

**ACHIEVING AND MAINTAINING INVENTORY
ACCURACY IN A SOUTH AFRICAN MRPII
ENVIRONMENT**

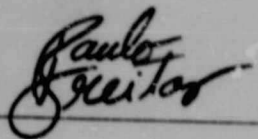
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A project report submitted to the Faculty of Engineering,
University of the Witwatersrand, Johannesburg, in partial
fulfilment of the requirements for the degree of Master
of Science in Engineering.

Johannesburg, 1986

DECLARATION

I declare that this project report is my own, unaided work. It is being submitted for the Degree of Master of Science in Engineering, in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in any other university.



18th day of August 1986

Declaration

ABSTRACT

Achieving and Maintaining Inventory Accuracy in a South African MRP-II Environment, can be realised through the use of Cycle Counting techniques coupled with sophisticated Inventory Management computer systems. These techniques and facilities enable businesses to obtain the 98% inventory accuracy level, as demanded by the MRP-II strategy. The most common causes of errors in inventory records are identified and recommendations are given on how to locate and eliminate them. Attention is also given to aspects crucial to the success of any corporate goal, like a high inventory accuracy. These aspects include the training of manpower and the educational levels in South Africa, of those people responsible for the achievement of such goals.

P. de Freitas

ACKNOWLEDGMENTS

In memory of my father
Jose Jorge de Freitas
whose outstanding guidance I try to follow.
1930-1983

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TABLE OF CONTENTS

1.0 INTRODUCTION	1
2.0 MRP-II - AN OVERVIEW	4
3.0 THE INVENTORY MANAGEMENT MODULE	10
3.1 Benefits of Inventory Management	12
3.2 Inventory Management Overview	15
4.0 SLALOM - THE VITAL ADD-ON SYSTEM TO INVENTORY MAN- AGEMENT	18
5.0 SLALOM IMPLEMENTATION - THE PROJECT MANAGEMENT AP- PROACH	22
5.1 The MRP-II Programme	22
5.2 The Matrix Structure and its Problems	24
5.3 Points to Observe when Implementing Computer Systems on a Project Basis	28
6.0 CYCLE COUNTING	30
6.1 Cycle Counting Versus Annual Physical Inventory	30
6.2 Cycle Counting Objectives	32
6.3 Cycle Counting Phases	33
6.4 Other uses for Cycle Counting	35
6.4.1 Cycle Counting for Open Manufacturing Orders	37
7.0 CYCLE COUNTING PROCEDURES	40
7.1 Cycle Counting Selection	40
7.1.1 The ABC Analysis Technique	41
7.1.2 The Geographical Counting Method	42
7.1.3 Random Selection Counting	43
7.1.4 Transaction Volume Counting	44

7.1.5 Schedule Receipt Date Counting	44
7.2 Allocation of Responsibility	44
7.3 Error Tolerance	45
7.4 Cut-off Control Techniques	47
7.5 Consolidating or Spacing Allocation	
8.0 INTRODUCTION TO THE MATERIALS HANDLING DEPARTMENT	50
8.1 Materials Handling Projects	51
8.2 Other Departments	
9.0 TOOLS FOR A CYCLE COUNTING PROGRAMME	55
9.1 The Cycle Counting Programme	55
9.2 Cycle Count Accuracy Chart	57
9.3 Cycle Count Summary Report	59
9.4 Reconciliation Feedback Report	61
9.5 Stock Adjustment Voucher	61
9.6 Monthly Trouble-shooting Meeting	64
10.0 A FRAMEWORK FOR CYCLE COUNTING	65
10.1 Forces Acting Within the Inventory Management System	65
10.2 Determining the Required Cycle Interval in order to Achieve System Balance	67
10.3 Illustration of the Use of the Formula	68
10.4 Setting the Required Parameters	68
11.0 CAUSES OF ERROR IN INVENTORY RECORDS	72
11.1 Unplanned Transactions	72
11.2 Part identification	75
11.3 Inventory Security	77
11.4 Untimely Transactions	78
11.5 Document Control Procedures	78
11.5.1 Computer Generated Printouts	79
11.5.2 Manually Controlled Sequence Books	80
11.6 Form Design	80
11.7 Working Habits	81
11.8 Flow of Information and Training	82
11.9 Housekeeping	82

11.10 Transaction Security	83
12.0 THE AUDIT TRAIL OF ERROR RECONCILIATION	85
12.1 Open Orders	86
12.2 Manufacturing or Spares Allocation	86
12.3 Transaction History Report	86
12.4 Control Books	88
12.5 Other Departments	88
13.0 TRAINING AND EDUCATION	90
13.1 The Educational Programme	90
13.2 The Training Programme	91
13.3 The "X-Y Charts" Method for the Development of Procedures	92
13.3.1 Advantages and Uses of X-Y Charts	93
13.4 Effects of Educational Levels on Operations	94
14.0 CONCLUSION: 8 STEPS TO ACHIEVE AND MAINTAIN HIGH INVENTORY ACCURACY	101
15.0 APPENDICES	109
15.1 Appendix A	110
15.2 Appendix B	113
15.3 Appendix C	115
15.4 Appendix D	118
15.5 Appendix E	120
16.0 REFERENCES	122

1.0 INTRODUCTION

The industrial concern where the author undertook the projects and approaches described in this report, is the Sulzer Brothers Company - Pump Division.

Sulzer Brothers is a multinational company with its founding headquarters in Switzerland and with factories or agents in every industrialised country in the world. It is a respected name mainly in the field of turbomachinery, where it excels.

In the South African situation, the Pump Division is regarded as the country's leading pump company. It specialises in high-technology pumps such as "boiler-feeders" used by the majority of coal-fired ESCOM power stations and petro-chemical pumps used in complexes like SASOL and in the future Mossel Bay oil-from-gas projects.

As far as size of operation is concerned, this company can be classified as being middle-sized, with approximately 800 people on its payroll. The production space is two thirds factory and one third warehousing. The factory contains forty large machines, including the most modern CNC machines. The rigorous measures of safety, cleanliness and quality control have earned Sulzer the best appraisals from many larger companies, which have carried out audits of Sulzer's complete manufacturing cycle.

Although appearing to be a model company, many problems still kept top management disturbed. One was the complete lack of effective objectives for all systems, manual, mechanical or computerised. The management style was classified as purely autocratic, while a move to a more democratic style was desired. Finally, there was the fact that the stock was running out of control, in both the financial and the physical accuracy aspects. Therefore, a major stocktake project was imminent.

It is important to mention, that due to a headquarter corporate decision, an IBM system 36 computer, supported by MAPICS (IBM's MRP-II) software, had been installed for two years. Due to lack of objectives, only the first two modules of MAPICS had been installed and these were the Product Data Management (the data base) and Inventory Management modules. However, the latter module alone was insufficient to keep inventory under the required control.

Top management decided that a turning point had to be established for the multitude of problems being suffered by the company, and thus developed the following "wish list":

1. To implement with clear objectives, the remaining MRP-II modules in a more efficient manner than in the previous two years.
2. This would have top management support and full MRP-II education would be provided to all. At the same time, up-to-date working procedures and objectives for the division would be established by the newly formed Information Systems Department.
3. To change the highly political environment to a more participative managerial style. The introduction of the MRP-II modules and new working procedures, covering department by department, was seen as the means to achieve this change.

The low stock accuracies and the high stock values led management to concentrate on this sector first. Any strategy to be used by management in the implementation of a project, which would achieve the desired inventory accuracy, had to accomplish the goals of the above "wish list". It was expected that the project's success would provide the turning point needed for the continual fulfilment of the "wish list", during the implementation of the remaining modules.

The project to improve the inventory situation, started with the formation of the project team, where the author who had recently joined the company,

got involved as a team member. The main tasks accomplished were the preparation for a general stocktake, and the investigation for the suitability of software packages to support the Inventory Management module, in order to improve stock accuracy and control. The team was wound up after the stocktaking exercise and the simultaneous implementation of the support package, called SLALOM, were completed.

These projects were the catalysts needed to bring about "change" and to initiate a chain reaction of similar projects and goals throughout the company.

This project describes how the author, now in his new function as Materials Handling manager, continued the effort to obtain and maintain at least a 98% accuracy as demanded by MRP-II. Various techniques such as the systematic improvement of working procedures and the development of a cycle counting programme are also discussed.

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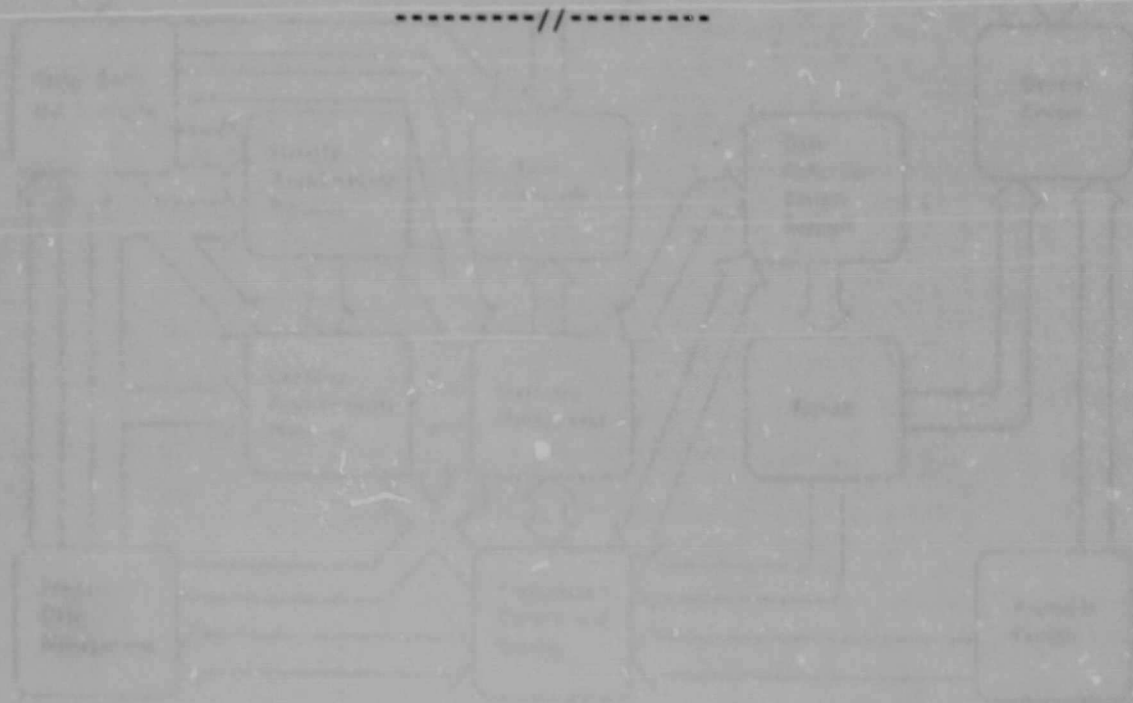


FIGURE 2.1: MRP-II Computerized Inventory Control System

2.0 MRP-II - AN OVERVIEW

MRP-II translates into Manufacturing Resources Planning and as the name implies it combines as many resources as possible into one global plan. This plan is then used to drive the processes of converting inputs into outputs or demands into supplies.

MRP-II is a system consisting of a series of computer packages or programs applying the logic on which the MRP-II philosophy is based. Each module is dedicated to manage, control and provide feedback on a specific manufacturing discipline such as Costing, Inventory Control, Planning, Forecasting and others. The general communication network between modules is shown below, (7), (8):

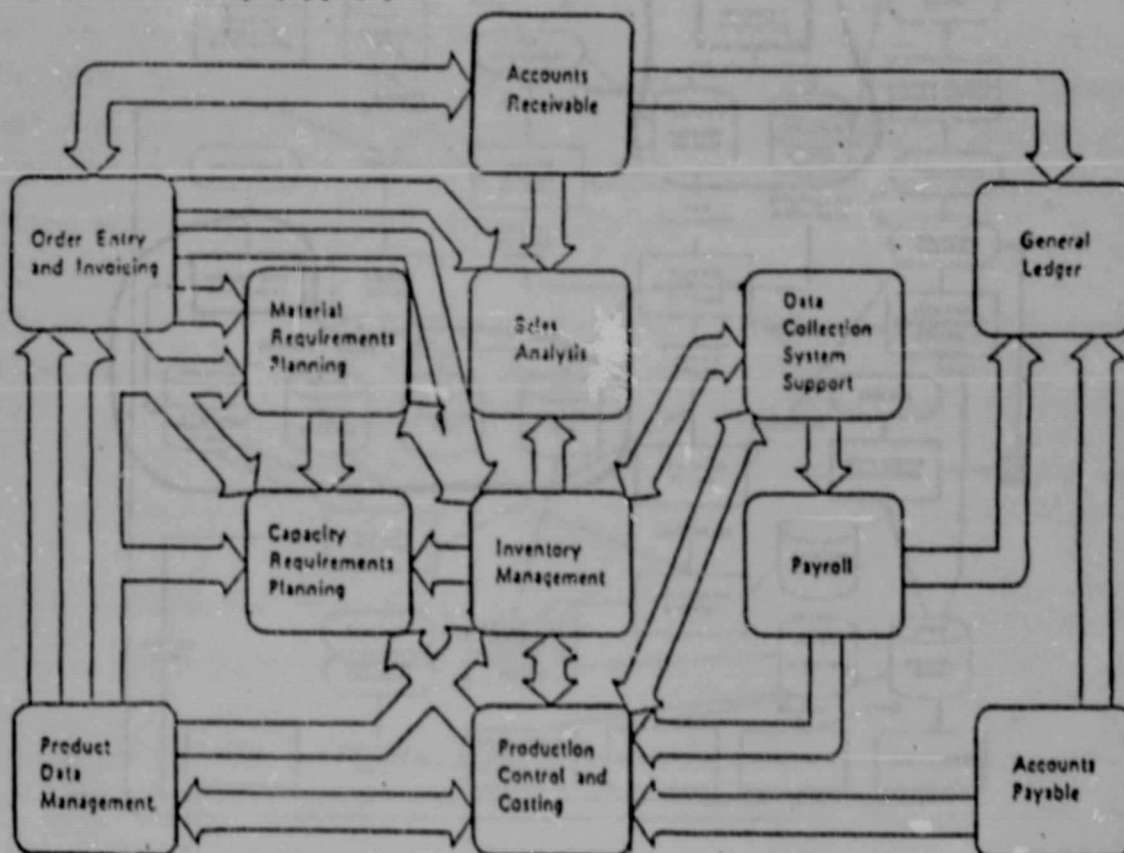


FIGURE 2.1: MRP-II's Communication Network Between Individual Modules, (8).

MRP-II is most successful when tackled as a project, looking at a few modules at a time and building up experience as one advances from module to module. Time is an important factor to bear in mind, since it usually takes several years to fully install MRP-II.

MRP-II should not be mistaken with one of its modules, which is simply called MRP, meaning Materials Requirements Planning (see figure 2.1). Although being one of the most important modules, MRP is one of the simplest to implement. This is because of the stringent requirements that must be met before MRP can be installed.

This report analyses one of these pre-MRP requirements: that of obtaining and maintaining at least a 98% inventory accuracy.

This requirement is crucial, because MRP is "staging" on paper and its information must be trusted to be usable. In order to be trusted it has to have, as an input, very reliable stock figures. With these figures MRP then proceeds with its enormous arithmetic capability of working out future material shortages and then plans to compensate for these shortages, by creating purchase or manufacturing orders.

The other points critical for the success of MRP, but beyond the scope of this report, are the following, (7) & (8):

- **Bill of Materials** must be properly structured to reflect the way they are used in production.
- **Usage per Parent** must be 99% accurate in order to have all parts to ship the product.
- **On-Order Balances** must be accurate on the quantity and arrival dates, since MRP "stages" over a time period and schedules the arrival of replenishments just before stockout.

The general minimum accuracy level of 98% is needed for both finished and raw material inventories, although for accessories, 95% is usually accepted. In our working environment, the range of stock called "accessories" includes small items like screws, bolts, seals, nuts, etc.. These items fall mainly under the C-class of the ABC Pareto classification, that is, those items constituting 80% of the volume but only 20% of the total stock value. Thus a minimum accuracy figure of 95% is adequate for these items.

The following example demonstrates clearly why such a high accuracy is needed to be able to plan effectively. If a component being manufactured is made up of three sub-assemblies and they each have an inventory accuracy of 90%, then the final probability of being able to make the component is only 73% (see figure 2.3).

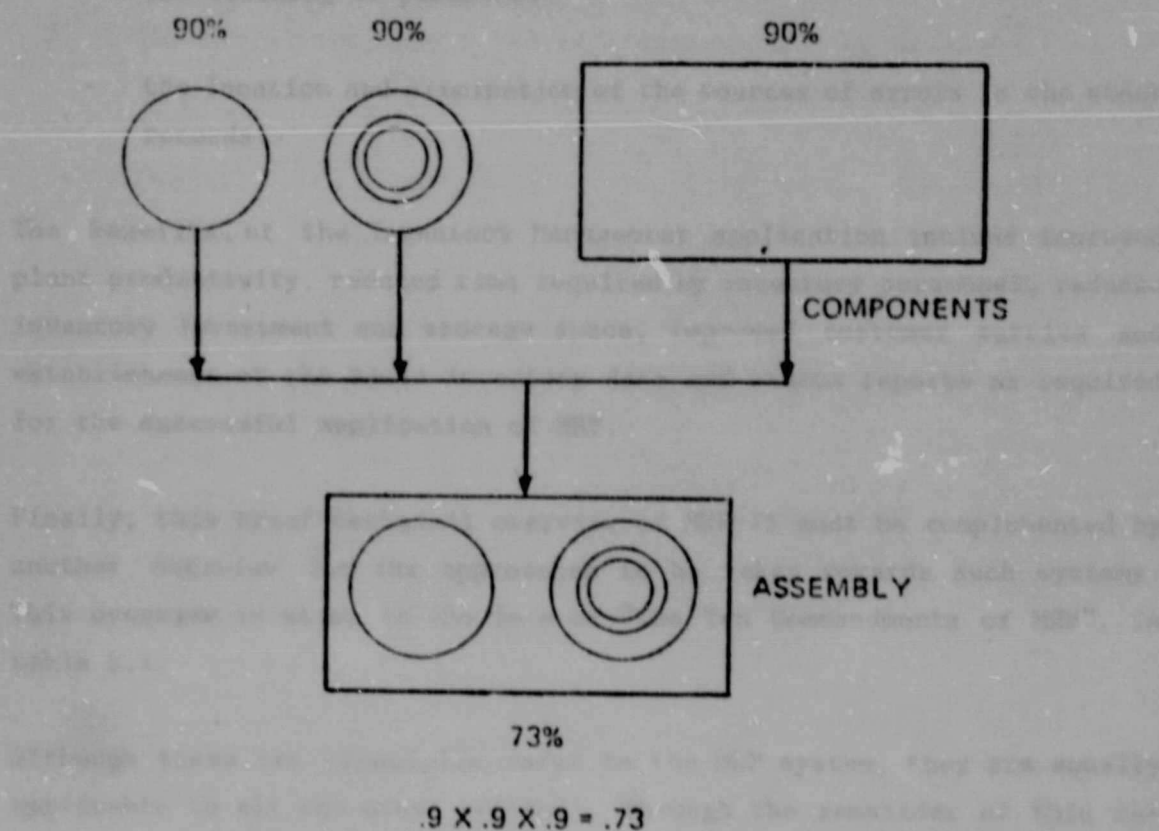


FIGURE 2.3: Effect of Accuracy Levels on the Final Assembly, (7).

If there are ten items, each at a 90% accuracy level, then the final probability is 35%, as compared to 10 items at 98% accuracy where the final probability is 82%. In practice, final products are usually made up of hundreds of sub-assemblies and accessories, which stresses the need for very high accuracies.

The module that is responsible for controlling stock movements is called Inventory Management. It is the second most difficult module of MRP-II to implement after the Master Schedule Planning module. This is because Inventory Management has one of the longest lead time tasks in the entire MRP-II project, that is, to establish stockroom discipline. This discipline consists of:

- limited access.
- the training of personnel.
- the location and elimination of the sources of errors in the stock records.

The benefits of the Inventory Management application include improved plant productivity, reduced time required by inventory personnel, reduced inventory investment and storage space, improved customer service and establishment of the basic inventory data and status reports as required for the successful application of MRP.

Finally, this brief technical overview of MRP-II must be complemented by another overview for the approaches to be taken towards such systems. This overview is shown in the form of "The Ten Commandments of MRP", in table 2.1.

Although these ten principles refer to the MRP system, they are equally applicable to all the other systems. Through the remainder of this report, the relevance of these principles will be noticeable in the steps taken towards achieving high inventory accuracy.

TABLE 2.1: The Ten Commandments of MRP (*)

- I. Thou Shalt Acquire and Sustain Thy Management's Support.
- II. Thou Shalt Establish Accountabilities for the Accuracy of Thy Data.
- III. Thou Shalt Set Objectives and Measure Thy Performance Against Them.
- IV. Thou Shalt not Place Thy Least Experienced in Thy Company's Most Critical Positions.
- V. Thou Shalt not Economise on Education Thy People.
- VI. Thou Shalt not Endeavour Implementation Without Experience.
- VII. Thou Shalt not Duplicate The Informal System on Thy Computer.
- VIII. Thou Shalt not Omit Tasks in Thy Haste nor Prolong Them for Thy Comfort.
- IX. Thou Shalt not Bear False Witness, Declaring MRP a "Data Processing" System.
- X. Thou Shalt not Expect MRP to Eliminate all Thy Problems.

(*) - Origin unknown, but issued during a MRP course done by HP.

3.0 THE INVENTORY MANAGEMENT MODULE

The Inventory Management module is a computerised system which handles, amongst other inventory control functions, the processing of stock transactions to and from the warehouse. Essentially, there are four different inputs to the Inventory Management module, as shown in the figure below:

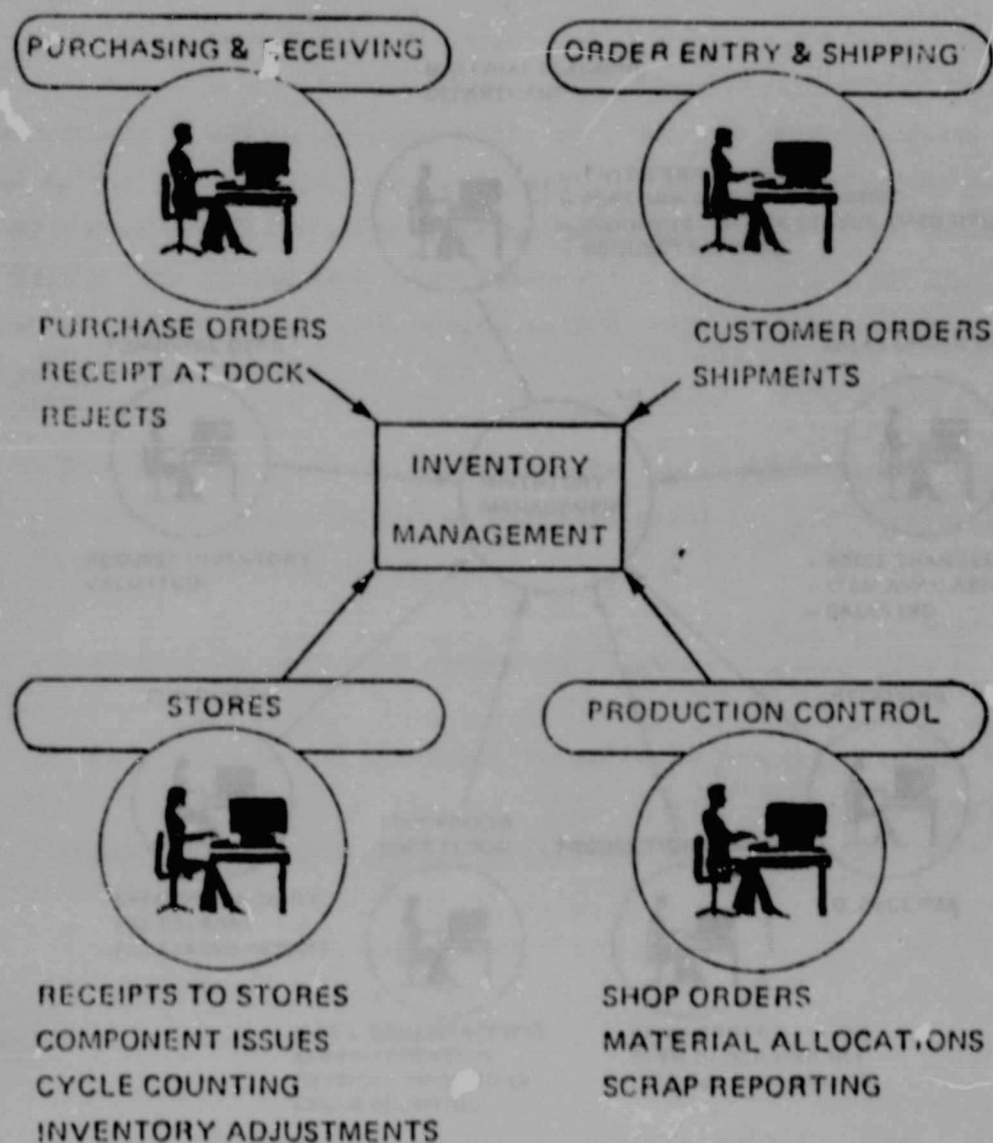


FIGURE 3.1: On-Line Processing of Inventory Transactions, (8).

Note that all the inputs from the above four sources are *on-line* and this is where the greatest advantage over manual inventory control systems lies. The information in a computerised system is instantly available to anyone outside the Materials department, thereby increasing departmental productivity immensely. For example, the Sales department no longer needs to physically investigate, in the workshop or in buying, the status of their customer orders, but can now simply inquire through their own terminals.

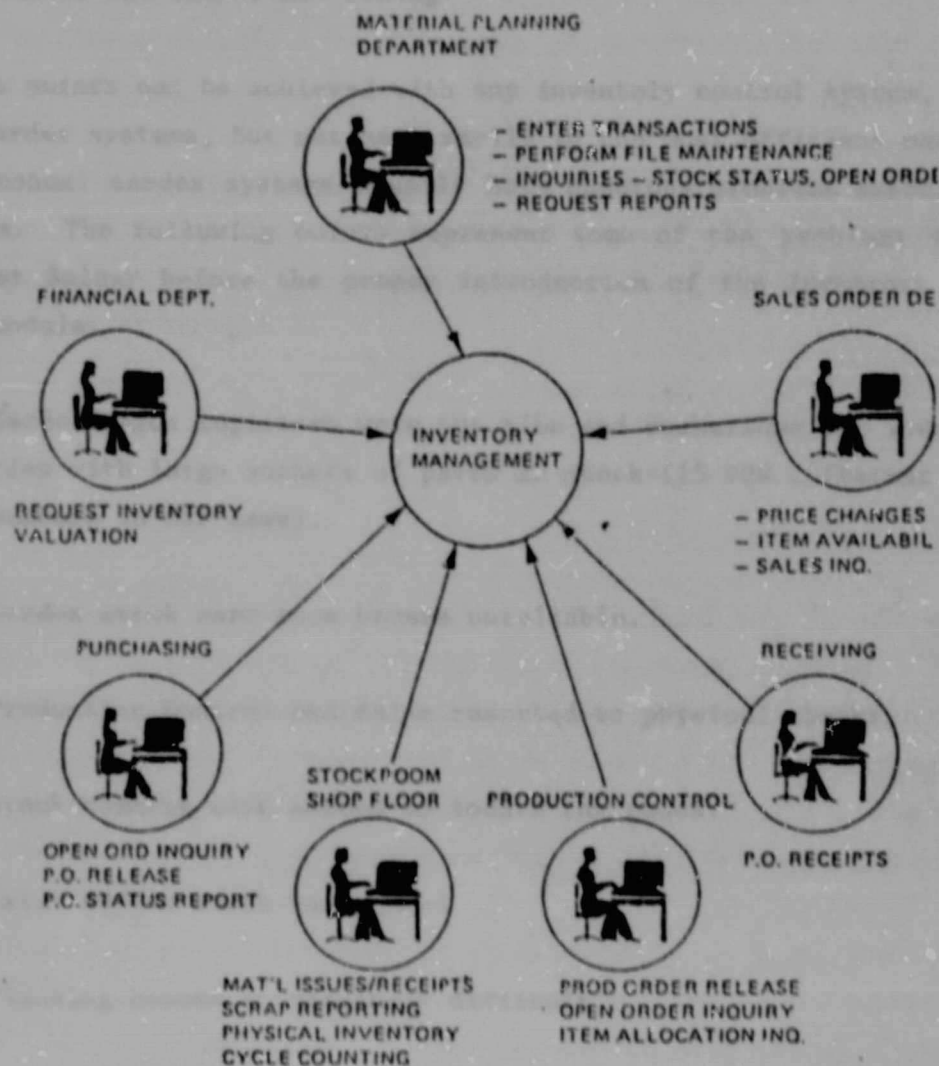


FIGURE 3.2: Inventory Management's Relationship to Functional Departments, (8).

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