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PREFACE

In June 1991 I arrived at the airport of Surabaya to assist in a project at the factory of Philips Ralin to obtain my M.Sc. degree in 'Technology and Development Sciences' (TOK) at the Eindhoven University of Technology. The graduating students are required to execute their research in a developing country.

When I arrived at Philips Ralin no one knew exactly how my practical training in the following six months would look like. First I would do an exploratory examination, after which my local supervisors and I would be able to fill in my practical training. Six weeks later we agreed I would assist the 'Warehouse Improvement Project'. The aim of the project was to lift up the services given by the Warehouse to a required level. In this report, this project is described.

The very pleasant months in Indonesia and this report would not have been possible without all the people who have helped me. This preface is the opportunity to express my gratitude.

To Mr. C.A.W. Burger who made my training possible, Mr. Budiman Santoso, who always made time to help me, Mr. Broto Suwardjo who I could assist with the project, and Mr Paul Peeters for his indispensable support, and to all the other people at Philips Ralin who supported me in executing the research and invited me to join them in leisure time.

Also to Drs. H. Gaillard and Prof. Dr. P. M. Kempen of the Eindhoven University of Technology for their support and supervision and patience in the terminal phase of my research. Also thanks to Drs. P. van Tilburg who was prepared to be my third supervisor, and to the other people of CICA.

And last but not least to Yvette Manger Cats and Jeroen IJgosse for reading and correcting my writings, and my friends and family for their moral support.

Erik Arkesteijn, September 1992
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EXECUTIVE SUMMARY

The Warehouse Improvement Project is executed at Philips Ralin Surabaya. The Indonesian company P.T. Philips Ralin is a joint venture, owned by the Indonesian government and Philips Electronics. The company has two production facilities: one for luminaries and one for incandescent lamps and fluorescent tubes (both products are called lamps). The sales activities are controlled by the Sales Department from the head office in Jakarta. The head office in Jakarta is monitored by executives of the Business Group Light of Philips Electronics in the Netherlands. The production facility of Philips Ralin, Philips Ralin Surabaya, delivers about 95 percent of its lamps to the Sales Department. The other 5 percent is exported to other Philips companies in South East Asia under the responsibility of the Plant itself.

The methodology for the project is one for consultancy assignments. The methodology consists of three phases. In the Orientation Phase the problem is analyzed and formulated. Total conformity among all participants is essential. In the Diagnose and Solution Phase, alternative solutions are designed. The best solution is selected and worked out. During the Implementation Phase the solution is implemented. Now, consultant gradually reduces his involvement in the project.

The report of the Warehouse Improvement Project consists of five chapters. In the first chapter the background of the problem is explained and the problem-formulation and project-objective are given. Philips Ralin Electronics has focused its attention on the production of sophisticated lamps, and the Plant itself focused attention on the production of lamps for the export market. The execution of these strategic goals cause an expansion of the product assortment. Consequently, the factory will have to deal with more materials and semi-finished products, and it will have to contract more suppliers. Till now, the expansion of the assortment has already caused an increase in the stock level at the Plant, exceeding the budget by 40 percent. This has negative results for the prices of the lamps. The conclusion is that the current planning and control systems for the flow of goods will not be able to cope with the expanding variations of finished products and growing amount of suppliers.

Presently the Philips Electronics Company is restructuring its activities. These programs determine a high priority for the improvement of capital utilisation and maximization of profit. Therefore the problem is urgent and requires a solution. The objective is to create a situation in which the organisation is able to control the expected variations of raw materials, semi-finished and finished products, with a minimum of capital invested.

Through investigation two main problems emerged. The first problem involves the logistic control system and the second involves the Warehouse. The control system turned out to be too slow and inaccurate for the increasing planning-load. The performance of the Warehouse is unsatisfying, because its technical systems and organisations are not developed enough to meet the current requirements.

Both highlighted problems are interlinked and essential to the success of the total logistic system. Therefore two projects are set up, of which the Warehouse Improvement Project is described in this paper. Part of the Warehouse Improvement Project is the description of a conceptual control model. This model determines the conditions for the functioning of the Warehouse. All the other activities
WAREHOUSE IMPROVEMENT PROJECT

with regard to the design of the logistic control model are part of the Logistic Improvement Project in which the PPC (department for production planning and purchasing) will play the main role. The Warehouse Improvement Project will concentrate on the improvement of the services provided by the Warehouse.

In the second chapter the Plant, the logistic system, and the situation at the Warehouse are described and evaluated. The logistic system of Philips Ralin consists of four links: 1) the suppliers which deliver their materials to the Plant; 2) the Plant that produces the lamps and delivers these to the Sales-Department; 3) the Sales Department that sells and delivers the lamps to the distributors; and 4) the distributors who sell the lamps to the consumers and shops. The products which are exported, are directly sold by the plant to the sales departments of Philips in other countries. The Plant itself consists of three factories. The Cap and Glass Factories make semi-finished products, lamp-caps, tubes and shells. The Light Factory manufactures the finished products lamps. The Warehouse plays an intermediate role between the suppliers, Sales Department, the foreign Philips companies, and the departments at the plant.

For every delivery from one link to the other, performance levels are set. The Sales Department committed itself to deliver to the shops and distributors within one week. Every month the Plant delivers to the Sales Department with a delivery time of six weeks. There are possibilities to shorten the delivery times for certain types of lamps, which may be investigated in the Logistic Improvement Project. The suppliers use delivery times of 3 weeks (for local suppliers) and 2 till 3 months (for foreign suppliers). The chance that a link can not deliver to another link in the agreed delivery time can also be formulated. For the Plant this chance has been set at 5 percent for local products and 20 percent for export-products. These figures stipulate improvement of the reliability for both areas. For the other down-stream links the figures are not investigated. For the suppliers, no figures are set. These are subject to deliberation between PPC and the suppliers. Till now PPC calculates with standard safety stocks from experience.

The conditions set in the Logistic control model determine the height of stock in the Warehouse, and the performance of the services of the Warehouse itself. The height of the stock is calculated by PPC and does not exceed the capacity of the storages of the Warehouse. In the past the logistic performance of the Plant made progress, but the performance of the Warehouse could not keep up. The result is that quality of the services of the Warehouse is insufficient and the departments are dissatisfied. Because the Material Handling manager has a lack of knowledge and has become isolated from the department managers, he is not capable of lifting up the performance of Warehouse to a sufficient level.

In the third chapter of the report the design for the improved Warehouse is described. A condition of the project is, not to change the composition of the personnel of the Warehouse. The technical level of the know-how requires technical and organisational solutions on a limited level. It may be possible to implement more complex systems, but it will be doubtful whether they will take root. Only the administrative techniques are implemented systematically. The awareness of the own performance and the reception of the performance by the other departments is nihil. This makes any discussion between the Warehouse and its clients very difficult and cooperative improvement actions
very rare.

To come to solutions, the Material Handling manager and the Warehouse personnel must be convinced of the need to improve. Therefore they must become aware of the gap between their performance and the requirements from the other departments.

The awareness of the own performance is stimulated by the introduction of performance indicators. The indicators, made visible by displays, serve three objectives. First they enlarge the knowledge of the performance, secondly they make evaluation possible, and thirdly they give the Material Handling manager an instrument to direct improvement actions.

To trace the most urgent needs for improvement the Material Handling manager must be well informed about the needs of the other departments. Therefore it is very important to restore the communications between the Warehouse manager and the other managers, and give it a permanent character. An objective is to use the relation with the other departments for the transfer of knowledge and information. On management level, the transfer can be realized through the setting up of periodical meetings (called Steering and Quality Meetings) and on operational level it can be realized through the setting up of improvement actions.

The central person in the transfer will be the Material Handling manager. If the activities are successful, these will strengthen his position and enlarge his authority. It will restore the confidence in the troubled relations with the Warehouse personnel and give the Material Handling manager more faith in the project on the short term, and in the relation with the other departments on the long term. Especially in an Indonesian context this is an important issue. At the moment the status of the manager is damaged. This resulted in a loss of face that the manager tries to compensate by passing the buck to his employees. But his behaviour is not accepted, and he is losing the control over his employees. Artificial restoration of his status by support of the Plant Manager alone will not have much effect. It must be clear that the position of the Material Handling manager is based on respect. A way to restore his position is to get him adopted again, by the group of department managers. By utilizing the meetings for training, they give him the instruments to live up to the expectations of his employees.

The Plant manager keeps control by using the Quarterly Management Report (QMR), that is written by Material Handling manager, every three months. The report contains the following subjects: results of the performance indicators, evaluation of the services of the Warehouse by the clients, client requirements for the new period, results of the latest improvement actions, and new or prolonged improvement actions with goals and cooperation. This fill-in report gives a good and fast insight in the relative performance and the progress of the Warehouse. The report forces the Material Handling manager to cooperate and consult the other departments and to initiate and motivate improvements. It is also an instrument that can assist him by organizing and executing his activities in a systematic way.

A adaption of the organizational structure of the Warehouse makes five of the storekeepers responsible for a package of materials throughout the complete flow from the receipts till the
WAREHOUSE IMPROVEMENT PROJECT

deliveries. This way, it is easier to trace problems and to solve them: the organizational structure of the Warehouse becomes more transparent.

On an operational level, improvement actions are initiated, and will be continued by the Material Handling manager. These actions introduce simple and basic systems which can be comprehended by the Warehouse personnel. The improvement actions are developed after consulting the clients to trace the urgent issues. These issues were transformed into (parts of) improvement actions at the Warehouse. They are always part of a logistic task of the Warehouse. The three logistic tasks are Information Supply (about stock levels), Storage (the maintenance of the product quality and quantity) and Distribution. The success of the Warehouse depends on the satisfaction of the clients with the fulfilment of these tasks. The fulfilment is checked through the performance indicators which must meet the norms determined by the clients.

PPC is not satisfied with the accuracy of information provided by the Warehouse. The difference between the administrated and the real stock levels give continuity-problems at the production for which PPC is responsible. Therefore the information supply has been centralized and a periodically (weekly) physical counting has been introduced. The centralization makes the supply better controllable and prepares the Warehouse for the installation of a computer work-station. The weekly physical countings serve three objectives; first to correct the stockcard-administration, secondly so as to check for the Accounting Department and thirdly to train the storekeepers. Every counting, a form is filled in and solutions must be formulated to avoid the same mistakes in the future.

The light factory is not satisfied with the quality of the materials delivered by the Warehouse. Some materials are damaged and cause more waste and idle time. Another problem is the loss of materials. The same materials are not stored at one place, so consequently some of them cannot be found back. To avoid this problem in the future a lay-out system for all products has been introduced. To start with the semi-finished products glass and the packing materials (urgent). The organisation of the lay-out system makes the introduction of a FIFO-system possible. At the moment this is only required and introduced for the semi-finished products glass and packing material.

The distribution of finished products for export to the harbour of Surabaya, has become a bottle neck. Mistakes were made with the shipment, and those required money and efforts to be equalized. The expanding workload requires a better setting up. Therefore an other handling system is designed to prevent the mixing up of products from different orders. The more efficient communication with the Export Department and the new and larger export-storage triples the capacity to two till three orders per week. The Warehouse takes full responsibility for the transport to the harbour.

The conceptual model for the logistic system proposes to utilize a pulling system to control the production of the semi-finished products caps and glass. The handling of the products is a task of the Warehouse. Consequently proposals are made to introduce the pulling system. The pulling system for caps can be implemented without problems and without the use of cards. The Warehouse will take care of the provision of the machines. For glass, a one-card kanban system is proposed with the glass-storage as intermediate. For the direct deliveries from the Glass to the Light Factory on a large scale extra investigation and cooperation between the Glass and Light factory will be
necessary. Part of the project is the setting up of a three shifts service for limited number of materials for the Light Factory.

The implementation phase of the project is described in chapter four. At Philips Railin, for an implementation in phases was chosen, to be started before the complete design have been finished. This strategy is possible because most of the activities can be implemented independently from each other, although there are cross-over influences.

Because the improvement-actions are small scale and mostly limited to changes in the Warehouse, the setting up of a complex organisation is not necessary. A small project-team is set up with the Material Handling manager and the student as members. The student will assist the Material manager who will implement the improvement-actions and who is also responsible. The team is extended with more members on a temporary basis. A monitoring team is set up with the Plant manager as a permanent- and the logistic consultant from Philips-Eindhoven in the Netherlands as a temporary member. In particular when both the logistic consultant and the student have left, the supportive and motivating role of the Plant manager becomes very important.

In the last chapter the conclusions, recommendations and evaluation are written down. In this summary only the recommendations are briefly repeated. The first three recommendations concern the project itself, the other concern the functioning of the warehouse now and in the next future. Time-schedule is commitment. Plans which are confirmed by all participants must be taken seriously. Both the improvements and the normal operations must be monitored in detail. Because confrontations are avoided and therefore problems are neglected easily, results from activities must be checked frequently and in detail. When training is given at the workplace and not in the office of the manager, misunderstandings can be detected easier and be solved at once. Motivation is the engine of the project. Visible effects of own efforts, training, rewards and more own responsibilities will influence motivation positively. Systems need a lot of attention from management. Systems need to be maintained and adapted to new situations time and time again. If the systems are poorly maintained, the Warehouse will revert to the old situation very soon. It is recommended to investigate the progress of the transfer of knowledge from the Quality Department to the Warehouse. Evolve the performance indicators. The indicators for the Information Supply Task and the Management Task are developed and implemented successfully. The other two Performance Indicators (PI's) are overshadowed by the efforts made to implement the other improvements. Do not lose contacts with the other departments.
BACKGROUND INFORMATION ABOUT INDONESIA

1 Introduction

This chapter is meant as a brief introduction to Indonesia. The information gives the context in which the project at the Plant of Philips Ralin in Surabaya has been developed and executed. Consequently a little more attention is paid to the economical factors of the Indonesian society.

2 Geography, Population, Climate, Government and History

The name of Indonesia is derived from the words India and nèso which means island in Greek. It extends across a land area of nearly 2 million square kilometres, which is the size of Australia, and more than 11 million square kilometres of sea territory. The nation counts 13,667 islands of which 6000 are populated. The archipelago is the result of a junction of three earth-plates. Because the situation is still unstable, volcanoes are occasionally erupting and more than 400 earth quakes are counted each year. Mountains with heights above 3000 meter are numerous. The many eruptions resulted in very fertile land.

FIGURE I: Map of Indonesia

The climate is dominated by monsoon winds. The west monsoon brings rain during the period from november till march and the east monsoon blows dry ear over the archipelago from Australia during the rest of the year. (Except West Sumatra, Kalimantan and Iran-Jaya, which have an equatorial climate so have rain during the whole year.) The temperature varies between 22 and 34 degrees
Celsius.

With a population of 180 million in 1990, Indonesia is the fifth most populous nation in the world (following respectively China, India, GOS and United States). Despite of government efforts to limit the population growth, it still is considerable with 2 percent or 3.5 million people per year. If this growth is continuing, the population of Indonesia reaches 222 million at the end of this century. Two-thirds of the population or 100 million lives on 7 percent of the land area (Java and Bali) with a density of 700 people per square kilometre. The government tries to ease the pressure by trans-migration programmes with little results. Jakarta is the capital of Indonesia and also the largest city with 7 till 8 million inhabitants. Surabaya and Bandung are respectively the second and third largest cities with 2.5 and 1.5 million inhabitants. The three cities are located on Java.

Approximately ninety percent of the Indonesian people are of the Islamic faith. About eight percent is Christian and 2 percent is Hindu. Buddhism and other religions play a minor role. The 300 ethnic groups speak more than 350 languages and dialects. The national language Bahasa Indonesia was introduced in the twenties of this century and became the second language, English the third.

Formally, the highest authority is vested in the People’s Consultative Assembly which has the authority to appoint the president and determine the general Outlines of State Policy to be implemented by the president. The Assembly consists of 500 members of the House of People’s Representatives, and 500 members directly appointed by the government. The House of People’s of consists of 400 members who are elected for five-year-terms in general elections, and 100 members appointed by the government. All members are screened before every election. In practice nearly all power is accumulated in the function of the president (since 1967 Soeharto). The government of each of the 27 provinces is carried out in four levels. Every province is headed by a governor who is appointed by the provincial assembly and must be approved by the president. In general, the function of governor is executed by a serviceman of high rank, who has accumulated a great deal of the regional decision power.

On Java first men were walking around already 5000 years ago. The first known well organized civilisation origins from Sumatra where the development of buddhist coastal trading cities lead to one of the most important kingdoms in South East Asia in the seventh century. At that time, the central part of Java was ruled by a buddhist and a Hindu kingdom. In the thirteenth century the great Hindu-Buddhist Majapahit kingdom arose, and within a century it reigned over the whole of Java and Bali and claimed sovereignty over the whole Indonesian Archipelago. During the fourteenth century the Islam was introduced on Java and within two centuries Java was of Islamic faith with the last Hindu people driven to Bali.

In the seventeenth century the Dutch founded Batavia and in the eighteenth century they extended their rule over the whole of Java helped by a lack of unity among the fairly new Javanese Moslem kingdoms. Western influence was already introduced by the Portuguese, who traded spices at the Moluccas. Till 1799 the United Dutch East Indies Company ruled on Java and monopolized trade in the archipelago. Till 1945 Indonesia was under direct rule of the Netherlands. During the war Indonesian nationalists could strengthen their movement and during the years after the war the
Dutch had to give way to the Indonesian desire for sovereignty.

Soekarno became the first president of the United States of Indonesia, (a secular state) which was formed into the unitary state the Republic of Indonesia in 1950. Soekarno followed a socialistic economical policy, which lead to economical deterioration and at the end to political chaos. In 1965 a fierce and violent struggle for power brook out and Soeharto, as the commander of the Army Reserves, proved to be the strongest. He was appointed as the new president in 1967.

3 Socio-Economical Structure and Trends

Indonesia is the largest oil-exporting country of the Association of South East Asian Nations (ASEAN) with products like petroleum, and natural gas. Indonesia is also a producer of other minerals like bauxite, coal, copper, gold, nickel and tin, and of agricultural commodities such as cocoa, coffee, palm oil, rice, rubber, spices, sugar, tea and tobacco. With still two-thirds of its territory covered with forest Indonesia has one of the largest resources of tropical hardwood. The enormous and productive fishery grounds give access to vast fishery resources.

The manufacturing industry is not a traditional sector in Indonesia and it has been developed in the late sixties when the New Order policy of Soeharto was introduced. The process of industrialization has been characterized by an extremely inward-looking orientation made possible by a highly protectionist policy. This resulted in a rather inefficient and highly subsidised industry. This process, which involved local assembly of imported components came to an end in the mid seventies.

Attention was shift to the production of capital and intermediate goods. The government directed public and private investment to these sectors with the so called Deletion Programmes (delete or reduce the import-share of domestically assembled manufactures). Also these sectors were strongly protected and monopolized.

The situation of monopolized basic industry resulted in higher prices for downstream manufactures. Then, from 1982 when the oil-prices decreased rapidly, domestic demand fell. The manufactures tried to find markets outside Indonesia, but were severely handicapped by the obligation to procure their inputs from the domestic producers.

To alter the situation, Indonesia has been slowly shifting from a subsidised substitution-oriented to a competitive export-oriented manufacturing sector. Another reason to shift to this policy has been the objective of the Indonesian government to decrease its dependency of oil-exports and to focus on a diversification of the manufacturing export sector.
TABLE I: Distribution of Gross Domestic Product by Sector of Origin in Percentages (selected years)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>53.9</td>
<td>47.2</td>
<td>24.0</td>
<td>23.4</td>
<td>23.5</td>
</tr>
<tr>
<td>MINING &amp; QUARRYING</td>
<td>3.7</td>
<td>5.2</td>
<td>23.0</td>
<td>15.1</td>
<td>13.1</td>
</tr>
<tr>
<td>CONSTRUCTION</td>
<td>2.0</td>
<td>3.0</td>
<td>5.3</td>
<td>5.4</td>
<td>5.3</td>
</tr>
<tr>
<td>SERVICES</td>
<td>31.7</td>
<td>34.9</td>
<td>34.3</td>
<td>39.3</td>
<td>37.2</td>
</tr>
<tr>
<td>MANUFACTURING</td>
<td>8.4</td>
<td>9.3</td>
<td>13.0</td>
<td>14.8</td>
<td>18.4</td>
</tr>
<tr>
<td>OTHER</td>
<td>0.3</td>
<td>0.4</td>
<td>0.5</td>
<td>0.2</td>
<td>2.5</td>
</tr>
</tbody>
</table>


NOTE 1: Because of differences between the two sources 1985 is the average. The differences per sector are barely significant except for Mining & Quarrying (16.2 and 14.0) and for manufacturing (13.5 and 16.0). The differences may be explained by other grouping of the sectors and different measured results by different sources (respectively World Bank and Central Bureau of Statistics).

NOTE 2: The fall in the share of services in the total GNP can be explained by the decrease of the share of commercial services, transportation and communication and in particular public administration & defense.

In 1990, the GNP of Indonesia totals approximately 158 trillion Rupiahs at current market prices (equivalent to approximately $95 billion) and with the population mentioned above it earned $528 per year per capita, a middle-income country in the ASEAN-group. The last ten years, the growth rate of the GNP is moving between 3 and 6 percent with a peak of 7.3 in 1983. The real growth rate is moving between 0 and 2.5 percent with a peak of 5.6 in 1983. The comparatively low real growth rate is inflicted by the high population growth. The last ten years, domestic inflation is relatively stable around 8 percent with a tendency to decrease slowly.

4 The Manufacturing Sector and Exports

The last decennium, the manufacturing sector is the driving force behind the growth of the Indonesian economy. The salvation of the export-position is mainly the result of the expanding trade in manufactures. Comparative advantages are the low salaries and a large resource of not and low-schooled labour. In the last 3 years the export of manufactured goods has grown 15 percent per year. In 1989 the share of manufactures in the total export of $22 billion was 60 percent. One-third of these 60 percent were wood- and paper-products. In 1987 exports of non-oil products surpassed the oil-products which fell to a share of 35 percent in 1989. Agriculture and mining products make up the remainder.

Although the government abandoned the policy to invest huge sums in the manufacturing sector it is
BACKGROUND INFORMATION ABOUT INDONESIA

still major co-producer with a share of 23.6 percent (all joint ventures). Foreign-owned is 17.2 percent and private Indonesian owned is 58.4 percent. The 0.8 percent that are left is completely state-owned firms. In general, the foreign investments are focused on activities where their superior technology or product advantages confer a decisive benefit. Examples are glass products, plastics, electronics chemicals and beverages. Total foreign accumulated investments reached $22 billion in 1989 for manufactures (73 percent of total foreign investments). Main part of the investments were realized by Japan (26 percent) and the NIC's (22 percent). Important western investors are the United States, Germany, and the Netherlands (respectively 7, 6 and 5 percent). Foreign investment is co-ordinated by a single government agency called BKPM. The share of foreign capital in investments ranges from zero up to 95 percent and is limited by statutory regulation depending on the kind of products, destination of the products and area of origin.

5 The Lighting Sector

There are 7 national producers of lamps selling at the Indonesian market. The three most important producers are Maspion, Chiyoda and Philips with estimated market shares of respectively 40-50, 20-30 and 10-20 percent. The total market for lamps is worth roughly estimated on 120 billion Rupiahs ($72 million) or a 120 million lamps each year.

All three producers serve different segments in the market with some overlaps. Maspion sells the cheapest lamps and serves the group with the weakest buying-power, Chiyoda is serving the middle group and Philips is serving the highest segments. Both Philips and Chiyoda have foreign shareholders. Maspoin is an Indonesian company working with foreign technology. The sales of lamps depends on the money that can be spend on lamps and the number of households which are connected to the national grid. At the moment the demand of lamps is growing with approximately 15 volume percent per year.
1 PROBLEM SETTING

1.1 Introduction

In the following paragraph the problem and its background is discussed, with as starting point the objectives of Philips Ralin Surabaya. The paragraph is concluded with the problem formulation in which the problem is defined.

In the third paragraph the starting point is the problem formulation. This problem consists of different parts. The most urgent part of the problem is selected to be solved first, and for this part a project will be set up. Then the project objective and an estimated project-result is formulated.

In the last paragraph of this chapter the project approach, consisting of three phases which have been passed through to complete the project, is described. There is an Orientation Phase in which the problem is analyzed and the Project-Objective is formulated. Then the Diagnose and Solution Phase is passed through, in which the solution is designed, to meet the project objective. In the last phase of the project, the Implementation Phase, the solution is implemented.

1.2 Problem Definition and Objective

The Indonesian company P.T. Philips Ralin is a joint venture, for 40 percent owned by the Indonesian government and for 60 percent by Philips Electronics. The company has two production facilities: One for luminaries and one for incandescent lamps and fluorescent tubes (both products are called lamps). There are five Sales Offices throughout Indonesia, which are controlled by the Sales Department from the head office in Jakarta. The head office in Jakarta is monitored by executives of the Business Group Light of Philips Electronics in the Netherlands.

The production facility of Philips Ralin, Philips Ralin Surabaya, delivers about 95 percent of the lamps it produces to the Sales Department. The other 5 percent is exported to other Philips companies in South East Asia. Prices of the lamps which are sold to the Sales Department are fixed (yearly budgeted cost prices). The selling prices of lamps for export are not fixed, but are subject of deliberation under responsibility of Philips Ralin Surabaya and for own account. The turnover of Philips Ralin Surabaya is 35 billion rupiahs (approximately 35 million Dutch guilders). There are 821 Employees working at the plant.

Presently the Philips Electronics company is restructuring its activities. These programs determinate a high priority to improvement of capital utilisation and maximization of profit. The Plant's objective is to expand its export activities to 25 % of its turnover. To be able to reach this figure two more goals are added. These goals are to achieve more reliable delivery times and to focus on the production of sophisticated products. (Export production mainly involves luxury lamps and the delivery times are below target.) These last goals are also passed on by the Sales Department.

The Plant manager at Philips Ralin Surabaya considers that improvements in the flow of goods will require most attention. First of all, if the plant expands its product assortment, it will require more materials and semi finished products. Also suppliers will have to be contracted. Therefore the plant
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has to be able to cope with the expanding variations of finished products and the growing number of suppliers. Secondly, if the Plant minimizes its' stock, the amount of capital invested in the stocks will decrease. In this way capital is made available to other, more profitable uses. The need and possibility to make capital available is illustrated by the excess of capital invested in stocks at Philips Ralin Surabaya with 40 percent above budget (see table 1 in annex D).

Focusing attention on the flow of goods is an internal approach. It is an approach to realize better utilisation of capital, which may result in more profit. To realize the growth in export and local market shares, an external approach (marketing) is required. However, the internal and external approach are related to each other. So may improvements in the flow of goods, like shorter delivery times and savings on production costs, support a marketing approach.

The marketing and sales activities are not executed by the Plant but by the Sales Department. The Plant is only responsible for optimizing its own activities (the production of lamps). Therefore the Plant will concentrate on the control of the production and the flow of goods. The problem formulation is the following:

The current planning and control systems for the flow of goods will not be able to cope with the expanding variations of finished products and growing amounts of suppliers.

If no activities are initiated to improve the current situation, problems will arise, like increasing inventory levels (capital costs), longer cycle times (delivery problems, longer planning horizons, more risk) and quality problems (more waste, unsatisfied costumers). Summarising, there is a gap between the control-needs and the control capabilities. Therefore, the objective is:

to create a situation in which the organisation is able to control the expected variations of raw materials, semi finished and finished products, with a minimum of capital invested.

To control such a situation, control systems are used. In western literature much attention is focused on sophisticated MRP systems which often require a very accurate and extensive information system. But instead, also simple techniques, like 'pulling systems', can be used. (For MRP: see a.o. Chase; for pulling systems: see Schonberger.) These are relatively simple because on operational level there is less information required from higher planning levels in the organisation. Or in other words the cybernetic cycle, of measurement, comparison, information feedback and intervention, is shorter (see Van der Veeken). But although the pulling system is more simple to control and maintain, it requires more self-activation of the employee on the operational level.

The feasibility of both the MRP or the Pulling systems depends on the production-process as well on infrastructural and cultural characteristics. The infrastructural characteristics may restrict the scope of the use of the systems, but especially the cultural characteristics determine the success. With both systems, the individual employee is confronted directly with his or her behaviour and performance.

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1) Material Requirement Planning (abbreviation: MRP or MRP I) or Material Resource Planning (abbreviation: MRP II).
PROBLEM SETTING

And introduction of confrontation techniques as well as more accurate behaviour may meet more difficulties in Indonesia than in a western environment (see Hofstede in annex A).

Finally can be concluded that the problem is twofold. With regard to improvement of the logistic system, the Plant manager indicated that not only the technical problem of designing the set of control and management techniques will require investigation, but also the Indonesian context, in which the set of techniques will be implemented, requires attention. Normally, the investigation would require special socio-economical field work. However, time was limited, so this part of the investigation is based on literature.

1.3 Description of the Project-Objective

Through investigation during the Orientation Phase of the project (see next paragraph) more detailed information is gathered about all parts of the logistic system of Philips Ralin Surabaya and more insight is gained into the problem. Finally, several parts of the problem can be distinguished. Among these, the most urgent problem turned out to be the situation in the Warehouse.

The information about stock levels is crucial, because the logistic control system that is said to be required, will not be effective if the information about the stock levels is inaccurate. The stock level information is inaccurate if planning has to be delayed because real stock levels are lower than recorded in the stockcard administration. But there is also inaccuracy if orders to suppliers are placed to early because real stock levels are higher than recorded.

An important task of the Warehouse is to give accurate information regarding changes in stock levels. In the past the accuracy of the Warehouse appeared to be low. Not only the information-supply service, but also other services are not as good as required to function in the current logistic system (e.g. maintenance of stock, communication). Therefore, the overall opinion of the management is that the activities of the Warehouse require updating (to the present situation and the near future). This is seen as a basic condition for a successful introduction of a new logistic control system. Therefore the solution can be found in two fields: On the one hand in the introduction of a better logistic control system. And on the other hand in the revision of the Material Handling department and in particular the Warehouse (as part of the same logistic system).

In consultation with the managers, who are the most important participants in the logistic system², it is decided that I would concentrate the project on the Warehouse.

The objective of the project is to enlarge the effectiveness of the existing systems in the Warehouse to help improve its service. This on condition that the employees can master the new or

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2) The most closely involved participants are the managers of the Production Planning and Control and the Material Handling departments. Together they are responsible for the flow of goods. Also the plant manager and a logistic expert from Philips-Eindhoven were present.
improved techniques and are able to evolve them. The design of the revised Warehouse must fit into the total logistic system.

At the end of my period at Philips-Ralin there has to be a design that is ready to be implemented. Part of the assignment is to assist in the first phase of the implementation. The result of the project-activities at the Warehouse has to be visible in improvements in the services given by the Warehouse. This is a challenge because results will only come slowly, especially when it is essential that after my departure the improvement activities will go on. In that case part of the task is to transfer not only knowledge but also routine.

FIGURE 1.1: From Problem to Project-Objective

1.4 Research Methodology: The Project Approach

The methodology used for the project is one for consultancy assignments (see Kempen). The theory is not tied to a certain discipline, therefore the solution is not immediately pushed in a certain direction (discipline). Main principle of the approach is client participation. The consultant must constantly check if he (or she) and participants (client and interest groups) are still on the same track. Below, the three phases of which the methodology consists are discussed. Table 1.1, on the next page, gives an overview of the main activities and results.

In the Orientation Phase, the problem is analyzed with the help of information gathered from interviews and documents. It is essential that there is total conformity among all parties concerned, therefore feedback from participants is very important. To structure the gathering of information and the analysis of activities, the Berenschot Basis Analysis for Logistics is used.

The Berenschot Analysis is a standardized method to investigate a company. The method can be used in case of bottlenecks in and around logistics. The method is used in projects that mainly focus on reduction of lead and delivery times, stocks and logistic costs. Although the method is directed to internal objectives, the starting point is a set of formulated requirements from the market (external
objectives). Berenschot gives an extensive check list, but not all points in the list require the same in-depth investigation. In this way it is possible to limit efforts spent on the analysis (for check list and further discussion, see annex C and ten Cate). For the gathering of information no specialist is required. This feature makes it possible to distribute tasks to people of the company to win time and stimulate participation.

The goal of the Diagnose and Solution Phase is to select the most feasible alternative all participants want to work with. This solution is designed by constantly analyzing, consulting and adapting alternatives. The design of the Warehouse is mainly concentrated on an operational level, but has to fit in the logistic system, that is partly formulated on strategic level. The logistic system is only described in a conceptual way, because further investigation is not part of the task. This phase is concluded with a report.

To describe the required logistic system, the Symlad method is used. The required logistic system is described with a basic structure consisting of basic processes, stock points and transport activities. The complete chain of the flow of goods is investigated to avoid sub-optimisation. The main objective is to keep the structure as simple as possible resulting in a simple control system. After describing the basic structure the control model is made. The idea is to minimize stocks in stores and pipe lines, because excess in stocks hides real problems in production and distribution. (For further discussion, see annex C and van Ballegooie)

Literature about warehousing was not found in Indonesia, during my stay in Indonesia. It could not be made available from the Netherlands in time. Therefore, the approach of this part has been based on general knowledge.

First, all clients (the other departments) of the Warehouse are identified. They are asked which services they require and with this information the required services are grouped by functions and linked to objectives and performance indicators. The goal is to enable the Warehouse manager to transform signals from outside into action by the Warehouse. An effective distribution of knowledge and responsibility linked to the groups of services is essential (for further discussion, see annex C and). Also this phase is concluded with a report.

The goal of the Implementation Phase is the final goal of the project: create a new stable situation in which all planned improvements are implemented. Because this phase actually intervenes in the employees' basic activities in the company, feedback is very important. All participants have to be aware of what is happening, and especially to which situation the changes will lead in the future. In the Implementation Phase, a temporary organisation is set up to monitor all changes. Part of my assignment is to assist in the implementation. Therefore time has to be reserved for this task. It is not only impossible (visa restrictions), but also not necessarily to assist in the complete in implementation of the project. Gradually my activities will decrease, and the Material Handling manager will take over these.
TABLE 1.1: Project Approach

<table>
<thead>
<tr>
<th></th>
<th>ORIENTATION PHASE</th>
<th>RESULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1 verify the problem</td>
<td>1 well defined problem supported by all management</td>
</tr>
<tr>
<td></td>
<td>2 gain attention for the problem</td>
<td>2 task description</td>
</tr>
<tr>
<td></td>
<td>3 define the task</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>DIAGNOSE AND SOLUTION PHASE</th>
<th>RESULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1 gather further information</td>
<td>1 a design supported by all important participants</td>
</tr>
<tr>
<td></td>
<td>2 analysis</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 discuss analysis-outcomes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4 design alternatives</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 discuss and design-alternatives</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6 start again till the result is achieved</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>IMPLEMENTATION PHASE</th>
<th>RESULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1 make implementation plan divided into steps</td>
<td>1 adapted plans</td>
</tr>
<tr>
<td></td>
<td>2 set up organisation to assist, control and monitor the implementation</td>
<td>2 evaluation reports</td>
</tr>
<tr>
<td></td>
<td>3 make every step</td>
<td>3 improved and stable situation</td>
</tr>
<tr>
<td></td>
<td>4 evaluate every step</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 make adaptations in the plan if necessary</td>
<td></td>
</tr>
</tbody>
</table>
2 PLANT DESCRIPTION AND EVALUATION

2.1 Introduction

In this chapter the Warehouse, and the system in which the Warehouse is functioning are described. The objective is to gain insight in the system and the situation of Philips Ralin Surabaya, and to get a better understanding of suggested improvements for the Warehouse (described in chapter 3).

In the following paragraph the goals, as stated by Philips Ralin Surabaya, are linked to the logistic system, which forms the direct environment of the Warehouse. The link is essential, because if the kind of goals are not relevant for the logistic system, the project has no raison d'être.

In the third paragraph the basic structure is explained and evaluated. The basic structure describes the flow of goods, or in other words: the physical part of the logistic system. All linkages of the logistic chain, from the raw materials to the client, are examined. This is done to avoid local problem solving at the expense of other phases in the chain.

The flow of goods, examined in the third paragraph, needs to be controlled. This is done with a control system, which is discussed in the fourth paragraph. At the end of the paragraph suggestions to improve the control system are shown in a Logistic Control Model. The Model determines the behaviour of the logistic system in which Warehouse must function. This Model forms the basis of the Warehouse Improvement Project.

In the last paragraph of this chapter the situation in the warehouse is discussed. The present situation is the starting point of the activities for improvement, and in turn, justifies the existence of the Warehouse Improvement Project.

2.2 The Market of Philips Ralin Surabaya and the Relevance of its Goals

The Plant Philips Ralin Surabaya delivers to Sales Departments of Philips Electronics in Indonesia and other Philips companies in South-East Asia. The sales offices of the Sales Departments deliver the lamps to distributors and shops, which finally deliver to the consumer.

Philips is the largest producer of lamps in the Indonesian market. The quality of the lamps is perceived as high. These factors give Philips a strong position on the indonesian market even though the price is 20 till 40 percent higher than most of its' competitors. However, the current strong position of Philips may weaken because the most important competitors are improving their quality, without significantly increasing their prices. This threat is especially valid for the cheaper segments of the market where prices are relatively more important. The growth of Philips' turnover in the domestic market is said to be approximately equal to the market-growth. In terms of market-shares, Philips is stabilizing.

Philips Ralin has set goals to counter the trend of a weakening position in the market. In line with the goal to focus on sophisticated products, the company puts extra efforts in the expensive segments.
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of the market, by introducing new products. An other aspect is that the production costs of the lamps have to decrease. The latter is done by restructuring the flow of goods and contracting cheaper domestic suppliers instead of expensive foreign ones. This will result in an improved utilisation of capital. Philips Ralin Surabaya also strives at working towards more reliable delivery times which is especially important for export. Normally the order delivery time of the export products (from the moment the order is received by the Plant till shipment) is two months, but may differ according to agreements made. The performance ratio for export deliveries in 1990 was 0 percent and for 1991 (1-91/6-91) 64 percent. This means that respectively 100 percent and 36 percent of the orders did not leave the Plant within the confirmed time. This performance does not lead to an increase of the order delivery time of the export. But a better performance in the delivery alone will not boost the export-demand. Therefore the Export Department will intensify its marketing and sales activities. The performance ratio for local deliveries\(^3\) in 1991 (1-91/6-91) was 92 percent for incandescent lamps and 86 percent for fluorescent tubes. So respectively 8 percent and 14 percent of the monthly orders did not arrive at the storages of the Phillips Sales Department on time. If the Plant has reliable delivery times, the Sales Department can decrease its safety stocks and be more reliable regarding delivery to its clients. At the short term especially the expansion of exports and the activities in the flow of goods will contribute to the profit of Philips Ralin. On the longer term, this will also be the case for the other activities.

As already mentioned, the goals will not be discussed within their marketing concept. The goals discussed above are the starting point for the logistic concept.

2.3 Basic Structure

The Plant in Surabaya consists of a Glass Factory, a small Cap Factory and a Light Factory. The Glass and Cap Factories produce semi-finished products (shells, tubes and one type of cap). The Light Factory produces and packs the finished products (incandescent lamps and fluorescent tubes). Most of the semi-finished products, the Light Factory needs for production, are made by the Glass and the Cap factory. A small part of the shells and caps is purchased. Not all semi-finished products are made for own use. A small part is produced for competitors. All semi-finished product are stored before they are utilised by the Light Factory or delivered to a client.

The materials needed by the Glass Factory to produce the semi-finished products, are purchased from local suppliers. Ten materials are mixed and melted into (liquid) glass. From this glass seven types of tubes and four types of shells are made. To make the shells and tubes continuous production is used.

To produce the caps, the Cap Factory needs seven materials from import and local suppliers. The production involves a very simple flow shop process (what means that the products have a fixed routing).

\(^3\) The performance for local deliveries is measured as a degree of completion of every monthly delivery (=order) to the Sales Department. It is measured in volume and gives the average completion of the monthly orders within one month during a given period.
The Light Factory does not only utilise tubes shells and caps, but also other materials. Altogether there are about 600 materials, of which 400 are packing materials. All packing materials are purchased from local suppliers. Almost all other materials are imported. Like the Cap Factory, also the Light Factory uses a flow shop process. In fact, it uses two different flow shop processes: one for incandescent lamps and one for fluorescent tubes. All lamps can be made with these processes, although change-overs are required to switch from one type of lamp to another. The Light Factory is separated into three sequential processes organised in three departments. First there is a Preliminary Production Department, where a part of the products is pre-treated. The second process takes place in the Production Department where the lamps are actually made. At last the products are packed in the Packing Department. Like the semi-finished products, also the raw materials are stored before use.

All products are made on orders placed by the Sales Department of Philips Ralin or another Philips company in South-East Asia. Therefore there is no large stock of finished products at the Plant. All lamps for export are stored at the Plant till an order is completed and subsequently shipped. All lamps for the local market go immediately to the Sales Department. The part of logistic system described above is the responsibility of the Plant. This part is depicted within the box 'Surabaya Plant' in figure 2.1 on the next page. Here can be concluded that the factor storage forms an important component.

The products which go to the Sales Department of Philips Ralin are brought to a distribution centre in Surabaya. From there, a part of the lamps is distributed to two other regional distribution centres (one in Jakarta and one in Medan). From the three regional centres the lamps are distributed to clients (shops or middlemen). In the box 'Sales Dept' in figure 2.1, the described responsibility of the Sales Department is shown.

The Glass and Cap Factories have an over-capacity of 20 to 25 percent. An investigation into the costs-factors within the Plant, will learn that the costs of handling of all materials and products, as well as the costs of controlling, involves a minor part of the total logistic costs of the flow. More than 70 percent of the total logistic costs at the Plant are capital costs. (See table 1, annex D.) The stock levels between every production stage are shown in table 2.1. The real total stock level of the complete chain is slightly higher than budgeted total. (See for real stock levels in december 1990 and may 1991 table 2 in annex D.)
FIGURE 2.1: The Basic Structure of the Logistic System of Philips Ralin
Because the capital costs of the stocks determine the main part of the logistic costs and a better capital utilisation has a high priority, attention is focused on stocks. Better capital utilisation gives Philips a stronger position on the market where the prices are under pressure. This may affect profits positively. The high stock level may hide particular problems in the control system of the flow of goods. By decreasing the stock level, the real (control-) problems must be faced.

Before we investigate the stock levels we go back to the costumers: the starting point. Earlier in this paragraph was stated: The clients of Philips Ralin (the distributors and shops) are the starting point for the evaluation of the current logistic system of the company. To what degree Philips is able to satisfy its clients, determines its success. The clients of Philips Ralin request a maximum delivery time of one week. Because reliable delivery times are part of Philips' set of goals, it is Philips' policy is to achieve this.

For two reasons this will have consequences for the stock positions. First, the minimum production quantity of the Surabaya Factory is larger than the distributor order quantity. Secondly, the Plant is not able to produce and deliver to the distributors within one week. Therefore Philips Ralin requires a stock of finished products. A solution that may be feasible is elimination of both stock points in Jakarta and Medan at the end of the flow and concentrate all finished products in a stock point at the Plant. A stock point at the Plant will only be possible from 1993 when the Plant will be transferred to a larger site. Elimination of the regional centres in Medan and Jakarta may become feasible depending on two factors. First, Philips Ralin must be able to deliver from this stock point to its distributors within one week. Secondly, the savings from stock and handling costs must be higher than the extra expenses of transport costs. But, for the moment it is more profitable to concentrate

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4) In other words: The plant cannot produce per order because an order from a distributor or shop is in most very small and the set up times of the machines are too long. If the Plant would do so, it would not be able to achieve a reasonable efficiency, and therefore would produce too expensive.
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on stocks at the Plant itself, because the stock of the Sales Department is still only 16% of the total stock and far below budget. Therefore this subject is not included in the project.

Finished Products Export have no commonality. Every country asks for a different product. Reducing the delivery time by adding a stock point at the Plant in Surabaya raise the costs at corporate level, because there is already a similar stock point at every Philips company in the other countries. These stock points will be required anyway, because it takes four weeks to ship products to the various countries. (Still keeping in mind an important goal: short and reliable delivery times to distributors.) In this case it is better to concentrate stock near the market.

The two largest stock points (raw materials for the Light Factory and semi-finished products) at the Plant determine 64 percent of all stock costs of Philips Ralin. The semi-finished products alone involve 24 percent of all capital invested in stocks. The main reason for the high stock is the minimal synchronisation between production in the Glass and Light Factories. The analysis clarifies that technical possibilities exist to at least reduce the stock level. It can be done by introducing a 'pulling system', in which the semi-finished products are made on demand and not on planning. Another solution could be to introduce better planning, but this is not favourable (see next paragraph). Another reason is the decision to keep a three weeks safety stock. An investigation into the necessity of the length of this period may be profitable. On the long term the best improvement may be the elimination of the semi-finished products stock. The feasibility of this solution depends mainly on the possibility (and willingness) of gaining very reliable and fast suppliers to overcome gaps (disturbances and maintenance periods) in the production of the semi-finished products. It still will be a trade-off between the costs of buying caps and glass and the costs to keep stock. The stocks for raw materials involve 40 percent of the capital use. This stock is also far above the budget. A main cause is that there is no synchronisation between orders put by the Sales Department, the planning of production and the purchasing of materials. This subject brings us to the control system of the flow of goods.

2.4 Logistic Control System

To be able to control the production and the logistics Philips Ralin has a planning on three different levels:

Long Term (2-4 years): The production plan for product families can be made from market information and policy. Decisions are made about resources (machines, capital and people), which are checked with Resource Requirements Planning (RRP). The outcome is the Long Term Planning.

Medium Term (1 year): The Master Production Schedule (MPS) is the planning for the next 6 months. The first three months are fixed in volume, of which the first month is fixed both in volume and product-mix. The MPS is the result of a monthly discussion between the Sales Department and...
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the Plant. The MPS is derived from monthly sales-plans, normstocks and future MAT-figures from the Sales Department. The Plant adds the estimations for export orders and checks the Rough Cut Capacity Planning (RCCP). Based on the agreed production output, the Sales Department makes a spreadsheet with movements of goods (the MPS). The Plant receives the MPS a week before the beginning of the month from which decisions can be made on the number of shifts and product-mix per machine unit.

Short Term (1 month): The Finished Production Schedule (FPS) is made. All orders are scheduled in line with decisions made at MPS-level. The plan is checked with the Capacity Requirements Planning (CRP) and with Materials Requirements Planning (MRPI) for the availability of materials. Finally, decisions for overtime are made.

Till this level the control model is functioning fine, but from this level further downwards in-efficiencies are found.

Shells and tubes are made on stock. The production planning is based on the first three months of the MPS. The Glass Factory management combines the weekly demands by the Light Factory which are planned for a period of three months and produces large quantities of a type of product at once. The Glass Factory hardly follows up the changing of demands within the periods it planned for. The result is an unbalanced stock of glass.

The cap production structurally exceeds the demands of caps by the Light Factory. The overproduction of caps is thought to be the cheapest alternative, based on the assumption that otherwise, in 1993 caps have to be bought. Thus the caps are made on stock.

For the purchasing of materials two systems are used. With the Re-Order-Level system, an order of a fixed quantity is placed, if the stock of an item is below an certain level. This quantity is reviewed every fixed period. This is used for materials which have long delivery times. The purchasing of the other materials, which have short delivery times, is based the MRP system. The materials are purchased according to a MRPI system. To determine the requirements for the Production department the MPS is exploded. Depended of the outcome of the explosion purchasing orders are placed and depended the FPS, the execution of the orders is delayed or accelerated. The two systems in their form are just introduced. Therefore there are some starting problems. Extra training of the purchasing staff is necessarily. A larger problem that MRP materials have to be purchased from the MPS and not from the FPS. It is not always possible to delay an order and the quantity of the order remains the same. Finally this situation leads to high stocks.

5) Moving Annual Total. Technique that is used to forecast (in this case) future production figures. The average of 12 sequential months is forward ended. For example May '91 till April '92 is figure of May '92; June '91 till May ,92 is figure of June '92; etc.

6) Height of stock of every type of glass-product is not in accordance with requirements, minimum production quantity or risk.

7) The MPS gives figures for finished products. When the number of finished products is known, the number of materials which are required to produce the MPS figure, can be calculated. This is called an explosion of the MPS.
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It has been proposed to purchase all MRP materials from the explosion of the fixed production schedule (the FPS) and not the planned production schedule (the MPS). The consequence is that the Sales Department will have to send the MPS one week earlier, which will give the suppliers time to deliver the materials. In this situation MRPI gives order-suggestions for MRP materials. It checks materials on-hand, materials ordered and the materials reserved for production. The Purchasing Department makes the decisions to buy articles based on MRP order-suggestions or based on reorder levels.

To counter the increasing stock levels of glass and caps a pulling system is introduced. The production of glass and caps is dependant on real requirements of the Light Factory. In fact the Glass and Cap Factories replace the semi-finished products which have been removed from the storage by the Light factory. The result is an constant stock of glass and caps.

In a pure MRP II system the explosion of the MPS would be used to plan all orders with an FPS outcome. This FPS would be used for every process in the line. So there would also be a plan for glass/caps production, a plan for preliminary production steps and delivery plans for the Warehouse. The FPS is easy to make by hand. There are only 9 machine-units and the possible irregularities can be easily solved by deliberation. Therefore the MRPI is not required in this stage. In practice the planning of the other processes in the line will cause an extra burden for the Planning Department. In case there are disturbances, changes or delays in the production of lamps, materials from storage and from the other processes can easy accumulate on the production floor. To avoid such a situation, it is necessary to constantly issue new production and delivery plans. By using the pulling system the products are not pushed by planning but pulled by demand. In the current environment it is impossible to utilize a pure JIT model. Nearly all materials from abroad are purchased on estimated requirements because of the long delivery times. Local suppliers are not always able to deliver the required quality or within the required time.

The result is the Control Model as shown in figure 2.2 on the next page. Of course it is conceptual, therefore it does not describe the logistic system in detail. All details like the question which parts must be automated, which hardware and software must be used, which procedures are required etc. is part of another project (see annex D).

2.5 The Warehouse

It is repeated that the reason to discuss the activities of the Warehouse is the dissatisfaction of the Departments of the Plant with the services received from the Warehouse. The objective of this project is to bridge the gap between services given by the Warehouse and the needs and the expectations of the other Departments.

The organisational structure of Philips Ralin Surabaya is the following: The Plant is divided into departments. There are two Production Departments (the Glass and the Cap Factory are grouped into one department) and 7 supporting departments (see figure 1 annex D). These are the Secretary,
FIGURE 2.2: The Control Model of the Logistic System of Philips Ralin
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the Personnel Department, Accounting, Material Handling, Purchasing and Production Control (PPC), Plant Engineering \(^8\) and the Export Department \(^9\). PPC is responsible for the control of the logistic system, and therefore responsible for the inventory control. Material Handling is responsible for the distribution of all materials and products on the site of the Plant as well for the stocking and delivery of finished products to the harbour (for export) and to the distribution centre of the Sales Department near Surabaya. The stocking and distribution of materials and finished products is the task of the Warehouse as part of the Material Handling Department. Other functions executed by Material Handling are not directly related to this project.

With this set of activities the Warehouse is the central point of the flow of goods at the Plant. Figure 2.3 explains that the Warehouse is the intermediary department for all flow of goods from suppliers to the production departments, from the production departments to the clients and from one production department to another.

FIGURE 2.3: The Warehouse as the Central Point in the Flow of Goods

\[=\] DIRECTION OF THE FLOW GOODS ACCOMPANIED BY INFORMATION

\[\longrightarrow\] DIRECTION OF THE FLOW OF INFORMATION

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8) This department is responsible for all buildings on the site, the electricity generators, the company cars etc.

9) As mentioned before, the Plant, and not the Sales Department, is responsible for exports. Therefore the task of the (relatively new) Export Department is to control the order flow from foreign Philips companies and to put through demands for product-adaptations.
PLANT DESCRIPTION AND EVALUATION

All these flows cause mutations in stock levels. The Warehouse records these mutations and passes the information to PPC and Accounting. There are three stockcard administrations at the Plant. One at the Warehouse, one at PPC and one at Accounting. The task of Accounting is to check all transactions made at the Plant. Because it is not an active role, Accounting is not included in the figure. The warehouse also gives information about stock levels to the Export Department on an irregular basis. Based on the information from the Warehouse, PPC plans the production, orders materials at the suppliers, and confirms the planned deliveries to the Sales Department. Also the Export Department confirms planned deliveries and makes agreements with PPC and the production Department, based on information from the Warehouse.

The two most serious problems at the Warehouse are: the stocking of goods and the flow of information about mutations in stock levels. The quality of glass products and packing material which are stocked for a considerable time becomes inferior (below norms stated, for groups of articles, by the Quality Department). Reasons for the inferior quality can partly be found at the suppliers, the Glass Factory or PPC. However, within its own field of responsibilities, the Warehouse also has part in the problem. For one, the Warehouse does not utilize first-in first-out systems. There is no quality control during stocking and therefore the stock is not maintained. Because there also is no lay-out system, every received batch can be placed anywhere. In theory the Warehouse tries to keep every group of products together, but because of over-stocking, products are easily scattered over the various storages where there are empty spaces. The result is lost batches, which causes disturbances in the production or causes over-stocking because PPC places new orders. In this case it is clear that improper stocking of batches and the lack of quality control during stocking, influences the accuracy of stock level-information. But also the handling of information itself, is disturbed by delayed or incomplete recorded receipts. All these mistakes cause approximately 15 percent of the stockcards in the Warehouse to be incorrect. Most of the incorrect stockcards involve packing material (mainly because of loss) and glass products (mainly because of quality problems). Approximately 25 percent of the stockcards are different in stockcard administrations of either the Warehouse, PPC or Accounting. This difference is partly due to disturbances in the transfer of information, but also to different interpretations of products or mistakes in the departments of PPC and Accounting. The latter is not discussed in this report.

Many of the problems which are mentioned in the preceding paragraph, would be solved if the communication between the Warehouse and the other departments would function better. In the past, all parties tried to find solutions by discussing the problems, but because of different expectations the relations remained disturbed. In this situation it is very difficult for the Warehouse to anticipate on needs or wishes of the other Departments. This is especially difficult because the

---

10) Sometimes the Export Department is asked to deliver with urgency. That is only possible if the import-materials are already available. The Warehouse delivers the information.

11) The suppliers deliver in boxes of a poor quality, so they cannot be stocked for a long time without the large risk of deforming. Of course this is a problem that could be solved through discussion with PPC (PPC is in contact with the supplier). If there was not a major communication problem, that is discussed later in this paragraph. The production-level of some types of shells and tubes by the Glass Factory is far above consumption-level. This results in old stocks which cannot be consumed by the Light Factory in time. PPC has problems with controlling the stock, which results in a stock level that exceeds the capacity of the Warehouse.
capacity of the Warehouse to innovate is small due to the lack of knowledge about Warehouse systems and the lack of flexibility to change from an authoritative to a more participative management style. Although all parties recognize the necessity to participate, there still is a lot of friction.

Last point to mention is that the export increases rapidly, resulting in a larger workload for the Warehouse. Presently there are no special facilities for the handling of export activities, but in the near future the Warehouse will need these special facilities and also some organisational adaptions.

**TABLE 2.2: Problems and Consequences in the Warehouse**

<table>
<thead>
<tr>
<th>STOCKING</th>
<th>INFORMATION FLOW</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPERATIONAL LEVEL</td>
<td>OPERATIONAL LEVEL</td>
</tr>
<tr>
<td>PROBLEMS</td>
<td>CONSEQUENCES</td>
</tr>
<tr>
<td>1 No FIFO</td>
<td>2 No quality Control</td>
</tr>
<tr>
<td>1 Inferior quality</td>
<td>2 lost batches</td>
</tr>
<tr>
<td>3 lack of knowledge</td>
<td>4 lost batches</td>
</tr>
<tr>
<td>2 lost batches</td>
<td>25% of the stockcards</td>
</tr>
</tbody>
</table>

**MANAGEMENT LEVEL**

<table>
<thead>
<tr>
<th>PROBLEMS</th>
<th>CONSEQUENCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Disturbed Communication</td>
<td>Problems and reinforcements of management and operational level</td>
</tr>
<tr>
<td>2 Lack of Knowledge</td>
<td></td>
</tr>
<tr>
<td>3 Authorative management</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE 1:** The problems and the consequences are not unambiguous related. There is interference between the different problems and causes. In the figure the most serious relations are shown.

**NOTE 2:** The factor overstocking is shown in the table because it is a factor that can be influenced only through deliberation with PPC, and not through improvement-activities within the Warehouse. This does not mean that this is treated as a minor problem. In the cooperation with PPC this has been the subject of discussion. See the next chapter for more details.
3 DESIGN FOR IMPROVEMENTS AT THE WAREHOUSE

3.1 Introduction

Now the Plant has been analyzed and the most appropriate task has been selected, the solution is presented in this chapter. Solutions are not found in one specific area: the scope of the project covers the whole Warehouse-organisation and its problems occur in the whole field of working. The possibility to concentrate the Project on one specific area within the Warehouse is too limited. Therefore, the solutions are formulated for the whole area. Because the knowledge and technical system already available at the Warehouse are very limited, the technical and organisational improvements are kept uncomplicated. More complex systems will meet too many difficulties during implementation and maintenance, and therefore will not take root. The implementation of the Project will only be partly executed in the six months period in which assistance from the under-graduate is available. But the overall opinion is that on management level the will and pressure is significant enough to continue the Project. The Implementation will be discussed in the Chapter 4.

In the first paragraph the Framework is described. The needs of the clients of the Warehouse are the starting point for the description of the solution. From this point is worked to the four Tasks, three Logistic Tasks and a Management Task, of the Warehouse which are named below. This Framework is developed with the help of the information received from clients of the Warehouse and the findings from the Analysis Phase. With the Logistic Tasks it is possible to manage all the activities the Warehouse is executing, in a systematic way. It is also easy to transfer signals into actions in one of the Task-areas of the Warehouse. The monitoring of activities, picking up of signals and initiating actions is executed by the Management Task. The periodical results of the execution of the Tasks are evaluated by Performance Indicators. The Framework also involves a change in the organizational structure. Five of the storekeepers take responsibility for a package of materials throughout the complete flow, from receipt till delivery. This way it is easier to trace problems, and to solve these; the Warehouse organisation becomes more transparent.

In the second till the last paragraph every Task is discussed concerning the contents. Main issues of the improvements in the area of the Management Task is the creation of the ability to transform signals from the other departments into improvements and the development of performance-awareness at the Warehouse.

Main issue for the Information Task is to learn to handle the flow of information more accurate. This is done by centralizing the handling of information and by implementing a Periodical Physical Counting procedure that will be explicitly used as a training instrument.

The introduction of a Lay-out and FIFO-system for duplex and semi-finished products glass is the first main activity in the field of the Storage Task. Extra consideration is offered to the efforts that will be required to maintain the lay-outs. The second important activity is the creation of the ability to maintain the quality of the materials. Essential participant is the Quality Department.

The implementation of an distribution organisation for export-products and the proposed contribution the Warehouse can make to execute a Pulling System are the main issues of improvement-activities of the Distribution Task.
WAREHOUSE IMPROVEMENT PROJECT

In the text there are made references to the annexes D, E, F and G. In these annexes trade-off calculations, procedures or guidelines and designs are showed. These subjects are results from the chosen solutions described in this chapter.

3.2 The Framework

3.2.1 The Clients of the Warehouse and their Needs

The Warehouse is a service organisation. The first objective is to satisfy the needs of its clients. If the Warehouse did not, it would not even exist. In its effort to satisfy the clients, the Warehouse is capable of contributing to the success and therefore the profits and the continuity of Philips-Ralin.

In the existing organisation the Warehouse is serving the following clients:

1. Glass Factory;
2. Light Factory;
3. Export Department;
4. Purchasing and Production Control Department (PPC);

This row is already presented in figure 2.2 in the preceding chapter.

Although the Administration Department is involved in the improvements-activities, it is not mentioned in the row above, because it is not a key participant in the flow of goods. Also the Plant Management is not mentioned above. The Plant manager is not identified as a client but as the facilitator of the Warehouse. The Plant manager stipulates the budget, he must approve investments at the Warehouse and he evaluates the performance. So, the Plant manager is a very important participant in the project. Above all because the Plant manager is the initiator of the Logistic Improvement Project.

At the start of the Project the departments are interviewed and asked to give their actual demands and those in the next future. Their evaluations combined with the findings presented in the preceding chapter, give the results shown in table 3.1 on the next page. For the reasons explained above the Plant manager is also included.

It is eye catching that the problems seem to be concentrated in three areas (except from Plant-objective stipulated by the Plant manager).

1. Urgent problems with accuracy (and a less with the speed) of the information flow, for both Export Department and PPC.

In this case both departments have problems with the same materials: the Export Department asks information about materials, PPC is controlling. Therefore also the norms are the same. The high
# Design for Improvements at the Warehouse

**Table 3.1: Required Services and occurred Problems per Client**

<table>
<thead>
<tr>
<th>DEPARTMENTS</th>
<th>REQUIRED SERVICES</th>
<th>DIMENSIONS OF THE SERVICE</th>
<th>NORMS</th>
<th>URGENCY*</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLANT MANAGEMENT</td>
<td>contribution to a decrease of the stock level</td>
<td>interest on capital invested in stocks</td>
<td>budget 1991</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1a see norms made by PPC</td>
<td>1a 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1b next day</td>
<td>1b 1</td>
</tr>
<tr>
<td>EXPORT DEPT.</td>
<td>1 information about stock levels</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 storage and shipment of finished products for export</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1a accuracy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1b speed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2a damage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2b mix (types)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2c amounts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2d speed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PPC</td>
<td>1 information about stock levels</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1a accuracy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1b speed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2a -</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2b -</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GLASS FACTORY</td>
<td>1 Supply of materials</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1a quality</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1b amount</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1c speed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1d continuity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2a speed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2b continuity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LIGHT FACTORY</td>
<td>1 Supply of materials</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1a quality</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1b amount</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1c speed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1d continuity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2a speed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2b continuity</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* 0: is functioning well; 1: is a significant problem; 2: is an urgent problem

** Especially the reliability of the stock levels of the duplex packing materials is a problem. The administrated stock level of the other materials are more reliable and if not they do not give as much problems (duplex materials are A-class materials, most other not).

*** Especially duplex packing materials and SFP-glass have quality problems.

Stringent norms are not the cause of the problems. The accuracy-problems were already existing before the norms were stated (during the project) and are often of larger extend than one till five percent. For the Warehouse management, it is also dangerous to blame the norms instead of its performance. This attitude will only result in a problem-avoiding attitude in stead of problem-solving. Less strict norms would also require a higher stock level to cover the risk of insufficient materials in stock. A higher a stock level causes more capital costs, which conflicts with the objectives of the
Plant described in the first chapter and repeated in table 3.1. As already could be found in the preceding chapter, the revision of the information task will be necessary.

2 Urgent problems with the quality of products delivered to the Light Factory.

Because the Light Factory utilizes more volume and more different materials and because these materials are much more sensitive to careless storage and handling activities, the quality-problems with the products are only occurring at the Light Factory and not at the Glass Factory. The materials for the Light Factory require a range different treatments and different storage-system. Important is the knowledge of treatment-possibilities of every material. The exceeding of quality-norms causes immediately disturbances in the production-process and more waste. The Glass Factory utilizes raw materials like sand, glass waste and chemicals mostly packed in bags. Lengthy storage-periods and careless handling or storage do not or nearly not affect the product-quality of these materials. But dust escaping from damaged bags affects the quality of the materials for the Light Factory. Therefore, the problem seems to be a Warehouse-Light Factory, but it turns out to be a general storage-problem.

3 Urgent problems with the shipment of finished products for export.

This problem is very actual. Difficulties occurred lately, but indicate large problems in the future. The Warehouse cannot cope with the growth of the number of export-orders, therefore action is required.

Reading the described problems, it may be clear that local problem solving is not favourite. There is no fundamental problem solved by just building new racks to store the packing materials properly, when the Warehouse management is not capable of translating a local solution into solutions for other problems. The problems only will be solved if the Warehouse has the ability for local problem solving and also brings that ability into practice. The fundamental problem is that the Warehouse in these circumstances is not able to fulfil its function in the logistic system. So, the packing material issue, for example, is only a symptom, not the problem.

3.2.2 The Tasks of the Warehouse, their Objectives and Activities

The position of the Warehouse in the logistic system of the Philips Ralin is based on three tasks. These Logistic Tasks can be extracted from the client-information in table 3.1. The fourth task is the Management Task that will be discussed below. For every Task a specific objective can be formulated. Every Task contains activities that make the Task serve its objective. The objectives align all activities to reach a required performance. If an activity cannot be directed to one of these three objectives the activity does not fit in the set of Tasks the Warehouse is responsible for. So the objectives demarcate the field within the Warehouse is active. An example of an activity that belongs to the Task 'Information Supply' is 'updating stockcards'. An example for 'Physical Distribution' is 'supplying goods to Production from Supply List'.
DESIGN FOR IMPROVEMENTS AT THE WAREHOUSE

The activities which are executed to fulfill the Tasks must be coordinated and monitored. But they must also be able to meet the demands on the long term. An activity may change or even disappear due to improvement actions or on request of the client. An example of this is that some goods which used to be distributed from the Supply List\(^{12}\), are now distributed from a Picking List\(^{13}\). So adoptions to new situations and improvement activities must be initiated. This is ensured by the Management Task. Although build-in eyes and ears are a condition to fulfill a task as required, the Management Task is the most important instrument to maintain short and open channels to the clients. For that reason the Management Task is also a steer- and control-instrument by which the manager of the Warehouse monitors the Logistic Tasks. Also the organizational structure of the Warehouse is designed to keep the communication with the clients as effective as possible. This will be discussed in paragraph 3.2.5.

1 Management Task (Service Control and Service Improvement Control);
Objective: Keep the service of the warehouse on the agreed performance-levels;

2 Information Supply
Objective: Give information of the required accuracy on stock levels of all items at agreed moments in time;

3 Storage
Objective: Maintain the original product-quality and quantity until it is used by the client;

4 Physical Distribution
Objective: Receive, and deliver the right product, in the right quantity, to the right place, in the agreed time;

In the formulation of every objective is referred to requirements or agreements made between the Warehouse and the other departments. The extend in which the Warehouse is able to fulfill the Tasks, which means to which extend the Warehouse is able to meet the requirements and the agreements, is measured by the performance indicators.

3.2.3 Performance Indicators

The Tasks have one or more performance-indicators by which the actual performance is measured. For every performance indicator a norm is set. This norm is made through deliberation between the Warehouse and the client and already shown in table 3.1. The performance of the Warehouse can be

\(^{12}\) The Supply lists are written to administrate the deliveries of the warehouse to the other departments and are written in advance by PPC. PPC writes down the expected deliveries and the Warehouse corrects them with the real figures. The same reasons that are given for the Receiving Report in first footnote of this chapter (except the second) are also valid for the Supply Lists too.

\(^{13}\) The Picking List is issued by the Production Departments and are orders to the Warehouse to supply a certain amount of a certain material. The delivery must be executed within one hour (as described in table 3.1). The total amount of materials asked for by the a Production Department must not exceed the amount the PPC wrote down in the Supply List.
WAREHOUSE IMPROVEMENT PROJECT

evaluated by comparing the measured level with the norm. The participants may also set objectives to gain the norm stepwise. Especially at the start of the improvement-actions this may be a useful instrument. The improvement-actions indicate already that the norms are not fixed. Clients may get higher demands, which must lead to a higher performance level. Formulating new norms for the performance-indicators is part of the necessity of ongoing improvements.

The performance-indicator cannot cover the whole performance on all levels. Its goal is the gain a quick insight in the performance of a Task. Therefore the performance-indicator must be simple, undisputable and restricted in number. Important is that the key-services are covered.

During longer periods, also the performance-indicator itself may change. When the performance-indicators do not cover any longer the most important aspects of the services of the Warehouse, they need to be modified. This situation will appear when management's field of attention has changed, due to developing policies, improvements or changes of the clients' interests.

3.2.4 Procedures, Information and Files

There are activities which are written down into procedures. These procedures make the way of working fixed. Procedures reduce the chance of ambiguous situations and carelessness. This seems a very formal way of working but sometimes this is necessary. Some activities must be written down because they involve administrative changes and money. Other are written down to co-ordinate the distribution of activities and responsibilities among two or more departments. In the past much friction was caused by participation in a too informal way.

All the procedures will be put in files. Together with the other procedures those of the Warehouse are kept at a central place at the Plant. But there are also files at the Warehouse. In such a file the procedure and the information that is gathered by executing the procedure is kept. This information is used to measure performance and improvement activities. Every employee of the Warehouse can consult the files.

3.2.5 Organisation

The Warehouse manager, not the Material Handling manager, is in charge of the daily control and therefore is always present in one of the stores. Employees are assigned to services of certain products. Because that products are assigned to a certain store, the storekeepers are responsible for all storage and handling activities with the materials kept in that storage. So they are responsible for the total flow from unloading the truck till the delivery on the production floor. This means also that the employee in charge also has to arrange the signature of the Quality-controller on the Receiving
Design for Improvements at the Warehouse

Complaints or other remarks from the client always lead to one person in a certain storage. This is visualized in figure 3.1.

**FIGURE 3.1:** One storekeeper is responsible for the total traject of the materials in his storage

![Diagram of responsible warehouse employee](image)

This way the feedback is more effective and the possibilities for control and improvement actions are better. Every group of employees working at one store has a senior storekeeper. At the moment there is made an organisational distinction between the glass-store and the other activities. The organizational chart is depicted in figure 3.2

**FIGURE 3.2:** Organizational chart of the Warehouse

![Organizational chart](image)

The senior storekeeper is part of the team, he has not a special job, only an extra task. He has the final responsibility of the services of the materials located in 'his' store. This means responsibility for the storekeepers in all three shifts (see Distribution Task, paragraph 3.6). In line with this discussion

**14** Receiving Reports are made when the suppliers have delivered the purchased materials. The Reports are made for three reasons. Firstly to avoid division with the supplier about the quantity and types of the delivered materials and to avoid fraud. Secondly it is used by the Quality Department as documentation when it checks the materials before they are stocked. Thirdly the report is used at the three administration to update the stock levels.
the administration Task will be centralized, so the information flow can be better controlled (see Information Supply Task, paragraph 3.4).

3.2.6 From Framework to improvement-activities

In the table 3.1 the problems of clients were marked and explained further in that paragraph. There was concluded that on the long term only fundamental revision of the services of the Warehouse could solve the problems. At last the Tasks were described in which the improvement-activities could take place.

On the next page table 3.2 is shown. In this table, a numerus of factors are shown, which stipulate the actions taken in the Warehouse Improvement Project. The findings from table 2.2 and 3.1 are combined with the current activities executed in the Warehouse. Dependent of the occurred problems and needs, new or improved activities and procedures can be formulated. By successfully implementing these activities, the Warehouse will create a new situation in which the performance services are within the norms stated in table 3.1. In table 3.2 is also stated how the performance can be checked with the norms. Note that every Task has a communication channel with the clients. Through this channel new improvements are initiated, guided and evaluated. All the new and improved activities will be described in the paragraphs 3.3 till 3.6 below the Task they fit in.

3.2.7 Costs of the Warehouse Improvement Project

Because the investments will be little, no detailed investment-calculations have been made. For that reason the investments will be pointed out and given account for briefly.

The Investments of the Warehouse Improvement Project have to be paid back from the savings realized by the implemented improvements. Because the Warehouse Improvement Project is part of the Logistic Improvement Project and in fact realizes the conditions required for a successful implementation, savings of the Warehouse Improvement Project are difficult to isolate from the other.

It is possible to calculate the decrease in the stock level that will be necessary to pay back the initial investments of the project within one year. The figure is one percent, and will certainly be matched by the Warehouse Improvement Project alone.

The investment-figures are given on the next page (in Rupiahs).
DESIGN FOR IMPROVEMENTS AT THE WAREHOUSE

accommodation and daily expenses student: 7,200,000
distribution organisation: facility: 4,000,000
hand-forklift: 8,300,000
central information office: 1,500,000
lay-out glass-store 1,000,000
lay-outs other stores 1,000,000
racks for duplex packing materials 1,500,000 +

24,500,000

The figures are including overtime made by the employees of the Warehouse. Note that for the three shifts service two extra people must be hired. Total costs: 400,000 Rupiahs per month.

It is also possible to investigate the savings of the improvements for the Warehouse itself (distributing the expenses made for the student equally among the improvement-actions). The expenses for the lay-outs (except for the glass-store) and the racks for duplex are paid back by the savings from a decrease of the exceeded budgets for obsolete factory stocks and sundry expenses which must be at least five percent.

At the glass store three daily workers have been hired to clean the old glass with chemicals so it can be utilized by the Light Factory. The glass is not as strong anymore as un-cleaned glass so it causes more waste. The daily who workers cost approximately 250,000, per month and will not be necessarily anymore after the improvements at the glass-store are implemented. The result will be a saving of 500,000 Rupiahs per month. The total amount of 3,700,000 (including 1,200,000 for student-expenses) will be earned back within 8 months.

The construction of the central information office is necessaria to be able to work with a PC-workstation in the near future. The building is only accelerated. Without the office dust will damage the computer. So these costs are caused by decisions made in the Logistic Improvement Project. If these costs must paid back by the Warehouse, the savings must come from a decrease of the total stock level because less mistakes will be made.

The investments for setting up the Distribution Organisation for export products are the highest of the project. This is mainly caused by the purchase of a new hand-forklift. This purchase is necessaria because the two available forklift trucks at the Warehouse are utilized all day already. To be able to handle the growing number of export products an extra forklift is required. The same reason is valid for the other facilities. These investments are minimal investments and required to ensure the growth of the export of finished products to other Philips companies. At least, the implementation will prevent the Plant for more high extra costs because of wrong shipments.

The night-shift is an extra service. Although the high extra costs for overtime will decrease, this service is not paid back by daily routine but is considered to be necessarily by the Light Factory management.
3.3 Management Task: Service and Service Improvement Control (Task One)

3.3.1 Objectives

In the Framework the objective for the Management Task is described as below:

Keep the service of the Warehouse on the agreed levels.

For keeping this goal, the Warehouse organisation (the execution as well as the management activities) need characteristics that are not sufficient expressed.

Improvement of these characteristics is the spine of the design. These characteristics are:

1. Dynamics
2. Performance Awareness
3. Accuracy of Working
4. Prevention

To fulfill the always changing needs of its clients, Philips has to adapt its products and services to maintain its position in the market. This has also consequences for Philips Ralin Surabaya. The consequences are already expressed in chapter 2. In general this results in a demand for a better performance. The same as is happening within Philips Ralin is happening within the Plant. Also the departments within the Plant must perform better and develop their services to new standards. One of the departments is the Warehouse, so also the Warehouse must keep up with the new standards. When it does not it curbs the progress of the whole Plant. A basic task of a manager is to pick up signals from other departments and developments in its field. With that outward look, the manager must be capable of selecting the opportunities and transforming these into improvements. The speed of these improvements must be dependent on the urgency. Most of the time, there is a need to act fast. Only in this way the department is able to keep up with the dynamic environment.

Setting clear objectives makes it easier to concentrate efforts and monitor improvements. For the employees it is more obvious which subjects are important. They are better motivated, not in the last place because the results are good visible. But the Warehouse lacks two basic conditions to practice this limited form of Management by Objectives. The employees must know their performance and they must not estimate their performance higher than the clients do. Without the awareness of their own performance, the employees are not likely to put much efforts into improvement programmes. To be able to transform objectives into results, the Material Handling manager must introduce performance indicators so performance can be measured. He must let the employees know the results and will initiate follow-ups. Secondly, the manager must convince the employees of the importance of performance-level and thirdly that performance is in fact the only thing that counts for a client of Philips-Ralin, and therefore also for the clients of Warehouse at the Plant.

If the performance-awareness is better, also the accuracy will be better. These two characteristics are influencing each other. It is also an attitude that must be developed. If the link between
DESIGN FOR IMPROVEMENTS AT THE WAREHOUSE

Performance and accuracy may be not very obvious in some situations, they must be explained. Especially closer monitoring is necessary. Above all, the manager must give the good example.

Prevention is a characteristic that needs a lot of attention at the Warehouse as well on management as on operational level. Long term effects are not assessed high enough, so there is not enough time and money invested to prevent future losses. Again the manager must be aware of the fact that these investments in maintenance are necessary and pass this knowledge on to the employees. Only having the knowledge the employees will be eager to put efforts into prevention.

3.3.2 Activities

Service Activities:

1. Find the needs and the requirements from the clients (Steering Meetings);
2. Keep service on the required levels (Quarterly Management Report);

Supporting Activities:

3. Checking current performance ratio’s;
4. Setting up and monitoring improvement actions;
5. Giving training.

The Material Handling manager is responsible for the performance of the Warehouse to its clients. His task is to communicate with the other departments on a regular basis, to evaluate performance, to set goals and to initiate improvement actions including training if necessary. All the activities mentioned above are already practised in the Warehouse, except for the third and the fourth. The improvements of the Management Task are focused on making the setting up, the execution and the monitoring of the improvement-activities of the logistic tasks more systematically.

3.3.3 Improvements

Every three months the Warehouse manager writes a report of the findings and actions in the past and in the next future. This activity has three objectives

1. Guideline for management actions in the next period;
2. Restore trust and contacts between the Warehouse and its clients;
3. Instrument for monitoring and assistance by the Plant management.

The report is called the Quarterly Management Report the performance Indicator for the Management Task and is further explained below (see for report annex F).
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To be able to write the reports the manager must organise Steering Meetings with the other departments. In this meetings the status quo can be evaluated and the situation in the future can be discussed. In these meetings minutes are taken down and distributed among the participants. Fixed subjects of the minutes are the evaluation of the last period (with the help of the Performance Indicators), follow ups, participation between the departments in the follow ups and the date and time for the next meeting. The reason to organize these meetings is to normalize the relations between Material Handling and the other departments and to guarantee continuity. By formalising the communication, its frequency will be less dependent on personal factors. Also differences of opinion with regards to distribution of responsibilities are less because all agreements are written down in the minutes.(See for procedure annex F).

The Performance indicators will be displayed in the main-storage, so the employees will be confronted with their own performance and more important, with the results of their own improvement-efforts.

3.3.4 Performance Indicator

The Quarterly Management Report contains the following subjects
1 Results of performance indicators;
2 Evaluation of the services of the Warehouse by the other departments;
3 Client requirements for the new period;
4 Improvement actions with goals and cooperation;
5 Results of the latest improvement actions.

This report will be handed over to, and discussed with, the Plant manager.
3.4 Information Supply (Task Two)

3.4.1 Objectives

In the Framework the objective is formulated like this:

Give accurate information on stock levels of all items with a required accuracy at agreed moments in time.

The Information Task includes administration work. A internal goal for this task is the limitation of the amount of administration work. The main reason to set the goal is not to free time for other work, but to decrease the amount of mistakes that are made. The Pulling System is a system that gives less administration work without losing control. The Pulling System is described in the Distribution Task. Another way to limit the administration work is to install computers and do it paperless. Most of the time, this avoids double and manual calculation work, which is a source of mistakes.

When the situation at the Warehouse will become more complex, automation may be a good alternative. At the moment it is not recommended for two reasons. Before the employees will be able to work with a computer-system, they must be able to master the current information system. Computers require more accuracy than the Warehouse has given evidence of. Secondly there is an automating project started up at PPC. It is considered better to concentrate automation-efforts on this project. The small scale approach has the advantage of surveyability, so monitoring and training is easier and mistakes can be found and corrected faster. Dependent on the results of the project at PPC, the Improvements made at the Warehouse in the next future and the expected workload, decisions will be made about one or two workstations at the Warehouse. *(For information about the automating project at PPC see annex D.)*

3.4.2 Activities

Service Activities:

1. Send receiving reports and supply lists to PPC and Administration (centralized);
2. Update and correct stock cards (centralized);
3. Execute Slow Moving Goods Check;
4. Check availability of materials from supply list;

Supporting Activities:


The first two activities themselves do not change much, but they will be centralized. This will be explained below together with the third and the fifth activities which are new.
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The activity 'checking availability of materials from supply list', is done by the Warehouse manager. In principle it can be done by the administrator. But in this way this is an activity that keeps the Warehouse manager in control of the work done in the Warehouse. This activity functions an extra physical check because PPC has already checked the stock levels in its stockcard-administration. The activity will be not necessary if the stockcards would be accurate. This will be the case in the next future if the improvements made in this project will be successfully implemented.

3.4.3 Improvements

The stock level of raw materials for the Glass Factory is controlled by Material Handling. This has rather a historical than a rational reason. Because PPC is responsible for the total stock level at the Plant it is better to move this activity to PPC.

Also the administration of the stock levels at the Warehouse is divided into two systems. One for semi-finished products glass and raw materials for the Glass factory and one for the other materials. For purposes of control it is better to have all information about stock levels in one system. This can be a manual system (stockcards like now) or a computer system (as will be introduced at PPC). Still the data can be entered at one or two places. The favourite solution is to establish one central office in the main-store. Here all information on stock levels is gathered and put in the stock cards. The office will be occupied by one person. This person will be responsible for all the handling of information. All the feedback from PPC and Administration can be directed to one person, the person in charge. This makes communication and control more efficient and effective.

Another, very practical reason to centralize the info handling, is the intention to introduce a computer workstation at the warehouse in the future. As already mentioned above, it is new to use a computer system for stockcard administration. Because the lack of experience, the implementation requires strong monitoring. Alike the situation at PPC, centralization means that less people have to be trained, so the most appropriate persons can be chosen. The efforts spend monitoring is also less (more feasible). On the long term, management can always decide to add a remote work station, although it has implications for the organisation of the information supply. (See for guidelines annex F). In line with the centralization of the information supply, the Material Handling Department better hands over the stock level-control task of raw materials glass to PPC.

At the moment a third stockcard-administration is emerging at the Export Organisation. This stockcard-administration is not included in the centralization. This (small) stock is controlled differently and therefore it is not put in the computer-system PPC is working on. On the middle-long term here a remote work station could be introduced for inserting stock-figures. In figure 3.3 on the next page the old and new organization of the information supply and distribution of stock control-tasks are displayed underneath each other.

An other activity is the Slow Moving Goods Check, asked for by PPC. The Warehouse gives figures about materials which were not used in the last period. When the computer system at PPC is implemented it can also give this information. At the moment this feature is not utilized so PPC is
depended on the Warehouse for its information. As long as this is the case the Warehouse will execute the procedure. *(For the procedure and the report see annex F.)*

The Periodical Physical Counting is an instrument to correct mistakes made in the past and part of the accounting-task of the Administration Department. The Counting used to be executed incidently and in an informal way, but the results where both qualitatively and quantitatively unsatisfying. Therefore, a procedure will be introduced to make the Counting a formal task of the Warehouse and Administration. The Counting is also used as a training instrument. The counters will not only check and write down the stock levels, they also will search for the causes of the large mistakes and will formulate solutions or actions to avoid the same mistakes in the future. Because the standard form they use is handed over to the managers of PPC, Material Handling and Administration within one week, the managers keep control.

FIGURE 3.3: The old (above) and the new (below) organisation of information supply and distribution of tasks regarding stockcard administration and stock control

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RM = Raw Materials  SFP = Semi Finished Products  FP = Finished Products
Initially, the stockcard administrator of PPC was involved. This was done to give the Counting, the largest effect as a training-instrument. But because the time of the administrator at PPC was totally consumed by the computer project and the Administration Department had to be involved anyway (periodically checking the physical stock levels is a formal task), the second option was to be implemented. *(See for the procedure and reports annex F.)*

3.4.4 Performance Indicator

The results from the Periodical Physical Counting (percentage of items for which differences between the stock cards and the physical stock are within the norm) are put in a figure.
3.5 Storage (Task Three)

3.5.1 Objectives

In the framework the goal is described like this:

Maintain the original product quality and quantity until the product is used by the client.

This objective is one of the most challenging of the Warehouse. At operational level the most causes of problems can be found in this field. On the other side, successful improvements in this field will create most effective results. So successful implementation of the improvement-activities described below will prove the ability of the Warehouse employees to change. Success on the long term is largely dependent on the Warehouse and Material Handling managers. Especially the Material Handling manager must be capable of initiating and monitoring maintenance of the systems.

3.5.2 Activities

Service Activities

1 Preventing damage, deterioration and loss

Supporting Activities:

2 Consultation meetings with Quality Department
3 Checking product quality;
4 Maintain lay-out and FIFO system (expanded with semi-finished products glass and duplex packing material).

The first, second and third activities are not yet executed by the Warehouse. This causes for a large part of the quality problems with the packing and other materials. The main causes are the lack of knowledge about the materials, possible solutions and accuracy. The execution of the lay-out is limited to only a small number of articles. The FIFO-system is only executed for coils. The lay-out system will be introduced for all materials and the FIFO-system only for semi-finished products glass and duplex packing material.

3.5.3 Improvements

Maintaining the original product quality (or preventing damage, deterioration or loss) is the responsibility of the Warehouse manager and the Material Handling manager. They get input from meetings with the Light Factory (see Management Task: Steering Meetings) and Quality Department, and from checks in the stores. The meetings with Quality Department are treated differently from the other meetings. These meeting have another character because they do not give information to
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steer, but to assist the quality maintenance of the inventory. In the meetings with Quality Department, the Warehouse can ask the Quality Department for information or assistance. In such a meeting decisions are made about actions to solve occurred or expected problems. Essential is that this transfer of information is effective. It is the task of the Material Handling manager to make sure that all employees of the Warehouse have picked up the information and also utilize it. Out of this information they have to generate the ability to solve their quality problems. The Consulting Meetings have a fixed agenda and minutes are taken down.

Through cooperation, the Quality Department can pass on knowledge to the employees on a continuously basis. Still, the Material Handling manager must initiate the meetings and show eagerness to have the information provided. Again it is done in a formal way because it is easier to communicate in a formal way with agreements made on paper than in the informal way. The informal way is practised in the past, and only caused friction. (See for procedure and minutes annex F).

All the gathered information will be saved methodically in a file, so it can be used as a source for future preventive maintenance. This information is also input for the lay-out.

By daily checking in the storages the two managers keep in control of the condition of the inventory. So also the Material Handling manager must check frequently. He will develop the insight in quality problems to be able to communicate with other departments about this kind of problems, to train his people in using the information and consulting the file when it is necessarily. If the Material Handling manager thinks it is required (in deliberation with the clients or the Warehouse manager or other employees of the Warehouse), he decides to take actions.

It is the task of the Material Handling manager to develop broad lay-outs for the storages. In the lay-outs is written down in which storages the articles are located. On this level is decided if additional space or racks will be required. The lay-outs will only need updating when significant changes occur, or after a longer period. It is the task of the Warehouse manager to fill in the details (see for the guidelines annex F). The lay-out for semi-finished-products glass is already made. The other lay-outs will be designed by the Material Handling manager alone (see the Implementation Phase, chapter 4).

The detailed versions of the lay-outs are changing frequently. Most of the time these are little adjustments (e.g. space for a new material). Most of the time the adjustments are made by the storekeepers in the daily routine, but the Warehouse manager keeps the responsibility. In every storage-office a board with the lay out of that storage hangs on the wall. In the lay-out, the areas, in which product-families are stored, are depicted. From this board the storekeepers and other employee (for example the Counter from Administration) can locate the product-family they are looking for.

The FIFO system is not demanded for every product. Depending on the standards set by the Quality Department the Material Handling manager decides to utilize a FIFO-system for a certain product or not. At the moment a FIFO-system is required for coil (already realised by the store itself), duplex boxes, sleeves (which are kinds of packing material) and semi-finished-products glass. (See for designs of the duplex-material-store and the glass-store annex G.)
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In the storages every batch that is stored is identified by a card. On the card the name of the products, the product-code and a possible remark are written down. The card has a colour that refers to the month the batch arrived at the Warehouse. An extra feature of the card is the part of the card that can be ripped off. The colour of the month makes the utilisation of a FIFO system possible. The part that can be ripped off can be used to make the maintenance of the FIFO system easier. This feature is especially useful cannot be put next to each other.

The advantage of using the cards is that the FIFO system can be used without any extra activity. The batches must have a card attached anyway, otherwise they cannot be identified. Another advantage is that there is always insight in the stratification of the items in the Warehouse. Recommended is to use at least one general rule: if a product is stored for more than six months PPC will be informed\(^\text{16}\). This is a rule of good housekeeping. It prevents a stock from getting very old, and assures periodically updating of the lay-out. It also prevents the Warehouse-employees from 'forgetting' batches. The cards also make the Slow Moving Stock Check easier. If the six-months period is the maximum, the Warehouse will need six colours for the cards.

The employees who are assigned to a certain store are responsible for maintaining the lay-out and the FIFO-system and the storage of materials according to the requirements \(\textit{see paragraph 3.2.6}\).

3.5.4 Performance Indicator

The Indicator is the total of the costs caused by damage appeared in the store, during handling, and from reject-bons from the Production Department of the Light Factory\(^\text{17}\). Administration keeps a record. The budget stipulates the norm. The information will be available every three months.

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\(^{16}\) According to the policy of PPC, only materials which are utilized frequently are purchased with a re-order system. Other materials are purchased with a MRP-system, so will only be at the store a short period before they are delivered to the Light Factory (Glass Factory only utilize standard materials). If a certain material is at the Warehouse longer than six months this indicates an irregularity.

\(^{17}\) If the Production Department of the Light Factory receives materials that cause or is considered to cause more loss or machine stops than usual, the Production Department asks Quality Department to check the quality. If the quality does not come up to the standards it is rejected and is accompanied with a 'reject-bon' send back to the Warehouse.
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3.6 Distribution (Task Four)

3.6.1 Objectives

Receive, and deliver the right product, in the right quantity, to the right place, in the required time.

The distribution to the clients of the Plant and to the clients of the Warehouse Department (the other departments) can be covered with same objective, because these are not fundamentally different activities. In practice, the execution is very different and therefore these will be looked upon as completely different activities. Both have an own Performance-Indicator

3.6.2 Activities

Service Activities:

1 Receipts of raw materials from outside supplier;
2 Delivery of raw materials to production units in the Light and Glass Factory;
3 Production control of caps and glass with the pulling system;
4 Delivery of finished products to Distribution Centre in Rungkut;
5 Delivery of finished products for export to the harbour;

Supporting Activities

6 Prepare re-use of boxes18.

The first, second, fourth and sixth activities do not change except from the better distribution of responsibilities and little administrative adaptions. The deliveries of most raw materials to the Light Factory and Glass Factory are already controlled by a pulling system (the picking list or self service), so this situation will not change. The sixth activity seems a very insignificant activity, but it involves nearly a full time job. This workload will decrease when the pulling system succeeds. The third activity is new, the fifth is radical adapted to new requirements. The third activity seems to be out of place here, but it is not. The production control by a pulling system has a large impact on the Distribution Task of the Warehouse. Because the Warehouse wants to give an active contribution to a better control of the stock levels, the pulling system receives extra attention in the investigation.

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18 All activities speak for them self except 'Prepare re-use of boxes'. One man in the store receives empty boxes from the Light factory. This boxes used to contain SFP's which are utilised by the Production Department. The Warehouse employee checks the boxes for damages and removes the attached tape. He selects the boxes which can be used again and stores them in a storage.
3.6.3 Improvements

By using picking lists or self service, only the distribution of materials from the storages to the Production Department is controlled. The purpose of using this technique is to avoid materials from accumulating in the Production Departments, when the production is beyond planning. But the materials do not stop accumulating, they accumulate in the storages. By using the Pulling System the inventory level is controlled by controlling the output of production. So, when Light Factory does not need a certain type of shell (for example because of an unexpected change in the planning) the Warehouse stops delivering that type of shell to the Production Department and the Glass Factory stops delivering that type of shell to the Warehouse, and consequently stops producing it.

This simple fact demands an other way for management of the Glass and Cap factory. Now, the objective is to produce as efficient as possible, but as alike as the demand as possible. All the over-production has a negative effect on the result of the Glass and Cap Factory. It is already calculated that it will be more profitable for the factory to produce on requirements for both factories, rather than to produce on stock (see for trade-offs annex E).

The pulling system cannot be compared with weekly or even daily plans. It takes hours to make plans, to discuss and to issue. All this overhead is sensitive to mistakes. The Pulling System is controlled by the input of the Light Factory and therefore does not need the overhead. The loop of executing, checking and correcting is passed trough much closer to the operational level with the interference of less people. This makes the chance to make mistakes low.

The Cap Factory makes only one type of cap, therefore the introduction of a Pulling System is simple. The only thing the employees of the Cap Factory must do, is filling the empty boxes which have been put down before the cap-machines by the Warehouse. The only task of the Warehouse is to swap empty boxes in the Light Factory for full ones from the Cap Factory. The empty boxes are the signals for the Cap Factory to produce new caps. (See for guideline annex F and for design annex G.)

At the Glass Factory the situation is more complicated, because the production of semi-finished products is not limited to one type. Although the Glass Factory cannot produce the shells and tubes one after another, how more accurate the Glass Factory can follow the demands of the Light Factory, the better. The better the Glass Factory can follow the demands, the less the stock level will fluctuate, and therefore the less safety-stock will be required. The fluctuation of the stock level is less. Another advantage of the Pulling System is the possibility to have direct feedback from the Light Factory to the Glass Factory. Shells (except E60) can be made on daily requirements. Tubes not (yet). The need for handling capacity will not be significant more. The only condition is that the Glass Factory must know the daily planning for shells. Tubes go to the Light Factory via the glass-storage. All the glass production that flows via the glass-storage is controlled by a single card kanban system. The minimum and maximum stock levels in the glass-store are determined by PPC. The Glass Factory is responsible for the stock level. Performance is measured on stock level fluctuations and direct deliveries. The deliveries via the store can be implemented at once. The direct deliveries first
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need extra investigation and co-ordination before the feasibility will be certain. The activities to realize these deliveries are not within the scope of this project.

A single card kanban system is used to control the stock level. A double card system is more complex and designed to control work in process. At the Plant, this is not the issue. For production on schedule the single card is more useful. The handling of the semi-finished-products which are purchased does not change. (See for guideline annex F and for design annex G.)

The Information about organizational arrangements according to the handling and deliveries of export products are still foggy. The outcome depends on the results of the computer project at PPC and decisions made at the IMPEX (IMPort-EXport) Department in Jakarta. As long as the results are not clear it is recommended to keep the organisation the same as usual (except the arrangement of the transporter). So PPC will still be in charge of the order-handling with the IMPEX department and the Material Handling manager makes the agreements with the transporter. In the past this job informally used to be divided between the Export manager, who arranged the shipment and the Material Handling manager, who used to arrange the transport to the harbour.

At the moment the average number of export-orders is one per week, and in general every order fills one container. Every order is specific (no commonality). Orders are shipped approximately two weeks after completion of production. Therefore the number of orders of which products are kept in storage at the same moment is limited. The production-amount always exceeds the amount to fulfill order. These extra products must also be stored, and must wait till an identical order, in casu an order of the same customer, will be produced. For the next year the target for export department is 2 orders (two containers) a week.

The export-storage is designed to store the products per order. For this purpose separate sections are designed. When an order is to be produced, the store receives an Ordercard from the Export Department, on which all products and amounts are printed. One section is assigned to the order. With the Ordercard the fulfillment of the order is controlled. In the past the products of different orders got mixed up, which irritated clients and with high extra expenses to undo the mistakes as a result. The chance of mixing up orders using separated sections is nihil. (See for procedure annex F).

Although at the total space available for storage is limited, it is recommended to use the whole storage near the Packing Department for export products. Mistakes made in this stage cannot be corrected any more before shipment is received by the client. The clients, who have obligations to distributors, are very sensitive for this kind of mistakes. So mistakes made in the last link of the logistic system of Philips Ralin have a large impact on the performance and therefore the reputation of the Plant as a reliable international production centre. To be sure the steep increase in growth of export can be continued a 100 percent reliability is required. (See for procedure annex G).

By making an agreement with Export Department the products can be shipped immediately after the orders are completed instead of waiting two weeks in the storage. This cuts the delivery time with one till two weeks and therefore expands the capacity of the Export-storage.
Light Factory requires also service at night. This means that the one and a half shift organisation must go to a three shifts service. This is possible without much difficulties. Two extra storekeepers will be required. (*For 3 shifts see annex G.*)

3.6.4 Performance Indicator

For the distribution of goods to destinations on the site:
Number of times a delivery arrives at the production floor too late. The number is counted by production departments of the Glass and Light Factories

For distribution of export goods:
Number of times a remark from the client is received by the Export Department about receipts of wrong amount of products.
4 IMPLEMENTATION

1.1 Introduction

The Implementation-phase is a critical phase in the project, because improvements become only effective after a successful implementation. Therefore preparations are made to organise the implementation as good as possible. But the most important factor still is the willingness and the ability of the Plant, and with regard to this project in particular the Warehouse, to change. In the first paragraph the factors which influenced the implementation-strategy are explained.

Given is a table with an overview of all the improvement-actions and when they will be implemented. In the third paragraph the implementation-organisation is described. The Implementation Phase is evaluated in the last chapter. The costs of the project were already discussed in the preceding chapter.

1.2 Determination of Sequence of Implementation of Improvements

At Philips Ralin an implementation in phases was chosen, which started before the complete design have been finished. This strategy is possible, because most of the activities can be implemented independently, although there are cross-over influences. For example, it is possible to implement the Periodical Physical Counting first, but as long as there is no action taken to relocate all materials, the counting cannot function with the optimum effect. The reasons to implement in phases are the following:

1. More time for obtaining experience. This is important for both the Material Handling manager and the assisting student. By first implementing a limited number of activities, mistakes can be corrected easier and avoided in the future. The result is a small learning curve.

2. More time for assisting the implementation. When the implementation is started earlier, the total time reserved for this phase becomes longer. Because the student can only stay for a limited period of six months this is an advantage. The risk of this strategy is that the implementation-activities consume too much time, slowing down the design-activities.

3. Faster results of urgent improvements. Some improvements are needed urgently. They can get priority and be implemented before the other design-phase is completed.

The implementation-phases take about four weeks time each (one month on the calender used at Philips Electronics). Because the phases are short and of standard length, there is a clear overview of the projects which are going. Also the results are quickly visible. For the employees at the Warehouse, who are not used to this fast changing situation and are involved in more improvement-actions at the same time, it is an advantage. At the end of the month an evaluation is organized with all the participants for every improvement-activity. The results will be discussed and the action may get a follow up, if necessary. Around this time, the employees are to be informed about the next phases of the implementation.
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The actual choice which improvements will be implemented first, depends on the following reasons:

1 Practical sequence. Some improvements have to be implemented after others, otherwise they do not work.

2 Complexity. With regard to the learning curve, complicated improvements are not implemented in an early stage. On the other hand, projects that require a lot of assistance to be implemented successfully, must be started up early enough in the six month period the student is still available.

3 Urgency. This speaks for itself, although not every participant values the urgency of an improvement action the same.

4 Within the Logistic Improvement Project some improvements have been given higher priority. The Warehouse Improvement Project must tune in its sequence to the sequence of the other project.

In the table on the next page, the new and improved activities shown in table 3.2 are shown again in the sequential order of implementation. The schedule is the result of the considerations described above and made by mutual agreement between the Plant manager the Material Handling manager and the student. (For detailed plans of November, December and January see annex H.)

Implementation-schedules are not necessary for executing activities 5 till 8 and 10. Activity 5 must be executed to be able to fill in the Quarterly Management Report, activities 7 and 8 are integrated in the follow-ups from the Consulting Meetings with Quality Department and reflect an attitude rather than an activity. Activity 6 is the activity that keeps the project going and in more improvements in the future. Also this activity is controlled by the Quarterly Management Report. For activity 10 an implementation-schedule is just a little overdone. The absence of implementation-schedules does not mean that the activities are executed with optimal effect from the start. For example, when the Consulting Meetings with Quality Department give results, the checking of product-quality will become easier and therefore better.

At the end of the project not all the procedures will have been written down. For the Information Supply procedures, preparations will be made, but how the procedures for the information supply will look like in detail depends on decisions that will be made by the Logistic Improvement Project-Team. The procedures of the Pulling System SFP glass will not be made because the implementation is delayed. The reason is that the Plant manager first wants to experience with the existing planning system, now better agreements between the Glass Factory and PPC have been made about maximal and minimal stock levels.

Activity 20 is discussed but formal implementation will formally be executed for the Information supply and the Distribution Organisation for finished products export. For SFP glass the responsibility used to be arranged already. For the SFP caps and the other materials the responsibilities will be
arranged informally. Little management attention must be given in the future, especially to the process of given the employees more self-responsibility, a long-term training effort.

**TABLE 4.1: Sequential order of implementation-actions of new or improved activities**

<table>
<thead>
<tr>
<th>ACTIVITIES</th>
<th>OCT</th>
<th>NOV</th>
<th>DEC</th>
<th>JAN</th>
<th>NOT YET PLANNED</th>
<th>PROCEDURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Set up of Steering Meetings;</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>2 Periodical Physical Counting;</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Consulting Meetings with Quality Dept;</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Pulling System (handling-system caps).</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Checking current performance ratio’s;</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
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<td>in QMReport*</td>
</tr>
<tr>
<td>6 Setting up and monitoring improvement actions;</td>
<td>x</td>
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<tr>
<td>7 Preventing damage, deterioration and loss;</td>
<td>x</td>
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<tr>
<td>8 Checking product quality;</td>
<td></td>
<td>x</td>
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<tr>
<td>9 Centralization of info-supply;</td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td>preparation</td>
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<tr>
<td>10 Execute Slow Moving Goods Check.</td>
<td>x</td>
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<tr>
<td>11 Physical Distribution Organisation;</td>
<td>x</td>
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<tr>
<td>12 Lay-out duplex packing materials;</td>
<td>x</td>
<td></td>
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<tr>
<td>13 Lay-out and FIFO SFP glass.</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td>guideline</td>
<td></td>
</tr>
<tr>
<td>14 Quarterly Management Report;</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
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<tr>
<td>15 lay-out for all materials in main -store;</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td>guideline</td>
<td></td>
</tr>
<tr>
<td>16 Three shifts service (preparations)</td>
<td>x</td>
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<td></td>
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</tr>
<tr>
<td>17 Three shifts service (execution);</td>
<td></td>
<td></td>
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<td>x</td>
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<tr>
<td>18 Pulling System (production control caps).</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td>guideline</td>
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</tr>
<tr>
<td>19 Lay-out for other stores.</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
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<tr>
<td>20 Distribution of responsibilities.</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21 Pulling System SFP caps</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td>preparation</td>
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</tr>
</tbody>
</table>

* In Quarterly Management Report: manager must check the performance indicators to be able to fill in the Quarterly Management Report.

The actions taken in October mainly involve the Material Handling manager himself. The objective is first to re-establish communication between the Warehouse and its clients, because they are needed to make the implementation of the other improvements successful. There are two exceptions: the SFP caps handling system and the Periodical Physical Counting. The first is introduced early in the project for three reasons: It is very simple to implement and involves a part of the Warehouse employees into the project in is an first phase and it an exercise for the introduction of the Pulling System for SFP caps in January. The Physical Counting is introduced in such an early stage, because of its urgency. The Counting must work before the first computers are installed in December (with regard to the Logistic Improvement Project).
WAREHOUSE IMPROVEMENT PROJECT

November is the last month the student will be available for assistance. Therefore those implementation-actions are planned, which will need the assistance the most. Although both the Plant manager and the student want to implement the Quarterly management Report in November, this is not possible and therefore delayed till December.

The making of the lay-outs for the stores is distributed over three months for reasons given in the preceding paragraph. With the support of the Logistic consultant in December and the Plant manager in January, the Material Handling manager will complete the Warehouse Improvement Project.

4.3 Organizational Arrangements for the Implementation Phase

Because the improvement-actions are small scale and mostly limited to changes in the Warehouse, the set-up of a complex organisation is not necessary. A small project-team is set up with the Material Handling manager and the student as members. The student will assist the Material manager who will implement the improvement-actions and who is also responsible. The team is extended with more members on a temporary basis, if actions have to be executed in corporation with other departments. A monitoring team is set up with the Plant manager as a permanent, and the logistic consultant from Philips-Eindhoven in the Netherlands as a temporary member. The monitoring team controls the implementation and it motivates and gives support if necessary. In particular when both the logistic consultant and the student have left, the supportive and motivative role of the Plant manager becomes very important.

The employees of the Warehouse play a crucial role in the project, therefore they are informed and convinced about the necessity of the every action, before it takes place. The employees are also involved in the evaluation of every action at the end of the month.
5 CONCLUSIONS, RECOMMENDATIONS AND EVALUATION

5.1 Introduction

Now my period at Philips Ralin is ended, it is time to draw conclusions and to make recommendations. The recommendations have been limited to six so they can be comprehended better. In the evaluation in the fourth paragraph some remarks are made of the process, I have been through during the period at Philips Ralin and my functioning.

5.2 Conclusions

The Plant manager of Philips Ralin planned to develop and implement a new control system for the flow of Goods at the Plant. During the Orientation-Phase, the management-team and the student decided by mutual agreement that the student would concentrate on the Warehouse. The conclusion was that the overall performance of the Warehouse was below the required standards. Because the Warehouse is an important factor in the logistic system of Philips Ralin, and its effectiveness is a condition for an effective stock control and production without problems, it was an urgent problem. With regard to the situation at the department, extra efforts and outside assistance were needed to lift the performance to a required level.

The problem at the Warehouse was concluded to be threefold and therefore focused on three objectives:

1 Re-establish communication with clients and give them an steering role in strategic choices and improvement actions of the Warehouse, now and in the future;

2 Upgrade the Warehouse systems to lift up the services to a required performance level.

3 Re-enforce the innovative capacity of the Warehouse by introducing Performance Indicators, borrowing know-how from the other departments on a continuous basis, by setting up improvement-actions together, and by closer monitoring efforts of the Plant manager.

The objective of re-establishing communication between the Warehouse and the other departments, is not only reached by designing and implementing (on paper-) effective communication-instruments. Half the effort or more must be put in restoring the trust between the Warehouse and the other departments. First of all, an attempt must be made to restore the faith of all department-managers (including the Warehouse manager) in the efforts of the Warehouse manager, after which first serious contacts are made. Important is to ensure the self-respect of all the managers. The contacts are characterised by the need for clear agreements to avoid old sores. Therefore it is essential that during this phase and further on, the new expectations are not set too high and not frustrated by careless behaviour of the participants (including the student): Haste makes waste.

19 The Management team consists of all department heads and the Plant manager, excluding the head of the Export Department (who still is a staff-member, not a manager).
During the design-phase it became clear that it was better not to develop technically too sophisticated systems. Both at management and operational level, the ability to reason in the abstract is not well developed and therefore the activities to operate and maintain the systems must be linked to real time objectives on the same operational level. Systems may be elaborated later on, when there more understanding is developed due to training and experience. When systems become more difficult to comprehend, the time to implement these successfully will be longer.

The comparatively fairly elaborated system that is implemented in the Export-store will need assistance for a longer time than the other systems. Also because at first sight it does not seem the most logical system to use, and therefore it is difficult to understand. Special temporary situation will cause confusion. The Glass Factory for example needs an overhaul every period during which it cannot produce and therefore temporary large stocks are kept. In such a situation the Glass-store cannot cope with the amount of glass so part of the lay-out cannot be maintained till the stock level will decreased till a reasonable level. This is not a problem, because it is temporary situation. The problem is, that after the normal situation is restored, the lay-out needs to be practised fully again. This means that understanding of the objective and working of the system, and flexibility in executing the system is required.

The previous conclusions underwrite the statement that management must pay attention to the training and monitoring of the employees who work with the systems. This is a difficult task. Knowledge about these systems and alternatives is an important condition. Having the knowledge, it is easier to enjoy the employees confidence, and confidence is required to make the transfer of knowledge effective. When this process has been started up, the motivation of the employees will become better. At the Plant this process could be noticed during the implementation of the project.

At the moment the know how is not at the Warehouse itself but at the other departments. By organising Consulting and Steering meetings this know-how can be transferred to the Warehouse. The position of the Warehouse manager still is significant and must remain its central place in the transfer. These factors and the use of Performance Indicators which are payed attention to by the Plant management will create more flexibility at the Warehouse. Although the ability to maintain the implemented systems can be developed, still the innovative power (the dynamics) must come from the other departments and the Plant manager.

5.3 Recommendations

The first three recommendations that follow concern the project itself, the other concern the functioning of the warehouse now and in the next future.

1 Time-schedule is commitment. Plans which are confirmed by all participants must be taken seriously. The participants are the Warehouse employees, the Material manager and the Plant manager as well as all temporary participants from the other departments.
CONCLUSIONS, RECOMMENDATIONS AND EVALUATION

2 Both the improvements and the normal operations must be monitored in detail. Because confrontations are avoided and therefore problems are neglected easily, results from activities must be checked frequently and in detail. When problems are found, only the causes are important (these must be solved) not 'whodunit'. When training is given at the workplace and not in the office of the manager, misunderstandings can be detected easier and be solved at once.

3 Motivation is the engine of the project. The employees are getting motivated when they recognize the links between a better performance and their own efforts. Training-efforts, rewards and more responsibilities (with restrictions) will influence motivation positively.

4 Systems need a lot of attention from management. It is noticed more than once in this paper, but systems must be maintained and adapted to new situations time and time again. If this is not done, the Warehouse will revert to the old situation very soon. Also the employees must be convinced of the importance of the systems. Therefore it is recommended to investigate the progress of the transfer of knowledge from the quality Department to the Warehouse. In the design, attention is paid to the quality-norms that also must be known at the Warehouse. Materials must be handled and stored according to the norms. If damage is occurring, the Warehouse employees must know which actions to take. The quality-information must be transferred to the Warehouse and written down. The process involves a training process that is long lasting and heavy, but very important. During the implementation, results were little, so this activity will need more management attention.

5 Evolve the performance indicators. During the project it is made clear that the Performance Indicators are considered to be important. The indicators for the Information Supply Task and the Management Task are developed and implemented successfully. The other two Performance Indicators (PI's) are overshadowed by the efforts made to implement the other improvements.

The thing is to pay attention to these Performance Indicators again and attention to the PI of the Storage Task in particular. This PI is essential to be able to evaluate the success of the improvements made in the follow-ups from the Consulting Meetings with Quality Department. The PI's of the Distribution Task are also important, but they cover partly activities that have less urgent problems and partly involve data which are collected by departments which are clients, so they are heard of anyway and therefore do not disappear.

6 Do not loose contacts with the other departments. Although the frequency and contents of the contacts with the other departments are controlled by the PI of the Management Task, the total effectiveness and efficiency still are difficult to evaluate. Friendly informal contacts contribute effectively to formal cooperation.

Especially the contacts between Material Handling and PPC will become much more effective and efficient if the informal contacts would be frequent and free from stress. Although the cause of the tensions is known and understandable, the current situation is far from optimal.
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consequences of the break-up of the original department in two (PPC and Material Handling) may be not well judged in the past, the short term solution can only be found in a better cooperation. Extra efforts especially of the Material Handling manager are necessarily. No doubt, frustrated feelings keep department managers at bay, but it will not solve the problems. The task of the Plant manager is stimulate an approach which will influence the functioning of the two departments positively on the short term and combining these departments on the long term again.

5.4 Personal Evaluation

My arrival at Philips Ralin Surabaya was not preceded by a project proposal. The project I would assist was not yet chosen and the exact task I would get was not yet known. It was part of the agreement that my task would be subject of discussion between me and the participants of the Logistic Improvement Project just started by the management of the Plant, after I would have made an analysis of the Plant.

Because I did not have an instrument to analyze the data I found at the Plant, it was difficult to arrange the data and come to conclusions. Also because logistics was not a specialism of me, it took time to get used to think about this kind of subjects and to put the new knowledge into order. Therefore I was pleased an internal paper of Berenschot could help me arrange the data effectively and draw my conclusions. If I had made better preparations, the Orientation Phase would have taken only four till six weeks instead of eight.

Characteristic of the interview-session with participants in the logistic system was the open and friendly attitude towards me. For me and the participants this situation was new and interesting. Another characteristic was that detailed information was considered to be of minor importance for me and therefore difficult to get from the interviewed persons. The first result was a lot of information that was not exact enough. Clear was that sometimes I had to press a little, but than information, if available, was given without problems.

It was decided, that I would focus on the Warehouse Organisation. Again no literature could help me in designing improvements. In the 2,5 million inhabitants-town not one book about warehouse systems was available. Because of re-organisations and holidays (July-August) requests for relevant literature at Philips-Eindhoven were not effective. Therefore I had to rely on more or less common knowledge from the university and experience of the period at Philips Ralin Surabaya. It was not a very big problem because the systems which were needed to be implemented were technically not very sophisticated. But of course, standard-solutions already experienced with at other Philips-plants, had to be developed again, and that takes time. Also standards used within Philips did not influence the designs of improvements at the Warehouse.

During the orientation phase it became clear that part of the problems were caused by the frustrated relation between the managers of the departments of PPC and Material Handling. At the start of my period at Philips Ralin I was introduced to the manager of PPC who was my daily supervisor. The
PPC-office was my workplace. So before I wanted to cooperate in the Warehouse Improvement Project, I first had to convince the Material Handling manager of my neutrality. During the whole project my position remained a touchy subject for the Material Handling manager. This situation made it difficult to discuss possibilities to overcome misunderstandings or shortcomings in services of the Warehouse.

It is clear that the design of the improvements is based on the assumption that every Logistic Task is in principle the same for every client, but that the execution of that task is strongly determined by the norms which the client practices for the materials. In this way the Warehouse is developing together with the other departments a kind of product/client structure, but without losing the control over the total, a significant problem in the past. The disadvantage of this system is that the manager can direct its efforts mainly inwards and forget the individual requirements of the clients. This may result in improvements in fields where they are not effective and the other way around. I compensated this danger by emphasizing on the contacts with the clients by making the contacts formal and regular and part of the Management Report (the Performance Indicator), and by immediately involving the clients in the project. Reading the evaluation the Plant manager has send me, I may presume that till now this setting up worked out fine, and at this point I am optimistic about the future.

Assisting the first phases of the Implementation was an essential part of my task in the project. For the Plant it was essential because there was no person available to intensively assist in the start up of the project. For me it was of importance to take the chance to get this experience.

The implementation was both difficult and easy. It was difficult because the valuation of time-schedules and other commitments were not the same for me and the Material Handling manager. For the Warehouse-employees it was hard to say no if they cannot cope with the amount of work involved by the improvements actions. In the beginning of the Implementation Phase I did not reckon with it enough. This could also happen because the transfer of information from the project team to the employees was not always as good as it should be. The employees were also not used to discuss plans or ask questions till they fully understand the information.

On the other hand improvements were easily to implement, because employees do not feel endangered by improvements, they are not suspicious about the project. When they recognized that the project was improving their activities and a member of the project team shows his confidence and his support, the employees are very helpful and very flexible with regarding to overtime.

During the implementation the support for the project from the Plant manager became a significant factor to convince the Material Handling manager of the importance of some urgent improvements.

The pressure from the Plant manager was partly inflicted by the reluctance of the material manager to invest more efforts in the project. His position was very fragile because by my appointment he felt like his department was publicly declared unable to solve its own problems. For him it meant a server loss of face. So the extra objective of the material manager was to come through the project as undamaged as possible. Another factor was the status of my position as a student. It was very difficult for him to take something for granted from an ordinary student. Because I am a western
WAREHOUSE IMPROVEMENT PROJECT

student, it was more or less acceptable. So, for me it was important to stay reserved in the presence of the manager and to take care of the more preliminary work. It was of deep concern to leave the representative function completely to the manager. It took great care and much diplomacy not to be offensive when discussing plans and ideas. After some time, when the first results were visible, and these had a positive influence on the relation with the employees and the clients, the manager took more interest in the succession of the project. This was of vital importance, because without the manager’s will to learn from the project and without his will to take improvements in the daily routine, the project has no use at all. It took time to gain cooperation and more time to gain the conviction that the project was a positive thing to work on. On the other hand, my time was limited and I had a objective to fulfil. Therefore I wanted to get things done in a shorter period than the Material manager was used to and could comprehend. This was a problem that could only solved partly, resulting in the unfinished scheme for November before I left. This was not that bad because the process was already started up. The Material Handling manager and the responsible employee were capable of enough finishing the schedule and start with the other phases of the project.

Through this project I have been in touch with nearly all the cultural characteristics Hofstede named in his essay (see for detailed discussion annex B). This does not mean that the problems and advantages I have met at Philips Ralin would not be occur in a similar project in the Netherlands. Like everywhere in the world every company and every human being is different. Of course, some problems which have been occurred in this project would not occur in the Netherlands in such extend, but the opposite is also true. For me it was very interesting to be part of the operations at the Plant. I am aware of the fact that I have been lucky I was offered the chance to assist in such a project with all the responsibilities, the practical experience and the change to be introduced to an very interesting culture at the other side of the world.
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