material stock record to check the availability of material against the production request.
4. If the material is available, send material confirmation form to production department.
5. If the material is unavailable, send unavailable form to production and generate purchase order to purchasing department.
6. Send material items to production and update outgoing items in material stock record, and update production request in production order record.

END.

Process Name: Generate Summary Report Subsystem

Process Number: 4.0

Input:

1. Summary Request Form
2. Material Stock Information
3. Material Order Information
4. Production Order Information

Output:

1. Summary Report
2. Pre-Purchase Order Form

Process:

BEGIN:

1. Receive summary request from purchasing department.
2. Read summary request information to portion in each type of report requested.
3. Retrieve material stocks information, material request information, and production order information and arrange in each type of information.
4. Generate material summary report, pre-purchasing form and send to purchasing department.

END.



**APPENDIX C**

**CUSTOMER SATISFACTION SURVEY SHEET**

Document No.	4-S-001-Rev.00
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Customer Satisfaction Survey Sheet

Customer name	SONY SIAM Co.,Ltd.					
Date	Evaluation items				Approved	Prepared
	Quality	Delivery	Cost	Service		
	5 · 4 · 3 · 2 · 1	5 · 4 · 3 · 2 · 1	5 · 4 · 3 · 2 · 1	5 · 4 · 3 · 2 · 1		
	5 · 4 · 3 · 2 · 1	5 · 4 · 3 · 2 · 1	5 · 4 · 3 · 2 · 1	5 · 4 · 3 · 2 · 1		
	5 · 4 · 3 · 2 · 1	5 · 4 · 3 · 2 · 1	5 · 4 · 3 · 2 · 1	5 · 4 · 3 · 2 · 1		
	5 · 4 · 3 · 2 · 1	5 · 4 · 3 · 2 · 1	5 · 4 · 3 · 2 · 1	5 · 4 · 3 · 2 · 1		
	5 · 4 · 3 · 2 · 1	5 · 4 · 3 · 2 · 1	5 · 4 · 3 · 2 · 1	5 · 4 · 3 · 2 · 1		
	5 · 4 · 3 · 2 · 1	5 · 4 · 3 · 2 · 1	5 · 4 · 3 · 2 · 1	5 · 4 · 3 · 2 · 1		
	5 · 4 · 3 · 2 · 1	5 · 4 · 3 · 2 · 1	5 · 4 · 3 · 2 · 1	5 · 4 · 3 · 2 · 1		
	5 · 4 · 3 · 2 · 1	5 · 4 · 3 · 2 · 1	5 · 4 · 3 · 2 · 1	5 · 4 · 3 · 2 · 1		
	5 · 4 · 3 · 2 · 1	5 · 4 · 3 · 2 · 1	5 · 4 · 3 · 2 · 1	5 · 4 · 3 · 2 · 1		
	5 · 4 · 3 · 2 · 1	5 · 4 · 3 · 2 · 1	5 · 4 · 3 · 2 · 1	5 · 4 · 3 · 2 · 1		
Criteria	5 : Very satisfied 4: Satisfied 3: Fair 2: Unsatisfied 1: Very unsatisfied					



**APPENDIX D**  
**PURCHASE CONSUMPTION INVENTORY**

## PCI Plan ( Purchase - Consumption - Inventory )

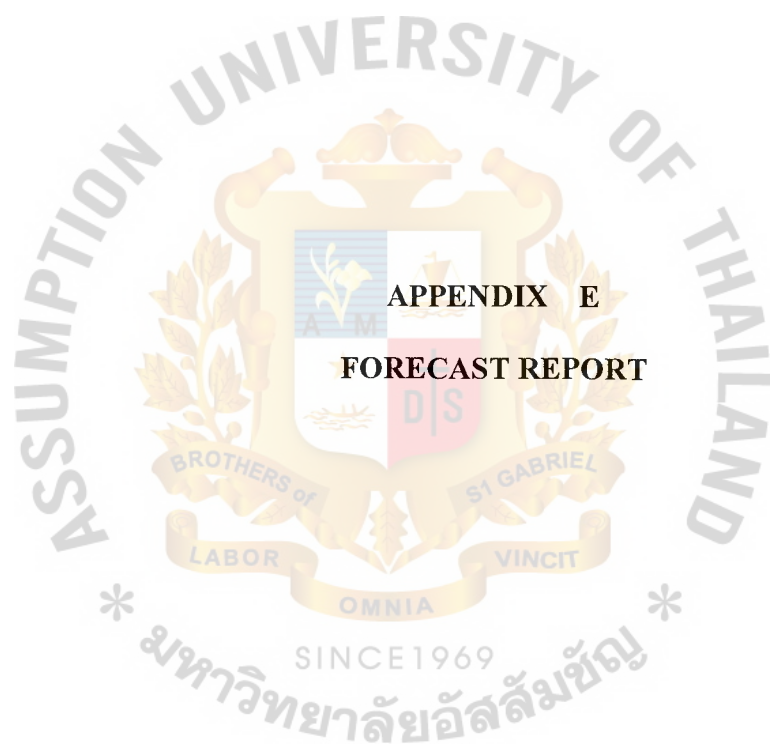
Local Supplier : U-Shin (Thailand) Co.,Ltd.

Month = Oct 2003		Oct(P/O):Nth			Nov (P/O):N+1th			Dec(Forecast):N+2th			Jan04 (Forecast):N+3th		
Model	Beg.Inv.	P	C	End.Inv	P	C	End.Inv	P	C	End.Inv	P	C	End.Inv
- Wire rod	1	3	2	2	4	4	1.5	4	3	2.5	5	5	2.5
- Frame F-16221	1,000	3,000	2,000	2,000	4,500	4,000	2,500	6,000	5,000	3,500	7,000	7,000	3,500
- LV-391A5	1,000	3,000	2,000	2,000	4,500	4,000	2,500	6,000	5,000	3,500	7,000	7,000	3,500
- LV-331B5	1,000	3,000	2,000	2,000	4,500	4,000	2,500	6,000	5,000	3,500	7,000	7,000	3,500
- LV-672	1,000	3,000	2,000	2,000	4,500	4,000	2,500	6,000	5,000	3,500	7,000	7,000	3,500
- Solder	50	150	100	100	250	200	150.0	400	300	250.0	500	500	250

## PCI Plan ( Purchase - Consumption - Inventory )

Oversea Supplier : APD Co.,Ltd.

Month = Oct 2003		Oct(P/O):Nth			Nov (P/O):N+1th			Dec(P/O):N+2th			Jan04 (Forecast):N+3			Feb04 (Forecast):N+3		
Model	Beg.Inv.	P	C	End.Inv	P	C	End.Inv	P	C	End.Inv	P	C	End.Inv	P	C	End.Inv
D-1682-A	2,500	5,500	5,000	3,000	7,500	6,000	4,500	8,500	9,000	4,000	8,500	8,000	4,500	9,000	9,000	4,500
D-1601	2,500	5,500	5,000	3,000	7,500	6,000	4,500	8,500	9,000	4,000	8,500	8,000	4,500	9,000	9,000	4,500
C-1603-A	2,500	5,500	5,000	3,000	7,500	6,000	4,500	8,500	9,000	4,000	8,500	8,000	4,500	9,000	9,000	4,500
C-1633-A	2,500	5,500	5,000	3,000	7,500	6,000	4,500	8,500	9,000	4,000	8,500	8,000	4,500	9,000	9,000	4,500
AH-162	150	350	300	200	450	400	250	450	500	200	450	400	250	500	500	250



**APPENDIX E**  
**FORECAST REPORT**

# SPK Co.,Ltd.

Bangplee factory

## FAX REPORT

To:U-shin (Thailand) Co.,Ltd.

Date: 21 Oct 2003

Attn: Mr. Houya MD. 様

cc: Mr. Morita DMD様

Ref: 038-955-369

From: Jaroonsak / SPK Co.,Ltd.

No of pages: 1

Including the cover page

Sub: Forecast in Dec 2003, Jan 2004

### Content:

Thank you very much for your cooperations.

I would like to inform you that our company will inform you the forecast in Dec 2003 and Jan 2004 as below;

#### Dec 2003

Confirm

- Wire rod 4 tons  
- Frame F-16221 6,000 pcs  
- LV-391A5 6,000 pcs  
- LV-331B5 6,000 pcs  
- LV-672 6,000 pcs  
- Solder 400 kg.

#### Jan 2004

- Wire rod 5 tons  
- Frame F-16221 7,000 pcs  
- LV-391A5 7,000 pcs  
- LV-331B5 7,000 pcs  
- LV-672 7,000 pcs  
- Solder 500 kg.

Please kindly check and reply back the feasibility.

Confirmed

Best Regards;

(Jaroonsak Jarassriwilai)

( Mr. )

Factory Manager

# SPK Co.,Ltd.

Bangplee factory

## FAX REPORT

To: APD Co.,Ltd.

Date: 21 Oct 2003

Attn: Mr. Sugihara 様

Fax: 81-6-6872-8931

From: Jaroonsak / SPK Co.,Ltd.

No of pages: 1

Including the cover page

Sub: Forecast in Jan 2004, Feb 2004

### Content:

Thank you very much for your cooperations.

I would like to inform you that our company will inform you the forecast in Dec 2003 and Jan 2004 as below:

#### Jan 2004

Confirm

D-1682-A	Damper	8,500 pcs
D-1601	Damper	8,500 pcs
C-1603-A	Damper	8,500 pcs
C-1633-A	Cone paper	8,500 pcs
AH-162	Adhesive	450 kg.

#### Feb 2004

D-1682-A	Damper	9,000 pcs
D-1601	Damper	9,000 pcs
C-1603-A	Damper	9,000 pcs
C-1633-A	Cone paper	9,000 pcs
AH-162	Adhesive	500 kg.

Please kindly check and reply back the feasibility.

Confirmed

Best Regards;

(Jaroonsak Jarassriwilai)

( Mr. )

Factory Manager

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